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TECHNOLOGY INDORE

A compendium of

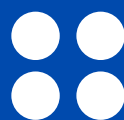
Ideas, Innovations & Technologies of IIT Indore



THE TECHNOLOGY
HANDBOOK

Feb 2026

3rd EDITION



ADDRESS FOR CORRESPONDANCE

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From the Director's Desk



It is my pleasure to present the third edition of A Handbook of Ideas, Innovation & Technologies of IIT Indore. This edition showcases technologies developed by the faculty members of IIT Indore along with their students, reflecting the Institute's continued emphasis on innovation and translational research.

IIT Indore has been consistently working towards enhancing the technology readiness levels of outcomes arising from

fundamental and applied research. This handbook provides a brief overview of indigenously developed technologies that have been patented or are under the process of patenting, including updated and newly added technologies since the previous edition.

We invite technology enthusiasts, entrepreneurs, industry leaders and other stakeholders to engage with us to explore these technologies further. The Institute remains committed to supporting interactions, demonstrations, and collaborations, and welcomes feedback and suggestions.

I sincerely appreciate the efforts of the faculty members and the Research and Development section along with the students involved in this who have contributed to this edition. I wish them continued success in translating research outcomes into prototypes and products with societal and industrial relevance.

We hope this compilation will further extend the reach and impact of IIT Indore technologies for the benefit of society.

Prof Suhas Joshi

Ph.D., FNAE, FNASc

Director, IIT Indore

Dean's Message



I am pleased to present the third edition of A Handbook of Ideas, Innovation & Technologies of IIT Indore, which highlights the research-driven technologies developed by the faculty members and students of the Institute.

IIT Indore continues to strengthen its research, innovation and research outreach initiatives to ensure that outcomes of fundamental and applied research translate into deployable technologies. This handbook presents an overview of patented and patent-pending technologies, including new and updated innovations since the previous edition.

I encourage industry, startups, entrepreneurs and other stakeholders to engage with us through collaborative research, technology transfer and consultancy. I sincerely appreciate the efforts of all contributors involved in compiling this edition and am confident that it will further enhance the visibility, outreach and impact of IIT Indore's technologies.

Prof. Abhirup Datta

Dean

Research & Development
IIT Indore

Associate Dean's Message



I am pleased to share the third edition of A Handbook of Ideas, Innovation & Technologies of IIT Indore, which presents a snapshot of the innovative technologies developed by our faculty members and students.

The Institute continues to strengthen its research ecosystem by streamlining processes related to project staff recruitment, administrative support, and human resource management, ensuring that research activities are carried out efficiently and effectively. These efforts aim to create a supportive environment that enables researchers to focus on innovation and technology development.

I appreciate the contributions of the faculty, students, and the Research and Development section in bringing out this edition. I am confident that this handbook will further promote the visibility of IIT Indore's technologies and encourage meaningful collaborations.

Prof. Surya Prakash

Associate Dean

Research & Development

IIT Indore

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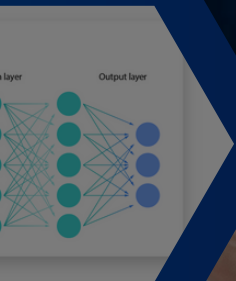
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This is the compilation of the technology details shared by faculty members of IIT Indore

Advanced Computing

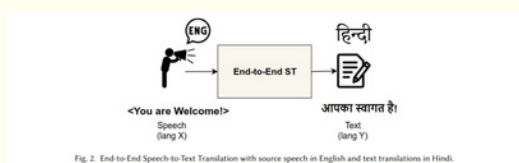
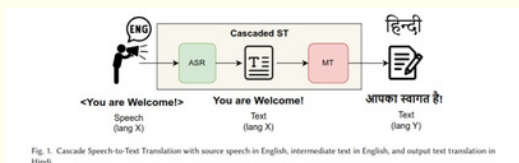
(Supercomputing, AI, Quantum Computing)



Speech-to-Text/Speech Translation of Indic Languages

The research focuses on Speech-to-Text (S2T) and Speech-to-Speech (S2S) Translation for 15 Indic languages, using cascade, end-to-end, and multilingual models. The study addresses the challenge of low-resource languages by converting source speech into target language text or speech. It utilizes advanced techniques like pre-trained models, data augmentation, and zero-shot learning.

The project includes a 7K-hour English speech dataset, 22 million parallel sentences, and 459 million tokens, using transformers and Language IDs for translation. Applications include online education, subtitles, and accessibility. Dataset creation is completed, and the focus is on improving efficiency for Translation Indic Languages.



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PATENT

Nil

RELEVANT INDUSTRIES

Education Healthcare
Media Legal
Entertainment Communication

INVENTORS

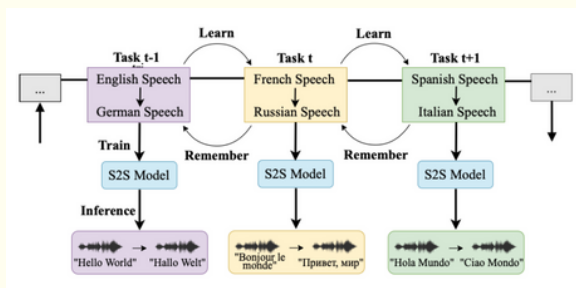
Nivedita Sethiya
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Science and Engineering)

A System and Method for End-to-End Continual Speech-to-Speech Translation

This invention is an audio-language machine learning model for multilingual speech-to-speech translation. It uses self-supervised and continual learning, updating the model incrementally while maintaining a replay buffer of previously trained language samples.

The model prevents catastrophic forgetting through gradient-based sampling and a combination of language-proportional and random sampling, eliminating the need to store and retrain on entire past datasets.

The approach enables efficient, lifelong learning for multilingual speech-to-speech systems, supporting incremental updates without performance degradation. It can be used for voiceover.



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PATENT

Published

RELEVANT INDUSTRIES

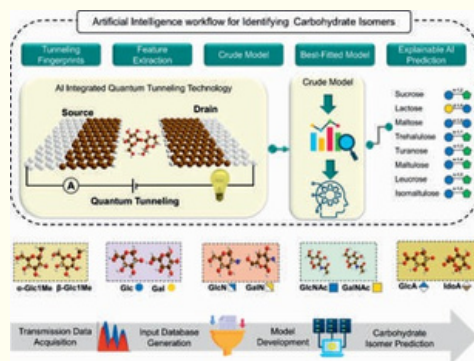
Sony Samsung
Amazon Netflix

INVENTORS

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Balaram Sarkar
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AI Integrated Quantum Tunneling for Stereoselective & Regioselective Identification of Carbohydrate Isomers

The AI-integrated quantum tunneling approach for stereoselective and regioselective identification of carbohydrate isomers aims to provide a quick and accurate platform for sequencing carbohydrates, a major stumble block in the progress of glycosciences. Carbohydrate isomers, which share the same molecular formula but differ in the spatial arrangement of atoms, pose significant challenges in structural identification due to their subtle variations in pyranose and furanose ring sizes, stereochemistry, anomericity, and diverse regiochemistry of glycosidic linkages. The core objective of our technology is to deliver rapid and cheap high-throughput carbohydrate sequencing by capturing the unique electronic signatures of carbohydrate isomers, encompassing a broad range of anomers, stereoisomers, and regioisomers at single molecule resolution.



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PATENT

Nil

RELEVANT INDUSTRIES

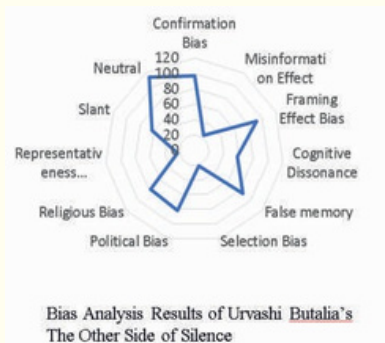
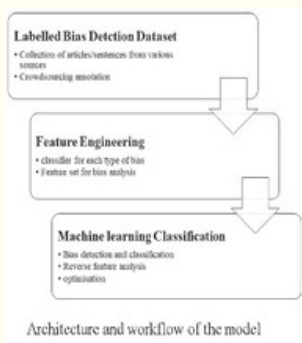
AI/ML Biotechnology
Pharmaceutical Material Science
disease diagnostic drug development

INVENTORS

Prof. Biswarup Pathak
(Department of Chemistry)

A Semi-Automated Target-oriented Linguistic Bias Detection and Classification Tool For 1947 Partition Texts

Bias analysis estimates the rationale, direction, and magnitude of systematic errors influencing measures of associations in a text (Lash et al., 2016; Frampton et al., 2022). It helps readers critically review information. This tool categorizes biases across ten linguistic categories in 1947 Partition texts. The dataset includes 6,850 sentences from Partition texts and Wikipedia articles under the NPOV (Neutral Point of View) dispute category. For the detection module, this study adapts the methods from the metrics of Chen et.al (Chen,2020; Chen,2020; Chen,2018) and Pryzant et.al (Pryzant, 2020). Using RNN (Recurrent Neural Network) classifiers with GRU (Gated Recurrent Unit) cells of size 32, the study employs GloVe word embedding dimension of 50, Adam optimizer, and a 0.001 learning rate to detect word- and sentence-level bias strength.



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PATENT

Nil

RELEVANT INDUSTRIES

Social Media Scholarly
Analytics Publishing

INVENTORS

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System and Method for Summarization of Speech to Text/Speech Translation

This work introduces a cross-lingual speech-to-text/speech summarization system that converts speech in one language into summarized text/speech in another. The two-stage cascade model integrates speech recognition, machine translation, text summarization, and text-to-speech synthesis, optimized for low resource languages like Hindi, Bengali, and Tamil.

The approach uses synthetic datasets and pre-trained models like BART, mT5, and mBART, employing a two-stage pipeline to reduce training time and error propagation. Potential applications include news summaries, educational content localization, and accessibility for multilingual audiences. The dataset and baseline models are ready for public release.



Fig. 1. Cascade Speech-to-Text Translation with source speech in English, intermediate text in English, and output text translation in Hindi.

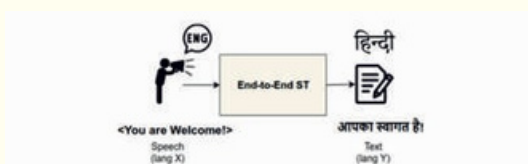


Fig. 2. End-to-End Speech-to-Text Translation with source speech in English and text translations in Hindi.

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PATENT

Under Process
(Indian Patent application No.
202421035153)

RELEVANT INDUSTRIES

IT Media
Education Customer Support

INVENTORS

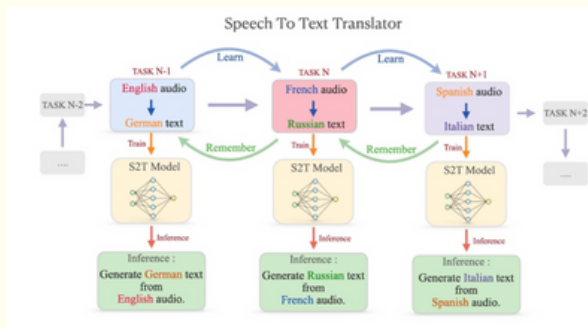
Nivedita Sethiya
Balaram Sarkar
Dr. Chandresh Kumar Maurya
(Department of Computer
Science and Engineering)

System And Method For Speech-To-Text Translation Based On Continual Learning Technique

This invention presents a system for end-to-end speech-to-text translation with continual learning. The model converts speech in one language to text in another while updating itself to prevent performance degradation across multiple languages.

The model supports incremental learning by maintaining a replay buffer of previously trained language samples, eliminating the need to store all past data. It prevents catastrophic forgetting through gradient-based sampling followed by a mix of language-proportional and random sampling.

This approach enables efficient, lifelong learning, enhancing multilingual speech-to-text systems without retraining on entire datasets.



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PATENT
Published

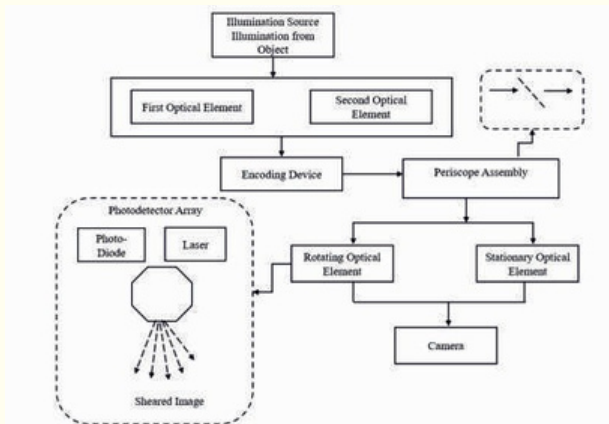
RELEVANT INDUSTRIES
Sony LG
Samsung Boat

INVENTORS

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Chandresh Kumar Maurya
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Science and Engineering)

Continuous Snapshots-Based Compressed Optical Streaking

The Continuous Snapshots-Based Compressed Optical Streaking Ultrafast Photography (COSUP) system redefines high-speed imaging by combining reference and sheared imaging in a single, compact design. Featuring a periscope assembly, rotating optical element, and photodetector array, COSUP captures both stationary and sheared images simultaneously on a single camera sensor, eliminating the need for expensive delay generators. This breakthrough enables continuous imaging of long-duration ultrafast phenomena, addressing challenges in existing systems. Optimized for reduced complexity and cost, the COSUP system is particularly suited for small to medium R&D organizations, defense applications, and advanced research.



lldeshmukh@iiti.ac.in

PATENT

Application No. 202421093794

RELEVANT INDUSTRIES

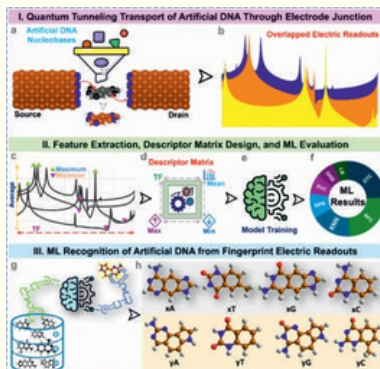
Aerospace R&D
Defense

INVENTORS

Prof. Devendra Laxmanrao
Deshmukh
(Department of Mechanical
Engineering)

Machine Learning Recognition of Artificial DNA Sequence with Quantum Tunneling Nanogap Junction

Artificially synthesized DNA has immense potential to revolutionize biotechnology, genetics, and DNA-based data storage. Accurate and rapid electrical identification of these synthetic DNA molecules is essential for their practical applications. This developed technology demonstrates a new approach for accurately identifying synthetic DNA nucleobases using quantum tunneling transport and machine learning. By analyzing how these nucleobases interact within model nanogap devices, unique electric conductance signals were captured, and the underlying molecular properties influencing these signals were analyzed. Further, machine learning models enabled precise and reliable predictions, showcasing the feasibility of electrical recognition of artificial DNA. This breakthrough has far-reaching implications in genetic research, synthetic biology, and next-generation data storage technologies.



The image shows the quantum tunneling transport through an artificial DNA nucleobase electrode nanogap junction and the step-by-step machine learning (ML) workflow for the recognition of artificial DNA.

biswarup@iiti.ac.in

PATENT

Filed, Indian Patent Application
No. 202421104096

RELEVANT INDUSTRIES

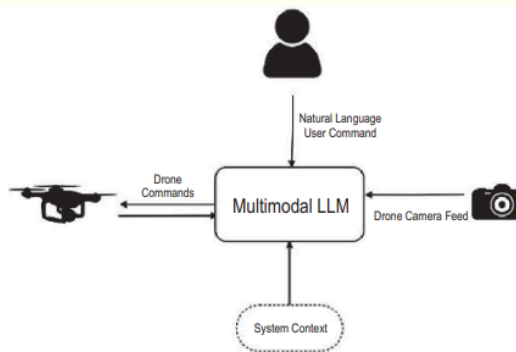
Disease diagnosis Biotechnology
DNA data storage Synthetic Genomics

INVENTORS

Prof. Biswarup Pathak
(FNASC, FRSC)

PromptPilot: Drone Control using Multimodal AI

PromptPilot offers a groundbreaking approach to UAV control through multimodal AI, enabling autonomous task execution via simple text inputs and live video feeds. A transformer-based multimodal LLM converts natural language queries and real-time drone footage into machine-readable code, enhancing versatility and reducing the need for technical expertise. Users can interact with the drone through a locally hosted web interface that supports live video streaming and control via chat commands or keyboard navigation, making UAV operation more accessible and efficient.



kvivek@iiti.ac.in

PATENT

Under process

RELEVANT INDUSTRIES

Surveillance and security,
agricultural, and site

INVENTORS

Tarun Balaji, Sunku Vineet, Dr.
Vivek Kanhangad, Department
of Electrical Engineering

Crypto-Steganography Tool

Crypto-Stego tool simulates and analyses the functionality of crypto-based steganography approach for securing DSP hardware accelerators against piracy and false claim of ownership threats. The Crypto-Stego tool accepts the DSP application input in the form CDFG along with module library and resource constraints. The tool shows all the intermediate steps of crypto-based steganography and the finally generated stego-constraints at the output. Further, it also generates scheduling and registers allocation pre and post embedded steganography constraints, onto the output window. The embedded steganography constraints in the hardware accelerator design can be used as digital evidence to secure against piracy threats.



asengupta@iiti.ac.in

PATENT

Nil

RELEVANT INDUSTRIES

VLSI, Hardware security

INVENTORS

Prof. Anirban Sengupta
Mahendra Rathor
(Department of Computer
Science and Engineering)

KHC-Stego Tool: Key-Triggered Hash-Chaining Driven Steganography Tool

KHC-Stego tool simulates and analyses the functionality of key-triggered hash-chaining driven steganography approach for securing DSP hardware accelerators against piracy and false claim of ownership threats. The KHC-Stego tool accepts the DSP application input in the form CDFG along with module library and resource constraints. The tool generates output of intermediate steps of key-triggered hash-chaining based steganography, finally generated stego-constraints, the security metric in terms of probability of coincidence, pre and post-steganography design cost. The embedded steganography constraints in the hardware accelerator design can be used as digital evidence to secure against piracy and false claim of ownership threats.



asengupta@iiti.ac.in

PATENT

Nil

RELEVANT INDUSTRIES

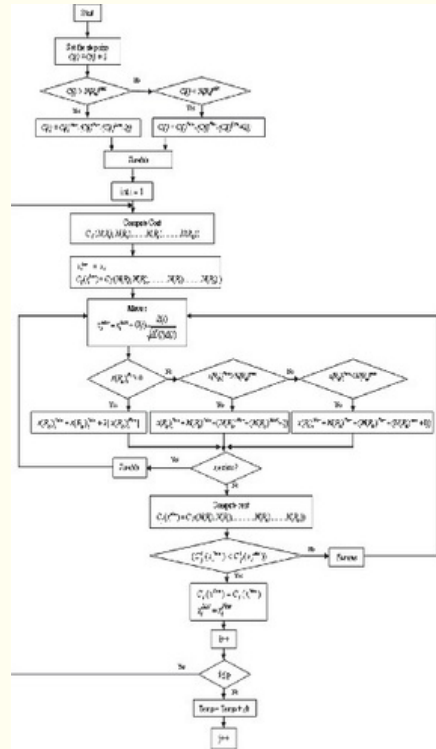
VLSI, Hardware security

INVENTORS

Prof. Anirban Sengupta
Mahendra Rathor
(Department of Computer
Science and Engineering)

Design Space Exploration System and Method There of Using A Bacterial Foraging Optimization Mechanism

An apparatus and method for automatically exploring a design space of an untimed CDFG during HLS, using a bacterial foraging optimization (BFO) mechanism, for designing or obtaining an application-specific processor is disclosed. The apparatus comprises of one or more processing unit(s) configured to: initialize bacterium position corresponding to resource configuration, wherein said bacterium are uniformly distributed over said design space; perform a chemotactic movement of said bacterium, by means of a specialized chemotaxis mechanism of said BFO, to enable change in position of bacterium from original or past position to new or present position.



asengupta@iiti.ac.in

PATENT

Granted, Indian Patent No. 366323

RELEVANT INDUSTRIES

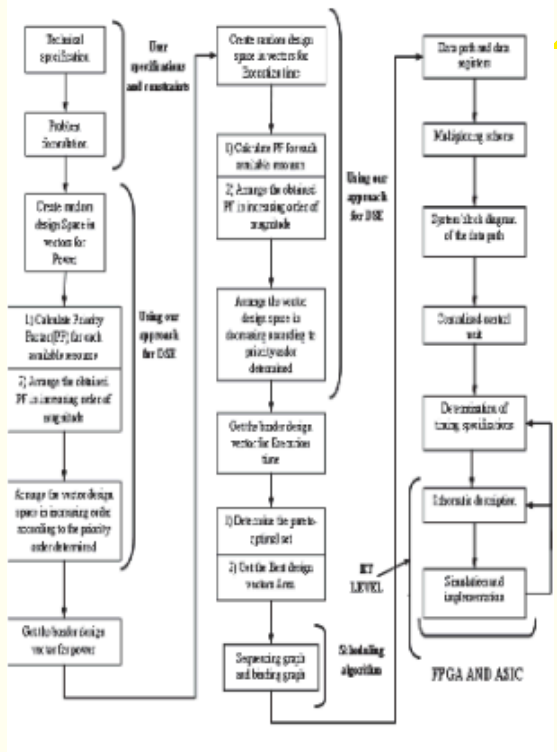
Chip Design, Hardware Security

INVENTORS

Prof. Anirban Sengupta
(Department of Computer Science and Engineering)

System and Methodology for Development of a System Architecture Using Optimization Parameters

Described embodiments involve methods, systems, and computer-readable media for system architecture development. Resource constraints specify the maximum available resources, while optimization parameters, including a final one, are defined. A design space consists of vectors representing various resource combinations, and a priority factor function is established for each optimization parameter.



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PATENT

Granted, USA Patent No. 8397204

RELEVANT INDUSTRIES

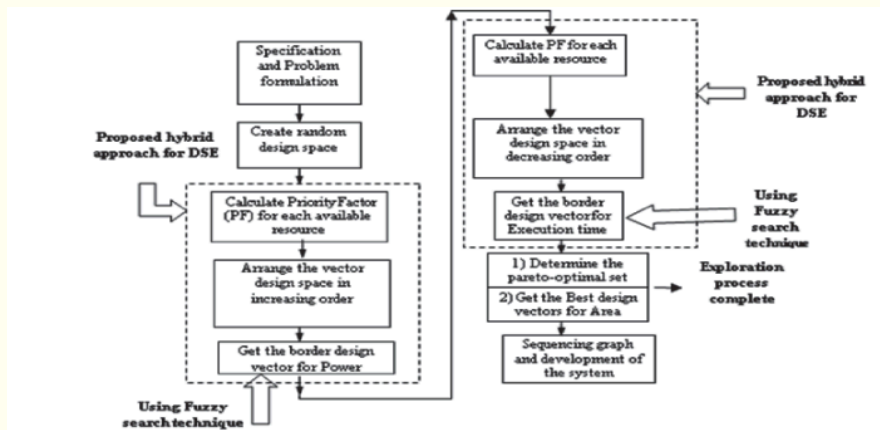
Chip Design, Hardware Security

INVENTORS

Prof. Anirban Sengupta
(Department of Computer Science and Engineering)

System and Method For Development of System Architecture

Methods, systems, and computer readable medium for developing a system architecture that involves defining resource constraints for kinds of resources and constraint values for optimization parameters, and defining a design space as variants, where each variant is a vector. Satisfying sets of variants are determined for optimization parameters by assigning membership values to each variant of a universe of discourse set and performing a fuzzy search of a universe of discourse set using the corresponding membership values. A set of variants is determined based on an intersection of the satisfying sets of variants.



asengupta@iiti.ac.in

PATENT

Granted, Canadian Patent No.
CA2741253A1

RELEVANT INDUSTRIES

Chip Design, Hardware
Security

INVENTORS

Prof. Anirban Sengupta
(Department of Computer
Science and Engineering)

Agri & Food Technologies



Early Disease Identification in Crops using AI based Hyperspectral Remote Sensing

Crop diseases cause significant crop losses, affecting food security. An end-to-end solution using Deep learning based hyperspectral remote sensing has been developed to detect diseases in soybean leaves at an early stage. The hyperspectral camera captures spectral signatures of chlorophyll content, leaf structure, and water content. The developed model recognizes discriminatory features from hyper spectral data that can distinguish between healthy and diseased leaves yielding realistic disease monitoring. The technology developed can provide an efficient, scalable solution for precision agriculture for other crops as well and prevent the spread of diseases, minimize crop losses and reduce the use of pesticides.

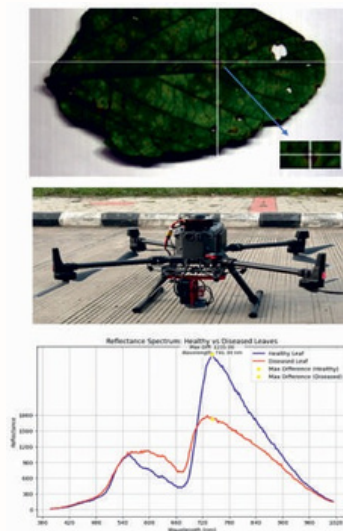


Fig: The top panel shows deceased soybean leaf, middle panel shows the UAV integrated with hyperspectral camera payload and bottom panel shows the spectral variation between healthy and diseased leaf

saurabh.das@iiti.ac.in

PATENT

Nil

RELEVANT INDUSTRIES

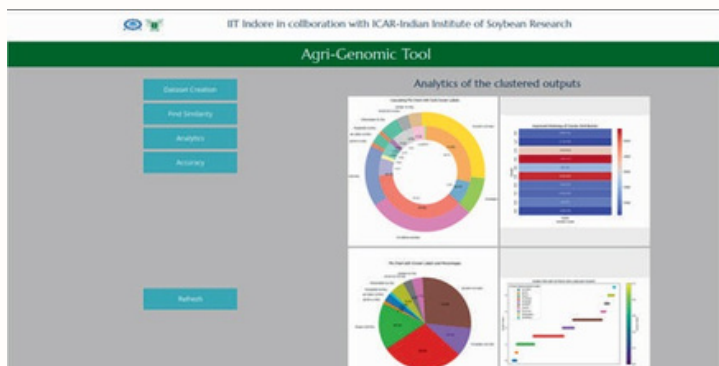
Agriculture Aerospace
Environmental Defense
Monitoring Forestry

INVENTORS

Mr. Abhishek Darwai
Dr. Saurabh Das
(Department of Astronomy,
Astrophysics & Space Engineering)

AgGeno

AgGeno is an end-to-end plant genome data analysis tool. By identifying special traits for improving seed quality, we aim to cut down the time for production for farmers. The tool is equipped with the integration of pipelines for sequence quality analysis, genomic data assembly, and the establishment of a standardized variant calling pipeline. Novel dataset creation (Soybean SNP sequence dataset) and feature extraction techniques have also been developed. The first prototype consists of algorithms for clustering and classification of genomic data, and a user friendly Graphical User Interface (GUI) has been developed to streamline data input and output processes.



artiwari@iiti.ac.in

PATENT

Nil

RELEVANT INDUSTRIES

Agriculture

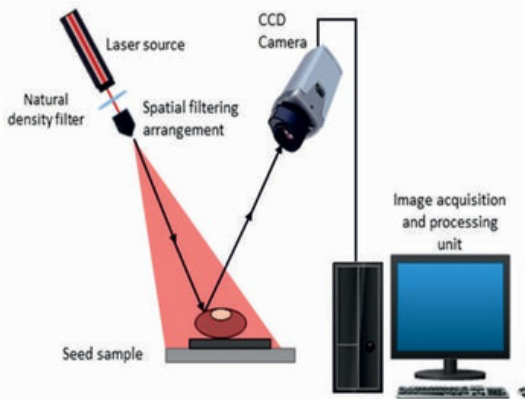
INVENTORS

Prof. Aruna Tiwari
(Department of Computer
Science and Engineering)

**In collaboration with Dr. Milind Ratnparkhe, ICAR-IISR Indore
& Devaditya Technocrats Pvt. Ltd.**

AI Based Soyabeen-Seed Viability Sensor for Assessment of Seed-Quality

Agriculture is crucial for India's economic and human development. This interdisciplinary work integrates laser biospeckle with deep learning to automate real-time seed quality estimation. A deep learning-based framework extracts spatial and temporal features from speckle images, employing models like convolution neural networks (CNN), deep neural networks (DNN), recurrent neural networks (RNN), and artificial neural networks (ANN). The technology, at TRL 3-4, has no current equivalent; C-DAC's Aanadarpan uses only 2D imaging. This product enables seed testing for farmers in rural and urban areas, supports industries enhancing seed productivity, and serves as a training tool for academic institutes.



vbhatia@iiti.ac.in

PATENT

Granted, Indian Patent No. 389627

RELEVANT INDUSTRIES

Agriculture Seed Industry
Farming

INVENTORS

Prof. Vimal Bhatia
(Department of Electrical
Engineering)

Development of Mobile App for Farmers to Help Them in Agricultural Activities: Krishi Sewa

The "Krishi Sewa" app assists farmers and stakeholders with potato crop management. It features identification of 17 major diseases and insects, confidence score and threshold mechanisms, and a database creation facility. The app asks questions related to symptoms to confirm diseases. Future plans include integrating Machine Learning models for disease and pest prediction using weather and other parameters, with precision agriculture, image processing, and AI/ML technologies. Currently in its final stage, the app will be used by ICAR-CIAE Bhopal. Developed under the Center for Rural Development and Technology (CRDT), IIT Indore, it aims to improve crop yields and empower farmers.



artiwari@iiti.ac.in

PATENT

Upon completion of the app, it will be copyrighted and given to ICAR-CIAE for future use

RELEVANT INDUSTRIES

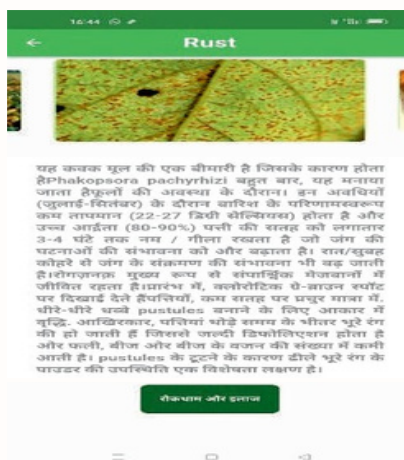
ICAR-CIAE Bhopal Farmers
NGOs

INVENTORS

Krish Agarwal
Divya Agarwal
Yash Vasistha
Shashi Rawat
Prof. Aruna Tiwari
(Department of Computer
Science and Engineering)

Crop Doctor: An Extensive Soybean Information App

The Crop Doctor app helps identify diseases and insects in Soybean crops. It provides information on major diseases, insect identification, soil health, and weather in English and Hindi. The app has been developed and is in the copyright process. Soybean, a vital oilseed crop in India, faces yield losses due to pests and diseases. This app allows farmers to upload crop pictures, identify issues, and receive treatment suggestions. It promotes sustainable farming by enhancing soil health using biological control agents. Developed under the Rural Technology Action Group (RuTAG) initiative, the app supports farmers in managing pests efficiently and economically.



artiwari@iiti.ac.in

PATENT

Currently in Copyright Process

RELEVANT INDUSTRIES

ICAR-IISR Indore NGO
Agricultural 'Samarth Society'
Bhopal

INVENTORS

Rajesh Dwivedi
Pranjal GadgeP
arul Mogre
Dr. Milind Ratnaparkhe
Prof. Aruna Tiwari
(Department of Computer
Science and Engineering)

An Alternative To Cold Storages- Development of A Portable Kit for Visible Light Photo Dynamic Inactivation of Microbes on Food Surfaces From Ultraviolet Towards Visible Light: A Sustainable Future

Cold storage contributes to environmental damage through greenhouse gas and carbon emissions. To address this, solutions are needed to reduce emissions and make the global food cold chain sustainable. Current approaches focus on energy efficiency and refrigeration emissions. Due to rising cold storage costs for small and marginal farmers, alternative storage methods are essential. We propose using Photodynamic Inactivation (PDI) of microbes as an alternative for storing vegetables and grains in cold storage, providing a more sustainable option to mitigate the financial burden on farmers while reducing environmental impact.



Photodynamic Inactivation Towards Microbes



2nd Phase with 1st Phase Expt.



sarkard@iiti.ac.in

PATENT

Flied, Indian Patent Application No.
202421010243

RELEVANT INDUSTRIES

Agriculture Food Industries
Healthcare

INVENTORS

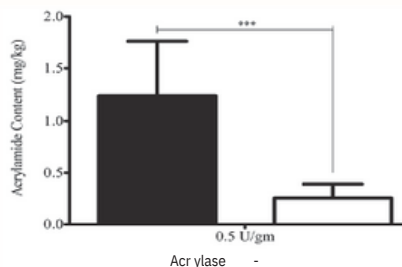
Niladri Sekhar Roy
Dr. Debayan Sarkar
(Department of Chemistry)

Development of Acrylase Formulation to Reduce Acrylamide Carcinogen Formation in Processed Food Products

An increased consumption of processed food has resulted in sharp increase in the incidences of cancer development in human being. Studies have shown that cooking of starch and carbohydrate rich food products at high temperature produces a carcinogen called “Acrylamide”, which increases risk of cancer development in humans. We have developed thermostable “Acrylase” enzyme formulation, which reduced more than 90% acrylamide production in processed food products such as French fries, buns, bread and bakery products after treatment with Acrylase enzyme. Product formulation done for the technology (TRL 6). Acrylase will reduce acrylamide production in widely consumed processed food products, thus will reduce risk of cancer development and improve quality of human life.



Acrylamide containing processed food



Treatment with “Acrylase” reduced 90% acrylamide production in processed foods

asonawane@iiti.ac.in

PATENT

Under process

RELEVANT INDUSTRIES

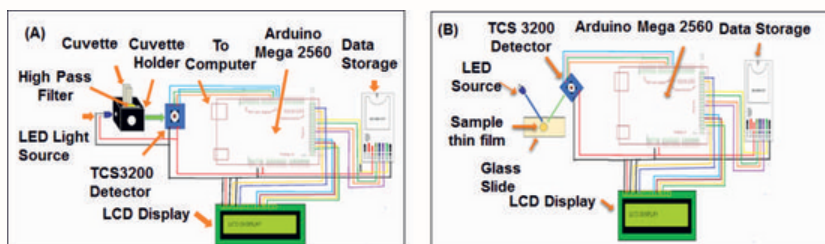
Food Sector

INVENTORS

Prof. Avinash Sonawane
(Department of Biosciences and
Biomedical Engineering)

Portable Biosensing System and Method for Milk Spoilage and Adulteration Detection

This invention relates to the a portable biosensing system and method for milk spoilage and adulteration detection. The invention provides a color sensor-based device that is interfaced with the Arduino controller tested using a ratio-metric fluorescent assay. The computational coding in Arduino enables us to read the red green-blue (RGB) parameters and display them on the liquid crystal display panel. The fluorescent responses were compared against a commercial fiber optic spectrometer. The processed data can be sent providing real-time information of milk quality to the buyer so that it helps to overcome the illegal practices during processing, packaging, and transportation.



abhijeet.joshi@iiti.ac.in

PATENT

Filed, Indian Patent Application No.
2021210232421

RELEVANT INDUSTRIES

Healthcare

INVENTORS

Sandeep Choudhary
Tanmay Vyas
Abhijeet Joshi
(Department of Biosciences and
Biomedical Engineering)

A Mobile App-Based Real-Time Groundwater Monitoring Platform at Village Scale with Smart Irrigation Integration

The proposed technology focuses on developing a village-scale mobile application that enables near real-time assessment of groundwater levels using artificial intelligence and machine learning techniques. Instead of relying on physical measurement devices, the system integrates historical groundwater records, meteorological variables, land-use information, irrigation demand, and hydrogeological characteristics to train predictive AI/ML models that can estimate current groundwater conditions. The mobile app provides intuitive visualization of groundwater levels, seasonal trends, and warning indicators to support agricultural and domestic water planning at the village and Gram Panchayat levels. Designed as a scalable digital platform, the system can be extended to support smart irrigation advisories by linking predicted groundwater availability with crop water requirements. The technology promotes data-driven local water governance, efficient groundwater use, and long-term water security.



mkgoyal@iiti.ac.in

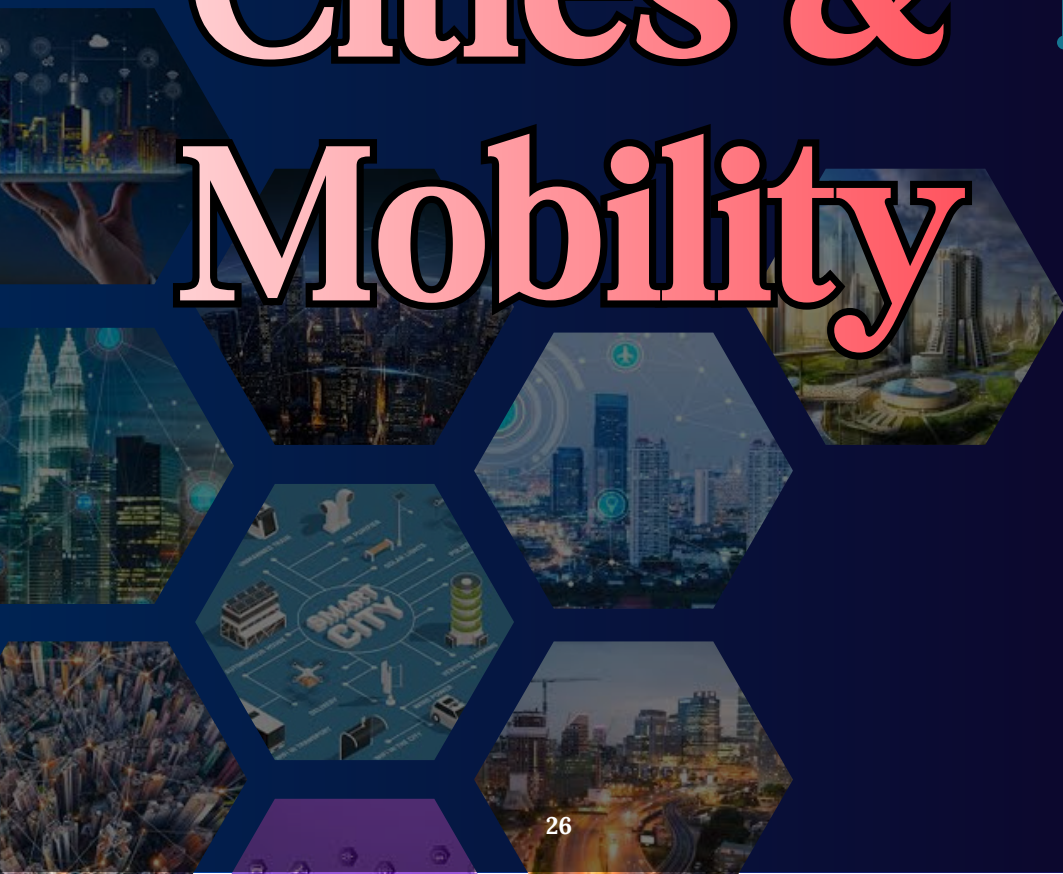
PATENT
Under Process

INVENTORS
Prof. Manish Kumar Goyal
Deepak Mishra

RELEVANT INDUSTRIES
Agricultural technology providers and
farming advisory services



Smart Cities & Mobility



Video Incident Detection System for Highways

This is a surveillance system based on real-time video anomaly detection using deep learning techniques, aimed at highway safety, effective traffic management, and timely emergency responses. Currently at Technology Readiness Level 4, our system has been rigorously trained and tested on highway toll videos in laboratory settings. Initial results demonstrate better anomaly detection rates compared to traditional methods. Continuous refinements aim to enhance its performance in diverse real-world scenarios, ensuring robust functionality across different conditions. In addition to anomaly detection, our solution offers a comprehensive suite of features: vehicle counting, heatmaps for identifying blind spots, vehicle tracking, multi-axle classification, and speed detection. These features collectively improve traffic management, reduce response times, and minimize accident risks caused by speeding or surveillance blind spots.



Live highway view with vehicle count and classification displayed.



Real time Highway Video Surveillance system dashboard

artiwari@iiti.ac.in

PATENT

Nil

RELEVANT INDUSTRIES

Transportation

INVENTORS

Prof. Aruna Tiwari
(Department of Computer
Science and Engineering)

In collaboration with Dr. Sanjay Singh CSIR-CEERI Pilani

Road Surface Quality Assessment and Monitoring

India has the second-largest road network globally, making maintenance a significant challenge. This system identifies defects, potholes, and road furniture, ensuring transparency and good governance through visualization and reports. Administrators access ground reality on road conditions with a click, enabling accurate material estimation, efficient rectification, budget planning, and repair quality prediction. Existing solutions are either expensive imported products or low-cost smartphone-based systems lacking precision and standards compliance. At TRL 5-6, this system offers a cost-effective alternative. Improved roads enhance connectivity, save lives, boost GDP, and support government schemes, making high-quality maintenance essential for economic growth and public welfare.



Mounting and Testing of PoC



UI showing comparison video of Before and after, with map

vbhatia@iiti.ac.in

PATENT

Under Process

RELEVANT INDUSTRIES

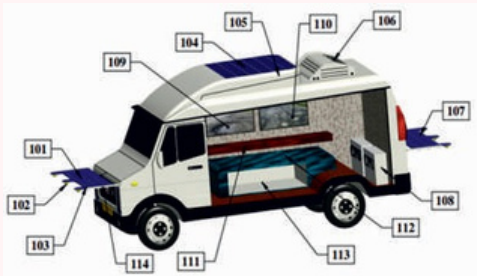
Infrastructure Smart City
NHAI Contractors
State Road Dept System Integrators

INVENTORS

Prof. Vimal Bhatia
(Department of Electrical
Engineering)

A Smart Road Asset Management System and Method There of

The Smart Road Asset Management System helps estimate potholes, cracks (including bleeding, block cracks, edge cracks, longitudinal cracks, ravelling, transverse cracks), and other damages, reducing workforce, equipment, time, and cost. It calculates total area and budget for road maintenance (Rural/Urban/ Highway) and assists with road maintenance tenders. Developed and delivered, the technology aims to reduce manpower in crack identification. In India, it enhances road infrastructure maintenance, reducing accidents, travel time, and vehicle wear, while improving safety and sustainability. The system also promotes smoother traffic flow, reduces fuel consumption, and creates tech-sector job opportunities, supporting India's smart infrastructure goals.



artiwari@iiti.ac.in

PATENT

Granted, Indian Patent No. 440090

RELEVANT INDUSTRIES

Transportation

INVENTORS

Ashish Verma
Neetesh Kumar
Sanjay Patidar
Upendra Singh
Prof. Aruna Tiwari
(Department of Computer
Science and Engineering)

A Low-Cost, Portable IoT-Enabled NO₂ Gas Sensor System with Enhanced User Safety

This technology addresses poor selectivity towards target gases, the lack of real-time monitoring, and the absence of remote alert systems for toxic gas concentrations. The solution includes the large-scale synthesis of advanced quantum 2D materials that are selective and sensitive towards target gases, operating effectively at room temperature.

An Android/iOS application enables real-time monitoring, and a resistance readout circuit is integrated with a GSM module for remote alerts via SMS and phone calls. The technology is currently at Technological Readiness Level (TRL) 7. This system aims to prevent gas tragedies, such as those in Bhopal and Visakhapatnam, by providing timely alerts to avoid catastrophic incidents.



shaibal@iiti.ac.in

PATENT

Granted, Indian Patent No. 435803
Granted, Indian Patent Application No.
202321052277

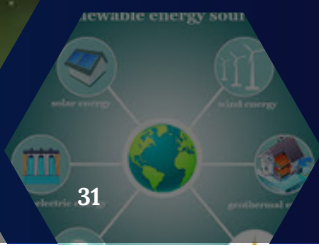
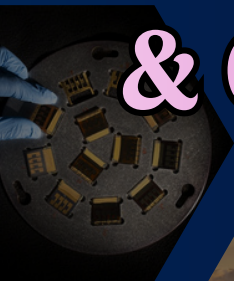
RELEVANT INDUSTRIES

Steel Environmental
Manufacturing Monitoring

INVENTORS

Chandrabhan Patel
Prof. Shaibal Mukherjee
Dr. Tridib Kumar Sarma
(Department of Electrical
Engineering)

Energy, Sustainability & Climate Change



Ground Water Management App and Ground Water Level Measuring Device

The technology aims to develop an integrated app and advanced measuring device for effective groundwater monitoring and conservation. The device is an electric switch-type with electrodes connected to a battery, beeper, and LED. The associated app includes a geolocator, water level visualization, comparison, and multilingual features. The technology is copyrighted and transferred to an NGO and four African countries. This system facilitates real-time monitoring, supports informed decision-making, and ensures sustainable water resource management, safeguarding agriculture and enhancing climate resilience. It also promotes community engagement and environmental stewardship, contributing to socio economic well-being and responsible resource utilization.

The app is given to an NGO, Ramkrishna Jaidayal Dalmia Seva Sansthan, Block-Chirawa, Dist- Jhunjhunu, Rajasthan (Bhupendra Paliwal, Project Manager) on Sept. 28, 2022, The complete unit (Groundwater level measuring device and Groundwater Management app) is presented to African Asian Rural Development Organization (AARDO) member countries (Sudan, Namibia, Zambia, and Ghana) in a technology awareness and outreach event, a joint initiative of AARDO & office of PSA to the Government of India.



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PATENT

copyrighted jointly with IIT Delhi

RELEVANT INDUSTRIES

Agriculture Farming
Environmental Government
Monitoring

INVENTORS

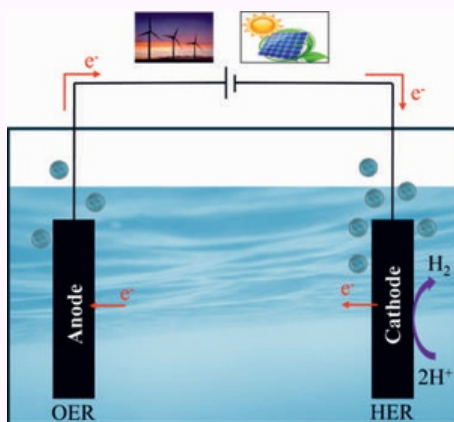
Anjali Gupta
Deepali Sukhija
Deepika Sukhija
Subir Kumar Saha
Dr. Davinder Pal
Prof. Aruna Tiwari

(Department of Computer Science
and Engineering)

in collaboration with RuTAG IIT Delhi

Renewable Hydrogen Production for Sustainable Energy Solutions

H₂ has gained prominence as a renewable energy carrier, serving as a cornerstone for achieving sustainable energy solutions. Our research is dedicated to developing efficient and cost-effective strategies for H₂ production through water splitting, utilizing advanced electrocatalytic materials. These state-of-the-art catalysts demonstrate exceptional properties, delivering superior performance in the H₂ evolution reaction (HER) under ambient conditions. Integrating innovative material design with renewable energy principles aims to accelerate the transition to green hydrogen production while ensuring industrial scalability. Ultimately, this work contributes significantly to global efforts to achieve decarbonization and sustainable energy systems.



spakhira@iiti.ac.in

PATENT

Nil

RELEVANT INDUSTRIES

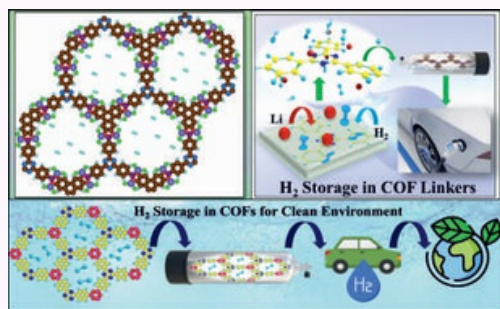
Agriculture	Energy Production
Chemical	Construction
Manufacturing	Materials

INVENTORS

Dr. Srimanta Pakhira
(Department of Physics and
Centre for Advanced Electronics)

Onboard H₂ Storage in Porous Materials for Vehicular Applications

Hydrogen, with its high energy density and zero-emission potential, is a promising candidate for future transportation fuels, particularly in fuel cell vehicles. However, challenges related to its production, storage, and transportation persist. Among the safest storage methods, the interaction of H₂ with porous materials via chemical or physical adsorption is highly regarded. Metal-organic frameworks and covalent organic frameworks offer high surface area, rapid sorption-desorption kinetics, and large pore volume, making them ideal candidates for hydrogen storage. We have investigated the H₂ storage properties of various metal-doped and chelated COFs and MOFs using DFT methods, providing valuable insights into H₂ physisorption behavior. These findings contribute to the design of efficient, reversible storage materials under ambient conditions.



spakhira@iiti.ac.in

PATENT

Nil

RELEVANT INDUSTRIES

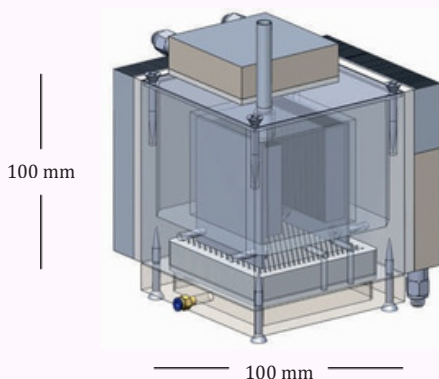
Research and Material Science
Development Nanotechnology
Institutes Automotive

INVENTORS

Dr. Srimanta Pakhira
(Department of Physics)

Thermoelectric Generator Based Portable Power Generation Unit (TEG-PPGU)

The TEG-PPGU (Thermoelectric Generator-Based Portable Power Generation Unit) is an innovative solution for compact and efficient energy generation. It integrates phase-change material (PCM) for stabilized heat absorption and phase transition, enabling consistent energy storage and delivery. The system includes a flameless premixed burner for enhanced fuel efficiency and a centralized cooling mechanism to optimize TEG performance. Designed for portability and ease of refueling via canisters, the unit is ideally suited for powering drones, camping equipment, defense applications, and small electric vehicles in remote environments. Its quiet operation and reliability make it a versatile energy source for diverse applications.



lldeshmukh@iiti.ac.in

PATENT

Filed, Indian Patent Application
No.: 202421072219

RELEVANT INDUSTRIES

Aerospace Outdoor &
Defense Adventure
Automotive EVs

INVENTORS

Prof. Devendra Laxmanrao
Deshmukh
(Department of Mechanical
Engineering)

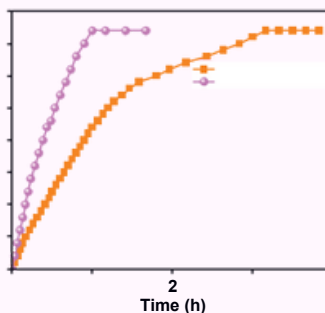
Catalytic Process for Hydrogen Production from Polymeric Polyethylene Terephthalate (PET) Waste

This technology reports the one-pot upcycling of PET-based plastic waste for hydrogen production at low temperature. The solution generates high-purity hydrogen gas from PET waste. Developed at a laboratory scale, the current Technology Readiness Level (TRL) is 4. The technology has been patented by the India Patent Office (IPO) and published in the Wiley-VCH journal (ChemCatChem, 2023, 15, e202300574). Upcycling PET waste into hydrogen gas and valuable chemicals reduces landfill use, cuts plastic pollution, promotes recycling, and generates jobs in research and waste management, offering cleaner energy solutions for communities.



H₂

- One-pot upcycling of PET into H₂ gas
- Complete selectivity for H₂
- High yield of H₂ (~38 L H₂/100 g PET/GRU)
- Works for different types of PET



Catalytic hydrogen production from PET-based plastic waste over ruthenium catalyst (inset: GC-TCD analysis of produced gas).

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PATENT

Granted, Indian Patent No.
422056

RELEVANT INDUSTRIES

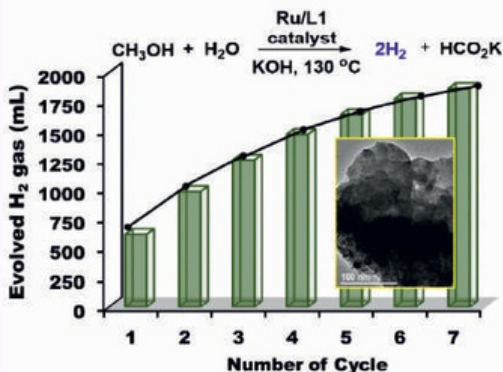
Energy Fuel

INVENTORS

Prof. Sanjay Kumar Singh
(Department of Chemistry)

Catalysts for Low-temperature Hydrogen Production

This technology reports low-temperature hydrogen production from methanol, generating high-purity hydrogen gas. Developed at a laboratory scale, the current Technology Readiness Level (TRL) is 4. The technology has been patented by the India Patent Office (IPO) and published in the RSC journal (Catal. Sci. Technol, 2021, 11, 136-142). Utilizing methanol for hydrogen production promotes a sustainable energy future by enhancing energy security, reducing greenhouse gas emissions, and supporting the transition to a low-carbon economy. Using biomass-derived bagasse for methanol production offers an eco-friendly alternative to fossil fuels, contributing to climate change mitigation and sustainable development.



Catalytic conversion of methanol to hydrogen gas and format in water over the ruthenium catalyst.

sksingh@iiti.ac.in

PATENT

Granted, Indian Patent No.
386686

INVENTORS

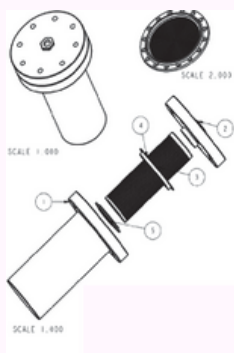
Prof. Sanjay Kumar Singh
(Department of Chemistry)

RELEVANT INDUSTRIES

Energy Fuel

A Modular Reactor for Manometric Apparatus Operable in a Hydrogen Environment at High Pressures and Capable of Handling Powdered/porous Nanomaterials

The invented modular reactor accurately measures hydrogen gas adsorption/desorption capacities of powdered/porous nanomaterials. Traditional manometric apparatus is challenging due to gas diffusion at high pressures and hydrogen embrittlement, which may cause malfunctioning of sensors and valves. This reactor has a calibrated volumetric capacity and features mesh at the top and bottom to isolate the sample from the reactor walls, preventing sample permeation. The mesh ensures gas reaches the sample from all directions, increasing permeability and promoting fast adsorption/desorption reversibility. This modular reactor is beneficial for industries supporting the hydrogen economy and automobile sectors developing hydrogen fuel cell vehicles.



S.No.	Port Name	Qty
1	CYLINDER_BASE	1
2	CYLINDER_LID_COVER	1
3	CYLINDER_PTFE_RING	1
4	NANO_ARRESTOR	1
5	NANO_HOLDER	1

sksahu@iiti.ac.in kundalwal@iiti.ac.in

PATENT

Filed, Indian Patent Application
No. 202221069960

RELEVANT INDUSTRIES

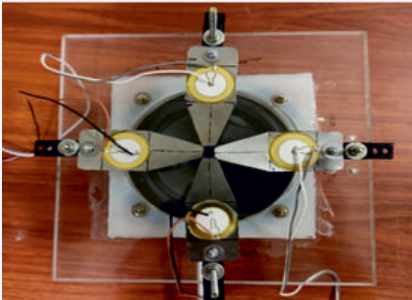
Green Energy Hydrogen Economy

INVENTORS

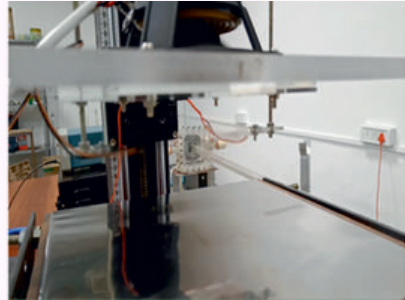
Nitin Luhadiya
Dr. Shailesh Kundalwal
Prof. Santosh Kumar Sahu
(Department of Mechanical
Engineering)

Application of Synthetic Jet with Flaps for Thermal Management and Energy Harvesting

Thermal management is crucial for efficient operation, and synthetic jets are used for heat removal. However, conventional synthetic jets are less effective in compact devices. The proposed method uses piezoelectric laps in the streamwise direction of a synthetic jet generated by an acoustic speaker. The laps alter air recirculation patterns, improving heat transfer. The system with piezoelectric laps showed a 55% improvement in the area-averaged Nusselt number and conserved up to 106 mW per strip. This system can enhance thermal management in applications like electronic components, electric vehicle battery packs, and solar photovoltaics, contributing to efficient, sustainable systems.



The prototype developed for an acoustically actuated synthetic jet with piezoelectric laps



Working of the piezoelectric laps when the synthetic jet is actuated using an acoustic speaker

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PATENT

Under Process

RELEVANT INDUSTRIES

Electric vehicle battery pack
Motors manufacturing

INVENTORS

Dnyanesh Mirikar
Rajat Kumar Dinesh
Dr. Harekrishna Yadav
Dr. Satyanarayan Patel
(Department of Electrical Engineering)

Innovative CO₂ Capture and Conversion System for Sustainable Industrial Applications

This technology introduces an advanced system for capturing CO₂ emissions from industrial sources and converting them into valuable products such as synthetic fuels, chemicals, and construction materials. Using solid adsorbents (like metal-organic frameworks and covalent-organic frameworks) based adsorption processes and catalytic conversion technologies, the system ensures higher stability, reusability, lower energy requirements, and cost-effectiveness, which are ideal for post-combustion capture in industrial plants. By transforming CO₂ into useful resources, this innovation reduces greenhouse gas emissions and supports a circular economy. It represents a practical step towards achieving carbon neutrality and addressing the pressing challenges of climate change.



The image showcases an innovative CO₂ capture and conversion system for sustainable industrial applications. It highlights integrating metal-organic and covalent organic frameworks with a futuristic and eco-friendly design.

spakhira@iiti.ac.in

PATENT

Nil

RELEVANT INDUSTRIES

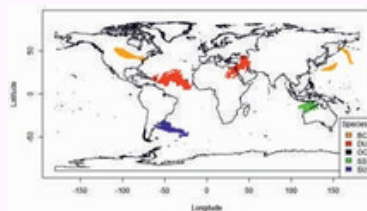
Chemical Construction
Manufacturing Materials
Agriculture

INVENTORS

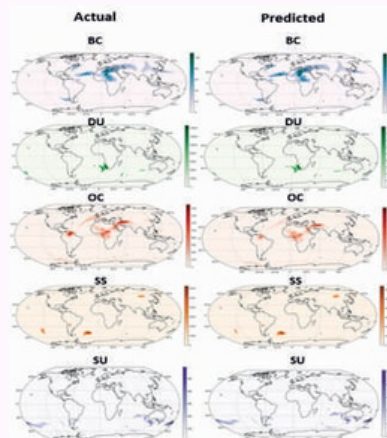
Dr. Srimanta Pakhira
(Department of Physics and
Centre for Advanced Electronics)

Spatio-temporal Distribution, Detection, and Prediction of Aerosol Atmospheric Rivers (AARs) on a Global Scale

The developed technology focuses on detecting and predicting Aerosol Atmospheric Rivers (AARs) of key aerosol species and their seasonal climatology using Artificial Intelligence (AI) and Machine Learning (ML). With 6.7 million premature deaths and \$2.9 trillion in annual economic costs from air pollution, aerosol pollution poses global challenges, impacting health, the environment, and Sustainable Development Goals (SDGs). The study employs AI and ML-based detection algorithms and convolutional autoencoder models for accurate real-time AAR prediction. At Technological Readiness Level (TRL) 4, this research advances aerosol pollution mitigation, enabling improved forecasting, seasonal climatology analysis, and enhanced resilience against air quality challenges.



Detected AARs of key species



Predicted AARs of key species at an arbitrary time step

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PATENT

Under Process

RELEVANT INDUSTRIES

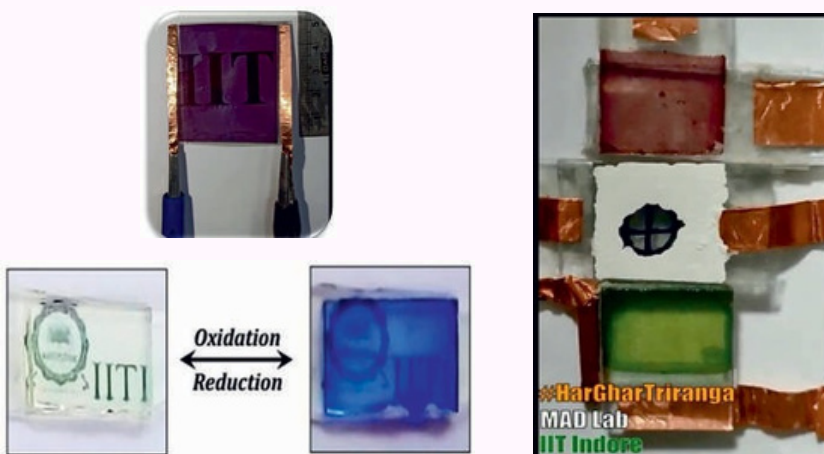
Metropolitan City Forestry
Authorities Health
Pollution

INVENTORS

Kuldeep Singh Rautela
Shivam Singh
Prof. Manish Kumar Goyal
(Department of Civil
Engineering)

Flexible Electrochromic Smart Windows

- The developed heat shielding electrochromic device filters heat when in transparent (optically) state, unlike the available device which filters IR but becomes opaque to the visible spectrum.
- Compatible for making flexible devices on PET/Plastic substrates as well. The device saves energy required to maintain the heat in a building/car. The current TRL of the technology is 3. Such windows will be of immense use for the Smart City projects.



rajeshkumar@iiti.ac.in

PATENT

Nil

RELEVANT INDUSTRIES

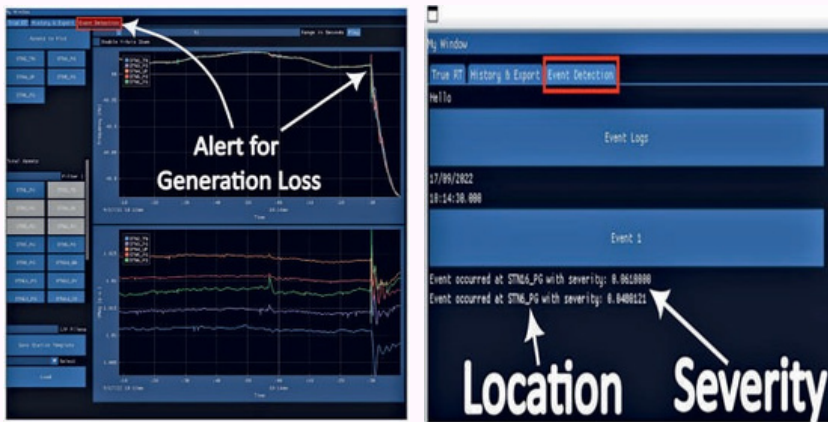
Automobile Infrastructure

INVENTORS

Anjali Chaudhary
Prof. Rajesh Kumar
(Department of Physics)

Wide Area-Monitoring of the Indian Electricity Grid for Enhanced Visibility

The proliferation of measurement devices provides granular, real-time data which can be used for optimizing grid operations. Our Make-in-India software offers a cost-effective alternative to expensive, non-customizable foreign solutions for power grid monitoring. Currently at TRL4, it features C++ algorithms for detecting grid events, real-time data visualization, and of line analytics. Tested on a Real-Time Digital Simulator, it includes concealed backend computations, an interactive GUI, and visual alarms to reduce critical grid failures. By automating grid analytics and lowering operator cognitive load, the technology enhances efficiency and prioritizes rural areas during load shortages, delivering scalable and reliable grid management solutions.



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PATENT

Granted, Indian Patent Application
No. 202321014760

RELEVANT INDUSTRIES

Electrical utilities

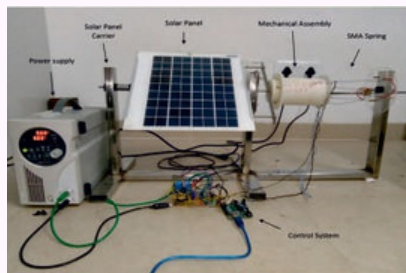
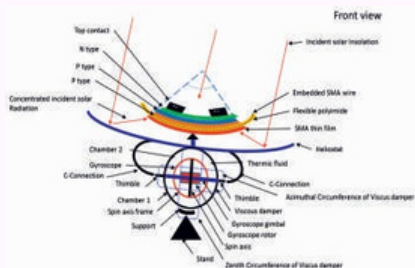
INVENTORS

Adnan Iqbal
Prof. Trapti Jain
(Department of Electrical
Engineering)

A Dual Axis Continuous Solar Tracking System Using Shape Memory Alloy Bimorph Based Solar Panel

Solar panels, a key energy source, currently capture only about 40% of solar energy due to fixed positioning based on latitude, season, and local conditions. Their efficiency drops significantly as the sun's angle shifts away from perpendicular.

Research on solar tracking aims to address this, with advanced methods using smart materials and passive energy systems. These materials can enhance energy capture while reducing active energy use in traditional systems. Coupled with flexible panels, they minimize shedding loss and improve efficiency. A dual-axis synchronous tracking system using smart materials has reached Technology Readiness Level (TRL) 6, promising improved solar energy utilization.



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PATENT

Granted, Indian Patent Application
No. 201721026063

RELEVANT INDUSTRIES

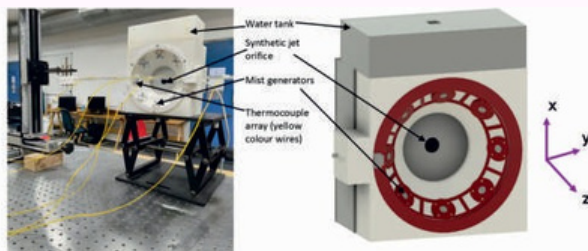
Solar Panel, Energy Sectors,
Semiconductor Printing,
Flexible Electronics

INVENTORS

Prof. Vipul Singh Department of
Electrical Engineering, Prof.
Palani I. A., Department of
Mechanical Engineering

A portable Evaporative Cooler based on a Synthetic Jet

Cooling is necessary for maintaining human comfort because it directly affects health, safety, productivity, and overall well-being. The evaporative cooling technology is popular in India because of the hot and dry climate for a more extended period of the year. The drawbacks of the available evaporative cooler include the inefficient mixing of water vapor in the air, high power consumption, and ample space required. To overcome this problem, we propose a cooling and mixing method based on synthetic air jets and evaporative coolers. The synthetic jet creates an air flow from the orifice in the form of a jet with high momentum. As the synthetic jet utilizes surrounding air to generate the air jet, it doesn't need an external mass flow source. Now, the water in the form of fine droplets (mist) is mixed with the flow of synthetic air jet, which creates a cooling effect through evaporation. The proposed invention can significantly reduce the temperature of the air by up to 9 °C when the surrounding air temperature is ~27 °C. An even higher drop in temperature is expected during the summer.



Synthetic jet-based Evaporative Cooler

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PATENT

Under process

RELEVANT INDUSTRIES

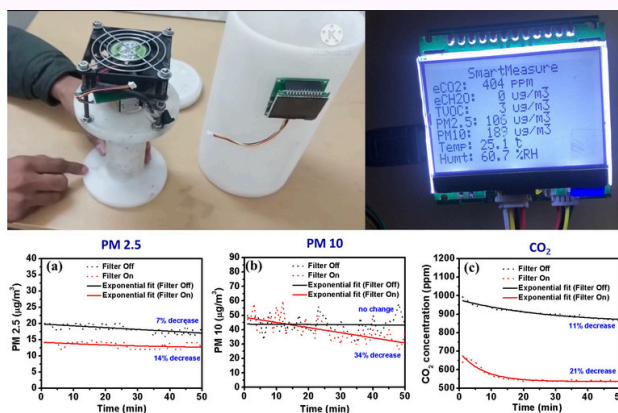
Symphony Limited, Bajaj
Electricals, Usha Fan, Alfa
Fans, Eminent Systems

INVENTORS

Dr. Harekrishna Yadav,
Department of Mechanical
Engineering

Designing and Development of Low-cost Air Purifier cum CO₂ Harnesser

Air pollution severely affects urban populations, with cities like Delhi NCR frequently recording hazardous AQI levels. To address this, a low-cost air purifier cum CO₂ harnesser was developed using cost-effective adsorbent films with the funding from MSME, GoI. The system simultaneously removes particulate matter (PM 2.5 and PM 10), odors, moisture, and captures CO₂ for potential utilization. Tested in a 100 sq. ft. enclosed space, the device reduced PM 2.5 from 65 to 16–36 $\mu\text{g}/\text{m}^3$, PM 10 from 120 to 38–87 $\mu\text{g}/\text{m}^3$, and CO₂ from 1050 to 526–544 ppm within 50 minutes, corresponding to Good to Satisfactory AQI. The sorbent is regenerable using low-grade heat, making the system compact, energy-efficient, and environmentally sustainable.



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PATENT
Under process

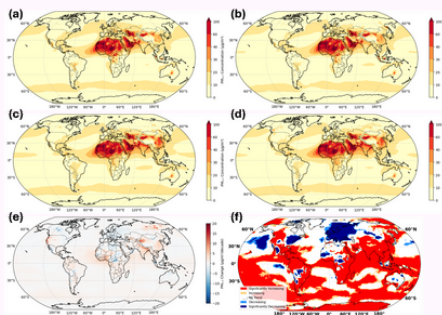
RELEVANT INDUSTRIES
Philips, Xiaomi,
Honeywell, Samsung

INVENTORS
Sanjay Kumar Singh
Debashis Panda
Vaishnavi Kulkarni

Deep Learning-Enabled High-Resolution PM_{2.5} Estimation and Population-Weighted Exposure Assessment Framework

This technology presents a deep ensemble machine learning framework integrating CNN, LSTM, and DNN architectures to estimate daily PM_{2.5} concentrations at high spatio-temporal resolution over regional to global scales. It combines satellite reanalysis data, meteorological variables, and population density to quantify population-weighted

pollution extremes, including exceedance days, annual maxima, and extreme percentiles. The framework enables robust air quality forecasting, exposure assessment, and identification of pollution hotspots, supporting evidence-based policymaking, early warning systems, and targeted mitigation strategies, particularly for data-scarce and rapidly urbanising regions.



The framework has been validated using multi-decadal global datasets (1980–2023) and benchmarked against WHO air quality observations, demonstrating high predictive accuracy and applicability for long-term exposure and risk assessment studies.

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PATENT

Under process

RELEVANT INDUSTRIES

Environmental Monitoring, Smart Cities, Public Health & Epidemiology

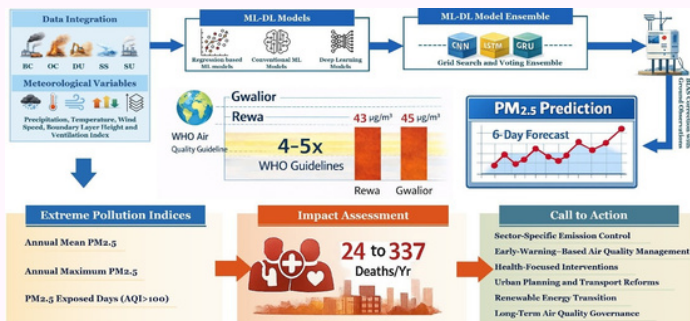
INVENTORS

Kuldeep Singh Rautela
Manish Kumar Goyal
Ajay Singh Nagpure

Ensemble Machine Learning–Deep Learning Framework for Air Quality Early Warning System and Associated Health Risks

This technology develops an ensemble ML-DL-based air quality early warning system that integrates satellite reanalysis–derived PM_{2.5}, ground observations, meteorological variables, boundary layer height, and ventilation index to generate accurate short-term PM_{2.5} forecasts. More than 40 ML-DL models were evaluated, and the best-performing CNN, LSTM, and GRU models were combined using weighted ensembling to improve prediction accuracy. The framework also quantifies PM_{2.5} extremes, population-weighted risk, and attributable mortality, supporting evidence-based air quality management and public health decision-making in urban airsheds.

The system provides a real-time and 6-day PM_{2.5} and AQI forecast by integrating the ensemble prediction model with the Open-Meteo API and includes population-weighted risk and mortality assessment to identify high-risk urban airsheds and support targeted mitigation strategies.



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PATENT

Filed; 202521120675

INVENTORS

Kuldeep Singh Rautela
Manish Kumar Goyal

RELEVANT INDUSTRIES

Environmental Monitoring, Smart Cities, Public Health & Epidemiology



PATENT
Under Process

RELEVANT INDUSTRIES
Industries located across
India that utilize water.

INVENTORS

Prof. Manish Kumar Goyal
Dr. Vijay Jain
Mr. Pradip Kailas Gopal

INVENTORS

Prof. Manish Kumar Goyal
Dr. Vijay Jain
Mr. Pradip Kailas Gopal

Large-Area Laser-Based Cleaning of Biofuel Samples

Surface cleaning technologies are critical in various industrial applications to enhance surface integrity and ensure components meet stringent performance specifications. However, with the accelerating advancement of high-precision industries—particularly in sectors such as aerospace, electronics, and advanced manufacturing—the demand for superior surface quality and enhanced component performance has significantly increased. As a result, the limitations associated with conventional cleaning technologies, including surface damage, environmental pollution, and insufficient precision, have rendered them inadequate for meeting the elevated standards of modern industrial applications.

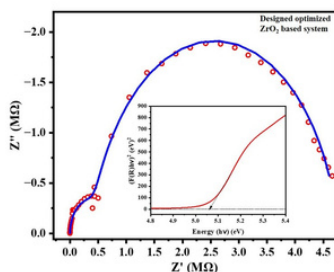


Figure: Illustration of Nyquist plot, as extracted from electrochemical impedance spectroscopy (EIS) of the designed optimally yttria doped nanostructured zirconia system under this invention. Theoretical model fit (with equivalent circuit) of the experimental data, yields a large dielectric constant (k) of about 1720. Inset: UV-Vis results of the system, indicating a large band gap (above 5 eV).

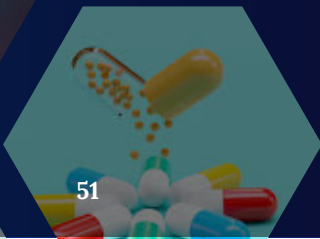
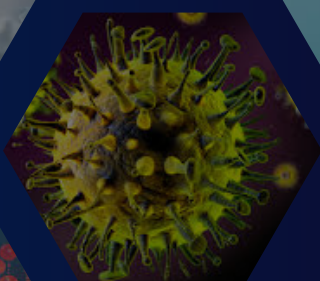
palaniia@iiti.ac.in

PATENT
Granted

RELEVANT INDUSTRIES
Ship Building Industries,
Automobiles

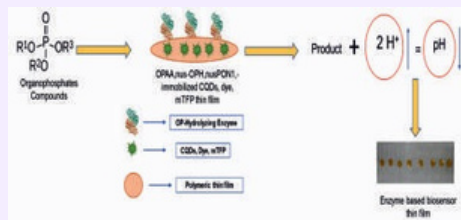
INVENTORS
Nandini Patra
Palani Iyamperumal Anand

Biotechnology

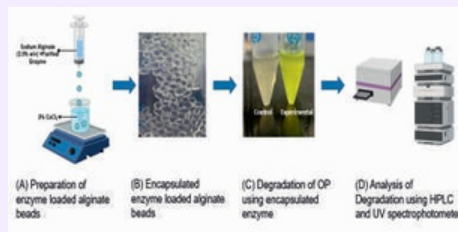


Recombinant Organophosphate Hydrolyzing Enzyme Immobilized Composites for The Detection and Degradation of Organophosphates Compounds

This invention deals with developing and using recombinant organophosphate (OP) hydrolyzing enzymes for detection and degradation. OP hydrolyzing enzymes used in this invention, along with their immobilized matrices, aid the process of detection and degradation of organophosphate compounds. The enzymes are immobilized on polymer-based thin films or nano/micron-size carriers that possess pH-responsive properties.



Schematic representation of detection of OP compounds through OP hydrolyzing enzyme immobilized pH sensitive fluorophores based biosensors



Schematic work flow of immobilization of recombinant enzyme and degradation of OP using immobilized beads

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PATENT

Filed, Indian Patent Application
No. 202321038508

RELEVANT INDUSTRIES

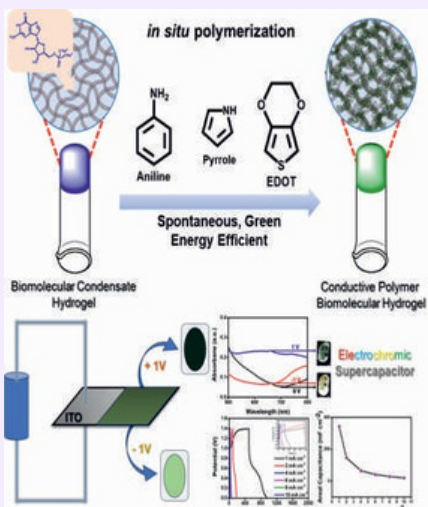
Agriculture Sector

INVENTORS

Tanmay Vyas
Surbhi Jaiswal
Prof. Prashant Kodgire
Dr. Abhijeet Joshi
(Department of Bioscience &
Bioengineering)

Conductive Polymer Embedded Biomolecular Hydrogels (CPBHS) and Method Thereof

Conductive Polymer Hydrogels (CPHs) mimic soft tissue mechanics, water-rich 3D scaffolds, and tunable electrical properties. A nucleotide condensate matrix assisted in situ polymerization method enables synthesizing CPHs using small monomers such as aniline, pyrrole, and ethylenedioxythiophene. Unlike prefabricated matrices, the biomolecular matrix enhances biocompatibility for biomedical applications.



The scalable, energy-efficient process allows polymerization of three conductive polymers—polyaniline, polypyrrole, and PEDOT—within a single Guanosine monophosphate matrix using water-soluble organic acids. Polyaniline hydrogels exhibit excellent electrochromic supercapacitor behavior with an areal capacitance of 236 mFcm^{-2} . These hydrogels serve as smart, printable materials for biosensors, health monitoring, bioprintable scaffolds, tissue engineering devices, and more.

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PATENT

Filed, Indian Patent Application
No. 202321083824

RELEVANT INDUSTRIES

Indian Startups Electrophysiologic
Global Companies al Applications

INVENTORS

Suryakamal Sarma
Nishita Jain
Dr. Tridib Kumar Sarma
(Department of Chemistry)

Fused Pyridine Derivatives as Anticancer & Antimicrobial Agents and Processes for the Preparation thereof

Cancer therapy seeks to deliver drugs selectively to cancer cells, minimizing off-target toxicity and reducing recurrence risks. We have developed new methodology for the synthesis thieno, thiazolo, and benzothienopyridine derivatives with hitherto unknown structures that act as protein antagonists and agonists, showing promise as next-generation anticancer or antimicrobial agents. Synthesized biologically active fused thieno [3,2-c], thieno [2,3-c], benzo[4,5]thieno[3,2-c]pyridine-, benzo[4,5] thieno [2,3-c]pyridine-, and thiazolo [4,5-c] pyridine-based systems. In the presence of a base, various heterocyclic aldehydes were transformed into corresponding sulfur fused aza-heteroaromatics through an imine-mediated tandem condensation-heteroannulation process. Our compounds demonstrated potent anticancer activities with IC_{50} values in the low nM range (297 nM) and kinase inhibition ranging from 1.95 μ M to 12.10 μ M against LIMK2, CDKs, and Aurora kinases. Additionally, thieno [3,2-c] and benzothieno [3,2-c] pyridines derivatives have demonstrated promising anti-microbial activity against gram-negative Escherichia coli (E. coli). These molecules, with enhanced selectivity and reduced side effects, could serve as anticancer and antimicrobial agents against multidrug-resistant strains by targeting bacterial DNA replication. Our methodology and new molecules lay a foundation for designing drug families with improved pharmacokinetic and pharmacodynamic properties, offering a pathway towards affordable and effective anticancer and antimicrobial therapies.

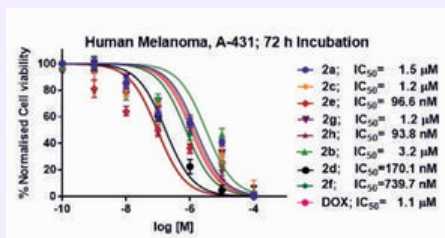


Figure. Dose-response curves of pyridine fused heterocycles 2a-2f for inhibition of human melanoma or skin cancer

cvenkat@iiti.ac.in

PATENT

Filed, Indian Patent Application
No. 202421085134

RELEVANT INDUSTRIES

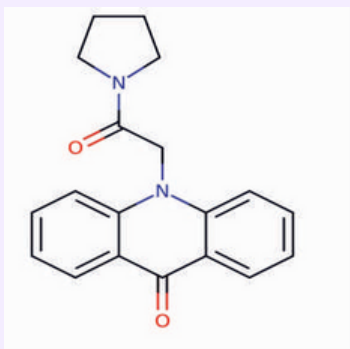
Pharmaceutical Healthcare

INVENTORS

Prof. Venkatesh Chelvam
(Department of Chemistry)

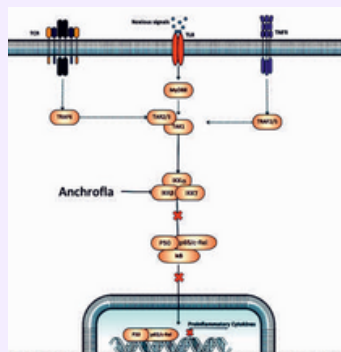
ANCHROFLA and method thereof to address the IKK β -mediated chronic inflammatory signaling

Chronic inflammatory diseases affect over 41 million people annually. Current treatments often exhibit suboptimal efficacy and severe side effects. Thioridazine, an antipsychotic drug, was repurposed as a potent anti-inflammatory agent (Baig et al., 2018), but it has also been reported to have cardiotoxic activity through hERG K (+) channel binding. To address this issue, we identified a molecule named ANCHROFLA using a structure-based approach. Preclinical studies demonstrated that ANCHROFLA inhibits inflammatory response by inhibiting IKB kinase β activity without affecting the hERG $\$K(+)\$$ channel activity. Therefore, ANCHROFLA offers a safer and effective alternative for mitigating inflammatory responses in chronic inflammatory diseases.



ANCHROFLA

10-(2-oxo-2-pyrrolidin-1-ylethyl)acridin-9-one



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PATENT

Filed, Indian Patent Application
No. 202421099306

RELEVANT INDUSTRIES

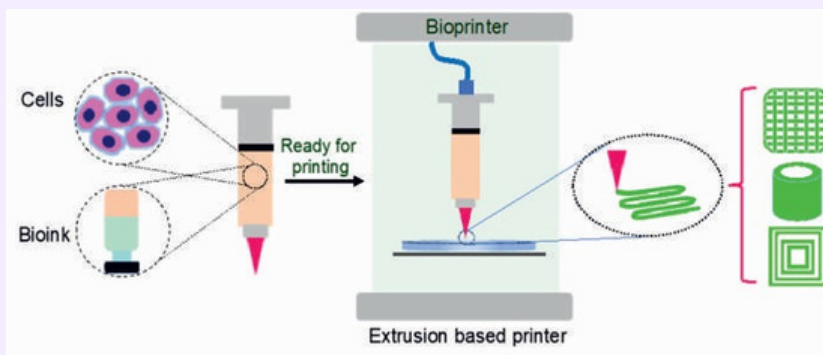
Pharmaceutical Healthcare

INVENTORS

Prof. (Dr.) Mirza S Baig
(Department of Bioscience and
Biomedical Engineering)

Novel 3D-printing Biomatrix Ink: A Double Cross-linked Self-healable Hydrogel for Cell Culture Applications

BioMatrix Ink, composed of non-animal derived synthetically cross-linked components, is ideal for 2D/3D cell culture and extrusion-based bioprinting.³² Its nanofibrous network mimics the extracellular matrix, supporting cell growth, signaling, and proliferation.³³ Tailored for specific applications, it can be used in 3D models, cell cultures, bioprinting, and sustained drug release.³⁴ Supplied as a powder, it rehydrates with aqueous solutions, including commercial media.³⁵ Advantages include reproducibility, easy handling (quick gelation without extreme conditions), tunability (adjustable viscosity for alternative techniques), printability (shear-thinning and thixotropic), and biocompatibility (validated with human fibroblasts, stem cells, osteoblasts), ensuring consistent, cell-friendly, and versatile usage.



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PATENT

Indian Patent Application No.
202417103775, Filed, UK Patent
Application No. 22106058

RELEVANT INDUSTRIES

Healthcare Additive
Sector Manufacturing

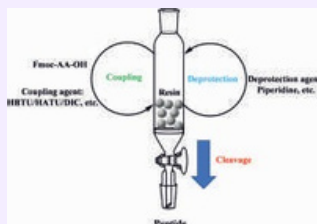
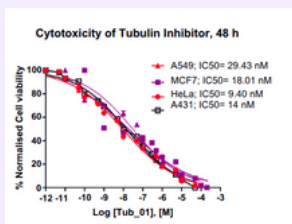
INVENTORS

Prof. Deepak M. Kalaskar
Prof. Apurba K. Das
(Department of Chemistry)

New Small Molecule Peptides for Treatment of Cancer

Prevalence of cancer worldwide and challenges in cancer treatment urge researchers to develop new and potent anticancer drugs. Anticancer drug potency and factors such as availability, ease of synthesis, serum stability, selectivity, pharmacodynamic and pharmacokinetic properties plays a crucial role in determining the clinical success of a drug. Tubulin inhibitors such as tubulysin M is one of the most potent anticancer agents (IC₅₀ of 0.02 nM) known to kill the cancer cells by inducing apoptosis. But the natural abundance of these inhibitors is very low, and the structural complexity escalates the challenges for its laboratory synthesis. We have developed a technology to design and synthesize a library of novel tubulin inhibitors which possess similar amino acid interactions as compared to natural inhibitors.

Recent human clinical trial studies questioned the physiological stability of tubulin inhibitors due to its reduced efficiency in antitumor activity. This was overcome by employing 4-amino thiazole-2-carboxylic acid and unnatural β -amino acids as components of the inhibitors to avoid hydrolysis by proteases. As proof of concept, several tubulin derivatives were chemically synthesized in our laboratory, examined on human cancers of breast, skin, lung, and cervix and found to be active in 9-29 nM concentrations. The new inhibitors are protected with intellectual proprietary rights in USA and India. The inhibition potency of the inhibitors would further be evaluated in vivo for treatment of variety of cancers.



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PATENT

Granted, Indian patent Application No. 202021036140; Granted, USA patent, US 11,518,786 B2

RELEVANT INDUSTRIES

Healthcare Industry

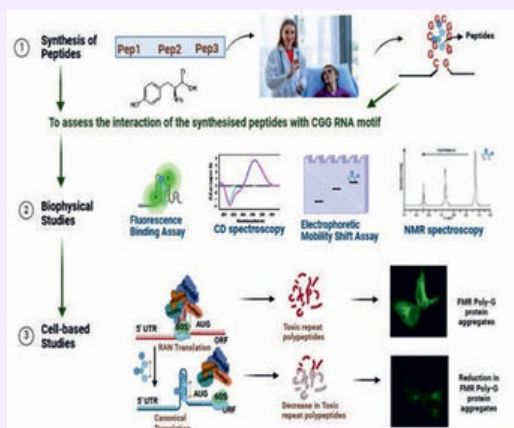
INVENTORS

Dr. Chelvam Venkatesh
Pandit A.
Ramesh B. Reddy
B.R. Yadav
K. Roy
D. Pathak B.

(Department of Chemistry)

Homoaromatic Peptides Mitigate FMR Poly-g-protein-mediated Toxicity and Alternative Splicing Defects in Fragile X-associated Tremor/ataxia Syndrome (FXTAS)

RNA regulates biological functions, but repeat expansion in certain nucleotides causes neurodegenerative disorders like Fragile X-associated tremor/ataxia syndrome (FXTAS) and Fragile X associated primary ovarian insufficiency (FXPOI). Expansion of CGG in the FMR1 gene results in toxic RNA foci, pre-mRNA splicing defects, and non-AUG translation (RAN), producing toxic FMR Poly-G protein aggregates. The number of affected patients is increasing, with limited awareness in India. Homo-aromatic Tyrosine based peptides Pep1, Pep2, and Pep3 target FMR Poly-G aggregates, offering high specificity, biological activity, low toxicity, and biocompatibility. These peptides have been tested on FXTAS-cellular models with positive results and can be developed for drug and delivery systems.



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PATENT

Under process

RELEVANT INDUSTRIES

Pharmaceuticals

INVENTORS

Mr. Krishna Singh

Dr. Tapas Ghosh

Prof. Amit Kumar

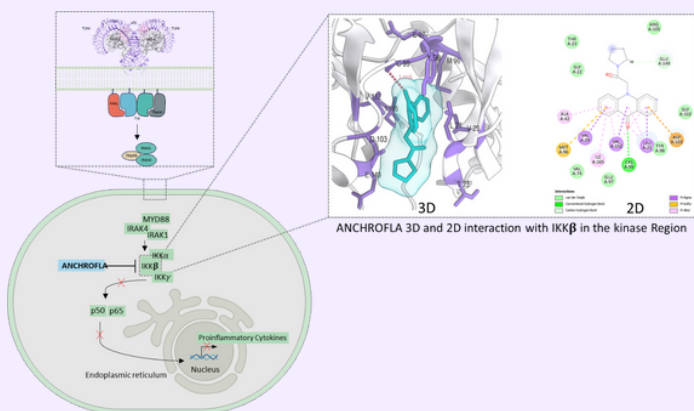
(Department of Bioscience & Bioengineering)

Prof. Apurba K. Das

(Department of Chemistry)

A compound inhibiting chronic inflammatory disease/s and method thereof

Our invention introduces a novel compound specifically designed to inhibit the activity of the Inhibitor of Nuclear Factor Kappa-B Kinase Subunit Beta (IKK β) protein complex. IKK β plays a crucial role in the activation of the NF- κ B transcription factor, which is integral to inflammatory processes, invasiveness, immune evasion, and metastasis. Our compound exhibits potent inhibition of NF- κ B activation by selectively targeting IKK β , effectively reducing the production of harmful pro-inflammatory mediators. This unique mechanism of action positions our compound as a promising candidate for the treatment of a wide range of chronic inflammatory diseases.



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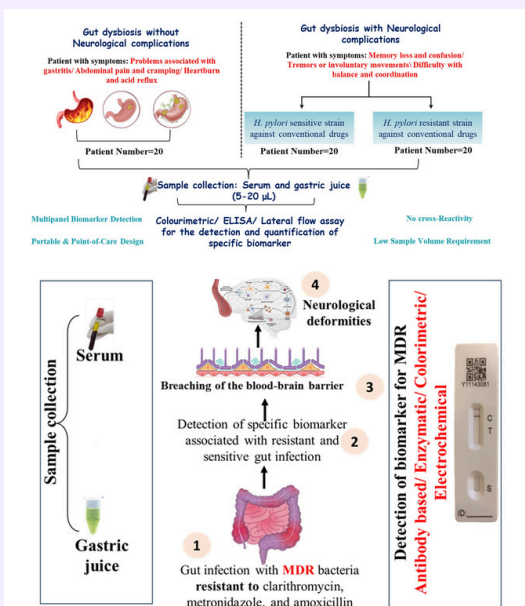
PATENT
FER submitted

RELEVANT INDUSTRIES
Bakul Pharma

INVENTORS
Mirza S Baig
Shivmuni Sarup

Biomarker for the screening/ early detection of antibiotic resistant infection derived neurological complications

This technology is a novel, non-invasive test that helps identify early brain health problems caused by antibiotic-resistant infections in the gut. When harmful, drug-resistant microbes disturb the natural gut balance, they can release substances that trigger inflammation and affect brain function. By measuring specific markers in easy-to-collect samples like blood and gastric juice, the test can detect these changes before symptoms appear. It allows for the effective treatment making it useful for personalized point of care medicine.



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PATENT

FILED: Application number:
202521054322

RELEVANT INDUSTRIES

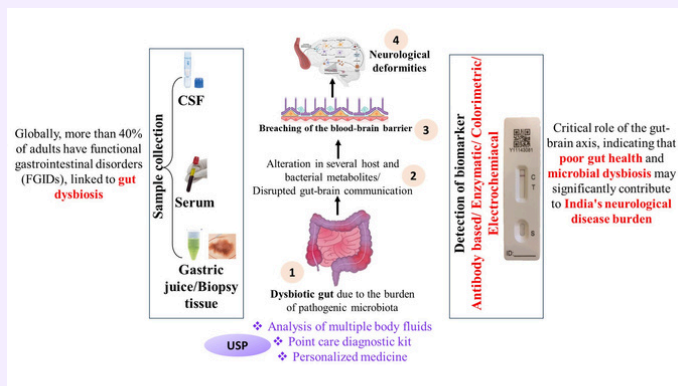
Diagnostic lab and
Pharmaceuticals

INVENTORS

Dr Hem Chandra Jha
Meenakshi Kandpal

Prognostic markers for the gut driven neurological deformities

This technology provides a novel non-invasive, multi-omics-based diagnostic platform for early detection and risk stratification of infection-driven gut dysbiosis associated with neurological disorders. By integrating metabolomic, lipidomic, and immunological biomarkers with advanced bioinformatics, the platform captures molecular disturbances along the gut-brain axis. Using easily accessible samples such as gastric juice/tissue and blood, it enables high-resolution, multi-parametric profiling for early diagnosis, disease monitoring, and prognosis of neurodevelopmental, neuroinflammatory, and neurodegenerative conditions, supporting personalised and precision-based therapeutic interventions.



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PATENT

FILED: application number:
202521054816

RELEVANT INDUSTRIES

Diagnostic lab and
Pharmaceuticals

INVENTORS

Dr Hem Chandra Jha
Meenakshi Kandpal

Healthcare & MedTech



An app for Patient Record Management System for the Rural Area

This application is designed for efficient patient record management, enabling seamless tracking of medical test data. It collects and stores values from 70+ critical blood and diagnostic tests in a centralized database. The app, developed as part of Nagarth Charitable Trust's commitment to equitable community health services for villages surrounding IIT Indore, generates a unique QR code linked to the patient's records. Patients receive a physical card embedded with this QR code, ensuring quick and secure access to their prior test results. During subsequent visits, doctors can instantly retrieve historical medical data by scanning the QR code, facilitating informed diagnosis and treatment planning. This innovative solution streamlines medical workflows, enhances patient care, and reduces redundancy in diagnostic testing.

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PATENT
Under Process

RELEVANT INDUSTRIES
Biomedical Hospital
databases management

INVENTORS
Prof. Aruna Tiwari
(Department of Computer
Science and Engineering)

Development of Low Cost, Flexible and High Responsivity UV Dosimeter

Exposure to UV rays can cause premature aging of the skin and signs of sun damage such as premature aging and other skin damage. UV rays can also cause skin cancer, immune system suppression, cataracts and other eye damage.

The uniqueness of the Solution lies in:

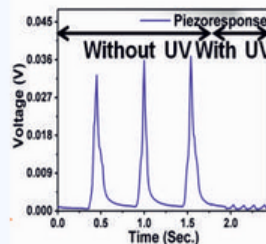
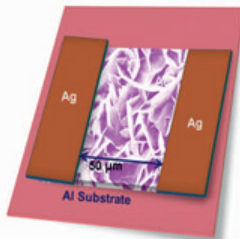
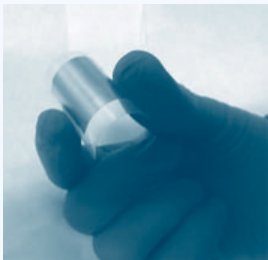
Flexible Al substrate:

1. Application in wearable Sensors
2. Piezoelectric effect

Growth of ZnO nanowalls: Highly sensitivity to UV radiation

High photosensitivity and Responsivity of 349 and 265 mA/W @ 0.1 V applied bias. The current TRL of the Technology is 3.

UV dosimeters are used in industries where workers are exposed to UV radiation, such as welding, healthcare (UV sterilization), and laboratory settings. They help ensure that exposure levels comply with safety regulations.



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PATENT

Nil

RELEVANT INDUSTRIES

Flexible UV-Vis
Electronics Photodetector

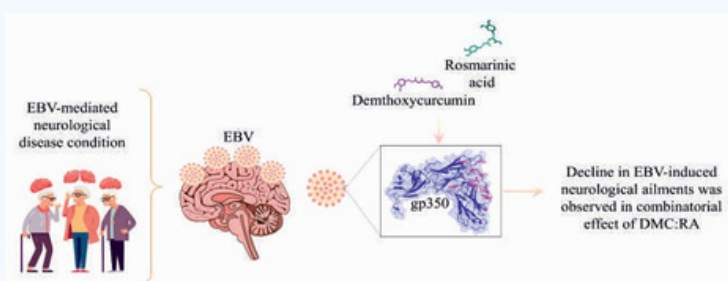
INVENTORS

Prof. Vipul Singh
(Electrical Engineering)

A Composition for the treatment of Epstein-barr Virus Mediated Brain Diseases and its Method of Preparation

Epstein-Barr Virus (EBV) infects approximately 90% of the global adult population and is associated with various cancers (e.g., nasopharyngeal carcinoma, gastric cancer, Hodgkin's lymphoma) and neurological disorders such as Multiple Sclerosis and Alzheimer's disease. Despite its widespread impact, there are currently no effective drugs or vaccines targeting EBV. Efforts to develop vaccines targeting EBV envelope glycoprotein gp350, a critical protein for viral attachment to host cells via the CD21 receptor, have been unsuccessful.

This invention identifies phyto-compounds with potent anti-gp350 activity as novel therapeutic agents against EBV. Through in silico screening, demethoxycurcumin and rosmarinic acid were identified as lead compounds demonstrating strong binding affinity to gp350. Among these, demethoxycurcumin exhibited profound inhibitory effects on gp350 function. These findings were validated through in vitro assays and animal models, confirming their antiviral efficacy, safety, and potential for clinical application. The use of these phyto-compounds offers a natural, side-effect-free alternative to synthetic antivirals, addressing the unmet need for effective anti-EBV drugs. By targeting gp350, these compounds block viral entry into host cells, preventing infection and reducing disease progression. This innovation presents a groundbreaking approach to managing EBV-related diseases and infections.



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PATENT

Filed, Indian Patent Application
No. 202521003721

RELEVANT INDUSTRIES

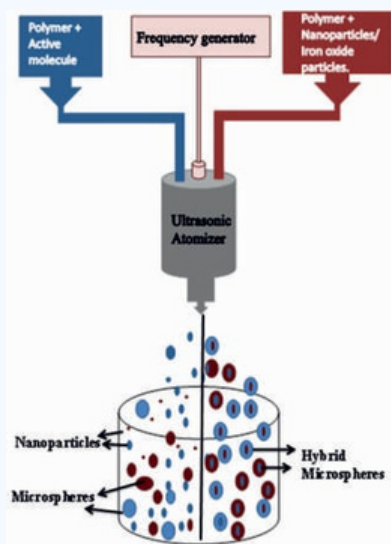
Pharmaceuticals

INVENTORS

Dr. Hem Chandra Jha
Ms. Annu Rani
Mr. Pranit Hemant Bagde
(Department of Biosciences and
Biomedical Engineering)

Ultrasonic Atomizer Based Method for Development of Biodegradable Anticancer Nanoparticles, Microspheres and Hybrid Micro-particles

The present invention relates to a method for synthesizing anticancer nanoparticles, and more particularly relates to a method of synthesizing nanoparticles, microspheres and hybrid micro particles loaded with anticancer drug using an ultrasonic atomizer for theranostic applications. The particles produced using this method have great potential in cancer chemotherapy.



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PATENT

Filed, Indian Patent Application
No. 201921015731

RELEVANT INDUSTRIES

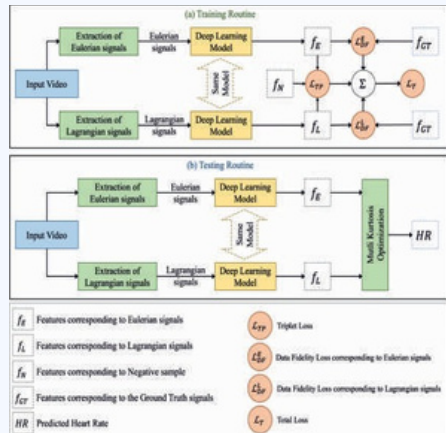
Pharmaceutical Healthcare

INVENTORS

Ms. Bhavana Joshi
Mr. Gaurav Pandey
Dr. Abhijeet Joshi
(Department of Bioscience and
Biomedical Engineering)

Robust Remote Photoplethysmography Estimation By Denoising Eulerian and Lagrangian Pulse Signals Using Contrastive Learning

The technology addresses the challenge of non-contact heart rate (HR) estimation from facial videos, overcoming limitations of traditional contact-based methods like pulse oximeters, which are unsuitable for continuous monitoring and risky for neonates, burn victims, and infectious patients. By combining Lagrangian and Eulerian methods with contrastive learning, it improves accuracy under variable lighting, motion artifacts, and camera focus. Validated at Technological Readiness Level (TRL) 5 in controlled environments, it enables safer, more comfortable HR monitoring for vulnerable populations and infectious cases. Additional applications include face anti-spoofing, deep-fake detection, and mental health analysis, advancing personalized healthcare and public health safety.



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PATENT

Filed, Indian Patent Application
No. 202221043505

RELEVANT INDUSTRIES

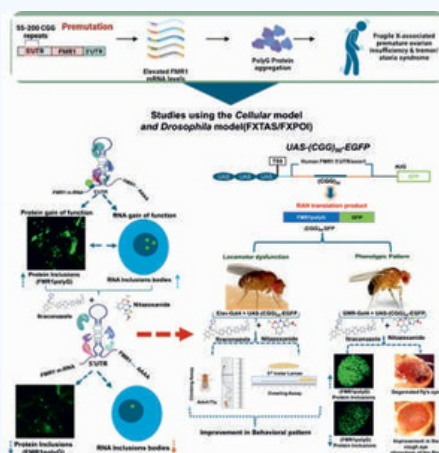
Security Healthcare
Monitoring Forensics

INVENTORS

Anup Kumar Gupta
Lokendra Birla
Dr. Puneet Gupta
(Department of Computer
Science and Engineering)

Innovative Dual Drug Formulation Counters FMR1Poly-G Protein Toxicity in Fragile X-associated Tremor/Ataxia Syndrome (FXTAS) and Fragile X-Associated Primary Ovarian Insufficiency (FXPOI)

FXTAS and FXPOI are neurodegenerative disorders caused by elevated CGG repeats, leading to toxic RNA foci and protein accumulation via RAN translation. To develop targeted therapies against FXTAS/FXPOI, our research focused on a key structural basis and identified a combinatorial complex of Itraconazole and Nitazoxanide drug molecules. The complex selectively binds to the CGG repeats, corrects splicing defects, reduces toxic protein buildup, and mitigates disease symptoms, highlighting their promise as therapeutic agents for FXTAS/FXPOI. Our study on repurposing of FDA molecules highlights the exceptional efficacy of the complex of FDA-approved drugs in addressing such repeat expansion disorders at the molecular level; it merges novel pharmacological approaches with critical insights into neurodegenerative diseases.



PATENT

Under process

RELEVANT INDUSTRIES

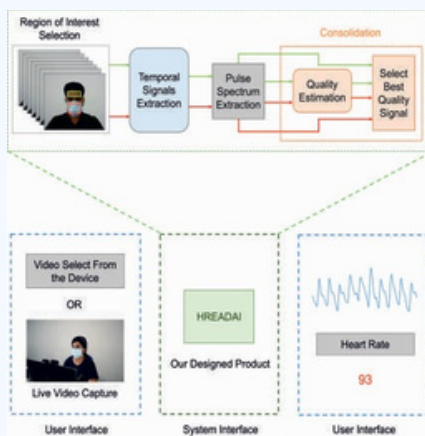
Pharmaceuticals

INVENTORS

Prof. Amit Kumar
(Department of Biosciences and
Biomedical Engineering)

System, Apparatus and Method for Heart Rate Determination of Individuals Wearing Face

The widespread use of face masks during pandemics hinders traditional heart rate (HR) monitoring methods relying on facial video analysis. This technology estimates HR remotely, analyzing video from both non-occluded facial regions and mask-covered areas. It consolidates data from both regions to improve accuracy. Validated at Technological Readiness Level (TRL) 5 in controlled environments, it ensures functionality and reliability. Ideal for healthcare settings, public places, and outbreaks, the non-invasive approach enhances comfort and reduces health risks. Additionally, it supports applications like face anti-spoofing, deep-fake detection, and mental health monitoring, advancing remote and accessible health monitoring solutions.



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PATENT

Filed, Indian Patent Application
No. 202321071568

RELEVANT INDUSTRIES

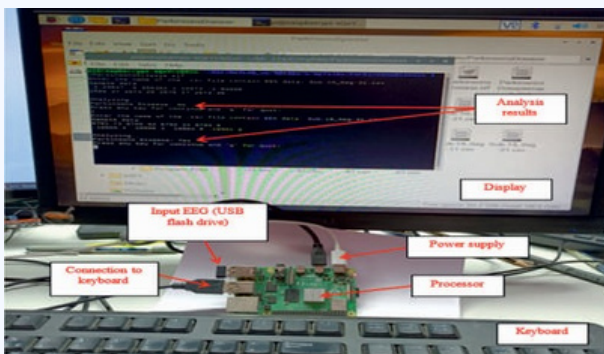
Security Healthcare
Monitoring Forensics

INVENTORS

Trishna Saikia
Anup Kumar Gupta
Dr. Puneet Gupta
(Department of Computer
Science and Engineering)

Automated Parkinson's Disease Detection System using EEG Signals

Parkinson's disease has affected almost 10 million people globally, with over 1 million cases reported annually in India. Early detection is critical, but no definitive imaging or biological markers exist. A system using multichannel EEG data for prediction is proposed. It employs multivariate iterative filtering (MIF) for signal decomposition, phase-space representation (PSR) for higher-dimensional analysis, and a pre-trained classifier for EEG segment classification. A GUI application, developed on a Raspberry Pi board, offers standalone Parkinson's detection. Tested with real-time EEG data, it achieves Technology Readiness Level (TRL) 8. Cost-effective and reliable, it supports telemedicine, aiding rural healthcare and reducing travel burdens.



pachori@iiti.ac.in

PATENT

Filed, Indian Patent Application
No. 202221027358

RELEVANT INDUSTRIES

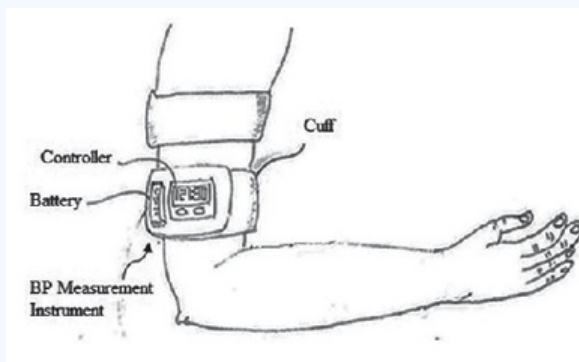
Smart Healthcare Industries

INVENTORS

Kritiprasanna Das
Prof. Ram Bilas Pachori
(Department of Electrical
Engineering)

A Standalone, Portable Apparatus for Automatically Measuring Blood Pressure with Remote Monitoring

Self-measurement of blood pressure (BP) predicts target organ damage, cardiovascular events, and mortality. Common cuff-based methods include the Korotkoff (auscultatory) and oscillometric methods. Mercury sphygmomanometers, though the gold standard for auscultatory measurement, pose environmental concerns and require trained personnel. Limitations include observer bias and lack of precision in oscillometric methods. This invention aims to develop a portable, user-friendly device for automatic BP measurement using the Korotkoff method. Key features include a patient-centric approach, compact design, and enabling self measurement anytime. The prototype has been rigorously tested, and ongoing work focuses on optimizing usability for widespread adoption.



Automatic Blood Pressure Measurement

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PATENT

Granted, Indian Patent No.
416164

RELEVANT INDUSTRIES

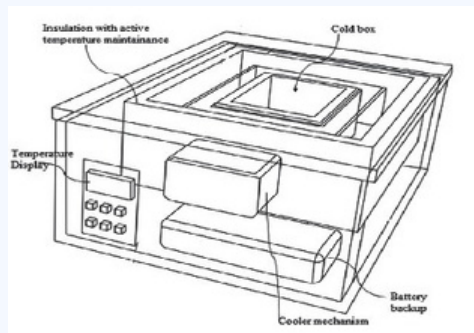
Health Care Bioscience
Industry Biomedical

INVENTORS

Dr. Abhay Gaidhane
Sawangi Meghe
Dr. Shilpa Raut
(Health Centre)
Prof. Devendra Deshmukh
(Department of Mechanical
Engineering)

A Vaccine and Biological Material Carrier Box

Immunization is crucial for preventing vaccine-preventable diseases, requiring reliable vaccine transportation. Traditional insulated containers relying on ice packs often face temperature fluctuations, disrupting vaccination schedules. This innovation introduces a self-contained, portable vaccine carrier with an anti-freeze mechanism, maintaining stable temperatures without ice packs. Tested rigorously, the carrier ensures 2–8°C for over 40 hours, even in varying conditions. Future plans include WHO certification and field experiments. This solution enhances immunization programs by providing reliable, temperature-controlled storage for vaccines and biological materials, benefiting healthcare workers in subcenters and villages, particularly during door-to-door campaigns.



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PATENT

Granted, Indian Patent No. 416164

RELEVANT INDUSTRIES

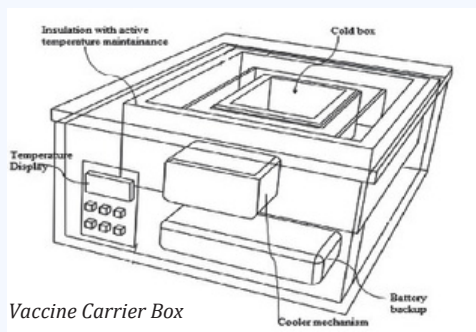
Health Care Industry,
Bioscience and Biomedical
, Research Industry

INVENTORS

Dr. Abhay Gaidhane
Sawangi Meghe
Dr. Shilpa Raut
(Health Centre)
Prof. Devendra Deshmukh
(Department of Mechanical
Engineering)

Kit for Screening of early phase detection of Epstein Barr Virus induced Alzheimer's disease

Neurodegenerative diseases, including Alzheimer's disease (AD), lead to progressive neuronal loss and impaired bodily functions like balance, movement, and speech. From 1990 to 2019, AD and dementia prevalence increased from 7,236.38 to 51,624.19 globally. Pathogens like Epstein-Barr virus (EBV) significantly contribute to these diseases. Numerous studies have reported that EBV proteins like EBNA1, EBNA3A, LMP1, LMP2A, BZLF1, gp350 and BNLF-2a are associated with AD and Multiple sclerosis (MS). This invention identifies a 12-amino-acid peptide from EBV glycoprotein-M (gM) that initiates amyloid beta-42 (A β 42) aggregation, accelerating AD progression. The gM peptide shows aggregation properties comparable to A β 42 and elevates AD markers, aiding in virus-mediated AD models for therapeutic testing.



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PATENT

Granted, Indian Patent No.
202121032715

RELEVANT INDUSTRIES

Pharmaceuticals

INVENTORS

Dr. Hem Chandra Jha
Dr. Deeksha Tiwari
Dr. Annu Rani
(Department of Biosciences and
Biomedical Engineering)

A Sanitization Device for a Protective Article

The device is a sanitization unit designed to store and sanitize protective articles like face masks using heat and moisture. It heats masks to 60–65°C with 80–85% relative humidity for effective sanitization. Structured as a portable storage unit, it protects masks from the external environment and minimizes contagion transmission. Compact and easy to handle, it enables in-situ sanitization, making it highly portable for users. This environmentally friendly solution promotes mask reusability, reducing the carbon footprint. The device combines functionality with portability, offering a practical and sustainable approach to mask sanitization.

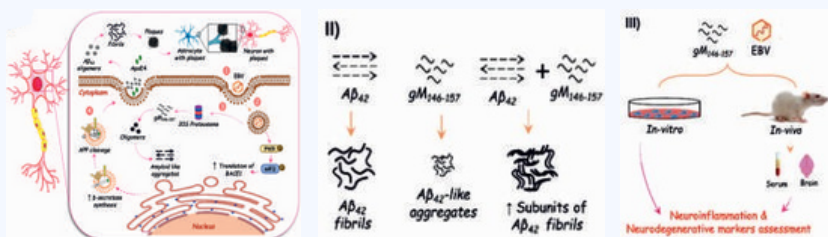


Illustration of possible details of technology for EBV-mediated Alzheimer's disease.

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PATENT

Granted, Indian Patent No. 440833;
Design Registration: Indian Patent
Provisional Application No.
202221041778

RELEVANT INDUSTRIES

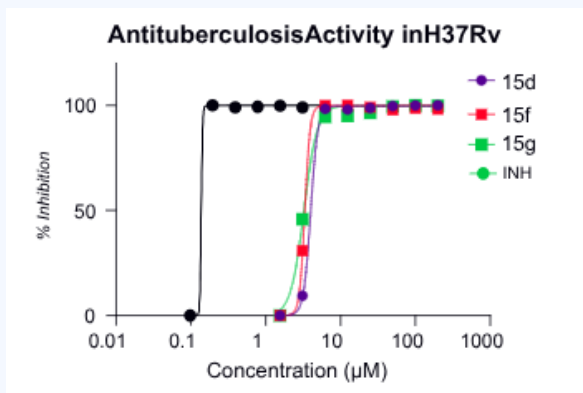
Healthcare Industry

INVENTORS

Dr. Ankur Miglani
Prof. Pavan Kumar Kankar
(Department of Mechanical
Engineering)

Small Molecule Drugs for Treatment of Tuberculosis

Tuberculosis (TB), caused by *Mycobacterium tuberculosis* (Mtb), remains a leading cause of death globally. The World Health Organization (WHO) reported 480,000 new multidrug-resistant TB (MDR-TB) and 100,000 rifampicin-resistant TB (RR TB) cases, with 50% occurring in China and India. Current anti-TB treatment lasts 6-9 months, but MDR and XDR-TB require years of second-line toxic drugs, with high failure and mortality rates. Incomplete treatment often leads to relapse. To address this, we synthesized over 150 novel antibacterial pyridine-based compounds, currently patented and copyright-protected in the USA and India. These compounds showed potent antimycobacterial activity at low micromolar concentrations and are now in preclinical in vivo studies for MDR and XDR-TB therapy.



cvenkat@iiti.ac.in

PATENT

USA Patent, US 11,427,596 B2; Indian Patent, IN 366986

RELEVANT INDUSTRIES

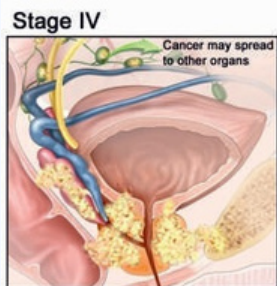
Healthcare Industry

INVENTORS

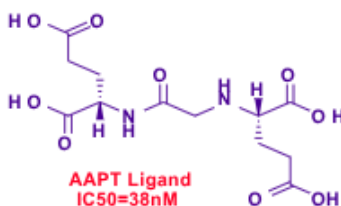
Dr. Chelvam Venkatesh
Dudhe P.
Krishnan M. A.
Sonawane A.
(Department of Chemistry)

Early Diagnosis and Treatment of Prostate Cancer

Tuberculosis (TB), caused by *Mycobacterium tuberculosis* (Mtb), remains a leading cause of death globally. The World Health Organization (WHO) reported 480,000 new multidrug-resistant TB (MDR-TB) and 100,000 rifampicin-resistant TB (RR TB) cases, with 50% occurring in China and India. Current anti-TB treatment lasts 6-9 months, but MDR and XDR-TB require years of second-line toxic drugs, with high failure and mortality rates. Incomplete treatment often leads to relapse. To address this, we synthesized over 150 novel antibacterial pyridine-based compounds, currently patented and copyright-protected in the USA and India. These compounds showed potent antimycobacterial activity at low micromolar concentrations and are now in preclinical *in vivo* studies for MDR and XDR-TB therapy.



Prostate Cancer



PCa Inhibitor



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PATENT

Filed, Indian patent Application No. 201821044594; USA Patent Application no. 16695851

RELEVANT INDUSTRIES

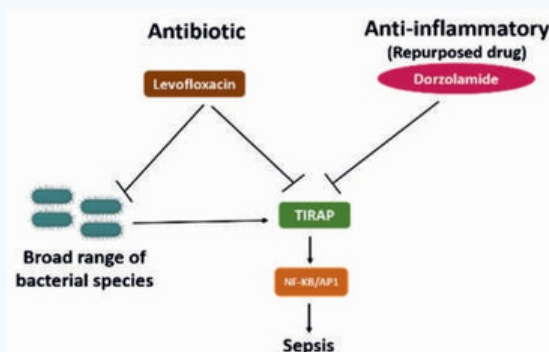
Healthcare Industry

INVENTORS

Dr. Chelvam Venkatesh
Sengupta S.
Krishnan M. A.
Pandit A.
(Department of Chemistry)

A Composition for Sepsis and Method Thereof

Sepsis, caused by microbial infections, impairs vital organs like the lungs and kidneys. Despite many therapeutic agents being tested since the 1980s, few have been successful, and no specific approved treatment exists. We propose a novel combination of levofloxacin, a broad-spectrum antibiotic, and dorzolamide, an anti-inflammatory drug, to address both bacterial killing and organ healing in sepsis. Preclinical studies are complete, and a Phase 1 clinical trial is planned. The invention is patented under reference E-137/6170/2023/MUM, application number 202321038927. New drugs for sepsis could save lives, reduce hospital stays, and address antimicrobial resistance challenges.



Illustrates composition and working process of the composition of the present invention.

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PATENT

Filed, Indian Patent Application No.
202321038927

RELEVANT INDUSTRIES

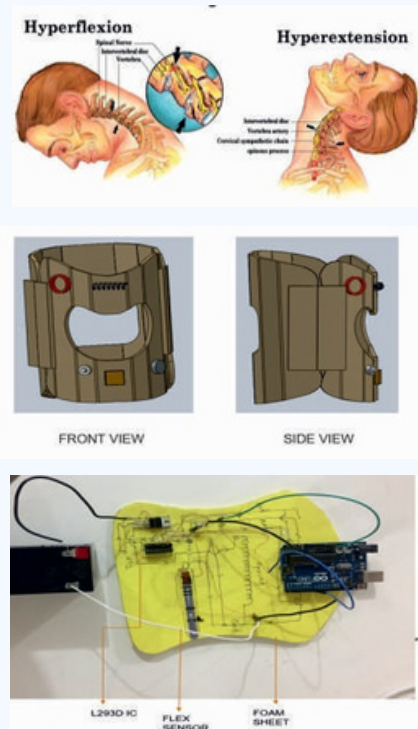
Pharmaceuticals

INVENTORS

Rajat Atre
Rahul Sharma
Prof. Mirza S Baig
(Department of Bioscience &
Bioengineering)

SMA Based Smart Cervical Collar

The cervical collars market is shifting towards soft collars, moving away from rigid ones once widely used for spinal injuries. Most neck injuries today don't require rigid collars, leading hospitals and healthcare associations to adopt soft collars. The demand is driven by rising neck pain, cervical spondylitis, aging populations, and neck injuries from sports and defense. Soft collars use piezo sensors to capture strain between the neck and collar, automatically adjusting pressure. They are made with shape memory alloys and a microcontroller, using a feedback mechanism to reduce the effort in monitoring correct wearing practices.



palaniia@iiti.ac.in

PATENT

Granted, Indian Patent Application
No. 201721008038

RELEVANT INDUSTRIES

Healthcare Sports
Defense Fitness

INVENTORS

Dr. Shilpa Raut
Senior Medical Officer
Prof. Palani I. A.
(Department of Mechanical
Engineering)

IoT-enabled Smart Absorbent Material and Sanitary Device

Currently, 61.4% of Indian menstruating women feel embarrassed about periods (The Hindu, 2023). To address this, Laser-induced graphene (LIG) and thin metal electrodes in sanitary pads offer a solution for leakage detection due to their absorptive and conductive properties. Integrated into replaceable pads, these electrodes detect bioluid via resistivity changes without skin contact. The system connects to an IoT device on the waist, providing vibrational feedback. The device alerts users to period initiation, leakage, or saturation, signaling when to replace the pad. This low-cost technology, currently at TRL 6, can also be applied to adult diapers for broader use.

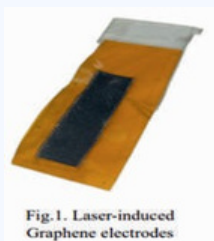


Fig. 1. Laser-induced Graphene electrodes

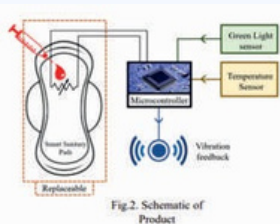
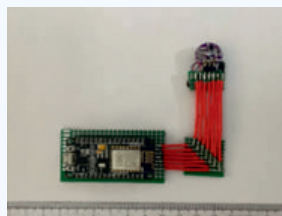


Fig.2. Schematic of Product



Prototype developed

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PATENT

Filed, Indian Patent Application No.
202321067853

RELEVANT INDUSTRIES

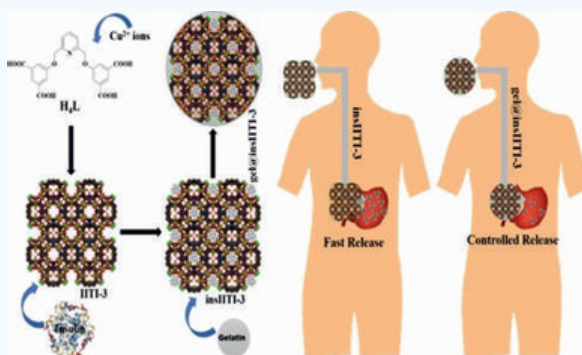
Healthcare Sports
Defense Fitness

INVENTORS

Kailaash Pandiyan, Aditi T,
Pragya Singh, Kanishka Goyal,
Ayushi Agrawal, D J Mistry,
Prof. Palani I. A.
(Department of Mechanical
Engineering)

Role of Gelatin Coating With Copper-based Metal-organic Framework For Controlled Insulin Delivery

Diabetes affects around 552 million people worldwide, with type 1 diabetes (T1DM) and type 2 diabetes (T2DM) being the main types. Insulin therapy is critical for managing these conditions, though the current delivery systems (syringe, pen, pump, inhaler) face limitations like cost, invasiveness, and inconvenience. Oral insulin delivery is beneficial but hindered by low bioavailability. The invention of copper Metal-Organic Framework (IITI-3) shows a high surface area of $1026.5 \text{ m}^2/\text{g}$ and pore diameter of 3.413 nm . Insulin encapsulation in IITI-3 with gelatin coating ensures controlled release. Gelatin improves biocompatibility and delivery efficiency, offering a promising solution for insulin administration.



Synthesis of IITI-3 using new linker, Insulin encapsulation within IITI-3, coated with gelatin and their drug delivery release phenomenon (Adapted with permission ACS Materials Lett. 2023, 5, 4, 1100–1108. Copyright 2023, American Chemical Society).

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PATENT

Under process

RELEVANT INDUSTRIES

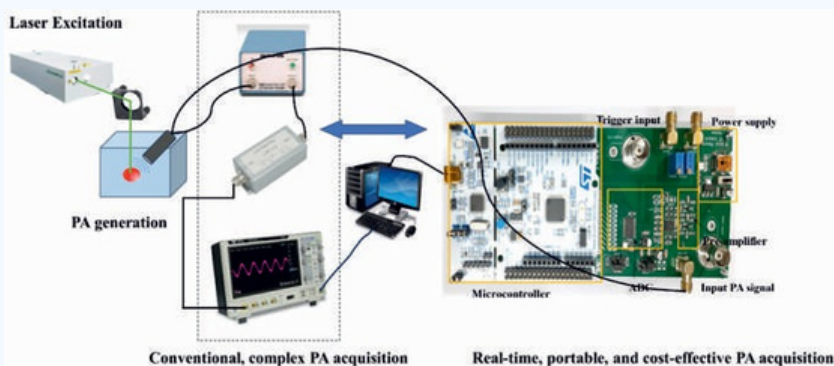
Pharmaceuticals Healthcare
Biotechnology

INVENTORS

Shaikh M. Mobin
(Department of Chemistry)

Fast Cancer Screening Device for Early-stage Cancer Diagnosis, using a Quantitative Photoacoustic Spectral Response Technique

Medical diagnostics are essential for effective treatment and recovery, with a focus on early diagnosis over the past two decades. The photoacoustic (PA) technique, a non-invasive approach, offers high sensitivity and accuracy. This research develops a cost-effective PA screening tool for early-stage cancer detection, targeting remote areas with limited medical facilities. The project utilizes a compact pulsed laser diode (PLD) based PA system for optical design. Field investigations at AIIMS Bhopal showed its potential to differentiate malignant and fibrocystic changes from normal fatty tissue in breast disease. The technology is at TRL 5, with the cost of the developed instrument under 1 Lac, compared to >70 Lac for conventional instruments.



svasudevan@iiti.ac.in

PATENT

Granted, Indian patents Application
No. 202221056741, 202221050788

RELEVANT INDUSTRIES

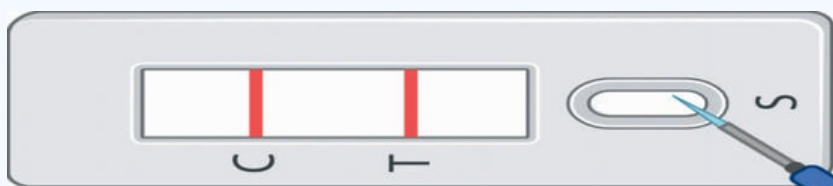
Healthcare

INVENTORS

Suhel Khan
Prof. Srivathsan Vasudevan
(Department of Electrical
Engineering)

Developed Rapid Non-invasive Diagnostic Kits (TB-RAP) for Tuberculosis

Tuberculosis (TB) infects 10 million people and kills 1.5 million annually. Existing diagnostic kits are costly, time-consuming, and less sensitive, leading to undetected cases. To address this, we developed the non-invasive, rapid, precise, and affordable TB diagnostic kit, "TB-RAP," which detects TB from saliva or sputum samples within hours without requiring trained personnel. The technology is under clinical validation using TB patient samples (TRL 6). The TB-RAP kit enables early, fast, and specific diagnosis of TB, helping to prevent the further spread of the device while reducing the need for trained manpower.



TB-RAP KIT
Schematic representation of TB-RAP Kit

"S"- Saliva or sputum sample "T": Test Sample "C": Positive control

asonawane@iiti.ac.in

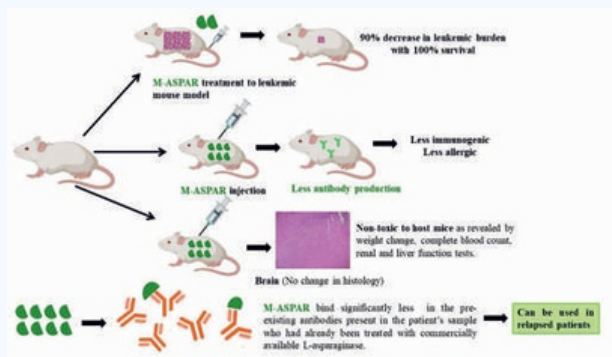
PATENT
Under process

RELEVANT INDUSTRIES
Healthcare

INVENTORS
Prof. Avinash Sonawane
(Department of Biosciences and
Biomedical Engineering)

Novel M-ASPAR Drug to Improve Treatment of Primary and Relapse Blood Cancer

L-asparaginase is commonly used for treating Acute Lymphoblastic Leukemia (ALL), but it causes serious side effects like allergies, neural disorders, blood clots, and toxicity to organs. Additionally, its success in treating relapse ALL is limited. We have developed the novel M-ASPAR drug, which significantly reduces side effects and improves therapeutic efficacy. M-ASPAR, currently in Phase I/II clinical trials (TRL 8), is nontoxic to the kidney, liver, spleen, brain, and bone. It has shown the ability to kill 90% of cancerous cells and achieve 100% survival in cancerous mice, offering a promising treatment option for relapse ALL.



Acute Lymphoblastic Leukemia (ALL) is treated using a combination of drugs that includes L-asparaginase as a major component. However, administration of L-asparaginase causes serious side effects and the therapeutic efficacy of L-asparaginase is significantly reduced in relapse ALL patients. We have developed novel M-ASPAR drug which is nontoxic to kidney, liver, spleen, brain, bone. M-ASPAR killed 90% cancerous cells and 100% survival of cancerous mice was observed.

asonawane@iiti.ac.in

PATENT

Granted, Indian Patent No. 365651

RELEVANT INDUSTRIES

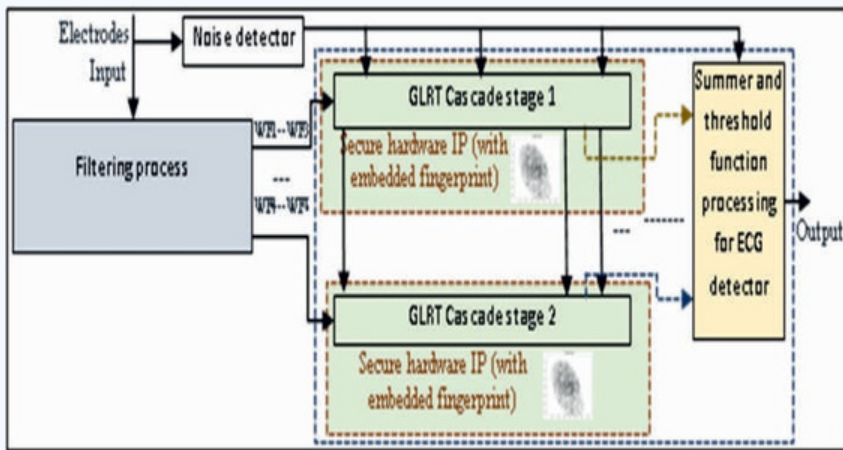
Healthcare

INVENTORS

Prof. Avinash Sonawane
(Department of Biosciences and
Biomedical Engineering)

Secure Hardware of GLRT Cascade Using Color Interval Graph Based Embedded Fingerprint for ECG

- (a) Presents the design methodology of generalized likelihood ratio test (GLRT) hardware intellectual property (IP) core for ECG detector.
- (b) Presents a secure GLRT hardware IP core for ECG detector using fingerprint biometric-based hardware security methodology during High Level Synthesis.
- (c) Presents Color Interval Graph (CIG) framework and register transfer level (RTL) datapath of a secure GLRT hardware micro IP core and secure GLRT hardware cascade IP core.



asengupta@iiti.ac.in

PATENT

Granted Indian Patent Application
No. 202321037433

RELEVANT INDUSTRIES

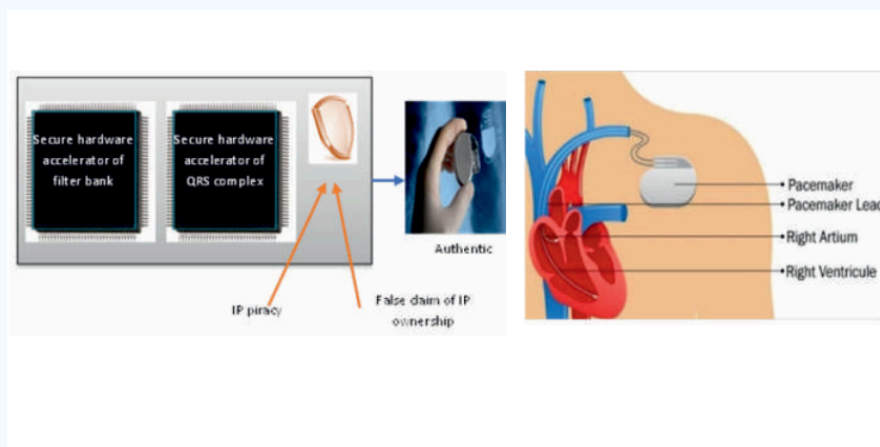
Healthcare, Chip Design,
Hardware Security

INVENTORS

Prof. Anirban Sengupta
(Department of Computer Science and
Engineering)

A Hardware Security Method to Design Secure Hardware Accelerators for Cardiac Pacemaker

A novel hardware accelerator for filter bank and QRS complex detector for implantable cardiac pacemaker. A novel secure design low with AES-256 for generating secure version of hardware accelerators for implantable cardiac pacemaker against IP piracy. This ensures robust security by enabling detection and isolation of pirated unsecured hardware accelerators before integration into implantable pacemakers, which otherwise may lead to fatal consequences for the patients. The proposed invention presents novel secure high level synthesis methodology that is capable to generate secure RTL datapath design for filter bank and QRS complex for implantable cardiac pacemaker.



asengupta@iiti.ac.in

PATENT

Filed, Indian Patent Application No.
202321036317

RELEVANT INDUSTRIES

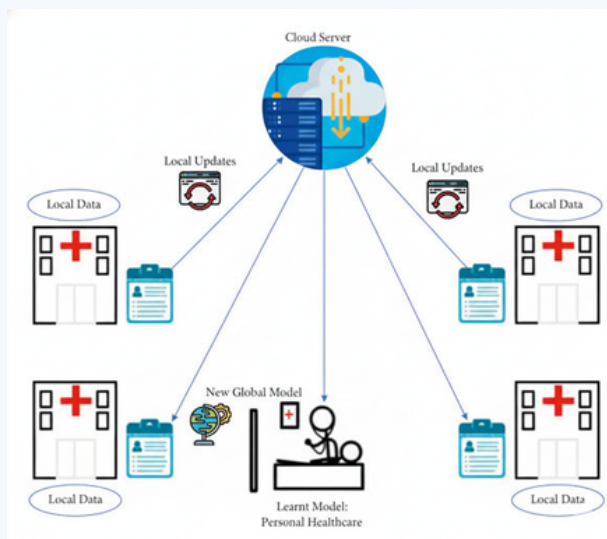
Healthcare, Chip Design,
Hardware Security

INVENTORS

Prof. Anirban Sengupta
(Department of Computer
Science and Engineering)

Federated Learning for Privacy-Preserving Heart Disease Prediction in Healthcare IoT

The research focuses on a privacy-preserving machine learning framework for heart disease prediction across multiple hospitals. It addresses the critical challenge of data silos and regulatory constraints (like HIPAA and GDPR) by utilizing Federated Learning (FL), allowing institutions to collaboratively train global models without exchanging sensitive raw patient data.



ayanm@iiti.ac.in

PATENT

Nil

RELEVANT INDUSTRIES

Healthcare

INVENTORS

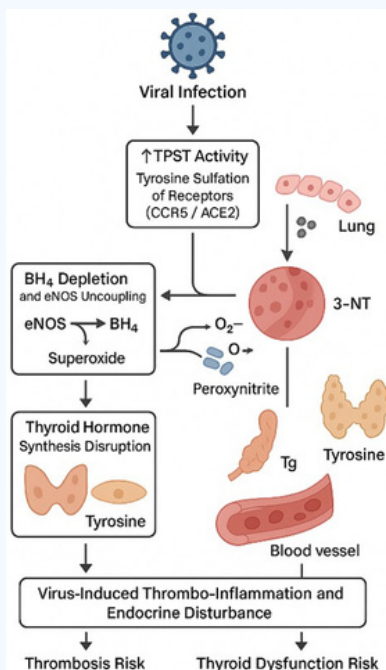
Siddhesh Nitin

Dr. Ayan Mondal

(Department of Computer
Science and Engineering)

Post-Viral Clot & Thyroid RiskScan Kit

Post-viral syndromes can include thrombo-inflammatory complications and thyroid-axis-dysregulation that emerge after the acute infection window. This technology is a multi-fluid-diagnostic kit that integrates biomarkers measured across blood-plasma and other clinically relevant fluids (saliva; optional respiratory and neurological fluids in specialist settings) to generate an early risk stratification output for post-viral thrombosis and thyroid-dysfunction. The kit is designed around cross-pathway panel that captures complementary signals from coagulation-associated inflammation, endothelial oxidative and nitrosative-stress, amino-acid and cofactor imbalance, and thyroid involvement. Results are combined into a single interpretive report (risk-tier/score) to support follow-up prioritization, confirmatory testing decisions, and targeted preventive care pathways



hemcjha@iiti.ac.in

PATENT

Submitted (Application No.
202521037211)

RELEVANT INDUSTRIES

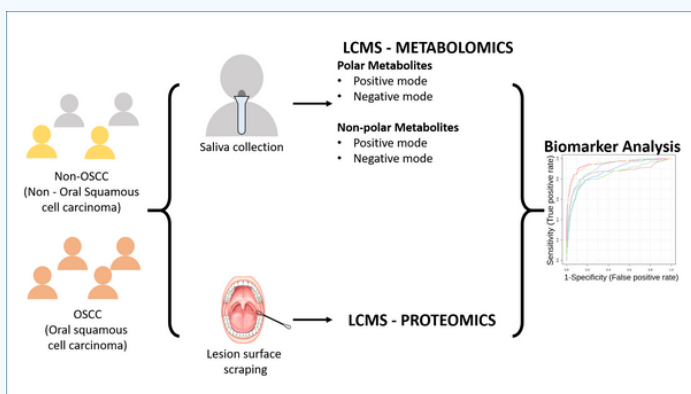
In-Vitro Diagnostics, Point-of-Care Testing, Hospitals/Clinical Labs, Biosensor Companies

INVENTORS

Dr Hem Chandra Jha
Siddharth Singh
Budhadev Baral
Vaishali Saini
Dr. Tarun Prakash Verma

Diagnosis Kit for Detection of Oral Cancer using Saliva

Oral squamous cell carcinoma (OSCC), the most common mouth cancer, often goes undetected until advanced stages, leading to poor survival. This innovation offers a painless spit and cheek swab test-no biopsies needed. Using chair side diagnostic kit, it measures changes in salivary molecules that signal early cancer. A panel of biomarkers distinguishes cancer from healthy or risky states with high accuracy. Ideal for routine screening in high-risk groups (tobacco users, etc.), it enables early treatment, better outcomes, and monitoring via simple kits.



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PATENT

Application Number:
202521056008

RELEVANT INDUSTRIES

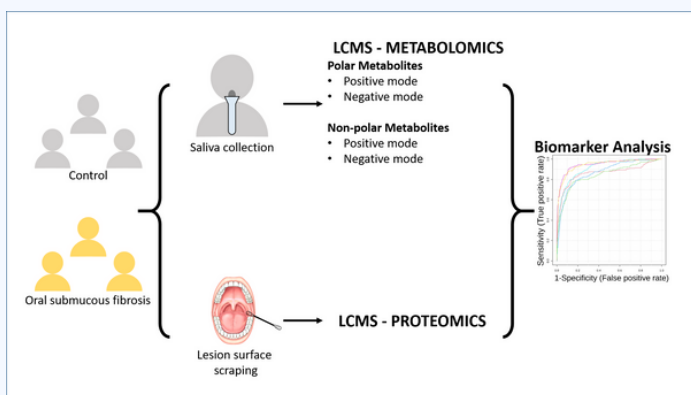
In-Vitro Diagnostics, Point-of-Care Testing, Hospitals/Clinical Labs, Biosensor Companies

INVENTORS

Dr Hem Chandra Jha
Dr Tarun Prakash Verma
Dr Deepak Agrawal

Saliva-Based Early Detection Kit for Oral Submucous Fibrosis- a Precancerous Condition

Oral Submucous Fibrosis (OSMF) is a precancerous condition commonly seen in betel nut users, leading to restricted mouth opening and a high risk of oral cancer. This innovative, non-invasive saliva test enables early detection and long-term monitoring without the need for needles or tissue sampling. By analyzing specific salivary molecules, the kit facilitates timely diagnosis, tracks disease progression, and helps prevent occurrence of cancer. Designed for routine screening of high-risk individuals, it offers a simple, user-friendly, and scalable solution for effective management and cancer prevention in OSMF patients.



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PATENT

Application Number:
202521056068

RELEVANT INDUSTRIES

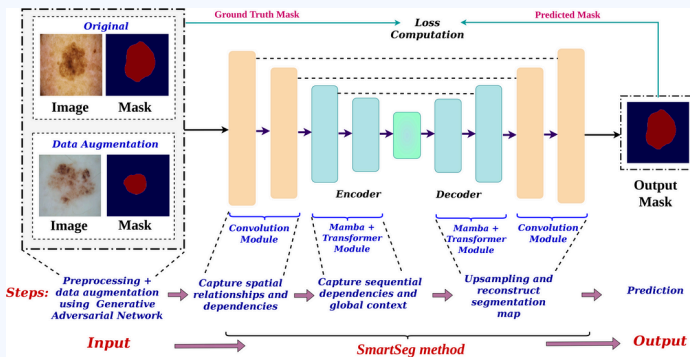
In-Vitro Diagnostics, Point-of-Care Testing, Hospitals/Clinical Labs, Biosensor Companies

INVENTORS

Dr Hem Chandra Jha
Dr Tarun Prakash Verma
Dr Deepak Agrawal

SmartSeg: AI-Enabled Precision Segmentation in Medical Imaging

Accurate segmentation of pathological regions in medical images is essential for effective diagnosis, treatment planning, and disease monitoring. The study integrates convolutional neural networks with linear transformer mechanisms and multiscale Mamba-based state-space modeling to segment complex medical images. Convolution-based modules capture fine-grained local details such as boundaries and textures, while Transformer and Mamba modules model long-range spatial dependencies and global anatomical context. This method enables accurate delineation of diseased regions even in cases with low contrast, irregular shapes, uneven illumination, and blurred tumor boundaries. In addition, the method incorporates a generative data augmentation strategy to improve generalization under limited annotated data by synthesizing realistic medical images while preserving structural consistency.



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PATENT

Nil

RELEVANT INDUSTRIES

IT Media
Education Customer Support
Healthcare Government

INVENTORS

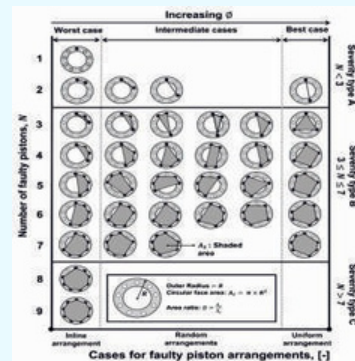
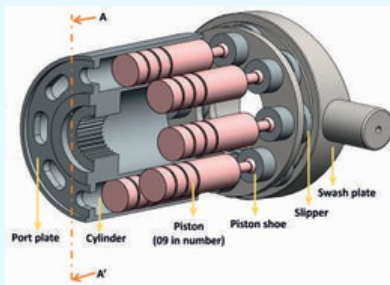
Dolly Uppal
Prof. Surya Prakash

Manufacturing & Industry 4.0



A Method of Maintenance for High-Performance Machineries Employing Axial Piston Pumps and Multiple Cylinders

The present disclosure relates to a method of maintenance and operation for high performance machineries, employing axial pumps and multiple cylinders, which are omnipresent in earth moving equipment, mobile hydraulics, and steering systems of aircraft and sea-going vessels. The method comprises identifying the position of healthy pistons and faulty pistons inside the axial piston pump. The alternative configuration is determined for faulty piston positions in such a manner to generate the least amount of peak-to-peak pressure fluctuations. The faulty pistons are repositioned for uniform pressure distribution for an optimized performance of the axial piston pump under faulty conditions. The proposed method reduces the maintenance downtime significantly and results in substantial cost savings through the reuse of the damaged parts and increases the working life or the utilization of an otherwise faulty pump.



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PATENT

Granted, Indian Patent No.
412148

RELEVANT INDUSTRIES

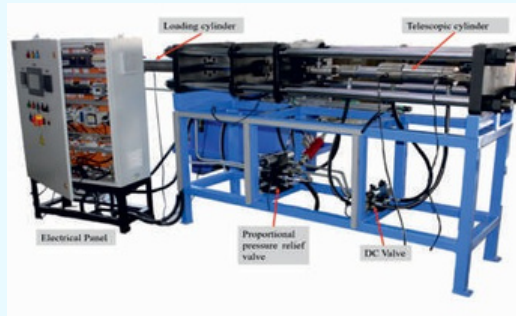
Defense Aerospace

INVENTORS

Dr. Ankur Miglani
Prof. Pavan Kumar Kankar
(Department of Mechanical
Engineering)

A Method and System for Detection and Determination of Failure of a Fluid-Power System

The invention provides a system for monitoring anomalies in a hydraulic system. It acquires sensor signals, such as low and/or pressure sensors on the hydraulic cylinder and uses a microprocessor to convert these time-domain signals into a time-frequency spectrum, a 2-D representation. A vision sensor, attached to the microprocessor, continuously monitors the spectrum to localize and identify the system's operating condition. The system logs anomaly identification, converts it to a defined format (e.g., .txt or .csv), and transmits it to a central server, triggering alarms and notifications when anomalies are detected in the system or components.



Experimental test-rig for demonstrating the fault prognosis and diagnosis in a high-pressure hydraulic system

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PATENT

Filed, Indian Patent Application
No. 202321059456

RELEVANT INDUSTRIES

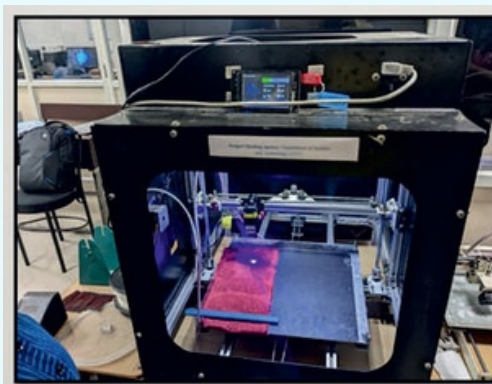
Defense Aerospace

INVENTORS

Dr. Ankur Miglani
Prof. Pavan Kumar Kankar
(Department of Mechanical
Engineering)

Low-cost Laser printer for printing Geographical Index and QR code on fabrics

Geographical indexing of fabric refers to categorizing or organizing fabrics based on their place of origin or the cultural, historical, and traditional characteristics tied to specific regions. This concept is commonly applied in the textile industry to identify fabrics that are unique to a particular geographic area. Benefits of Geographical Indexing in Fabric: Cultural Preservation, Authenticity, Economic Support. We have developed a low-cost laser printer for printing QR codes and the GI index on the fabric without damaging the fabric. Initially, trials were attempted on Maheshwari and Chanderi silks.



LOGO Printing Setup with Diode Laser (405 nm)



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PATENT

Under Process

RELEVANT INDUSTRIES

Textile

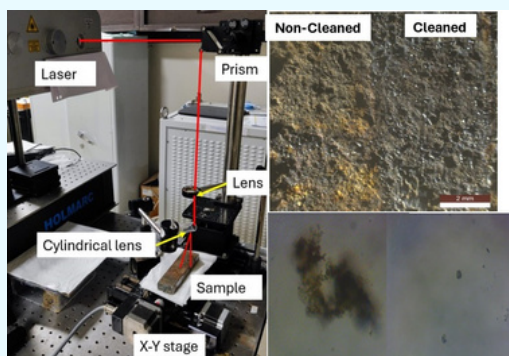
INVENTORS

Prof. Palani I.A.
Prof. Suhas S Joshi
Dr. Anshu Sahu
Ms. Sunitha
(Department of Mechanical Engineering)

Laser Cleaning of Biofouling from Ship Hull

Biofouling (growth of algae, and mussels on ship hull) increases the low resistance of ship, resulting in fuel consumption and CO₂ emissions. Mechanical cleaning damaged the hull coating. Hence, laser-based cleaning is an alternative effective approach to clean ship hulls.

Blue and Green lasers with varying energies were used for irradiating on the larger area of the hull surface. Further, cleaned reactive surfaces restrict the growth of the marine organism.



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PATENT

Nil

RELEVANT INDUSTRIES

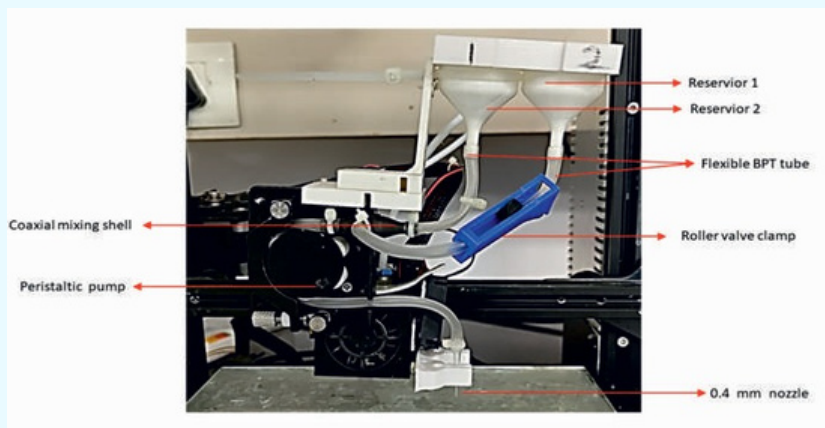
Marine	Metalworking
Shipbuilding	Aerospace
Automotive	Heritage
Energy Sector	Preservation

INVENTORS

Prof. Palani I.A.
 Dr. Kiran Bala
 Dr. Nandini Patra
 Mr. Rohit Pandya
 Mr. Amit Nabira
 (Department of Mechanical
 Engineering)

System and Method for Direct Ink Writing

This invention enhances Direct Ink Writing (DIW) in 3D printing by introducing a dynamic system that adjusts the composite composition during printing. It uses a stepper motor-based peristaltic pump with an Ender-3 printer to improve deposition consistency and precision. This innovation enables the creation of complex parts with varied composite materials, overcoming existing limitations and advancing DIW capabilities for advanced design and manufacturing.



girish.verma@iiti.ac.in

PATENT

Filed, Indian Patent Application No.
202321079655

RELEVANT INDUSTRIES

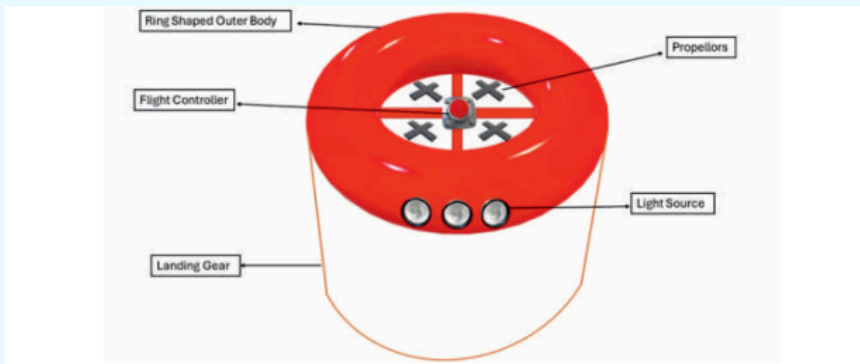
Additive Manufacturing

INVENTORS

Dr. Girish C. Verma
(Department of Mechanical
Engineering)

Design of Industrial Illumination Drone with Obstacle Avoidance

The project introduces an industrial drone for targeted illumination, replacing traditional torch-mounted caps. It enhances visibility and safety by directing light precisely, adapting to challenging environments. Unlike typical cargo or surveillance drones, this concept transforms drones into dynamic lighting sources to improve industrial work conditions. Currently in the ideation stage, it focuses on collaboration, funding, and ethical development. The project also explores creative drone applications, aiming to improve safety, productivity, and technological advancements across various sectors.



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PATENT

Nil

RELEVANT INDUSTRIES

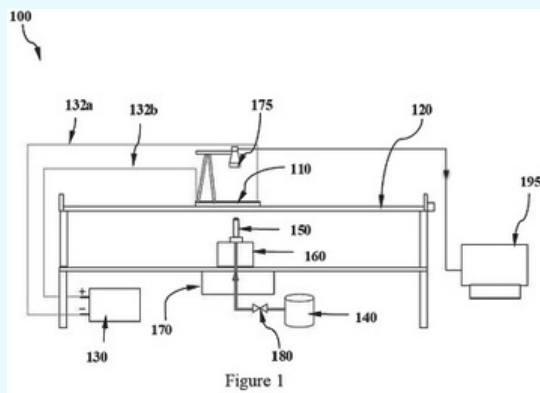
Manufacturing, Infrastructure
Development, Construction

INVENTORS

Dr. Devesh Mishra, Dr. Sumit
Gautam
Department of Electrical
Engineering

A Method and Apparatus for Transferring Heat from Stationary/ moving Surfaces Using Impingement Jet

This invention focuses on the thermo-fluidic characteristics of impinging jets, specifically examines the heat transfer of stationary and moving surfaces. It includes stepper motors, ball screws, sensors, nozzle, and thermal imaging device that captures high-resolution temperature data in real-time. The technology overcomes existing limitations on the infrared thermal imaging during jet impingement cooling for complex dynamic systems. It can be used in various industrial applications namely, metallurgical processing, paper drying, textiles, electronics cooling and aerospace. Beyond industrial applications, it can be used for predictive modeling for thermal systems, paving the way for sustainable, energy-efficient technologies with broader societal benefits.



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PATENT

Granted, Indian Patent No. 471000

RELEVANT INDUSTRIES

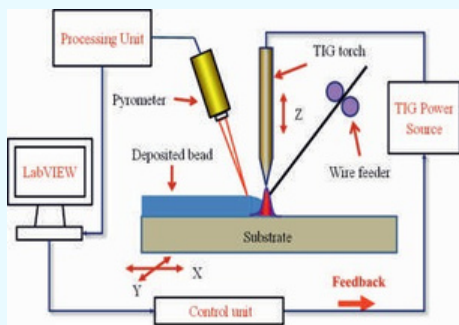
Metallurgical Processing Industries,
Steel Industries, Paper and Textile
Industries

INVENTORS

Avadhesh Kumar Sharma, Akash
Kumar Jain, Mayank Modak,
Prof. Santosh Kumar Sahu,
Department of Mechanical
Engineering

In-Situ Temperature Monitoring and Feedback Control in the Wire Arc Additive Manufacturing Process

Gas tungsten arc welding (GTAW) is valuable for surface hardening and additive manufacturing. To counteract the shortage of skilled operators due to harmful radiation, a novel automation technology was created. This system employs a ratio pyrometer to control temperatures during wire arc additive manufacturing (WAAM) and replaces the foot pedal with electronic circuitry and feedback control via LabVIEW software. Validated in labs, it enhances stability and bead quality, proving its concept at TRL 4.



Schematic for temperature monitoring and control for wirearc additive manufacturing.



Temperature-dependent feedback control for the multilayer deposition with the moving heat source at a deposition speed of 0.15 m/min, wire feed speed of 2.5 m/min, and setpoint temperature of 1250 °C for 1–5 layers, (b) temperature controlled multilayer deposited wall.

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PATENT
Nil

RELEVANT INDUSTRIES
Aerospace and Medical Implants.

INVENTORS
Anas Ullah Khan, Dr. Yuvraj K Madhukar , Department of Mechanical Engineering

Design and Development of Triboelectric Nanogenerator Based Machine Skin Integrated with Smart Actuator for Digital Twin Development

Diagnostics are essential for identifying machine defects. To progress from Industry 4.0 to 5.0, a customizable "Machine Skin" with self-energizing smart sensors is proposed for traditional machinery. This system uses an IoT-enabled Triboelectric Nanogenerator (TENG) to detect vibrations and send data to a Digital Twin for analysis, enabling condition monitoring and predictive maintenance. It includes a closed-loop mechanism with an IoT actuator to adjust machine RPM, preventing failures and ensuring continuous production. Currently at TRL 2-3, this technology offers cost-effective smart manufacturing solutions for industries in developing nations.



Schematic of the Machine skin and actuator on the air compressor incorporated with its Digital Twin

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PATENT

Filed, Indian Provisional Patent
Application No. 202421017372

RELEVANT INDUSTRIES

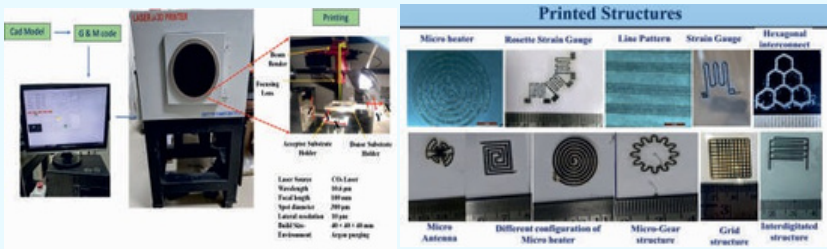
Manufacturing, Heavy Industries.

INVENTORS

Diksha Jaurker, Prof. Suhas S
Joshi, Dr. Vibhor Pandhare,
Prof. Palani I.A., Department of
Mechanical Engineering

Implementation of Laser Decal Transfer Towards Laser μ -3D Printing

In microfabrication, μ -3D printing combines laser direct writing and additive manufacturing for maskless printing of micron-scale 3D structures. Using thin films as feed material, it fabricates multimaterial structures, including metals, polymers, and alloys, without altering material properties. This technology addresses limitations of screen and inkjet printing, such as nozzle clogging and instability, enabling the production of microelectronics components like metaantennas, bandpass filters, and strain gauges with a minimum thickness of 2 μm . At TRL-8 and ready for commercialization, the Laser μ -3D printer advances the fabrication of sensors and actuators, meeting the growing demand in electronics industries.



*Laser μ -3D Printer developed
in-house at IIT Indore*

palaniia@iiti.ac.in

PATENT

Filed, Indian Provisional Patent
Application No. 202221022267

RELEVANT INDUSTRIES

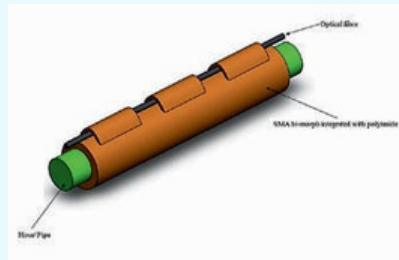
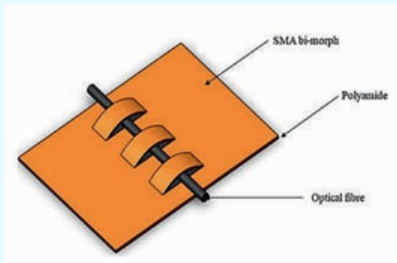
Microfabrication, Semiconductor
Printing, Flexible Electronics

INVENTORS

Dr. Anshu Sahu, Prof. Vipul
Singh, Prof. Palani I.A.,
Department of Mechanical
Engineering

Strained SMA Bimorph & Spring Based Condition Monitoring System for Fluid Leak Detection in Hydraulic Hoses SMA

Monitoring temperature in hydraulic packs used in heavy industry is challenging. A sensor system focuses on detecting and monitoring fluid leakage in hydraulic hoses. The sensor uses a shape memory alloy (SMA) bimorph with clamps and an optical fiber. Wrapped around the hose, it detects fluid leakage by measuring bending loss in the optical fiber, caused by temperature-induced changes in the SMA's shape. Leakage is monitored via resistance changes in strained SMA wires. An IoT-enabled controller displays leakage status through a mobile app. The technology has reached TRL 4.



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PATENT

Granted, Indian Patent Application
No : 202221022267

RELEVANT INDUSTRIES

Automobile, Ship building, Heavy and
Manufacturing Industries

INVENTORS

Prof. Palani I.A., Department of
Mechanical Engineering

Metal Inert Gas (MIG) Based Additive Manufacturing Technique For Fabricating Shape Memory Alloy Ring

Vibrations during machining generate frictional heat, causing thermal expansion, machine wear, and wobbling, leading to dimensional errors and poor surface finish. Shape-memory alloys (SMAs) can dampen vibrations by dissipating heat energy. NiTi SMAs, known for their shape memory effect and pseudoelasticity, are ideal for structural vibration control. They are produced using methods like powder metallurgy, thermal spray, and plasma melting, but MIG additive manufacturing offers strategic advantages. This technology is nearing TRL 5, promising enhanced vibration control and improved machining quality.



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PATENT

Granted, Indian Patent Application
No : 201721007136

RELEVANT INDUSTRIES

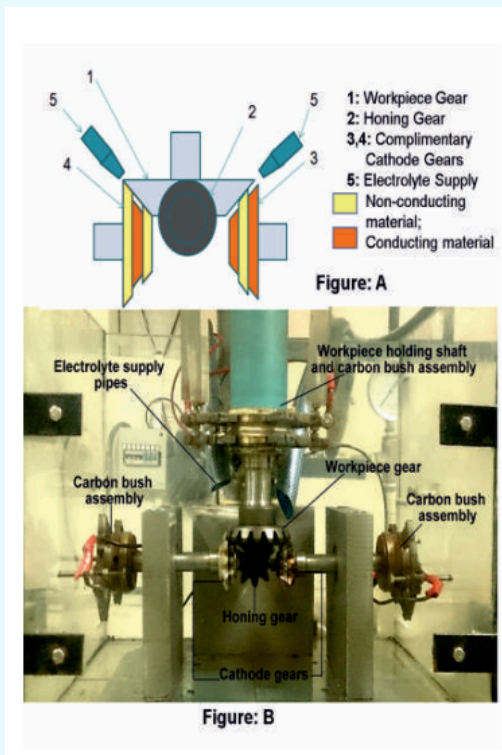
Manufacturing and Machine tool
industry, Heavy industry

INVENTORS

Prof. Bhupesh K Lad, Prof.
Palani I.A., Department of
Mechanical Engineering

Non-Contact Technology for High Quality Finishing of Bevel Gears

A novel twin complementary cathode gear concept was developed for non-contact electrochemical honing (ECH) of bevel gears, with a machine (Fig. B) for processing 20MnCr5 alloy, commonly used in automotive applications. Continuous or pulsed DC power enables pulse- ECH (PECH), which outperformed ECH, achieving up to DIN 6 gear quality. Plasma nitriding further enhanced PECH performance. The technology, at TRL 4-5, offers a sustainable, environmentally friendly, and cost-effective solution for high- quality finishing, improving bevel gear performance and service life.



nkjain@iiti.ac.in

PATENT

Nil

RELEVANT INDUSTRIES

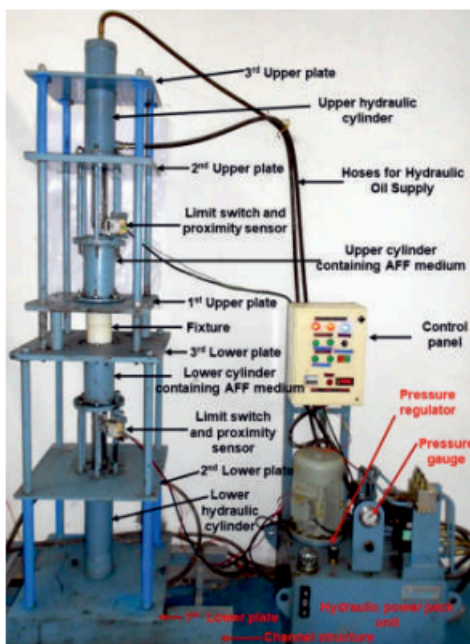
Automobile, Marine, Avionics, Home Appliances, and any Industry using and/or testing of Gears

INVENTORS

Javed Habib Shaikh, Sunil Pathak, Prof. Neelesh Kumar Jain, Department of Mechanical Engineering

Abrasive Flow Finishing Machine for High Quality Finishing of Cylindrical and Conical Gears

Challenges exist in achieving high-quality finishes for cylindrical and conical gears. An Abrasive Flow Finishing (AFF) machine has been developed for finishing spur, helical, and bevel gears using a putty of molding clay, silicon carbide abrasives, and silicone oil. This process meets 7 DIN quality standards, allows simultaneous finishing of multiple gears, and is being investigated for additively manufactured parts. Laser texturing enhances AFF performance. With a TRL of 3-4, this sustainable, flexible, and cost-effective method emits no harmful substances and costs Rs. 5 Lacs, much cheaper than commercial models at Rs. 70 Lacs.



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PATENT

Nil

RELEVANT INDUSTRIES

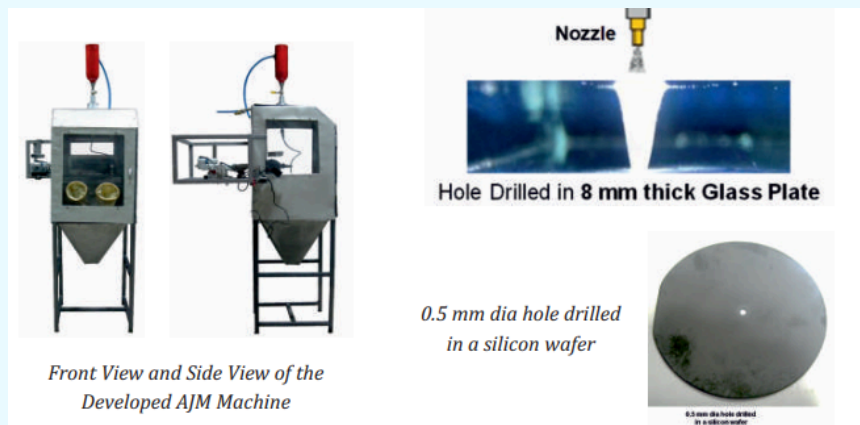
Automobile, Marine, Avionics, Home Appliances, and any Industry using and/or testing of Gears

INVENTORS

Anand Petare, Prof. I.A. Palani,
Prof. Neelesh Kumar Jain
Department of Mechanical
Engineering

Micro-Controlled 3-Axis Machine for Abrasive Jet Machining (AJM) Process brittle materials.

An innovative, cost-effective machine for machining thin ceramics using the AJM process has been developed. It features micro-controlled three-axis movement and efficient abrasive-air mixing via line vac. The machine drills 0.5 mm diameter holes in 200-micron thick silicon wafers and 5–10 mm thick glass plates. It also supports controlled sandblasting to enhance material fatigue strength. With a TRL of 4-5, this lexible and safe machine costs only ₹1 lakh, signiicantly cheaper than commercial alternatives (₹35+ lakhs). It is ideal for machining thin ceramics, semiconductors, and brittle materials.



nkjain@iiti.ac.in

PATENT

Nil

RELEVANT INDUSTRIES

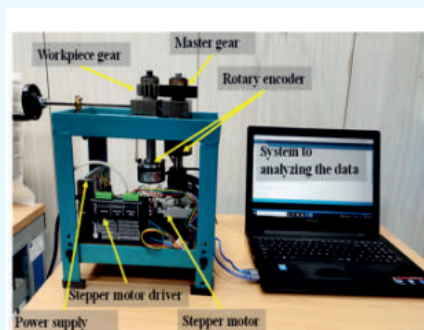
Manufacturing and Machine tool industry, Heavy industry

INVENTORS

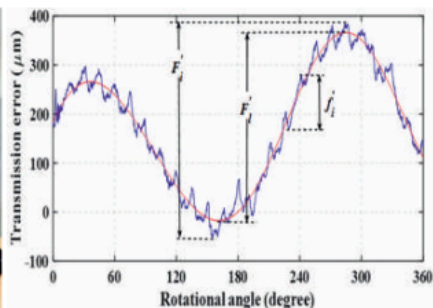
Prasad Kulkarni, Pratik Bagal,
Devkant Singh, Prof I.A. Palani,
Prof Neelesh Kumar Jain,
Department of Mechanical
Engineering

Single Flank Roll Tester for Functional Performance of Cylindrical Gears

A compact, economical, Arduino-programmed single flank roll tester has been developed to evaluate Total Transmission Error, Tooth-to-Tooth Transmission Error, and Total Pitch Error of cylindrical gears using a rotary encoder, stepper motor, and power supply. With a TRL of 4-5, this device costs Rs. 80,000 compared to Rs. 35 Lacs for commercial alternatives. Data is easily acquired via a pen drive and analyzed using an MS Excel program. Accurate and portable, it is nearly ready for industry transfer, offering a cost-effective solution for gear testing.



Photograph of the Developed Single Flank Roll Tester



Sample Results from Single Flank Roll Tester

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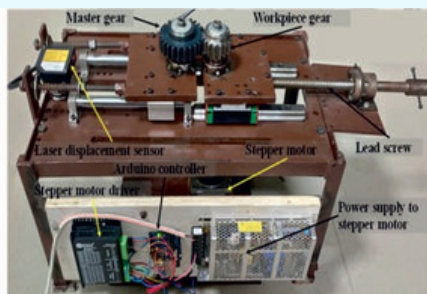
PATENT
Nil

RELEVANT INDUSTRIES
Manufacturing and Machine tool industry, Heavy industry

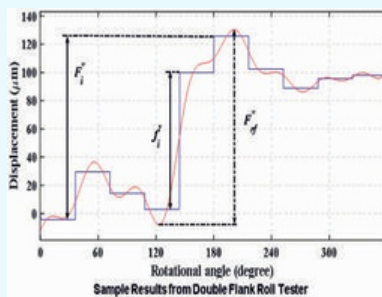
INVENTORS
Dr. Vivek Rana, Prof Neelesh Kumar Jain, Department of Mechanical Engineering

Double Flank Roll Tester for Functional Performance of Cylindrical Gears

A compact, economical double- flank roll tester for cylindrical gears has been developed, using Arduino, a laser displacement sensor, a lead screw, and a stepper motor. It measures Total Composite Error, Tooth-to-Tooth Composite Error, and Radial Runout with high accuracy. Costing ₹90,000 compared to ₹25 lakh for commercial equipment, it offers significant savings. Data can be acquired via a laptop or PC using a pen drive. With a Technology Readiness Level (TRL) of 4-5, it is nearly ready for industrial transfer, providing a portable, innovative solution for gear testing.



Photograph of the Developed Double Flank Roll Tester



Sample Results from Double Flank Roll Tester

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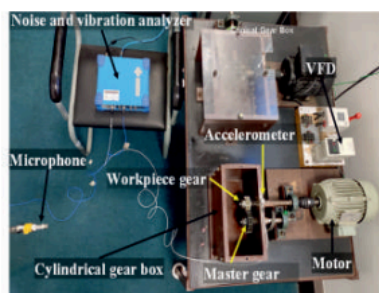
PATENT
Nil

RELEVANT INDUSTRIES
Automobile, Marine, Avionics,
Home Appliances

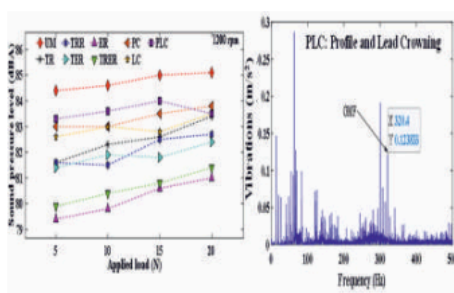
INVENTORS
Rajat Kasliwal
Anand Petare
Prof. Neelesh Kumar Jain
(Department of Mechanical
Engineering)

Noise and Vibrations Test Rig for Cylindrical and Conical Gears

This technology analyzes noise and vibrations in conical and cylindrical gears. A compact test rig has been developed to measure vibrations and noise in the frequency and time domains under varying speeds and loads. It identifies noise sources using a Noise and Vibration Analyzer, accelerometers, microphones, and a sound intensity probe. The system employs separate motors for cylindrical and conical gears, controlled by a Variable Frequency Drive (VFD). With a TRL of 3-4, this equipment is cost-effective (Rs. 2 Lacs vs. Rs. 40 Lacs commercially) and compact, offering precise data acquisition for gear performance analysis.



Photograph of the Developed Test Rig for Noise and Vibrations



Sample Results for Noise and Vibration Signals

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PATENT
Nil

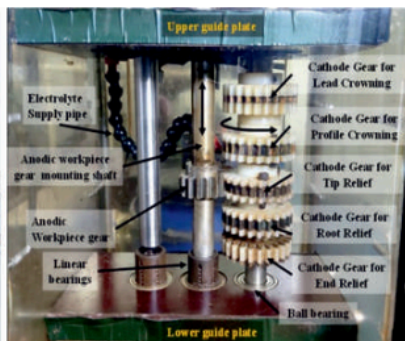
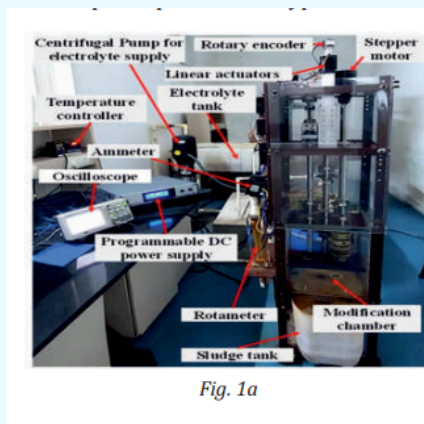
RELEVANT INDUSTRIES
Manufacturing and Machine tool industry, Heavy industry

INVENTORS

Gaurav Kumar, Rahul Kashyap, Anand Parey, Prof. Neelesh Kumar Jain, Department of Mechanical Engineering

Non-Contact Flank Modification Technology for Spur Gears

A novel non-contact machine utilizing the pulsed electrolytic dissolution (PED) process was created to apply five modifications to spur gears: tip relief, root relief, end relief, flank crowning, and profile crowning, using specialized cathode gears. The machine can implement any single modification, combinations, or all five at once. Experiments demonstrated reduced surface roughness, elimination of hob cutter marks and cracks, and enhanced performance, with modified gears showing lower noise and vibration. Five theoretical models were also developed to predict each type of modification.



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PATENT

Granted, Indian Patent No. 484056

RELEVANT INDUSTRIES

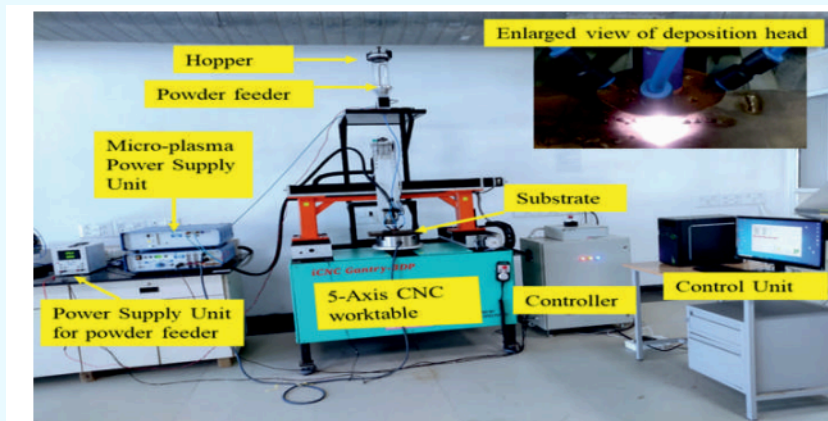
Automobile, Marine, Avionics,
and any industry using gears

INVENTORS

Rajat Kasliwal, Anand Petare,
Prof. Neelesh Kumar Jain,
Department of Mechanical
Engineering

μ -Plasma based Additive Manufacturing Technology for Metallic Materials

An additive manufacturing machine for metallic materials uses micro-plasma transferred arc with a maximum current of 20 A and power of 440 W. It features 5- axis CNC control and supports deposition materials in powder, wire, or combined forms. It manufactures materials like Ti6Al4V alloys, Co-Cr-Mo-based knee implants, Inconel 625 superalloys, tool and die materials (e.g., Stellite, P20), and NiTi shape memory alloys. It enables micro-joining of thin sheets (<3 mm) of stainless and mild steel. Additionally, it develops high/medium entropy alloys, shape memory, and functionally graded materials.



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PATENT

Nil

RELEVANT INDUSTRIES

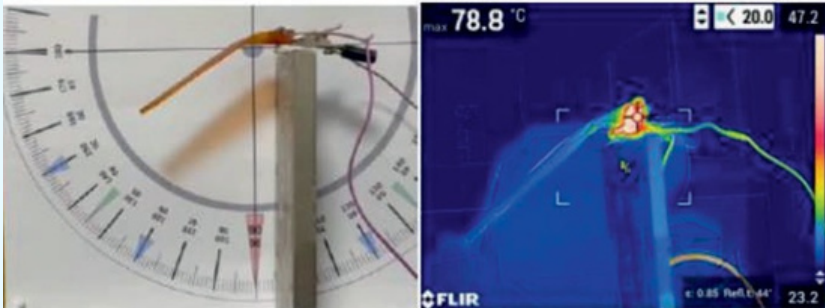
Manufacturing and Machine tool industry, Heavy industry

INVENTORS

Rajat Kasliwal, Anand Petare,
Prof. Neelesh Kumar Jain,
Department of Mechanical
Engineering

SMA-based bioinspired water strider robot and method thereof

The primary object of the present invention is to overcome the drawbacks associated with prior art. Another object of the present invention is to provide an SMA-based bioinspired water strider robot. Another object of the present invention is to provide an electrically controlled autonomous Crawling water strider Robot structurally constructed using origami techniques. Another object of the present invention is to provide an integrated biomimicking walking robot for various applications, including surveillance, face detection, and face recognition. The system has a capability for pipeline inspection and surveillance.



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PATENT

Filed, Indian Patent Application No.
202421046169

RELEVANT INDUSTRIES

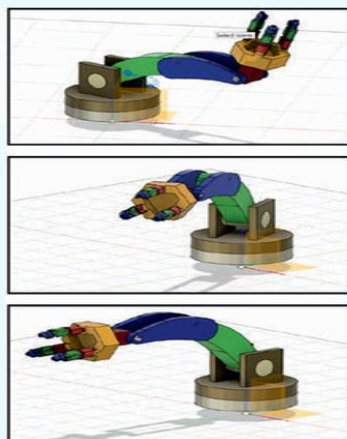
Defense and Industry

INVENTORS

Prof. Palani I.A., Kailash
Pandian, Kaushal Gangwar,
Arruri Satwik, Department of
Mechanical Engineering

Multi-Modal Drone with Gesture Controlled Shape Memory Alloy Actuated Robotic Arm

The primary goal of this project is to create a versatile unmanned system capable of seamlessly transitioning between aerial and ground mobility, offering enhanced operational flexibility in various mission scenarios such as disaster response, defence, and industrial applications. The drone integrates advanced morphing technology, high-torque servo motors for transformation, and a robotic arm actuated by SMA to enable tasks such as object retrieval and bomb defusal. This study explores the technical feasibility and design considerations involved in building a multi-modal system that combines the agility of aerial movement with the stability and precision of ground mobility.



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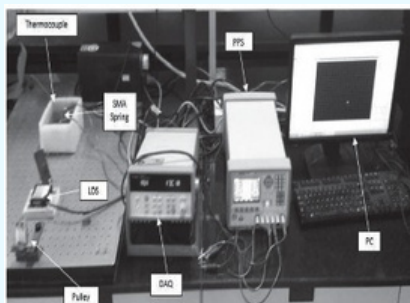
PATENT
Under Process

RELEVANT INDUSTRIES
Warehouses, Automotive
and defense

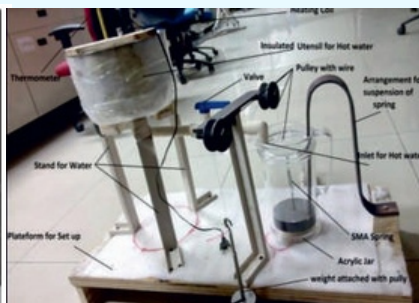
INVENTORS
Soham Mondal
Tejal R Uplenchwar
Krishna pal Tomar
Prof. Palani I.A.
(Department of Mechanical
Engineering)

Thermo-mechanical Test Bench for Reliability Estimation of Shape Memory Alloy (SMA) Springs

Shape memory alloys (SMA) are smart materials that return to their original shape upon heating (80–130°C). This shape memory effect makes them ideal for industrial actuators. SMA springs exhibit rapid responses during the initial thermo-mechanical cycles but may fail with repeated actuation, risking machinery breakdown. Reliability in repeated use is crucial for their industrial applications. A developed system predicts SMA spring reliability and supports small displacements. The technology is at TRL level 6, highlighting its readiness for realworld implementation.



Testbed for Electrical
Actuation of SMA



Testbed for hot water
actuation of SMA

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PATENT

Granted, Indian Patent Application
No. 201621007005

RELEVANT INDUSTRIES

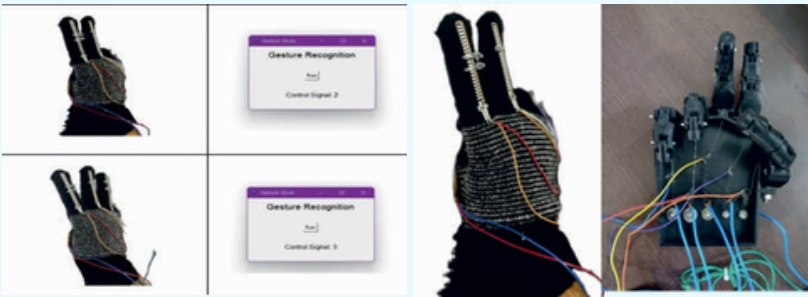
Aerospace, Automobiles,
Robotics, Machine Tool

INVENTORS

Prof. Bhupesh K Lad, Prof.
Palani I A, Department of
Mechanical Engineering

Design and Development of a Gesture-based SMA-actuated Robotic Hand for Human-machine Interface

Bomb disposal poses significant risks to soldier safety. This project introduces a hand gesture-based interface using a glove with flex sensors to control a robotic hand driven by shape memory alloys. A machine learning algorithm interprets user gestures, enhancing recognition accuracy, while commands are wirelessly transmitted to the robot. The design features visual feedback for precise operation. With the technology at TRL-5, it is ready for deployment, aiming to improve safety and efficiency in bomb disposal operations.



Gesture Control

Man machine interface with Robotic Hand

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PATENT

Filed Indian Patent Application No.
202421051320

RELEVANT INDUSTRIES

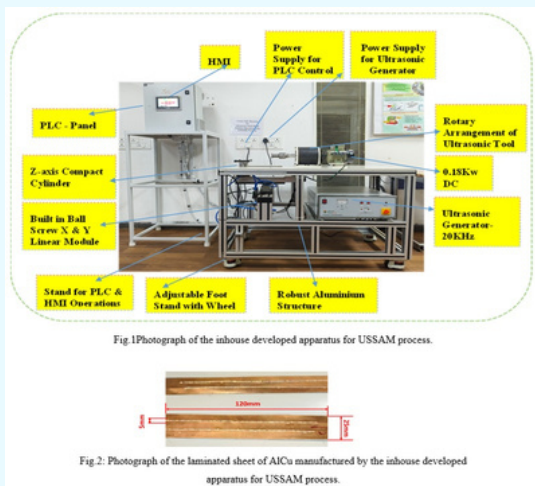
Defense and Industry

INVENTORS

K.A. Vyvaswath, Mr. Arpit Singh,
Prof. Palani I.A., Department of
Mechanical Engineering

Ultrasonic Solid State Additive Manufacturing & Technology for Multi-Material Laminates (USSAM)

India's first machine for solid-state joining of multi-material laminates thin sheets using a continuous joining track through Ultrasonic Solid-State Additive Manufacturing (USSAM) has been designed and developed at the Additive Manufacturing Lab (AML), IIT Indore. With the rapid expansion of Electric Vehicle (EV) and solar panel manufacturing aimed at achieving "Net-Zero Emissions," challenges such as hotspot formation and delamination defects have increasingly been observed in these advanced components. To address these critical issues, a cost-effective ultrasonic solid-state additive manufacturing system and associated technology for multi-material laminates were conceived and developed.



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PATENT

Patent Published - 202521028308

RELEVANT INDUSTRIES

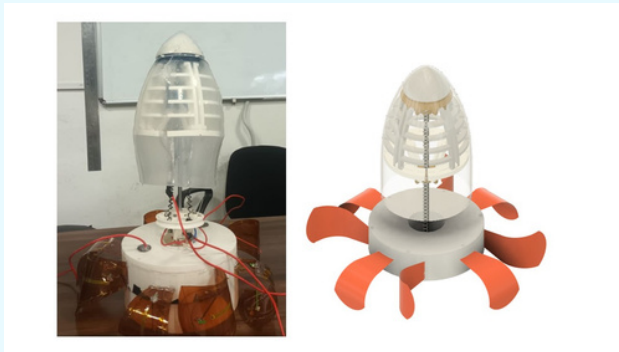
EV, Solar Panel, Aviation,
Embedded Electronics

INVENTORS

Rahul Naidu
Prof. Neelesh Kumar Jain
Dr. Ashish Rajak

Design and Development of Bistable SMA Actuated Bioinspired Soft Aquatic Robot

This project focuses on the design and development of a bio-inspired soft aquatic robotic system capable of efficient, silent, and adaptive underwater locomotion. The robot incorporates a bistable actuation mechanism driven by Shape Memory Alloy (SMA) springs to achieve snap-through motion for vertical displacement. Flexible tentacle-like structures made of Kapton polyimide sheets embedded with SMA wires provide directional control and maneuverability through selective actuation. By combining compliant soft materials with thermally driven SMA actuation, the system overcomes the limitations of conventional rigid, propeller-based underwater robots. The proposed design demonstrates biomimetic motion and structural adaptability, making it suitable for applications such as ship hull inspection, underwater mining and aquatic life monitoring.



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PATENT

Nil

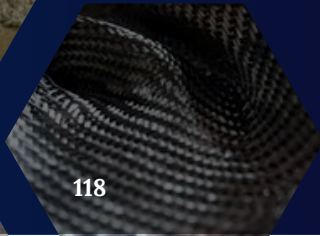
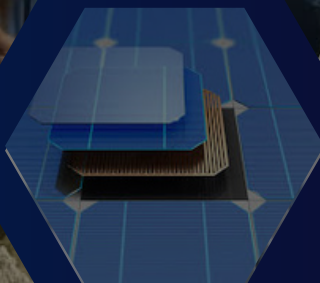
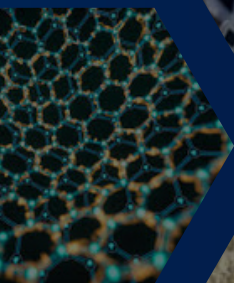
RELEVANT INDUSTRIES

Robotic Industries, startups
related space exploration

INVENTORS

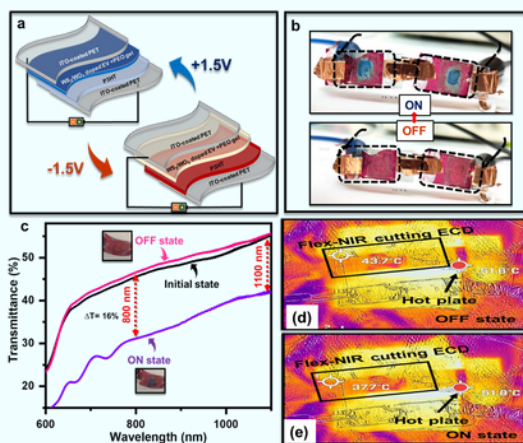
Joreegala Nithisha
S Sri Vaishnavi
Prof. Palani I. A.

Advanced Materials, Rare-earth & Critical Minerals



Technology for Developing Thermal Eye-Soothing Electrochromic Goggles

A highly flexible prototype goggle based on WS /WO with heat filtering capabilities has been developed and demonstrated to have a heat-soothing effect. The electrochromic goggle shows high near-infrared shielding by maintaining a temperature difference of 6°C and cuts more than 15% of the heat in the ON state. The prototype delivers an optical modulation of 60% and a photopic coloration efficiency of 34 cm²/C along with excellent cyclic stability. The real-world applicability has been demonstrated by making mini-goggles that change color between blue and magenta and cut heat making a way for designing flexible and bendable heat-soothing eye-care gadgets.



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PATENT

Nil

RELEVANT INDUSTRIES

Eyewear Goggles

INVENTORS

Bhumika Sahu

Love Bansal

Nikita Ahlawat

Deb Kumar Rath

Subin Kaladi Chondath

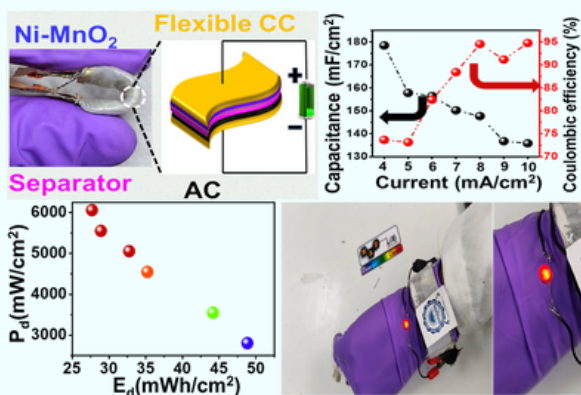
Prof. Rajesh Kumar

(Department of Astronomy,

Astrophysics and Space Engineering)

Technology for developing wearable supercapacitor based on Ni-MnO₂

The present work reports a technology for the fabrication of an asymmetric all-solid-state wearable supercapacitor (ASWSC) device using a nickel-doped manganese oxide (Ni-MnO₂) electrode. The ASWSC device demonstrates superbendability with excellent energy storage capability, delivering a high specific capacitance of 178 mF/cm², 95% coulombic efficiency, and an impressive power density of 6056 mW/cm² at 28 mWh/cm². A wristband-type ASWSC device fabricated by connecting two devices in series for glowing a red LED for a few minutes reveals the practical importance of the device in flexible electronics.



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PATENT

Nil

RELEVANT INDUSTRIES

EV Automobiles

INVENTORS

Bhumika Sahu

Love Bansal

Nikita Ahlawat

Subin Kaladi Chondath

Prof Rajesh Kumar

(Department of Astronomy,
Astrophysics and Space
Engineering)

A Thin Film Rechargeable Battery and Method Thereof

Our research work on advanced electrical energy storage establishes the potential of lightweight, binder-free thin-film electrodes for safer, low-cost, rechargeable Li-ion batteries with high performance. We have developed the prototype of a thin-film rechargeable Li-ion battery consisting of a novel lightweight, binder-free, cost-effective, environment-friendly tin oxide (SnO_2) composite-based cathode with a current collector, and Li as an anode, which exhibits remarkably high performance—delivering extremely high capacity, stability, and lifetime (1430 mAh g^{-1} and 1160 mAh g^{-1} even after 100 and 400 cycles respectively), high-rate capability (300 mA g^{-1}), and high coulombic efficiency (98-99%), as compared to the standard graphite and other available cathodes.

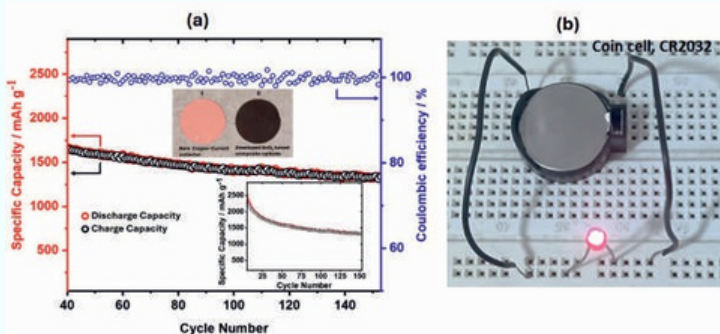


Fig: Performance of the thin-film battery prototype was tested through lighting up the red LED in requisite time scale.

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PATENT

Filed, Indian Patent Application
No. 202421038081

RELEVANT INDUSTRIES

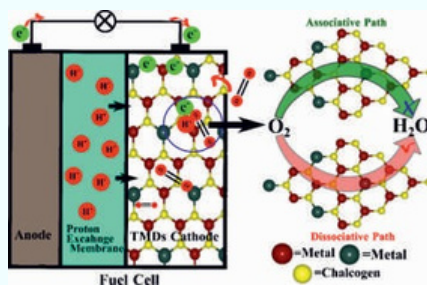
Energy storage Battery industries

INVENTORS

Prof. Sudeshna Bandyopadhyay
(Chattopadhyay)
Banadeep Dutta
Adi Pratap Singh
(Department of Physics)

Revolutionizing Oxygen Reduction Reaction (ORR) Through Novel Electrocatalyst Design with Advanced Computational Methods

The exploration of inexpensive electrocatalysts with excellent catalytic activity and chemical stability for the oxygen reduction reaction (ORR) is crucial for the widespread adoption of sustainable and renewable energy conversion technologies in practical applications. Two-dimensional transition metal dichalcogenides (TMDs) and carbon nanotubes (CNTs) have demonstrated a great capability to serve as substitutes for conventional catalyst (Pt) supports owing to their considerable advantages such as large specific area, high electric conductivity, tunable properties, robust durability, and resistance to byproduct poisoning. We explored the potential of two-dimensional Pt-doped zirconium disulfide (Pt-ZrS₂), Nb-doped zirconium diselenide (Nb-ZrSe₂), and Co nanoparticle encapsulated single-wall carbon nanotubes (Co@SWCNT) as efficient electrocatalysts for ORR.



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PATENT

Nil

RELEVANT INDUSTRIES

Renewable Energy Green Energy
Catalysis and Technologies
Electrocatalysis

INVENTORS

Dr. Srimanta Pakhira
(Department of Physics and
Centre for Advanced Electronics)

Unraveling the O_2 Reduction Reaction on 2D Monolayer $LaNiO_3$ Perovskite

The transition to clean energy is vital for a sustainable future. Hydrogen, as a versatile energy carrier, holds immense potential for decarbonizing industries, transportation, and energy storage. Coupled with the rise of Electric Vehicles (EVs), powered by renewable energy sources, the global push for reducing



greenhouse gas emissions is gaining momentum. Innovations in hydrogen production, such as green hydrogen, and advancements in EV battery technology are accelerating this shift. These developments not only mitigate climate change but also foster energy independence, making clean energy solutions a cornerstone for achieving global environmental and economic goals. We theoretically studied the structural and electronic properties of 3D bulk $LaNiO_3$ perovskite. We have cleaved the (0 0 1) surface from 3D $LaNiO_3$, which has a zero-band gap (E_g), to create 2D monolayer $LaNiO_3$ computationally and studied its electronic properties. We explored the ORR mechanism on the 2D monolayer $LaNiO_3$ perovskite by inspecting each intermediate. The present research work provides an insight into the evolution of 2D TMD-based multifunctional electrocatalysts towards HER/ORR and also a deep understanding of the nature of active sites.

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PATENT

Nil

RELEVANT INDUSTRIES

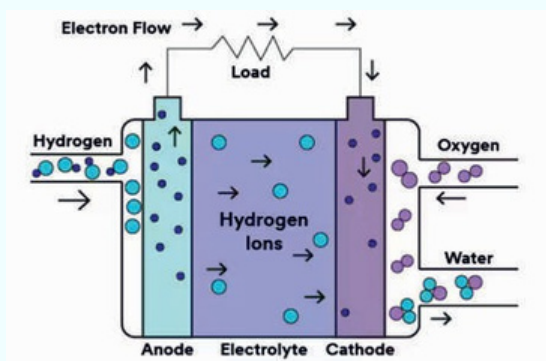
Renewable Energy Green Energy
Catalysis and Technologies
Electrocatalysis

INVENTORS

Dr. Srimanta Pakhira
(Department of Physics and
Centre for Advanced Electronics)

Exploring perovskite materials for potential ORR applications

Fuel cells are promising energy conversion devices, relying on the oxygen reduction reaction (ORR) at the cathode. However, ORR's sluggish kinetics demand efficient electrocatalysts, with Pt-based materials being the benchmark despite their cost and scarcity. To overcome these limitations, 2D perovskite monolayers offer a novel solution due to their tunable electronic properties. Computational studies reveal that the 2D monolayers perovskites enhance electronic density at the Fermi level, facilitating improved ORR activity. By exploring both associative and dissociative ORR pathways, these materials demonstrate thermodynamically favorable intermediates and a $4e^-$ transfer mechanism. Integrating 2D perovskite monolayers can revolutionize fuel cell technology with cost-effective, sustainable alternatives.



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PATENT

Nil

RELEVANT INDUSTRIES

Renewable Energy Green Energy
Catalysis and Technologies
Electrocatalysis

INVENTORS

Dr. Srimanta Pakhira
(Department of Physics and
Centre for Advanced Electronics)

Innovative Cathode Design: High-Entropy Prussian Blue Analogs for Sodium-Ion Capacitors

The increasing demand for high-performance energy storage systems has driven the development of technologies that bridge the gap between batteries and supercapacitors. In response to this need, our group has developed hybrid sodium-ion capacitors (SICs) by combining a high-entropy Prussian blue analog (HEPBA: $K_3Cu_{0.2}Ni_{0.2}Co_{0.2}Mg_{0.2}Zn_{0.2}[Fe(CN)_6]$) cathode with an activated carbon anode. The specific multi-metallic composition of HEPBA enabled the resulting SIC to show a significant improvement in energy storage performance compared to conventional cathodes. This work offers an affordable and sustainable energy storage solution, addressing critical issues such as lithium scarcity and the environmental impact of traditional lithium-based systems, marking an important advancement in next-generation energy storage technology.

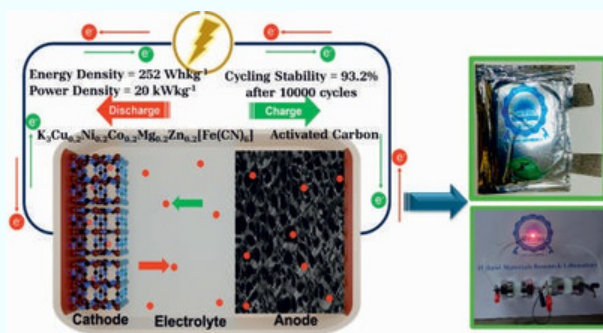


Figure 1. $K_3Cu_{0.2}Ni_{0.2}Co_{0.2}Mg_{0.2}Zn_{0.2}[Fe(CN)_6]$ /AC-based sodium-ion capacitors and its device.

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PATENT

Under Process

RELEVANT INDUSTRIES

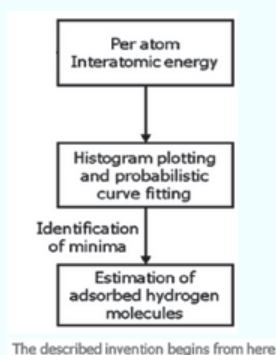
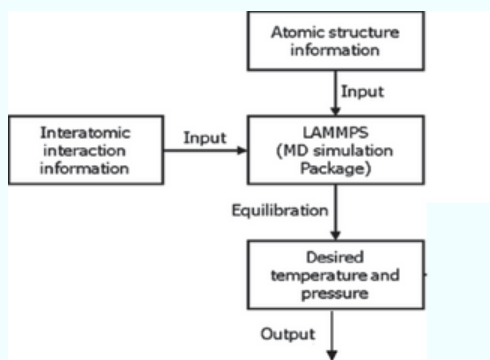
Electric Vehicle Battery
Electronics

INVENTORS

Dr. Dharendra Kumar Rai
(Metallurgical Engineering and
Materials Science)

A Method for Estimating the Gas Adsorption Capacity of a Solid Adsorbent

This technology involves a method for estimating gas adsorption capacity on solid substrates using molecular dynamics simulations. While performing simulations of adsorbents and adsorbates at the nanoscale, estimating the amount of adsorbates is crucial, especially for structures with complex geometry, ill-defined pores, and warps. The method uses computational techniques like Density Functional Theory (DFT), DFT-molecular dynamics, semi-empirical methods, and classical molecular dynamics. Classical molecular dynamics is preferred for its computational efficiency. The process helps calculate the gravimetric density of adsorbed quantities and the number of hydrogen molecules adsorbed during simulations at specified temperatures and pressure.



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PATENT

Filed, Indian Patent Application
No. 202221024912

RELEVANT INDUSTRIES

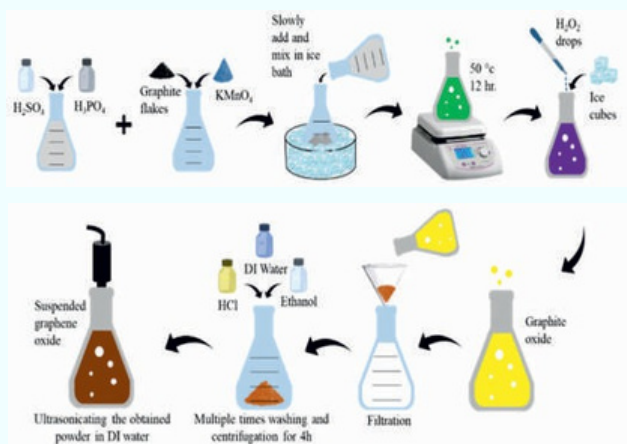
Gas Adsorption/ Materials Studio
Storage

INVENTORS

Nitin Luhadiya
Dr. Shailesh Kundalwal
Prof. Santosh Kumar Sahu
(Department of Mechanical
Engineering)

Method for Synthesizing Reduced Graphene Oxide Aerogels

The invented process synthesizes low-density reduced graphene oxide (r-GO) aerogels functionalized with titanium nanoparticles (TiO_2) using a simple, scalable method. Graphite is first converted to graphene oxide (GO), and titanium (III) chloride (TiCl_3) is oxidized to produce TiO_2 nanoparticles. The GO solution and TiO_2 nanoparticles are combined to form the Ti-rGO aerogels. Unlike existing methods, which require multiple steps and equipment, this process is cost-effective and simple. The Ti-rGO aerogel, with TiO_2 in anatase form, is highly porous, aiding in gas adsorption, pollutant removal, and photocatalytic applications, with enhanced hydrogen adsorption capacity.



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PATENT

Filed, Indian Patent Application
No. 202321016125

RELEVANT INDUSTRIES

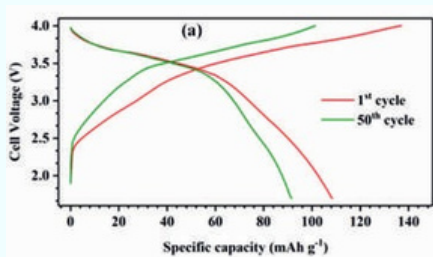
Automobile Industries
Insulation lining Industries

INVENTORS

Nitin Luhadiya
Dr. Shailesh Kundalwal
Prof. Santosh Kumar Sahu
(Department of Mechanical Engineering)

Na-ion Battery Based on Earth-Abundant Materials

To achieve 'Net Zero Emissions,' increasing renewable energy production is crucial. While lithium-ion batteries (LIBs) face sustainability issues due to limited lithium reserves, sodium-ion batteries (NIBs) offer a promising alternative for stationary storage and mid-range electric vehicles. NIBs, using abundant sodium, share similarities with LIBs. We developed a biphasic $\text{P2/O3 NaMn}_{0.60}\text{Ni}_{0.30}\text{Cu}_{0.10}\text{O}_2$ cathode and fabricated a pouch-type Na-ion cell with hard carbon as the anode. The developed cathode provides a capacity of 188 mAh/g, average cell voltage of 3.4 V, cell capacity of 108 mAh/g, specific energy of 367 Wh/kg, and TRL 4, with excellent performance due to the cathode's biphasic structure.



(a) Charge-discharge curve of 1st and 50th cycle.

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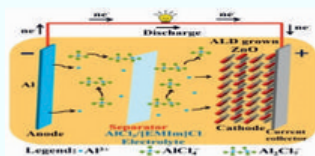
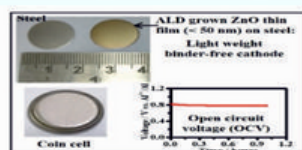
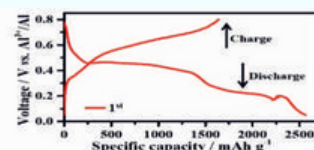
PATENT
Under Process

RELEVANT INDUSTRIES
Electric Renewable Energy
Vehicles Sector

INVENTORS
Dr. Sunil Kumar
(Department of Metallurgical
Engineering and Materials
Science)

Advanced Electrical Energy Storage (beyond Li-ion battery): Light-weight, binder-free thin-film cathode for high performance rechargeable, low-cost Aluminium-ion battery

As global power requirements rise, alternative energy storage systems like sodium-ion, magnesium-ion, and aluminum-ion batteries are gaining attention due to limitations of lithium-ion batteries, such as high cost and limited resources. Aluminum-ion batteries, known for low cost, high safety, low flammability, and environmental friendliness, are a promising solution. Prof. Sudeshna Chattopadhyay's research focuses on ultra-thin (< 50 nm), lightweight, high-performance, low-cost aluminum-ion batteries. This work, published in ChemistrySelect (2018, 3, 12512–12523), titled "Binder-Free ZnO Cathode synthesized via ALD by Direct Growth of Hierarchical ZnO Nanostructure on Current Collector for High-Performance Rechargeable Aluminium-Ion Batteries". Patents are being pursued for this innovation and other thin-film batteries.



*Ultra-thin (< 50 nm), light-weight
electrode for safe,
low-cost, high performance
Al-ion battery.*

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PATENT

Nil

RELEVANT INDUSTRIES

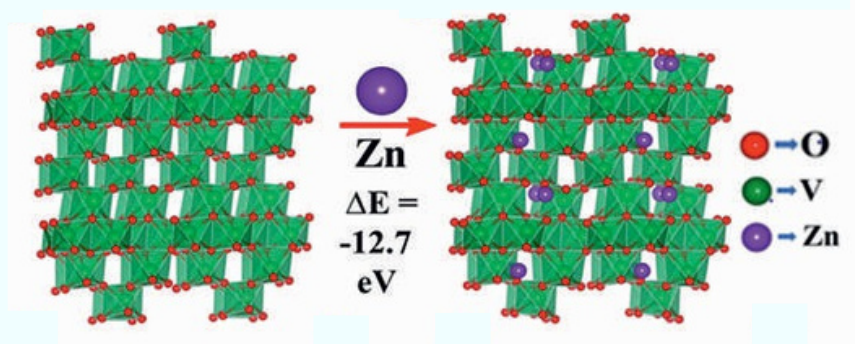
Battery Industries

INVENTORS

Prof. Sudeshna Chattopadhyay
(Department of Physics)

Aging-Responsive Phase Transition of VOOH to V₁₀O₂₄·nH₂O vs Zn²⁺ Storage Performance as a Rechargeable Aqueous Zn-Ion Battery Cathode

Vanadium oxyhydroxide (VOOH) has been studied as a starting material for different vanadium oxide phases used as an aqueous zinc-ion battery (AZIB) cathode. This work explores the phase transition of VOOH to V₁₀O₂₄·nH₂O and its electrochemical performance for hosting Zn²⁺ ions. The VOOH cathode shows energy densities of 208.3, 281.2, 269.2, and 240.6 Wh/kg after aging for 0, 60, 120, and 150 days, respectively. The 150-day-aged VOOH cathode delivers 39.7 Wh/kg at 4466 W/kg, with minimal capacity loss (0.002%) over 20,300 cycles. The Zn//VOOH-150 cell demonstrates a breakthrough with 126.2 Wh/kg and 1033.2 W/kg, enhancing energy storage systems.



Pristine V₁₀O₂₄ and Zn-intercalated V₁₀O₂₄

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PATENT

Nil

RELEVANT INDUSTRIES

Battery Industries

INVENTORS

Dr. Srimanta Pakhira
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Centre for Advanced Electronics)

A Method for Uniform Placement of Periodic Geometries on Curved Surfaces

A novel mapping method is developed and demonstrated for the uniform placement of periodic geometries on curved surfaces. Existing methods face several challenges, such as non-uniform separation distances between unit cells and difficulties in conformally wrapping unit cells over arbitrary surfaces, which often lead to degraded performance. In the proposed technique, a hybrid approach is implemented that employs a mathematical equation to find equidistant points over a non-planar surface and subsequently utilizes full-wave simulation to evaluate the electromagnetic responses of the overall geometry. The proposed method is demonstrated by designing a bandstop frequency selective surface (FSS)-based filter on various non-planar surfaces, including corrugated and hemispherical geometries. The structures are fabricated using 3D printing, and their measured responses are closely matched with the simulated results. This innovation significantly enhances the applicability of FSS and other periodic geometries in aerospace and defense industries, ensuring reliable performance on curved surfaces.

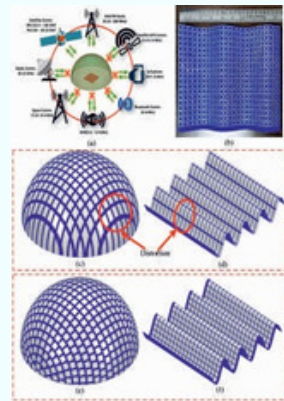


Fig. 1. (a) Applications of curved frequency selective surface (FSS). (b) Fabricated prototype made using the proposed technique. Comparison between different methods in designing periodic geometries on non-planar surfaces: (c) hemispherical surface and (d) sinusoidal surface developed using the conventional method, (e) hemispherical surface and (f) sinusoidal surface developed using the proposed method.

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PATENT

Filed, Indian Patent Application
No.202421033410

RELEVANT INDUSTRIES

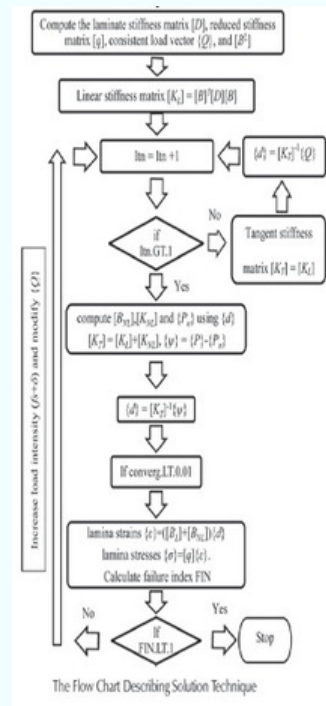
Aerospace Radio frequency
Defense and Microwave
Industries

INVENTORS

Dr. Saptarshi Ghosh
(Department of Electrical
Engineering)

High-Performance Lightweight Curved Composites

Lightweight curved structures made from fiber-reinforced plastics, functionally graded sandwiched composites, and carbon nanotube (CNT) reinforced composites are used in weight-sensitive engineering applications like aircraft hangers, ship hulls, submarines, aircraft panels, jet engine cowling, furnaces, missiles, and bulletproof armors. Notable innovations include hygrothermal performance, progressive failure and crack propagation predictions, stiffened composites for increased load capacity within fixed material consumption, and instability issues for thin panels. A computer code is developed which simulates fiber-reinforced, functionally graded composites, and curved structures (flat, cylindrical, conoidal, spherical, hyperbolic paraboloidal, and elliptic paraboloidal). These lightweight structures offer better durability, heat/moisture resistance, and lower operational costs.



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PATENT

Nil

RELEVANT INDUSTRIES

Defense Marine Structures
Construction Space Research

INVENTORS

Dr. Kaustav Bakshi
(Department of Civil
Engineering)

Multilayer Hybrid Composite Panels Under Impact Loading

Assessing material performance under impact and blast loading is challenging due to extreme deformation and complex phenomena. This project introduces multilayer hybrid composite armor to enhance protective design. Unlike traditional ceramic-based armors, carbon fibers in hybrid composites are evaluated under high strain rates, aiming to replace ceramics for lightweight, cost-effective solutions. The developed armor offers superior penetration resistance, validated through experimental and numerical analysis, and can replace traditional composite materials. It benefits law enforcement, military personnel, and guards, contributing to improved performance, safety, and economy in protective systems. The study advances the state-of-the-art in impact-resistant materials.

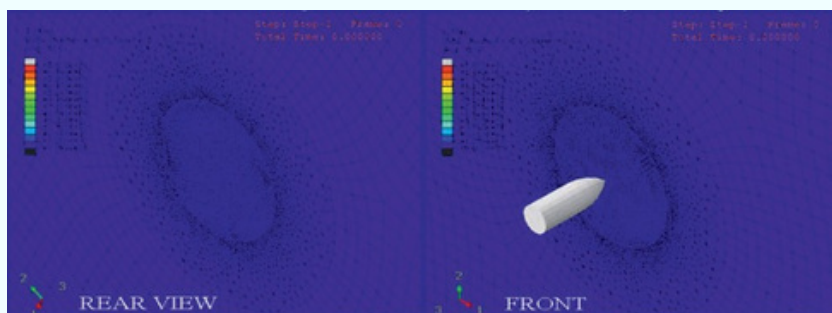


Plate of 2 mm thickness impacted with bullet of CRH 2 getting stuck in the plate

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PATENT

Nil

RELEVANT INDUSTRIES

Defense

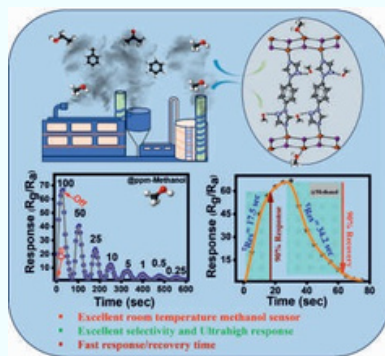
INVENTORS

Gyanesh Patnaik
Dr. Abhishek Rajput
(Department of Civil
Engineering)

Room Temperature Chemiresistive Sensor for Methanol

Urbanization and rapid industrialization pose several challenges, which include human exposure to toxic volatile compounds. Among these, methanol poses a severe health hazard, as ingestion, inhalation, or skin absorption can lead to tissue damage—particularly affecting the eyes and nervous system, and in extreme cases, can result in fatalities. To address this critical issue, the research group led by Dr. Abhinav

Raghuvanshi from the Department of Chemistry, in collaboration with Prof. Shaibal Mukherjee from the Department of Electrical Engineering, has developed a state-of-the-art chemiresistive methanol sensor based on Copper(I) coordination polymer. The chemiresistive sensor demonstrates exceptional performance at room temperature, detecting 100 ppm methanol exposure within 17.5 seconds and a detection limit as low as 1.22 ppb. Convenient synthesis, cost-effectiveness, and stability of the material, along with high sensitivity, selectivity, swift response, and room temperature operation of the sensor, make this technology suitable for real-world applications.



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PATENT

Nil

RELEVANT INDUSTRIES

Sensor technology

INVENTORS

Dr. Abhinav Raghuvanshi
(Department of Chemistry)
Prof. Shaibal Mukherjee
(Department of Electrical
Engineering)

Compressed Colored Bi-layered Bricks

The manufacturing of red-colored fired bricks harms the environment, leading to bans in many Indian states. Eco-friendly gray ash bricks lack aesthetic appeal, and synthetic colors increase costs. Researchers at IIT Indore developed low-cost "Compressed Colored Bi-layered Bricks" using inherently colored dimensional stone waste. Millions of tons of such waste from regions like Dholpur, Jaisalmer, Kota, and Makrana were blended with steel industry slag and chemical binders to create an M-10 grade colored composite. These bi-layered bricks, costing less than ₹5 each, save 35% in costs by eliminating plaster and paint, ideal for low-cost building infrastructure.



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PATENT

Nil

RELEVANT INDUSTRIES

Brick Precast Product
Manufacturing Manufacturing
Paver Block

INVENTORS

Vivek Gupta
Prof. Sandeep Chaudhary
(Department of Civil
Engineering)

Multichromatic Superhydrophobic Fluorescent Carbon Quantum Dots for AI-Enabled Anti-Counterfeiting and Coating Applications

The technology involves the synthesis of solid-state carbon dots (CDs) using the solvothermal method with an objective to achieve superhydrophobic and fluorescence properties. These four distinct fluorescent nanomaterials CDs (Green (YG), Yellow (CR), Orange (YR), and Red (APC)) revealed exceptional contact angles of 158°, 172°, 154°, and 160°. Inspired by these properties, these CDs have been applied in fingerprint detection without using any additives with 90±1% accuracy using a custom Python program. Additionally, the CDs have been used to create superhydrophobic coatings on cotton textiles and mild steel, enhancing their durability and resistance to moisture. This innovation presents versatile applications in forensics, textile manufacturing, and material protection.

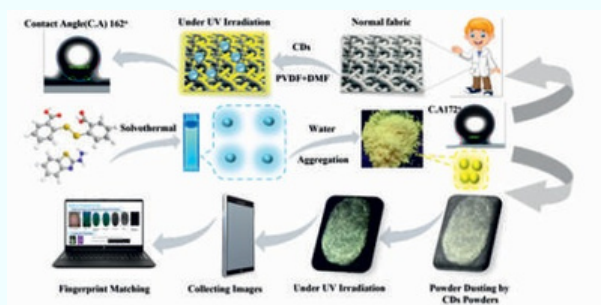


Figure: Illustration the process of the solid-state CR-CDs and their application in the field of coating application as well as in the development of fingerprint detection.

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PATENT

Filed, Indian Patent Application
No. 202421055635

RELEVANT INDUSTRIES

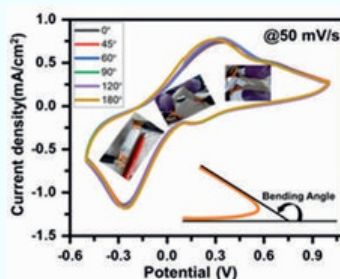
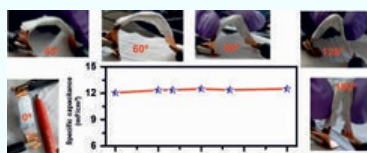
Textile	Biomedical
Electronics	Healthcare
Power Solutions	Security

INVENTORS

Dr. Mrigendra Dubey
(Department of Bioscience &
Bioengineering)

Supercapacitive All-Inorganic Nano Metal-Oxides' Complex: A 180° Super-Bendable Asymmetric Energy Storage Device

Flexible supercapacitors with high specific capacitance and 100% retention at maximum bending angles are ideal for real-life applications. A prototype 180° superbendable supercapacitor ($\text{Co}_3\text{O}_4//\text{WO}_3$) demonstrates high specific capacitance, power, and energy density. Complementary redox activity of electrode materials enhances electrolyte ion mobility, improving device performance. Detailed electrochemical analysis confirms superior charge storage due to this redox activity. Published in J. Mater. Chem. C, 2023, 11, 16000–16009, the work highlights potential applications in wearable electronics and energy storage. These flexible devices represent significant advancements for the energy storage industry, ensuring durability and efficiency in various conditions.



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PATENT

Nil

RELEVANT INDUSTRIES

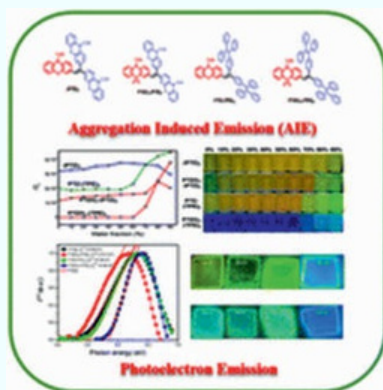
Wearable Electronic
Electronics Textiles
Electric Vehicles

INVENTORS

Love Bansal
Dr. Rajesh Kumar
(Department of Physics)

Room Temperature Phosphorescence

Room temperature phosphorescence (RTP) has attracted great attention for the scientific community for their wide applications in optoelectronic devices. However, these materials are still very scarce, partially due to the unclear mechanism and lack of designing guidelines. Phenothiazine boronic ester derivatives were developed and investigated for RTP. The materials are easy to prepare and cost effective. The technology is currently in the large scale manufacturing. The RTP materials are used in light-emitting diodes, anti-counterfeiting, sensors, and bioimaging. Therefore these materials are directly going to benefit for energy and health sectors.



Source: doi.org/10.1039/D3TC03921H

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PATENT

Nil

RELEVANT INDUSTRIES

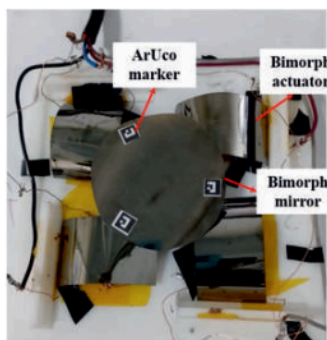
LED Health Sectors

INVENTORS

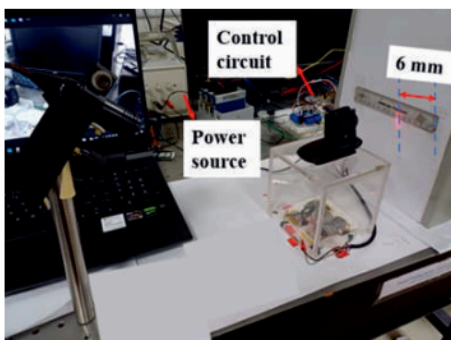
Prof. Rajneesh Misra
(Department of Chemistry)

Shape Memory Alloy Flexible Smart Mirrors for Opto-Mechatronics Applications

Conventional Fast Steering Mirror (FSM) technologies like Piezoelectric Transducers and voice coil actuators are heavy and power-intensive. In contrast, Shape Memory Alloy (SMA) thin film bimorphs are lightweight and efficient. An SMA-based Stewart platform with four electrically actuated bimorph arms provides three degrees of freedom: rotation around the x and y axes and translation along the z-axis. Made from Nitinol on a Kapton Polyimide substrate, these bimorphs can return to their original shape after actuation, with camera feedback ensuring precise laser beam steering.



*Flexible mirrors in the form of
Stewart platform*



After actuation

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PATENT

Granted, Indian Patent Application
No.202321055165

RELEVANT INDUSTRIES

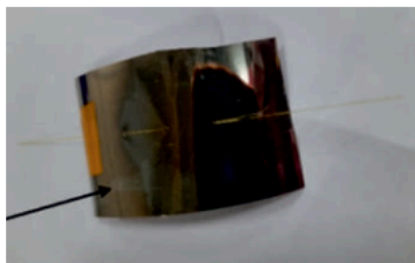
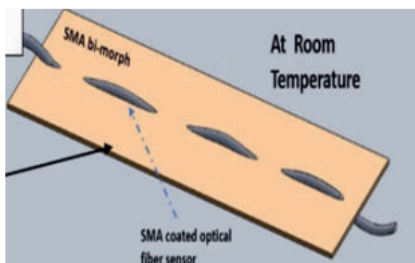
Optics, Precision Manufacturing
Related Industries

INVENTORS

Kaushal Gangwar, Prof. Palani
I.A., Department of Mechanical
Engineering

SMA Coated Optical Fiber Sensor for Cryo Temperature Sensing

The SMA coating on optical fiber causes bending at low temperatures, leading to signal attenuation and highlighting the fiber's sensitivity. By embedding SMA-coated fibers in SMA bimorphs, this bending is enhanced, improving sensitivity. This cost-effective approach offers an alternative to traditional FBG-based cryo-sensors, making it promising for low-temperature sensing and structural monitoring in space systems. It leverages shape memory alloys, providing a competitive platform for developing innovative optical fiber sensors for low-temperature applications.



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PATENT

Under process in collaboration with ISRO

RELEVANT INDUSTRIES

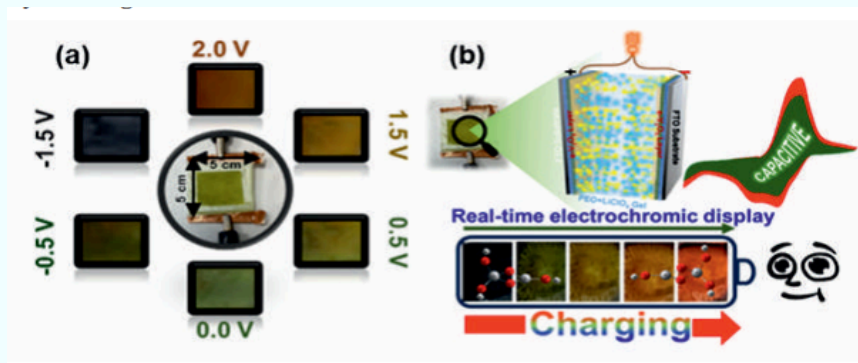
Space Related industries,
Industries dealing with low
Temperatures

INVENTORS

Prof. Palani I.A., Department of
Mechanical Engineering

Stoichiometrically Optimized Electrochromic Complex $[V_2O_2 + \xi(OH)_3 - \xi]$ Based Electrode: Prototype Supercapacitor with Multicolor Indicator

The systematic modification of metal oxides enhances their color-modulating energy storage capabilities. This study showcases a stoichiometrically tuned porous vanadium oxide complex, $[V_2O_2 + \xi(OH)_3 - \xi]$ $\xi=0.3$, for multifunctional electrochromic supercapacitors. The electrode exhibits excellent charge storage and electrochromic properties. In a solid-state device, it achieves ultrahigh power density, energy density, and specific capacitance, displaying red when fully charged, green when half charged, and blue when discharged.



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PATENT

Patent Number: 556843

RELEVANT INDUSTRIES

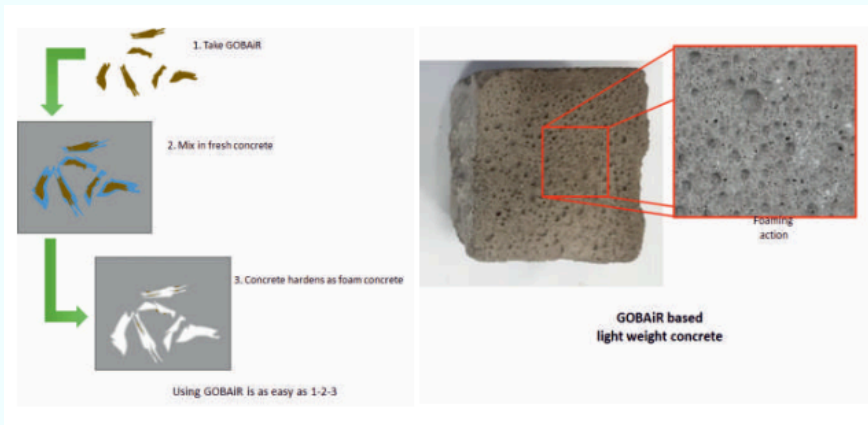
Automobile and
Constructions

INVENTORS

Love Bansal, Bhumika Sahu, Deb
Kumar Rath, Prof. Rajesh
Kumar, Department of Physics

GOBAiR - A Novel Cow Dung Based Foaming Agent For Developing Low Cost Sustainable Light Weight Construction Materials

India has over 5.3 million stray cattle, which can be mitigated by commercializing cow dung. GOBAiR is an eco-friendly foaming agent derived from cow dung, serving as a cost-effective alternative to chemical agents for lightweight concrete and bricks. It eliminates autoclaving, reduces production costs, and allows for on-site manufacturing, resulting in blocks that are stronger (12–14 MPa), lighter (1400 kg/m³), and 24% cheaper than alternatives. At TRL 4-5, GOBAiR supports sustainable construction, enhances energy efficiency, improves GRIHA/LEED scores, and promotes better stray cattle management.



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PATENT

Flied, Indian Patent Application No.
202421010279

RELEVANT INDUSTRIES

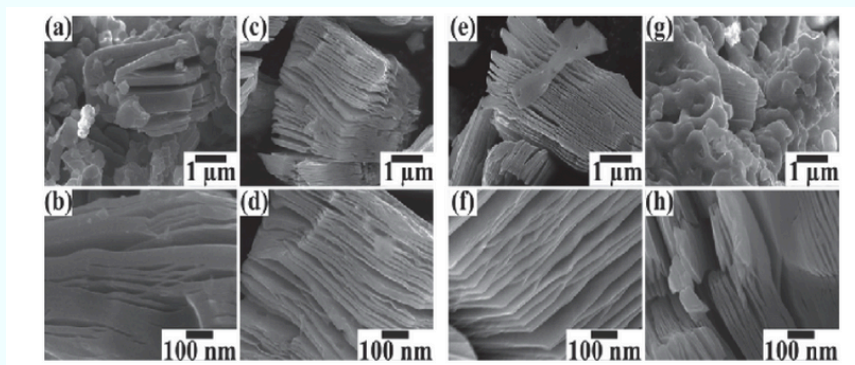
Gaushalas; Precast Light Weight
Concrete Manufacturers; Fly ash
Brick Manufacturer

INVENTORS

Sanchit Gupta, Prof. Sandeep
Chaudhary, Department of Civil
Engineering

Mass Production of >99% Ti_3AlC_2 MAX Phase for High Quality 2D Layered MXene

The quality of MXene relies on the purity of the MAX phase, affecting its properties and applications. Traditional methods for obtaining high-purity Ti_3AlC_2 MAX phase are costly (~₹25,000–30,000 for 10 g) and use high-vacuum techniques. Our invention synthesizes over 99% pure MAX phase at ambient air pressure, producing 2D Ti_3C_2 MXene nanosheets with high interlayer spacing and accordion-like morphology. This method offers excellent conductivity and stability for applications like hydrogen production, photovoltaics, and energy storage, while significantly reducing energy consumption and costs for large-scale production. The technology's current TRL is 7.



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PATENT

Granted, Indian Patent Application
No. 202321043993

RELEVANT INDUSTRIES

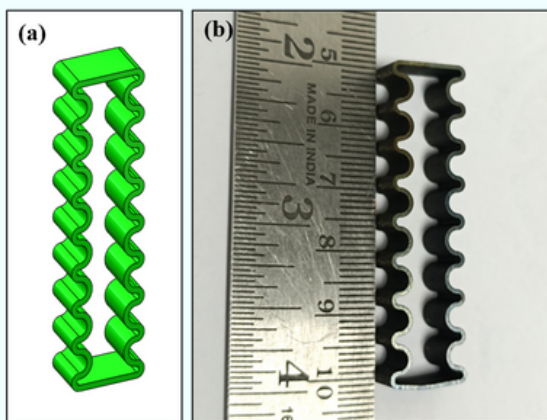
Semiconductor, Energy Storage and
Conversion, Coating, Bio-related

INVENTORS

Ravindra Jangir
Ekta Choudhary
Prof. Rupesh S. Devan
(Department of MEMS)

SMA-Based Two-Way Micro-Motion Actuator for Adaptive Wavefront Correction

In spaceborne optical payloads, factors like launch stresses and thermal cycling cause critical optical misalignments. SMAs' two-way property is used for this application to enable repeatable, bidirectional stroke control without complex biasing mechanisms. These micro-actuators provide precise micron-level surface displacements for active wavefront correction in deformable mirrors.



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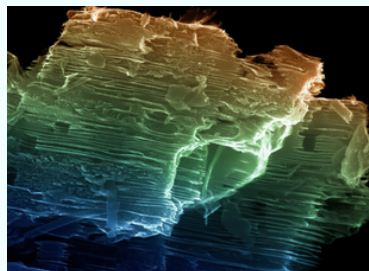
PATENT
Under Process

RELEVANT INDUSTRIES
Defence

INVENTORS
Nikunjhai J. Bheda
Kaushal Gangwar
Dr. I.A. Palani
Dr. Suhas S. Joshi

Process for Industrial-scale production of pure Ti_2AlC MAX phase at ambient pressure conditions and $\text{Ti}_2\text{C-T}_x$ MXene thereof

The present invention relates to a scalable and cost-effective process for the synthesis of phase-pure Ti_2AlC MAX phase and its subsequent conversion into $\text{Ti}_2\text{C-T}_x$ MXene for energy storage and energy conversion applications. The invention discloses a resource-efficient and scalable technology for synthesizing ~99.9% pure Ti_2AlC MAX p



phase using a molten salt-shielded solid-state reaction route. The technology focuses on precise optimization of critical process parameters, including precursor composition, reaction temperature, dwell time, and heating ramp rate, to minimize secondary phase formation and improve phase purity. The synthesis is carried out in an open-air system under ambient pressure conditions, thereby avoiding the need for high-vacuum or inert-gas-controlled environments. Thus, the resulting MXene obtained thereof is endowed with excellent electrical conductivity, electrochemical activity, and stability, making it suitable for large-scale deployment in energy storage and conversion technologies.

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PATENT

Granted (Indian Patent No.:571396,
Application No. 202521009426

RELEVANT INDUSTRIES

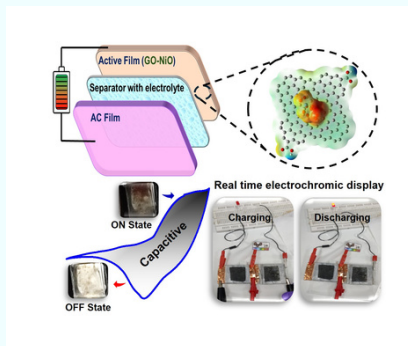
Sigma Aldrich, Adani Green Energy,
Reliance Industries Ltd.

INVENTORS

Rupesh S. Devan
Ravindra Jangir
Suman Yadav

Developing Solid State Electrochromic-supercapacitor Prototype through DFT-guided Charge Transfer Engineering in 2D-Carbon Doped NiO

Understanding the exact mechanism is the key factor for developing high-performance, application-specific devices for the real world. Though belonging to the same family of carbon, graphene (Gr) and graphene oxide (GO) show different mechanisms of charge transport especially in the context of their electrochemical applications. Here, the doping of carbonaceous materials (Gr and GO nano-flakes), pre-optimized using density functional theory calculations (DFT), was carried out in nano-granular NiO to design electrochromic supercapacitor. The GO-NiO electrode shows diffusion-controlled mechanism-based charge storage properties, with a high specific capacitance with sufficient color modulating properties to design color indicative supercapacitor. The GO-NiO electrode, when realized as an asymmetric supercapacitor (GO-NiO-SCD) displays a high capacitance value of $\sim 105 \text{ mF/cm}^2$ and 100% retention even after 500 cycles of continuous charging and discharging. The color change, coherent to the (dis-) charging, shows its multifunctional applications. A prototype solid state capacitor could lit an LED thus demonstrating its on-field application. On the other hand, the Gr-NiO electrode demonstrated a surface-controlled mechanism, as also depicted from molecular electrostatic potential plots of Gr and Gr-NiO, showing faster switching of less than a second to switch between colored and bleached states. This work significantly shows the tailored carbon doping in NiO unveils distinct charge storage mechanisms, empowering multifunctional devices that seamlessly merge energy storage with real-world electrochromic applications thus giving a color indicative electrochromic supercapacitor for smart building applications.



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PATENT
Nil

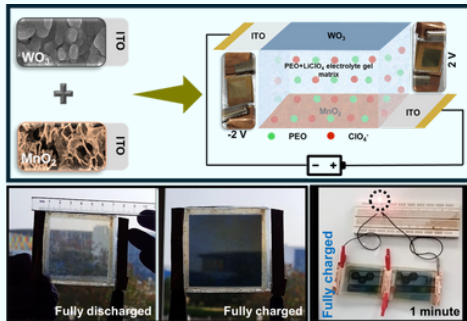
RELEVANT INDUSTRIES

INVENTORS

Bhumika Sahu
Love Bansal
Nikita Ahlawat
Deb K. Rath
Abhishek S. Shekhawat
Subin K. Chondath
Shailendra K. Saxena
Rajesh Kumar

Complementary Oxides Based Electrochromic Supercapacitor: Multiwavelength Switchable Solid State Device

Multifunctional electrochromic devices make use of materials that exhibit other properties, like supercapacitors, batteries, solar cells, etc., in addition to electrochromism. The steady electrochemical performance and strong energy storage capacity are two benefits of inorganic electrochromic devices that make them attractive for industrial applications. Here, an all-inorganic solid-state electrochromic supercapacitor has been fabricated using electrodeposited MnO_2 and a complementary WO_3 electrode which shows multiwavelength color modulation on application of a voltage of as small as ± 2 V. The device shows an appreciable color change from pale yellow to dark blue with a high optical modulation of 70% and a change in transmittance of 40% at 680 and 1050 nm wavelength, respectively, capable of an additional application as a heat cutter. The device shows a fast response while changing color with a switching time of as low as a half-second and a high coloration efficiency of $520 \text{ cm}^2/\text{C}$. The device, in a handy gadget form, demonstrates exceptional stability at both wavelengths. The device shows excellent charge storage properties with fast charging and slow discharging and a maximum specific capacitance of $22.6 \text{ mF}/\text{cm}^2$ at a $0.1 \text{ mA}/\text{cm}^2$ current density. The device shows excellent cyclic stability with 95% capacitance retention after 500 charging/discharging cycles. A large-area device was also fabricated at lab scale for on-site demonstration. It maintained its superior electrochromic properties, suggesting its huge potential for use as energy storage electrochromic smart windows. Additionally, as a proof of demonstration for practical application, the two ssED connected in series lighten a red LED in its fully charged state suggesting its multifunctional application.



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PATENT
Nil

RELEVANT INDUSTRIES

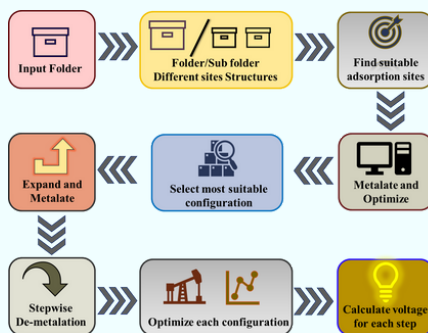
INVENTORS

Nikita Ahlawat
Bhumika Sahu
Deb Kumar Rath
Subin Kaladi Chondath
Love Bansal
Rajesh Kumar

Machine Learning Force Field Assisted Automated Design of High-Voltage Electrode Materials for Metal-ion Batteries

Machine Learning Assisted High-throughput Screening of Battery Electrodes and Electrolytes

Design and testing of an electrode material computationally is a multi-step and complex process. In this work, we have proposed an automated pipeline which can take a unit cell of electrode material and generate stepwise voltage profile for Li-, Na-, and K-ion metal-ion batteries. We have replaced the computationally costly quantum mechanical DFT calculation with universal machine learning force field which can predict the voltage of thousands of materials in no time. The automated pipeline automatically finds suitable adsorption sites, ion-intercalation and de-intercalation, structural change and voltage calculation followed by stepwise voltage profile generation with minimum human intervene.



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PATENT
Nil

RELEVANT INDUSTRIES

INVENTORS

Dr. Biswarup Pathak
Mr. Souvik Manna
Dr. Sandeep Das
Dr. Surya Sekhar Manna
Ms. Poulami Paul
Ms. Shifa Bano

A system and method for fabricating a multi-layered binder-free anode architecture for high-performance light-weight lithium-ion batteries

Our research work relating to the invention in the field of advanced electrical energy storage with high performance. We have developed a prototype of rechargeable Li-ion battery (LIB) consists of novel lightweight, binder-free, cost-effective, environment friendly metal-oxide composite-based multi-layered anode architecture with current collector, which exhibits remarkably high performance (by delivering a high specific capacity of at least 1650 mAh g^{-1} at 50 cycles, a volumetric capacity greater than $10,000 \text{ mAh cm}^{-3}$, with a Coulombic efficiency 98-99% and high-rate performance, along with scalable areal capacity, stability and lifetime as compared to the standard graphite and the other available cathodes/equivalent electrodes.

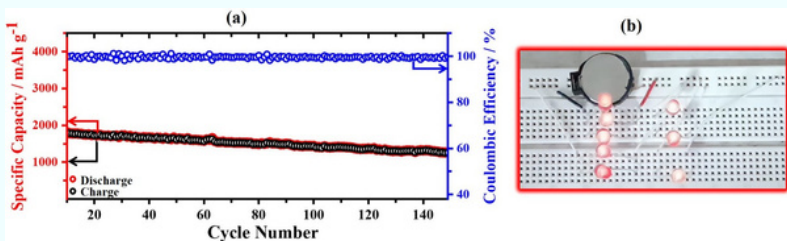


Figure: Electrochemical characterizations of multilayered electrode system of rechargeable thin film Li-ion battery: (a) cycle performance (galvanostatic charge discharge, GCD) and Coulombic efficiency plot of rechargeable Li-ion battery at a current density of 300 mA g^{-1} , indicating the achievement of significantly high capacity, high stability and lifetime, along with high Coulombic efficiency; (b) Performance of the battery prototype (coin cell CR2032) as tested through lighting up the 8 LED indicators in requisite time scale, in the present invention (TRL 6).

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PATENT

Filed, Application No. 202521133509

RELEVANT INDUSTRIES

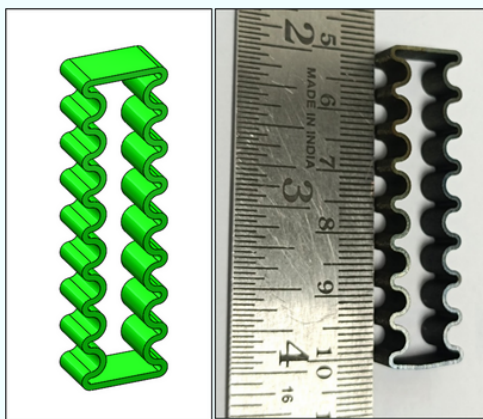
Battery industries, Energy storage, Renewable energy

INVENTORS

Prof. Sudeshna Chattopadhyay
(Bandyopadhyay)
Adi Pratap Singh
Banadeep Dutta

Two-way shape memory alloy for adaptable micro-mirror applications

Shape Memory Alloys (SMAs) possess the intrinsic capability to recover their original shape after experiencing large deformation when subjected to controlled thermal excitation. This functionality arises from a reversible thermo-elastic phase transformation between the low-temperature martensite phase and the high-temperature austenite phase. In the martensitic state, the SMA can be deformed under external loading, resulting in detwinned martensite and the accumulation of recoverable transformation strain. Upon heating, the material transforms to the austenite phase and fully recovers its original geometry, thereby enabling reliable one-way actuation.



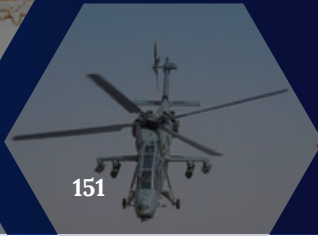
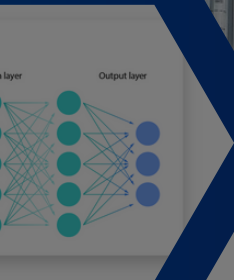
palaniia@iiti.ac.in

PATENT
Filed

RELEVANT INDUSTRIES
Space and Optics Related
industries

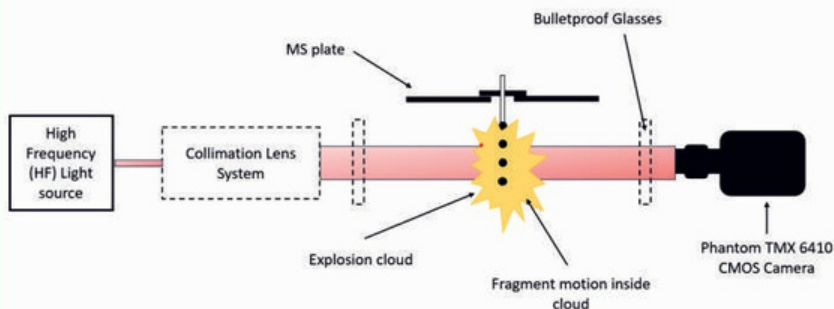
INVENTORS
Nikunj Bheda
Suhas S. Joshi
Palani Iyamperumal Anand

Space & Defence



Digital Inline Holography to image high speed fragments inside explosion cloud

The Digital Inline Holography (DIH) system redefines high-speed imaging of explosive events by combining concepts of shadowgraphy and Digital Holography with simple and robust setup. Featuring a High Frequency (HF) illumination source with nanosecond pulse bursts, the system achieves astounding time resolution to nano seconds (ns) time scale eliminating the cons of previous used systems for explosion imaging. In addition, the illumination source shares its capacity of penetrating the dense detonation cloud to image high-speed moving fragments during their early-stage motion. This breakthrough enables continuous imaging of the fragment motion just after explosion initiation. Optimized for reduced complexity, the developed DIH system is particularly suited for small to medium R&D organization



lldeshmukh@iiti.ac.in

PATENT

Application No. 202421093794

RELEVANT INDUSTRIES

Aerospace R&D
Defense

INVENTORS

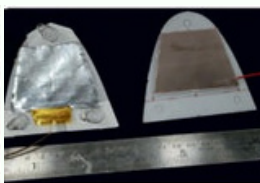
Prof. Devendra Laxmanrao
Deshmukh
(Department of Mechanical
Engineering)

Triboelectric Based Shoe Shole for Energy Harvesting for Powering Microdevices for Army Personnels

To address frequent recharging of wearable electronics, a shoe with an integrated triboelectric nanogenerator (TENG) and electronic components is developed. TENGs convert mechanical energy into electrical energy through electrostatic induction between tribo-positive and tribo-negative surfaces. Installed within the shoe sole, the system generates and stores energy in a storage device as the user walks. This stored energy powers small microdevices, especially in remote locations. The solution offers a longer lifespan and eliminates frequent recharging. The technology is at Technology Readiness Level (TRL)-6, showcasing significant progress toward practical application.



Position of TENG inside the sole



Tribomaterials attached with 3D Printed Structure

Working Principle of Triboelectric Nanogenerator



palaniia@iiti.ac.in

PATENT

Under Process in collaboration with ARDE Pune

RELEVANT INDUSTRIES

Defense Biomedical
Sports Shoes Industries
Manufacturing

INVENTORS

Prof. Vipul Singh
(Department of Electrical Engineering)
Prof. Palani I.A.
(Department of Mechanical Engineering)

Drone-AI Technology for Wide-Area Crowd-Counting in Surveillance and Security Applications

Crowd management in smart cities is essential for safety, with automated crowd counting being key. This drone-based technology uses a frame extraction algorithm to create non-overlapping crowd images from an aerial view. It estimates total crowd count by adding people from these frames. Field-tested in real environments, it provides accurate results and helps manage large crowds, enhancing public safety and preventing stampedes.



kvivek@iiti.ac.in

PATENT

Under process

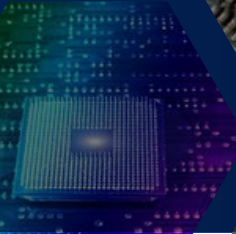
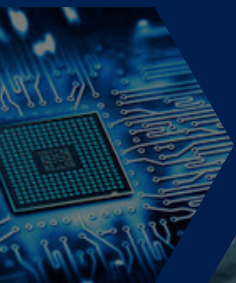
RELEVANT INDUSTRIES

Additive Manufacturing Law
Enforcement Agencies and Large
Event Organizers

INVENTORS

Harshwardhan Chaube, Harsh
Bardhan, Siddharth Singh
Savner, Dr. Vivek Kanhangad,
Department of Electrical
Engineering

Semiconductors



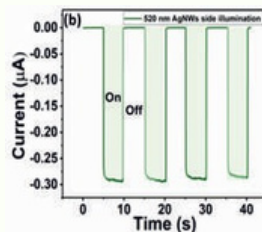
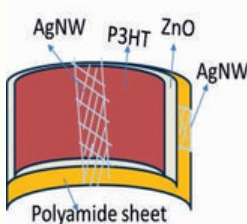
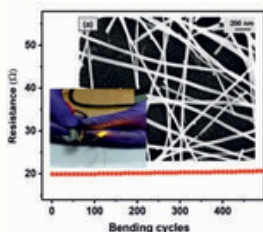
AgNW Based Electrode and its Application in Photodetector

The increasing demand for flexible optoelectronic devices necessitates flexible transparent conducting electrodes (FTEs). While indium tin oxide (ITO) is widely used for its high conductivity and transparency, its high cost and brittleness limit its suitability for flexible substrates. Therefore, alternative materials for FTEs are sought.

This AgNW based Flexible electrode gives highly flexibility, solution processability, transparency and conductivity, SPR effect and has application in wearable electronics.

Flexible self bias hybrid Photodetector is self bias UV-Vis detection, high photosensitivity $\sim 10^5$ in self bias mode. The current TRL of the Technology is 3.

Flexible photodiodes have a positive impact on society by enhancing healthcare monitoring through wearable technology, promoting inclusivity in accessible devices, and contributing to environmental sustainability in electronics.



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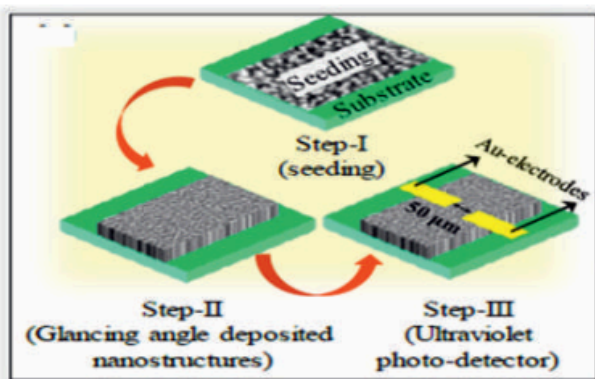
PATENT
Under process

RELEVANT INDUSTRIES
Flexible UV-Vis
Electronics Photodetector

INVENTORS
Prof. Vipul Singh
(Electrical Engineering)

Completely Visible-Blind Ultraviolet Photodetectors

Ultraviolet (UV) radiation ranges from 10–400 nm and includes three bands: UV-A, UV-B, and UV-C. The sun emits all UV bands, with UV-A and some UV-B reaching Earth. We created a compact, sensitive UV photodetector that is blind to visible light, fast, and made from porous, crystalline ZnO thin films. This design improves sensitivity and purity compared to previous models. Applications include environmental studies, UV monitoring, and enhancing skin-tanning safety to prevent health risks from overexposure.



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PATENT

Nil

RELEVANT INDUSTRIES

UV photodetectors are commonly used in various fields, industrial applications

INVENTORS

Prof. Krushna R. Mavani,
Department of Physics

The Semiconductor Revolution for Powering Smart Cities and Sustainable Infrastructure

Semiconductors are the heart of modern technology and play a crucial role in developing smart cities and infrastructure. The fundamental need for integrated circuits, sensors, and communication systems is vital for smart cities and infrastructure. For example, semiconductors are used in solar panels to generate renewable energy, LEDs for energy-efficient lighting, and sensors to monitor environmental parameters like air quality. In smart mobility, semiconductors power electric vehicles (EVs), enable advanced driver-assistance systems (ADAS), and support vehicle-to-infrastructure (V2I) communication, ensuring safer and more efficient transportation. Additionally, semiconductors play a crucial role in data processing and storage for smart grids, traffic management, and IoT-based applications. Their versatility and efficiency make them indispensable for building sustainable and interconnected urban environments.



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PATENT

Nil

RELEVANT INDUSTRIES

Wide bandgap Semiconductors, 2D Semiconductors, Fuel Cells, Batteries

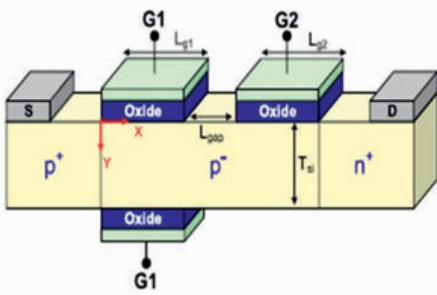
INVENTORS

Dr. Srimanta Pakhira
(Department of Physics and
Centre for Advanced Electronics)

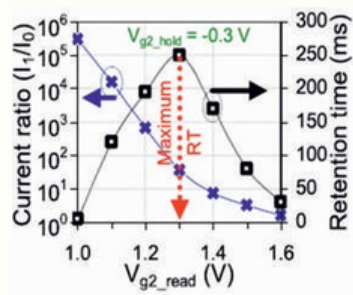
Multiple Gate Tunneling Field Effect Transistor Device for Capacitorless Dynamic Memory

The claimed architecture has three distinct independent gate terminals of which two gates (electrically connected) are at the front and back interfaces of the intrinsic region. The second front gate is used to create electrically induced potential well for the charge storage, an essential feature of capacitorless (1T) dynamic memory.

Portable electronic gadgets including smart phones and Internet of Things (IoT) deployments require cloud services for which high-density and cost-effective DRAM is essential. A versatile mobile system-on-chip necessitates a matching DRAM capability to serve the needs of the society.



Schematic illustration of multiple gate tunneling field effect transistor for application as capacitorless dynamic memory.



Retention time and current ratio as a function of bias applied at gate-2 during read bias of the capacitorless DRAM.

akranti@iiti.ac.in

PATENT

Granted, Indian Patent Application
No. 201621007078

RELEVANT INDUSTRIES

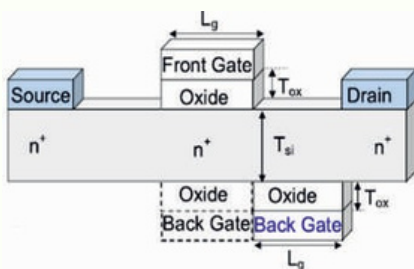
Semiconductor Industry

INVENTORS

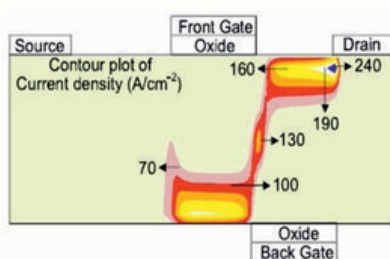
N. Navlakha
Prof. Abhinav Kranti
(Department of Electrical
Engineering)

Multiple Gate Junctionless MOSFET (Metal Oxide Semiconductor Field Effect Transistor)

The present invention discloses a multiple-gate Junctionless Metal Oxide Semiconductor Field Effect Transistor (JLMOSFET) capable of super steep/sharp transition from off-state to on-state at very low operating/supply voltage through misalignment between front and back gates. The functionality of electronic gadgets is governed by transistors which switch from low to high state. This switching of current by a decade requires at least 60 mV of gate bias. A reduction in the gate voltage translates into lower power consumption and energy efficient circuits and systems, which will be beneficial logic circuits.



Schematic illustration of misaligned front and back gates in junctionless transistor for steep current switching.



Current density contour highlighting the advantages of misaligning front and back gates in junctionless transistor.

akranti@iiti.ac.in

PATENT

Granted, Indian Patent No. 431061

RELEVANT INDUSTRIES

Semiconductor Industry

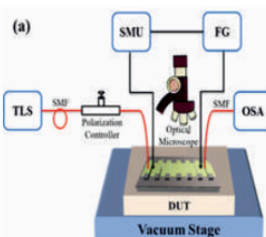
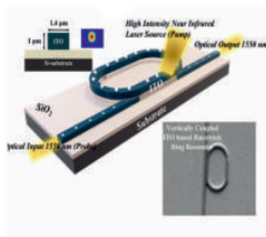
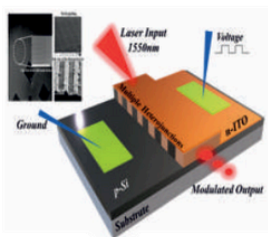
INVENTORS

M. Gupta
Prof. Abhinav Kranti
(Department of Electrical
Science and Engineering)

Semiconductor Heterojunction Technology for Chip-scale Photonic Devices

We are utilizing semiconductor heterojunctions for realizing chip-scale devices with a cost-effective fabrication approach. The technology is also helpful for building bio-chemical sensors. The technology for semiconductor heterojunctions has been developed over the years for electrically and optically tunable photonic devices e.g. The epsilon near zero in ITO has been achieved with engineered processing of ITO and number of devices based on Si-ITO heterojunctions have been developed. Proof-of-concept Devices have been developed.

The technology can be utilized to make sensing devices for early optical detection of (protein biomarkers causing) deadly diseases.



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PATENT

Published, Indian Patent Application
No. 202321010734

RELEVANT INDUSTRIES

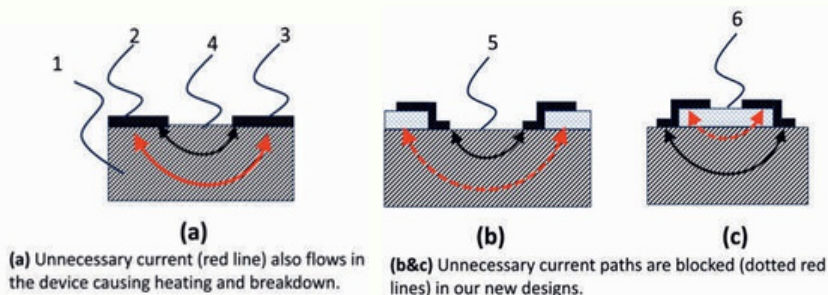
Telecom Industry, Data Centres,
Sensor Manufacturers

INVENTORS

Prof. Mukesh Kumar
(Department of Electrical
Engineering and Centre for
Advanced Electronics)

Photoconductive Device for THz Emission and Detection with Metal-semiconductor and Metal-insulator-semiconductor Contact Electrodes

Terahertz technology offers potential in imaging, spectroscopy, and telecommunication, but photoconductive THz devices need efficiency and cost improvements. Our metal-insulator-semiconductor (MIS) design enhances efficiency, electrical robustness, and reduces fabrication costs by cutting lithography layers from four to three. It also enables low-bandgap semiconductors like Ge to be used for device fabrication, making them compatible with cost efficient fibre lasers. Simulations are complete, with devices in fabrication and testing. To commercialize this innovation, THz-Innovations Pvt Ltd, a DPIIT-recognized startup, has been established at ACE IITI. Our invention aims to advance research and development in THz technology, driving broader applications and accessibility



mukesh.kr@iiti.ac.in asingh@iiti.ac.in

PATENT

Filed, Indian Patent Application No.
202321062886

RELEVANT INDUSTRIES

Semiconductor Industry

INVENTORS

Dr. Abhishek Singh
(CAE)

Prof. Mukesh Kumar
(Department of Electrical
Science and Engineering)

Design and Development of High Temperature Setup For Temperature Dependent Energy Band Gap Measurements for Semiconductors

Understanding the temperature-dependent band gap of semiconductors is crucial for applications in extreme conditions, including space. This setup, designed for ambient conditions without a vacuum, measures band gaps from 300K to 500K. Data obtained has been published in various research papers. With India's national semiconductor mission, this technology supports the manufacturing sector, promoting investment in scientific instrumentation. It provides valuable data for the semiconductor industry, aiding in selecting materials suitable for specific temperature ranges, thus enhancing research and industrial applications.

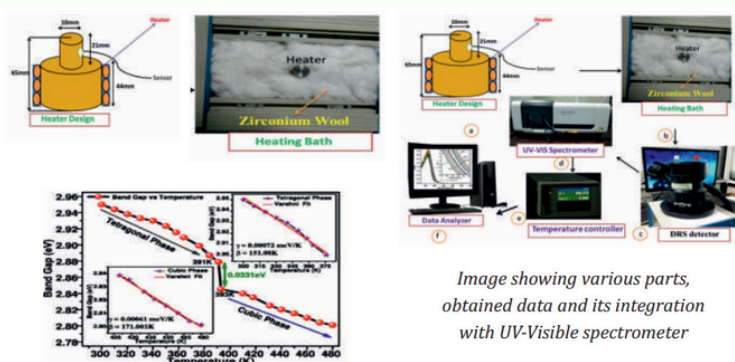


Image showing various parts, obtained data and its integration with UV-Visible spectrometer

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PATENT

Nil

RELEVANT INDUSTRIES

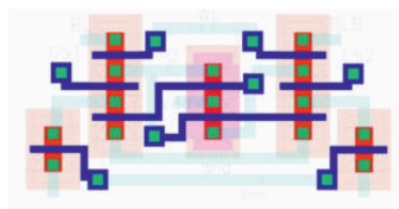
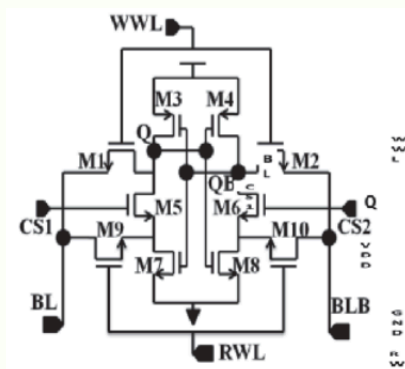
Scientific Instrumentation and Semiconductor Industry

INVENTORS

Prof. Pankaj R. Sagdeo
(Department of Physics)

Low Leakage-high Stability Differential Positive Feedback Controlled 10T (DPFC10T) SRAM Cell

The proposed solution is a positive feedback-controlled 10T SRAM cell designed for low leakage power and improved read-write stability. Utilizing access transistors M1-M2 and M9-M10, and NMOS transistors M5 and M6 activated by CS1 and CS2 for positive feedback, this innovation enhances energy efficiency in ultra-low voltage devices like biomedical implants. It provides reliable data storage with minimal power consumption, benefiting portable electronics and promoting sustainability in energy-efficient technologies.



Proposed differential positive feedback controlled 10T (DPFC10T) SRAM cell (a) Schematic. (b) Layout

skvishvakarma@iiti.ac.in

PATENT

Granted, Indian Patent No. 370308

RELEVANT INDUSTRIES

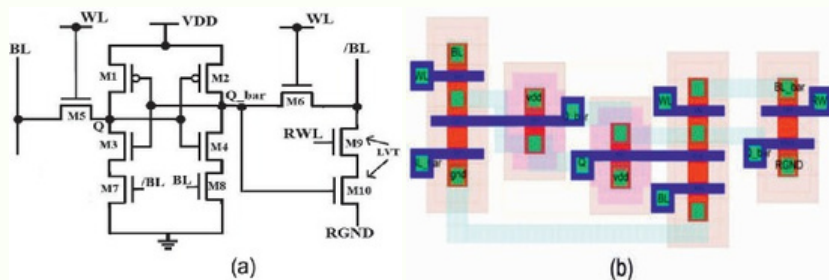
Industries Related to Semiconductors,
FPGAs, Advanced Biomedical Instruments,
Wireless Communication.

INVENTORS

Pooran Singh
Prof. Santosh Kumar
Vishvakarma
(Department of Electrical
Engineering)

An Ultra Low Power, Read Decoupled-Differential Write, 10T SRAM Cell with Higher Read/Write Noise Margin

SRAM design faces challenges due to continuous technology scaling, making it vulnerable to noise from process-voltage-technology variations. Cache memories often remain in standby mode, causing unwanted leakage power during subthreshold operation, demanding power consumption reduction. Technology scaling worsens SRAM density as the decreasing I_{read}/I_{leak} limits the cells per memory column. Conventional designs must be reconsidered for ultra-low voltage applications. Low- V_{th} devices enhance read performance, while threshold voltage techniques and stacking improve power consumption and stability. The proposed 10T SRAM cell reduces leakage power, improves read speed, and stability, making it suitable for ultra-low-power applications like wireless sensors, biomedical implants, and handheld devices.



Proposed 10T SRAM cell (a) Schematic
(b) Layout

skvishvakarma@iiti.ac.in

PATENT

Granted, Indian Patent No. 358866

RELEVANT INDUSTRIES

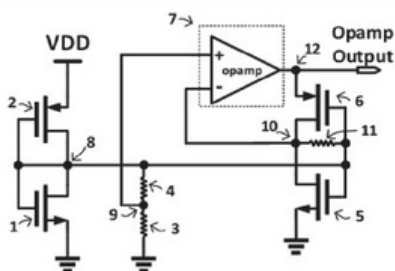
Consumer Electronics, Biomedical Applications, High Performance Computing etc.

INVENTORS

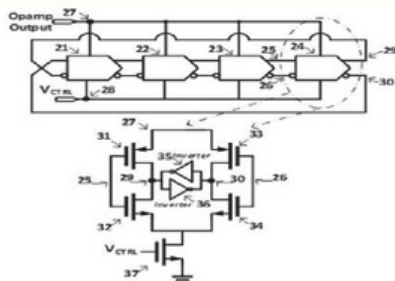
Vishal Sharma
Prof. Santosh Kumar
Vishvakarma
(Department of Electrical Engineering)

A Constant Transconductance Bias Device

A high-speed cleaner clock is crucial for frequency synthesizers and clock-data recovery in communications. This invention utilizes a constant transconductance (gm) bias device to reduce PVT variations in ring oscillators. It provides reliability in advanced CMOS nodes, using a negative feedback system to adjust the inverter's supply voltage and stabilize oscillation frequency. The solution features a reference voltage generator, an Op-Amp-based feedback loop, and a VCO, ensuring robust frequency control across PVT variations.



The reference biasing generator circuit consisting of a self-biased inverter forming a negative feedback loop with transistor M1-M2.



The architecture of the used VCO used in constant gm device.

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PATENT

Published, Indian Patent Application
No. 202321073981

RELEVANT INDUSTRIES

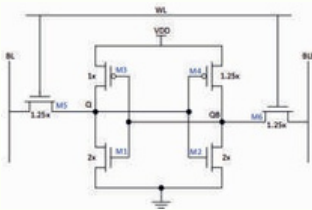
Analog Devices

INVENTORS

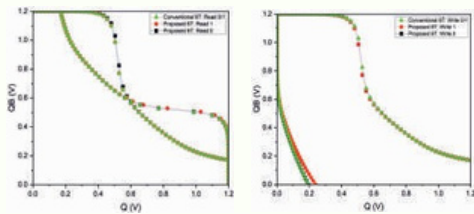
Kumar Ravi
Nagulapalli Rajasekhar
Prof. Santosh Kumar
Vishvakarma
(Department of Electrical
Engineering)

Power on Initialization of SRAM Cell for FPGA

Memory is essential in electronic devices, with 6T SRAM favored for its high speed and compatibility with CMOS technology. During startup or reset, SRAM cells often need initialization to a specific state, such as Zero State, crucial for testing applications. Traditional reset circuits consume significant power, which increases costs and testing time. A proposed automatic power-on initialization mechanism uses a resized PMOS transistor to improve energy efficiency, reduce delay, and simplify the process. Simulations validate its potential for low-power applications like portable devices, FPGAs, and medical instruments.



Proposed asymmetric 6T SRAM design for self reset on power up.



Static noise margin (SNM) comparison of proposed asymmetric SRAM cell with standard SRAM cell at 1.2V supply

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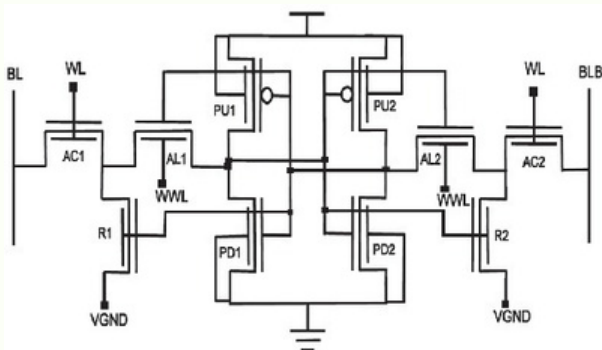
PATENT
Under Progress

RELEVANT INDUSTRIES
Advanced Micro Devices

INVENTORS
Narendra Singh Dhakad
Govindu Sathvik Reddy
Radheshyam Sharma
Prof. Santosh Kumar
Vishvakarma
(Department of Electrical
Engineering)

Read Recharge (RRC) Based Process Variation Tolerant 10T SRAM cell

Ultra-low-power on-chip SRAM is critical for improving reliability and battery life in modern SoCs. Operating in the sub-threshold regime enhances process variation tolerance but significantly decreases speed. The proposed SRAM cell, featuring two N-type FinFET transistors and a read recharge circuit (RRC), improves stability and read performance, making it suitable for low-voltage, medium-frequency applications like biomedical implants and wireless sensing, potentially extending the lifespan of portable systems beyond three years.



Read recharge based proposed RRC 10T SRAM cell with read write current paths

skvishvakarma@iiti.ac.in

PATENT

Granted, Indian Patent No. 413266

RELEVANT INDUSTRIES

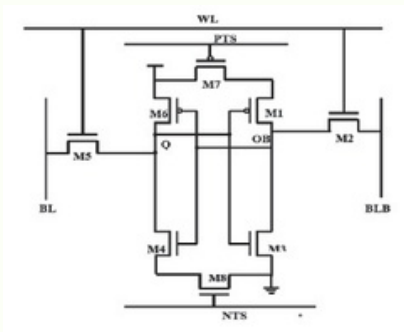
Semi Conductors, Chip Design

INVENTORS

Nandakishor Yadav
Prof. Santosh Kumar
Vishvakarma
(Department of Electrical Engineering)

P-N Tuned Differential 8T Static Random Access Memory (SRAM) Cell

SRAM design in the sub-threshold regime offers ultra-low power for embedded memories, but it can slow performance and increase sensitivity to variations. Challenges like hold stability and read disturb are highlighted in MOSFET scaling. The 6T cell faces read disturb from bit-line coupling, while the 8T cell improves read margins (560mV vs. 6T's failures) through decoupled feedback. Tuning access conflicts lowers WTP to 240mV (8T) and 270mV (6T). Enhanced SRAM efficiency boosts computing performance, supports sustainability, and accelerates AI applications like image recognition and NLP.



Proposed 8T SRAM Cell

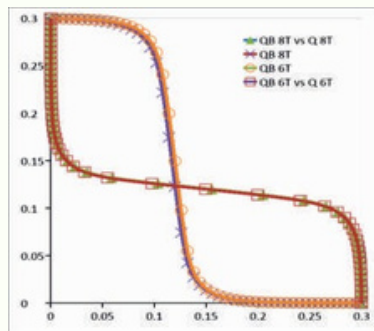


Fig: SNM for 8T vs 6T SRAM Cell

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PATENT

Granted, Indian Patent No. 406860

RELEVANT INDUSTRIES

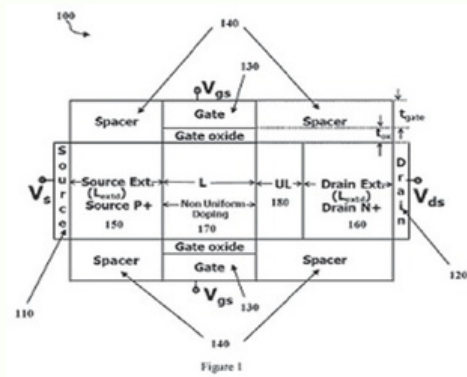
Semi Conductors, Chip Design

INVENTORS

Chandrabhan Kushwah
Prof. Santosh Kumar
Vishvakarma
(Department of Electrical Engineering)

High-Performance Double Gate Tunnel Field Effect Transistor For Low Power Applications

The developed technology introduces a lateral asymmetric channel (LAC) doping profile for double-gate tunnel field-effect transistors (DG-TFET) to enhance analog/RF performance compared to uniform doping (UD). Simulations show that the LAC profile, combined with an underlap (UL) feature, improves performance by increasing on-state current (I_{on}), lowering subthreshold swing (SS), and reducing gate-drain capacitance, thereby boosting cut-off frequency (f_t). The UL feature also mitigates ambipolar behavior. With low leakage current and steep SS (<60 mV/dec), DG-TFETs are ideal for low-power system-on-chip (SoC) designs, including biomedical implants, mobile devices, and neural processors, especially at supply voltages below 0.5 V.



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PATENT

Granted, Indian Patent No. 388463

RELEVANT INDUSTRIES

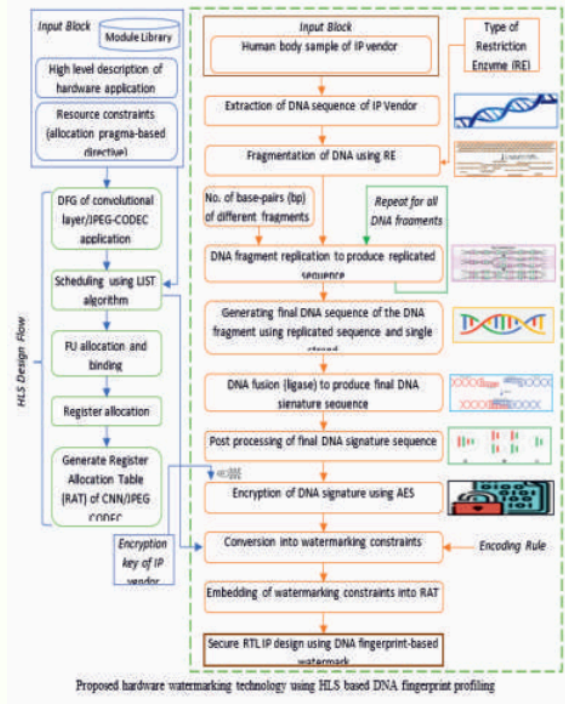
Biomedical Implants, Mobile
Multimedia Gadgets, Neuro Signal
Processors

INVENTORS

Vikas Vijayvargiya
Prof. Santosh Kumar
Vishvakarma
(Department of Electrical
Engineering)

CAD Based DNA Fingerprint as watermark Countermeasure for Hardware Cybersecurity of VLSI applications

The proposed technology presents a strong hardware watermarking framework utilizing a CAD-based DNA fingerprint profiling process to protect hardware intellectual property (IP) in multimedia, medical applications, machine learning, and digital signal processing. It automates the creation and embedding of a unique DNA fingerprint watermark from the IP vendor into hardware designs, safeguarding against IP piracy and false ownership claims while improving cybersecurity for VLSI-based designs.



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PATENT

Granted, Indian Patent No. 543947

RELEVANT INDUSTRIES

Security and VLSI

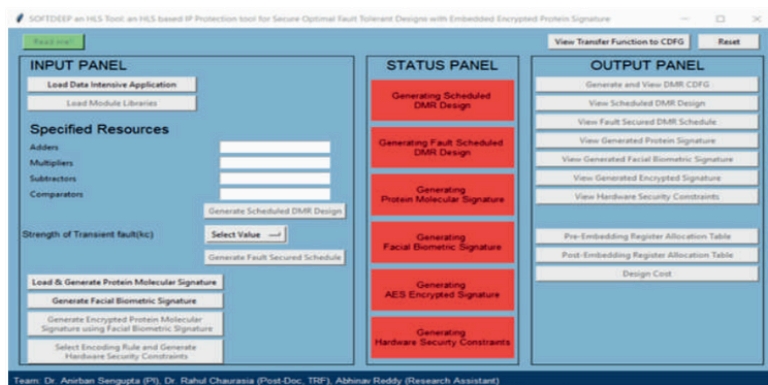
INVENTORS

Prof. Anirban Sengupta
(Department of Computer
Science and Engineering)



SOFTDEEP: An HLS Based IP Protection Tool for Secure Optimal Fault Tolerant Designs with Embedded Encrypted Protein Signature

A Molecular biometric based hardware security tool to simulate and analyse the design space exploration method producing secure design solutions for data intensive application frameworks with ability of k-cycle transient fault detection and/or error correction and detective control against piracy and false claim of ownership threats and generation of an optimal k-cycle transient fault detectable and /or fault correctable datapath processors with embedded protein biometric signature sample of an intellectual property (IP) vendor during high-level synthesis of integrated circuits (ICs).



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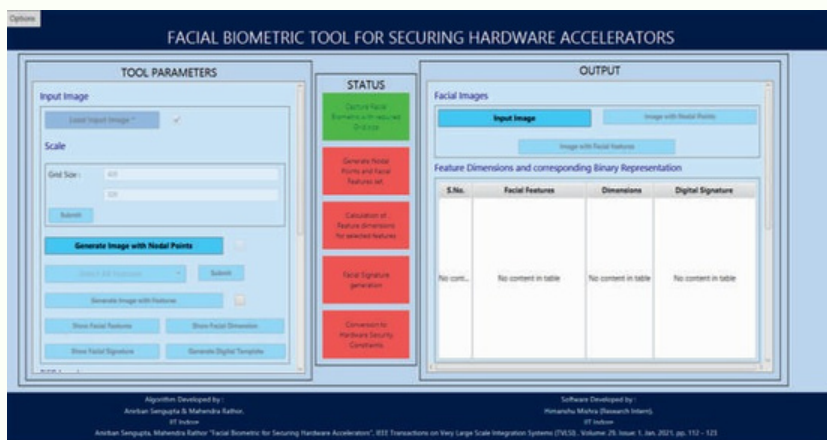
PATENT
Nil

RELEVANT INDUSTRIES
VLSI, Hardware security

INVENTORS
Rahul Chaurasia
Prof. Anirban Sengupta
(Department of Computer
Science and Engineering)

Faciometric Hardware Security Tool

The Faciometric hardware security tool has been developed to simulate and analyze the functionality of facial biometric based approach for securing DSP hardware accelerators against piracy and false claim of ownership threats. The Faciometric hardware security tool accepts the DSP application input in the form CDFG along with the resource constraints. Further, it generates scheduling and registers allocation pre and post embedding facial signature constraints, onto the output window. The embedded facial signature in the hardware accelerator design can be used as a unique digital evidence to secure against piracy and false claim of ownership threats.



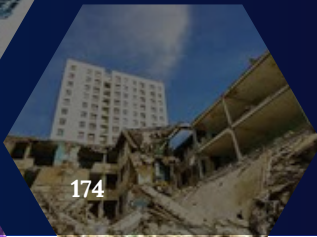
asengupta@iiti.ac.in

PATENT
Nil

RELEVANT INDUSTRIES
VLSI, Hardware security

INVENTORS
Mahendra Rathor
Prof. Anirban Sengupta
(Department of Computer
Science and Engineering)

Disaster Management & Resilient Infrastructure

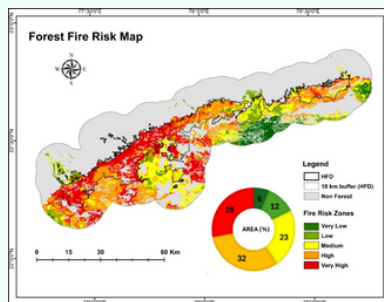


Investigation of wildfire risk and its mapping using GIS-integrated methods

Our research focuses on developing a framework for studying wildfires in small areas, using openly available data. It is especially relevant to tropical and subtropical regions of South Asia, where changing climates and human interventions increase wildfire risks. In India, deciduous forests, particularly during the pre-monsoon season, are vulnerable due to dry conditions and human activities.

The study, conducted in the Hoshangabad Forest Division, integrates geospatial analysis, remote sensing techniques, and the Analytical Hierarchy Process (AHP) within a GIS environment to assess wildfire risks. This methodology helps identify wildfire risk zones and analyze temporal patterns. This is an Integrated Methodological Framework for Wildfire Risk Assessment Using Open-Source Data in Small Forest Areas or National Parks.

The framework has shown good accuracy in risk zonation and is valuable for developing fire mitigation strategies. It can be applied to other areas to protect communities and ecosystems. The methodology has been implemented in two other forest divisions, achieving higher accuracy.



phd2101161005@iiti.ac.in

PATENT

Nil

RELEVANT INDUSTRIES

Disaster management official or ORGs
NGOs

INVENTORS

Mohd Amin Khan
Prof. Pritee Sharma
(School of Humanities and Social Sciences)

Low-cost Unmanned System for Atmospheric and Pollutants Profiling

A UAV-based vertical atmospheric profiling system is developed, contributing towards low-cost alternatives for pollution and atmospheric measurements. The sensor-integrated UAV platform is capable of onboard processing in near real-time, providing valuable input for the management and mitigation of pollution without needing costly ground infrastructures. This platform will also provide in situ atmospheric boundary layer measurements with high spatial and temporal resolution, suitable for meteorological applications and research. The system will be useful in wind energy, smart cities, and air quality monitoring among other application areas. Currently, we are at TRL 6, demonstrating the technology in various environments.

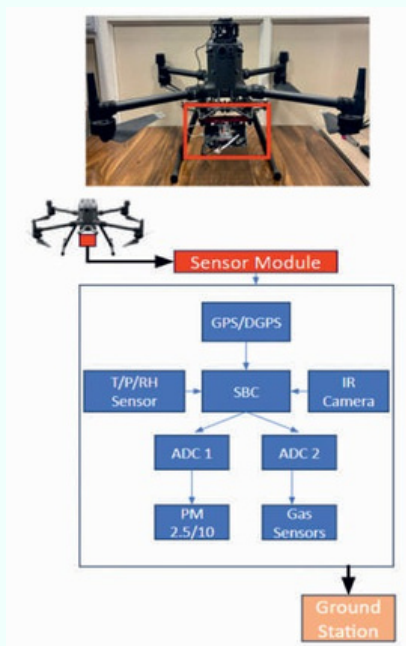


Fig: The top figure shows the developed prototype of the sensor onboard the UAV and the bottom figure illustrates the complete framework.

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PATENT

Nil

RELEVANT INDUSTRIES

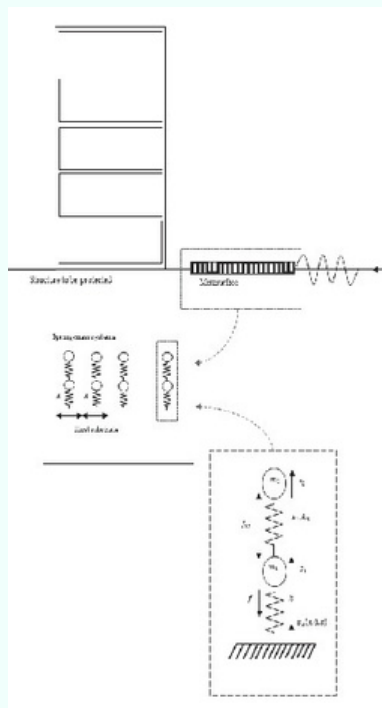
Space Industry Mining
Smart Cities Pollution

INVENTORS

Mr. Ranjan Kumar
Mr. Vaibhav Tyagi
Dr. Saurabh Das
(Department of Astronomy,
Astrophysics and Space
Engineering)

Controlling of Surface Seismic Wave using META Surfaces

Metasurfaces are used to manipulate seismic waves, reducing earthquake damage. A novel design involves an array of nonlinear two-degree-of-freedom spring-mass systems mounted on a nonlocal elastic substrate. Combining nonlinearity, a double mass system, and nonlocal elasticity, the design reveals Rayleigh wave dispersive properties. A dual spring-mass system creates two frequency band gaps, transforming surface waves into shear waves at cut-off frequencies. Hardening nonlinearity confines high-frequency waves, while softening nonlinearity produces broader band gaps. Optimized metasurface designs using springs, beams, and plates can protect bridges, tunnels, buildings, and monuments, offering cost-effective solutions for energy harvesting and earthquake impact mitigation.



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PATENT

Nil

RELEVANT INDUSTRIES

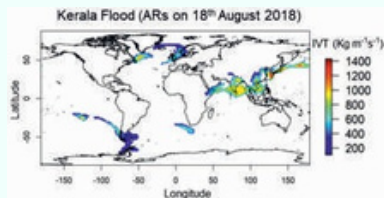
Gas & Oil Industry Mining
Nuclear Power Companies
Plants Civil

INVENTORS

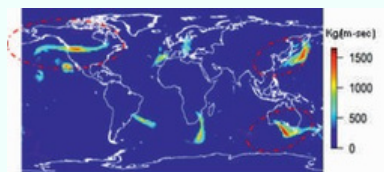
Manasa Bhat
Dr. Santanu Manna
(Department of Mathematics)

Data-driven Solution to Enhance Climate Resilience and Mitigate The Impacts of Hazards

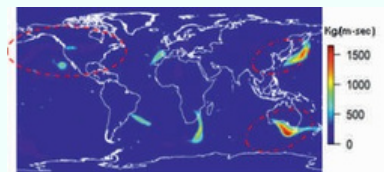
The developed technology aims to predict atmospheric rivers (ARs) using Deep Learning Models to mitigate their impacts. With global extreme weather events rising due to climate change, the study introduces a pioneering framework integrating climate risk assessment and addressing multi-sectoral impacts. Advanced AI-driven early warning systems predict ARs and mitigate effects like floods, enhancing disaster preparedness. At Technological Readiness Level (TRL) 4, the work demonstrates progress in AR characterization, modeling, and validation, with practical application potential. This research revolutionizes disaster preparedness by proactively addressing extreme precipitation, contributing to climate resilience and safeguarding sectors like agriculture and energy against escalating threats.



(b) ARs observed at a time



(c) ARs Predicted through Convolutional Autoencoder



(a) Kerala flood (b) ARs observed at a time © ARs Predicted through Convolutional Autoencoder

mkgoyal@iiti.ac.in

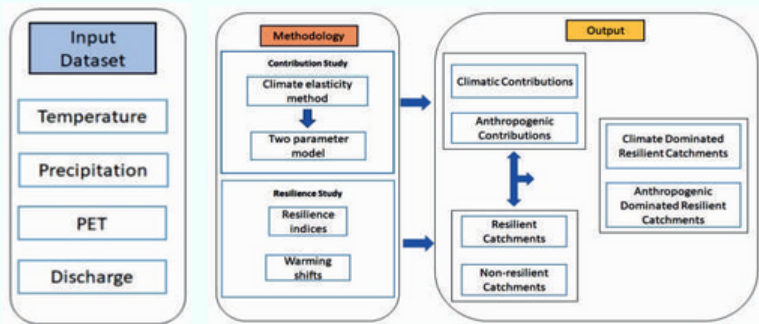
PATENT
Under Process

RELEVANT INDUSTRIES
farming industry water resources
management managing bodies
bodies

INVENTORS
Shivam Singh
Prof. Manish Kumar Goyal
(Department of Civil
Engineering)

A Novel Process on Quantification of Hydrologic Resilience Potential and its Attributions

The developed technology assesses the impact of anthropogenic stress and climatic variability on catchment hydrology and resilience using the adjusted elasticity index. Addressing challenges in sustainable watershed management due to climate change, it introduces a novel approach for evaluating hydrological resilience at river basin scales. This percentile-based model, at Technological Readiness Level (TRL) 4, is spatiotemporally independent, robust, and validated for implementation. It quantifies mean annual water balance dynamics under diverse environments, aiding hydrology research, stakeholders, and policymakers. The technology predicts hydrologic responses to climatic disturbances, offering a versatile tool for sustainable water resource management and addressing global warming challenges.



A method for measuring hydrological resilience of a region in response to anthropogenic activities and climatic changes

mkgoyal@iiti.ac.in

PATENT

Filed, Indian Patent Application
No. 201921037336

RELEVANT INDUSTRIES

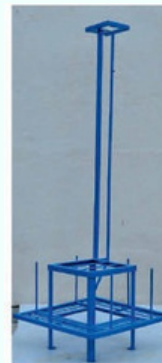
Risk Management Disaster Management

INVENTORS

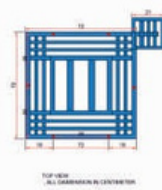
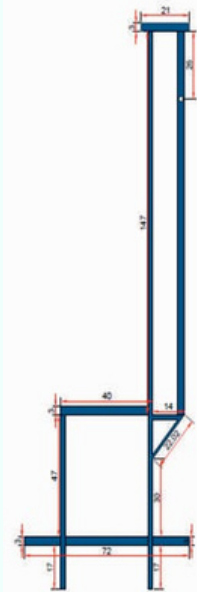
Jhilm Sinha
Dr. Jew Das
Prof. Manish Kumar Goyal
(Department of Civil Engineering)

Portable Integrated Stand for Constant and Falling Head Permeability Apparatus

The permeability test is crucial in geotechnical engineering for understanding soil properties. Traditional wall-mounted equipment lacks flexibility, posing challenges for use in diverse and remote settings. The innovative apparatus addresses these issues with a unique design, precise controls, and a user-friendly interface for efficient water flow measurement and test monitoring. Its portable, flat-surface setup eliminates the need for wall mounting, enhancing adaptability, space efficiency, and cost savings. This device enables reliable permeability testing in various environments, including remote sites. Now at TRL-8, the technology is ready for implementation in industries and academia, offering consistent and practical solutions.



ISOMETRIC VIEW

TOP VIEW
ALL DIMENSION IN CENTIMETERFRONT VIEW
ALL DIMENSION IN CENTIMETER

neelima.satyam@iiti.ac.in

PATENT

Register Design No. 393005-001
at IPO

RELEVANT INDUSTRIES

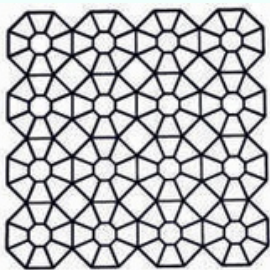
Manufacturing

INVENTORS

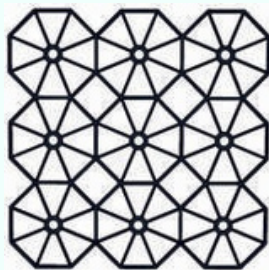
Monika Dagliya
Nitin Tiwari
Dr. Neelima Satyam
(Department of Civil
Engineering)

Multiaxial Concentric Octagonal Geogrid (MCOG) and Multiaxial Diamond Anchored Octagonal Geogrid (MDAOG)

New geogrids are needed to manage the large volumes of crushed stone aggregates for India's road network. Research has led to the creation of two innovative geogrids: the Multiaxial Concentric Octagonal Geogrid (MCOG) and the Multiaxial Diamond Anchored Octagonal Geogrid (MDAOG). With unique octagonal shapes, these designs outperform existing options and tackle issues related to climate change, aggregate scarcity, and waste management. They promise to improve infrastructure durability and support sustainable development goals.



*Multiaxial Concentric
Octagonal Geogrid (MCOG)*



*Multiaxial Diamond Anchored
Octagonal Geogrid (MDAOG)*

baadigaramu@iiti.ac.in

PATENT

MCOG, Design Number: 429180-001 (Granted), Patent Application Number: 202421066554, MDAOG Design Application Number: 429181-001, Patent Application Number: 202421066553

RELEVANT INDUSTRIES

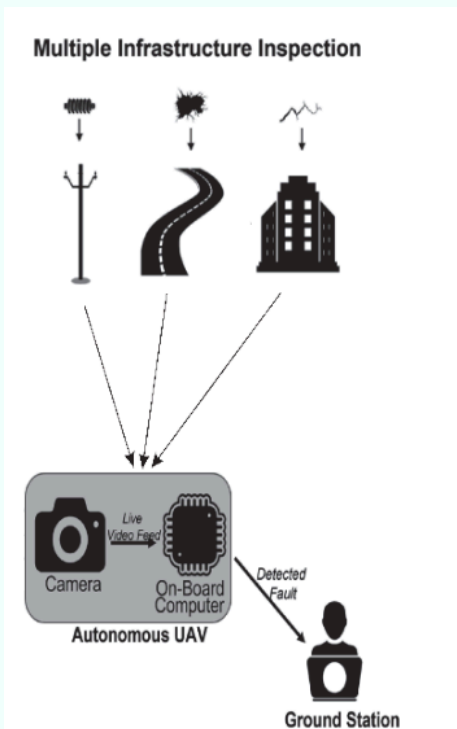
Civil Engineering, Construction and Geosynthetics Related Industries

INVENTORS

Dr. Girish C. Verma
(Department of Mechanical Engineering)

UAV Based Crack Detection in Infrastructures Using AI-ML

To meet the increasing need for reliable infrastructure safety, we created an autonomous two-stage fault detection algorithm (2SA) that uses a master-slave mechanism to classify faults in electrical, road, and civil categories. Achieving approximately 93% accuracy and a 90 ms recognition time, this system integrates with drones for remote inspections. Prototyped with sensors like cameras and LiDAR, it streamlines inspections while reducing risks to human inspectors. Ongoing efforts focus on improving redundancy, versatility, and communication protocols for safer and more reliable infrastructure assessments.



abhirup.datta@iiti.ac.in

PATENT

Under process

RELEVANT INDUSTRIES

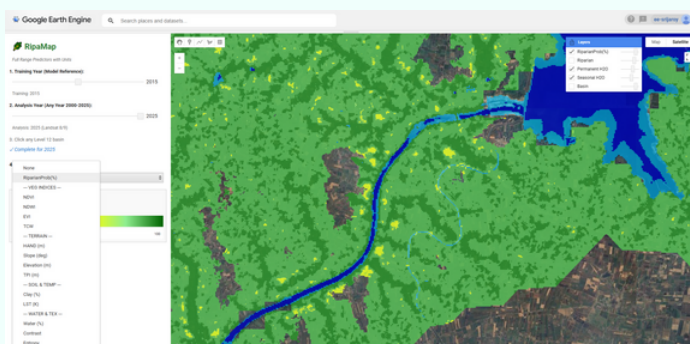
Manufacturing, Infrastructure
Development, Construction

INVENTORS

Prof. Abhirup Datta, Kumar
Sheshank Shekhar, Harsha
Avinash Tanti, Department of
Astronomy, Astrophysics and
Space Engineering

Riparian Zone Extractor, Mapper and Condition Assessment Tool

A cloud-based geospatial system utilizing Spatiotemporal Random Forest machine learning to automatically delineate riparian ecosystems across river basins. The tool processes 13 hydro-geomorphic predictors (NDVI, NDWI, EVI, TCW, HAND, slope, elevation, TPI, clay, LST, water frequency, texture metrics) extracted from Landsat 5/8/9 imagery (2000-2025). Trained on 476 verified riparian sites, it employs dynamic indices-based water classification (permanent >90% frequency, seasonal <90%) and hydro-geomorphic constraints to identify riparian vegetation within 1000m water buffers. Provides audit-ready outputs for regulatory compliance, historical baseline reconstruction, encroachment quantification, and restoration planning at basin scale.



mkgoyal@iiti.ac.in

PATENT

Filed (Application No: 202521130273)

RELEVANT INDUSTRIES

Environmental Consulting & Impact Assessment (EIA/EMP); Hydropower

INVENTORS

Prof. Manish Kumar Goyal
Dr. Srija Roy
Mr. Shivam Singh

KSO-PW tool -: Key-driven Structural Obfuscation and Physical Level Watermarking

The KSO-PW tool can be used to simulate and analyze Key-driven structural obfuscation and watermarking for securing DSP hardware accelerators against reverse engineering and piracy. The tool accepts DSP application input as CDFG, along with module library and resource constraints files. It outputs all intermediate steps of the obfuscation and watermarking process, culminating in a watermarked floorplan of the obfuscated design.

The screenshot displays the KSO-PW tool interface, titled "Key Based Multiphase Structural Obfuscation with Physical Level Watermarking". It is divided into three main sections: Primary Inputs, Key Inputs, and Output.

Primary Inputs: This section contains several upload buttons and file lists:

- Upload your user application file: (FIR_loop.txt)
- Upload your Unroll DSP file: (FIR_loopunroll.txt)
- Upload your Library file: (ResourceAreaAndLa...)
- Upload your Baseline Constraints file: (BIR_Constraints_Base...)
- Upload your Constraints file: (FIR_Constraints.txt)

At the bottom of this section are buttons for "Done" and "Select New Key".

Key Inputs: This section contains input fields for keys and a signature:

- Enter Key value for Partitioning:
- Enter Key value for THT:
- Enter Key value for Folding:
- Enter Signature:

At the bottom of this section are buttons for α , β , γ , and CLR.

Output: This section displays the results of the obfuscation and watermarking process:

- Column 1: x4 -> 7,8
- Column 2: x4 -> 9,10
- Column 3: x4 -> 11,12
- Column 4: x4 -> 13,14
- Block: 8
- Column 1: A -> 1,2,3
- Column 2: d2 -> 1,2,3,4,5
- Column 3: x2 -> 1,2,3,4,5,6,7,8
- Column 4: x2 -> 9,10
- [View Final Floor Plan](#)
- > Watermark Metrics
- > Final Cost
- Total runtime = 22249ms

asengupt@iiti.ac.in

PATENT

Nil

RELEVANT INDUSTRIES

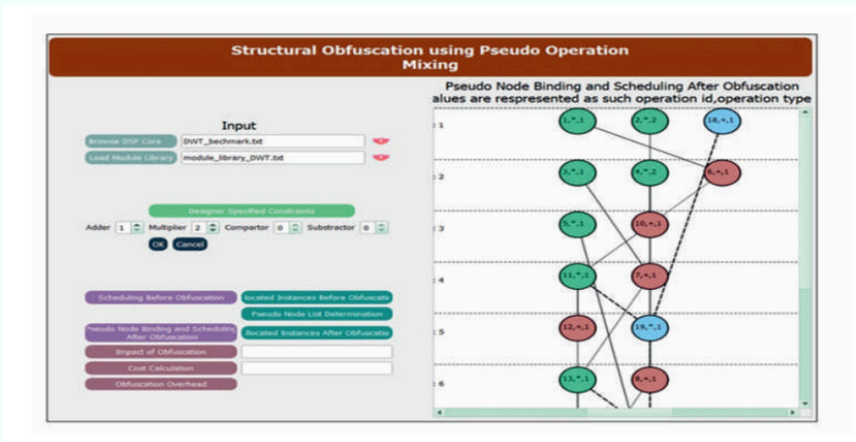
VLSI, Hardware security

INVENTORS

Prof. Anirban Sengupta
Mahendra Rathor
(Department of Computer
Science and Engineering)

POM-SO tool -: Pseudo Operation Mixing Based Structural Obfuscation Tool

Prof. Sengupta and his team have developed a POM-SO tool (pseudo operation mixing based structural obfuscation) to simulate and analyse the pseudo operation mixing based obfuscation approach for securing DSP hardware accelerators against reverse engineering (and Trojan insertion). The POM-SO tool accepts the DSP application input in the form CDFG along with module library and resource constraints. The tool shows intermediate steps of pseudo operation mixing and inally generated structurally transformed scheduled and resource allocated DFG at the output. This output can be used to generate a structurally obfuscated RTL design of a DSP application which can hinder reverse engineering.



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PATENT

Nil

RELEVANT INDUSTRIES

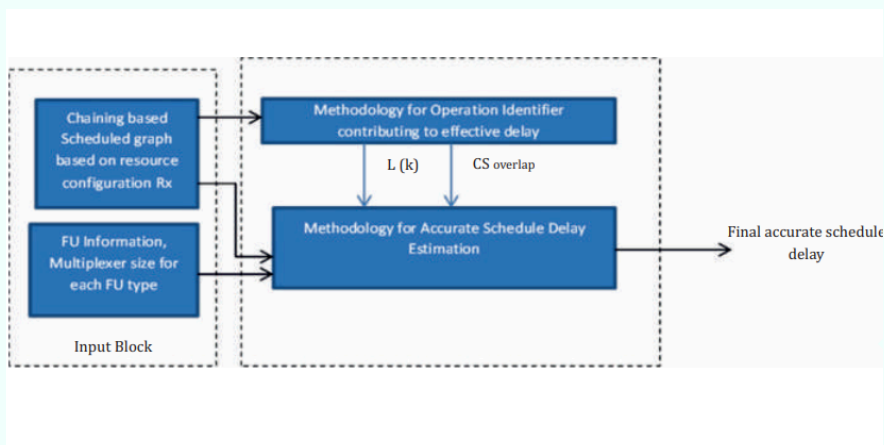
VLSI, Hardware security

INVENTORS

Mahendra Rathor
Prof. Anirban Sengupta
(Department of Computer
Science and Engineering)

Improved Schedule Delay Estimation Process for Datapath During High Level Synthesis of Application Specific Processors

An improved execution delay estimation process for high level synthesis (HLS) of application-specific processors is disclosed. Typically, execution delay is estimated by assessing only the functional units in each control step, which may not reflect the true delay of the corresponding datapath circuit. This new methodology provides a more accurate estimation of schedule delay compared to existing techniques.



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PATENT

Granted, Indian Patent No. 458850

RELEVANT INDUSTRIES

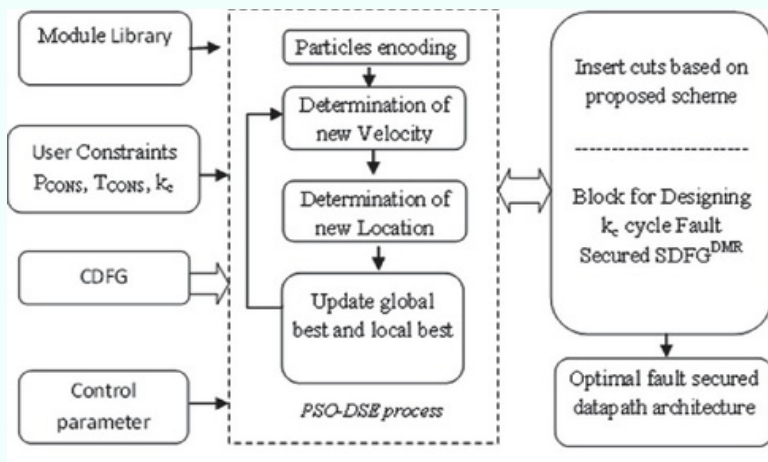
Chip Design, Hardware Security

INVENTORS

Prof. Anirban Sengupta
(Department of Computer Science and Engineering)

Design Space Exploration of Optimal KC-Cycle Transient Fault Secured Datapath System with Intelligent Cut Insertion

In one implementation, a mechanism for generating a user-friendly, economical, adaptable and simplified system for exploring/designing a kc cycle transient fault secured datapath circuit for transient single and multi-cycle faults based on user power/area and delay budget with module that intelligently/aptly applies cut insertion for delay reduction during high level synthesis, is disclosed. For achieving the same an apparatus is configured to design a kc cycle transient fault secured dual/double modular redundancy (DMR) system, for generating at least one scheduled data flow graph (SDFG) DMR systems.



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PATENT

Granted, Indian Patent No. 432435

RELEVANT INDUSTRIES

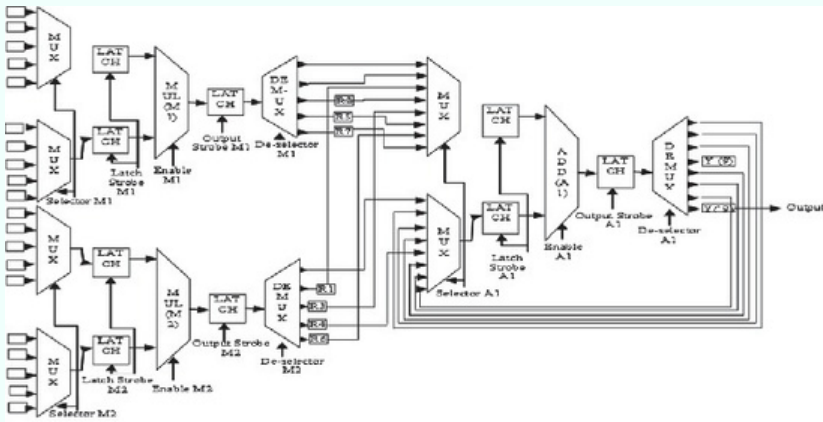
Chip Design, Hardware Security

INVENTORS

Prof. Anirban Sengupta
(Department of Computer Science and Engineering)

Design Space Exploration of Optimal K-cycle Transient Fault Tolerant Datapath Based on Multi-Objective Power-Performance Tradeoff

The present invention discloses a system (apparatus) and method for design space exploration of an optimal single or multi cycle (k-cycle) transient fault detectable and /or error correctable data path which indicates design space exploration method producing design solutions with ability of k-cycle transient fault detection and/or error correction and generation of an optimal k-cycle transient fault detectable and /or fault correctable datapath that minimizes user specified power and delay (or performance) constraint, by detecting transient faults using a double/ dual modular redundancy (DMR) and/or correcting them using a double/ dual modular redundancy (DMR) with recovery circuit.



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PATENT

Granted, Indian Patent No. 392356

RELEVANT INDUSTRIES

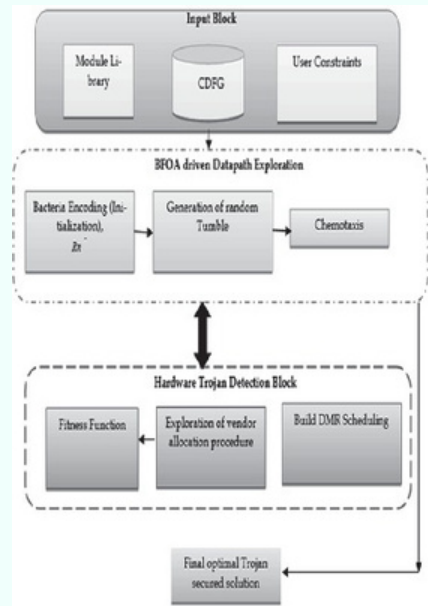
Chip Design, Hardware Security

INVENTORS

Prof. Anirban Sengupta
(Department of Computer Science and Engineering)

Design Space Exploration of an Optimized Hardware Trojan Detectable /Secured Datapath During High Level Synthesis

An evolutionary algorithm (EA) driven novel design space exploration (DSE) of an optimized hardware Trojan secured datapath based on user power-delay constraint during high level synthesis (HLS) is presented. The present invention provides DSE for hardware Trojan detection includes a problem encoding technique that enables exploration of efficient distinct vendor allocation as well as enables exploration of an optimized Trojan secured datapath structure. The exploration backbone for the present invention is bacterial foraging optimization algorithm (BFOA) which is known for its adaptive feature (tumbling/swimming) and simplified model.



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PATENT

Granted, Indian Patent No. 430067

RELEVANT INDUSTRIES

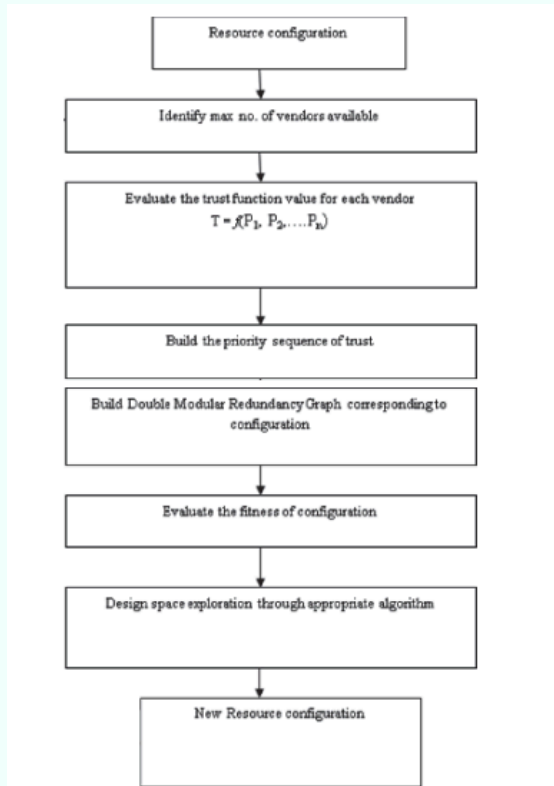
Chip Design, Hardware Security

INVENTORS

Prof. Anirban Sengupta
(Department of Computer Science and Engineering)

Method and System for Automatic Fault Recovery and True Output Extraction During High Level Synthesis

Systems and method for transient fault isolation, hardware Trojan fault detection/isolation and true output extraction during high level synthesis of at least one other system are disclosed. The present invention discloses an efficient and cost effective equivalent circuit system with Double Modular Redundancy (DMR) scheme to isolate a correct output. In one implementation, the present invention provides a system comprising at least one comparator means, at least one OR-ing means, and at least one multiplexer means.



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PATENT

Granted, Indian Patent No. 484388

RELEVANT INDUSTRIES

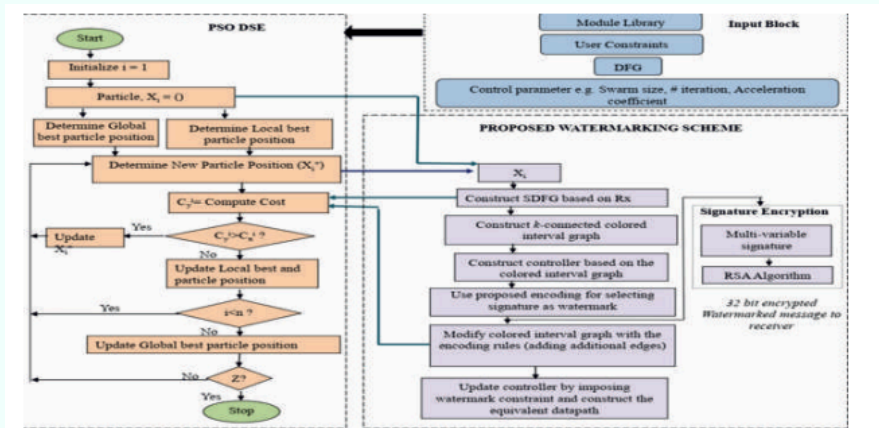
Chip Design, Hardware Security

INVENTORS

Prof. Anirban Sengupta
(Department of Computer Science and Engineering)

Embedding Watermark Based on Multi-Variable Signature Encoding at Behaviour Level for Reusable IP Core Protection

Disclosed is an embedding watermark during high level synthesis at behavior level for reusable IP core protection. In one implementation, the present invention generates low cost watermarking solution during high level synthesis (HLS) based on multi-variable signature encoding for security of reusable IP cores. The watermark generated by the proposed approach satisfies the following properties: (a) low embedding cost (b) robustness (c) low watermark creation time (d) strong proof of authorship (e) lower hardware overhead (f) fault tolerance. Comparison with similar technique revealed the present invention obtains watermarked solution with lower embedding cost with lesser storage overhead and creation/embedding time.



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PATENT

Granted, Indian Patent Application
No. 4466/MUM/2015

RELEVANT INDUSTRIES

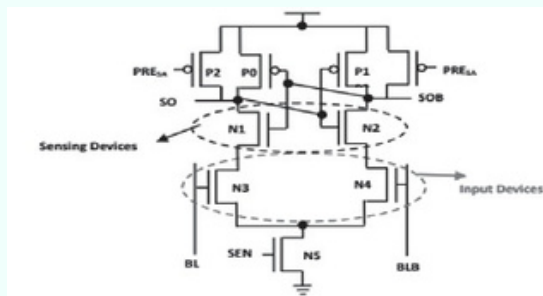
Chip Design, Hardware
Security

INVENTORS

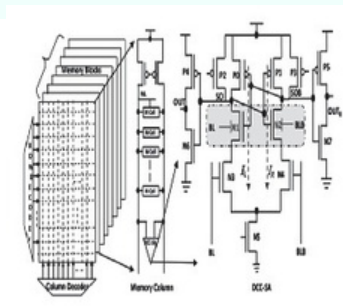
Prof. Anirban Sengupta
(Department of Computer
Science and Engineering)

Offset Compensated Data Sensing Technique For Low Energy Embedded SRAM

Continuous downscaling of technology has increased integration density and performance but also introduced process variations like random dopant fluctuation (RDF) and line edge roughness (LER), leading to SRAM read yield losses. This work proposes a Differential Current Compensated Sense Amplifier (DCC-SA) to address variability-induced failures in embedded SRAM. The DCC-SA dynamically adjusts overdrive potential to compensate for branch current mismatches, reducing bit-error-rate, energy consumption, and input-referred offset. It offers higher offset tolerance and a lower power-delay product, making it ideal for low-power IoT processors. Monte Carlo simulations confirm its robustness against process variations, highlighting its effectiveness and innovation.



*Prior art, Conventional
Current Latch Sense Amplifier*



Development of a zirconia nanostructure based wide bandgap high k dielectric material for semiconductor devices

The present invention relates to a material of high k dielectric and large bandgap for semiconductor devices, e.g., in Dynamic Random Access Memory metal insulator metal (DRAM MIM) capacitors, Central Processing Units (CPUs), flash memory, ensuring improved electrical performance in next-generation semiconductor devices. The present invention provides a process for the development of an optimally yttria doped nanostructured zirconia based wide bandgap high-k dielectric material, with a dielectric constant (k) value of 1720, along with a band gap of about 5 eV for advanced microelectronics and high-performance next-generation electronic devices. A material of high k value and simultaneously having a large band gap is the crucial point of this invention

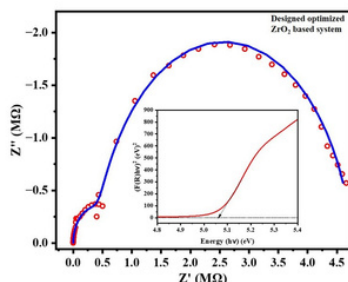


Figure: Illustration of Nyquist plot, as extracted from electrochemical impedance spectroscopy (EIS) of the designed optimally yttria doped nanostructured zirconia system under this invention. Theoretical model fit (with equivalent circuit) of the experimental data, yields a large dielectric constant (k) of about 1720. Inset: UV-Vis results of the system, indicating a large band gap (above 5 eV).

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PATENT

Filed, Indian Patent Application No.
202521066327

RELEVANT INDUSTRIES

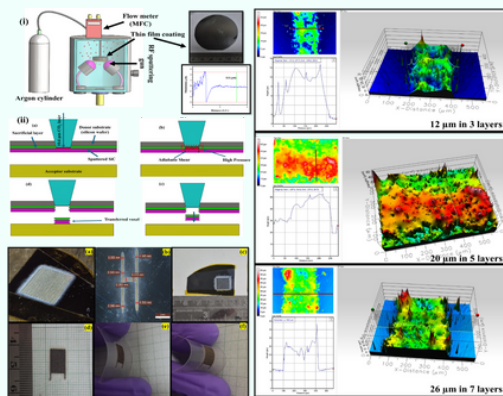
Semiconductor
technologies/Semiconductor

INVENTORS

Prof. Sudeshna Chattopadhyay
(Bandyopadhyay)
Adi Pratap Singh
Banadeep Dutta

Micro-3D printing of multilayered Silicon carbide for pressure sensing applications

The present technology demonstrates a laser micro-3D printing technology capable of directly fabricating crystalline silicon carbide (SiC) microstructures with thicknesses of 12–26 μm dimensions that are extremely difficult to achieve using conventional ceramic processing routes such as CVD, sintering, or polymer-derived ceramics. The process utilizes a PDMS-driven laser-induced voxel ejection mechanism, enabling maskless and vacuum-free printing of SiC with micron-scale precision. By establishing an optimized energy-coupling regime (stand-off distance 10.5 cm, laser power 4.0–4.3 W, and 60–70% pulse overlap), the technique achieves high-fidelity voxel control, producing uniform linewidths of 200–300 μm and layer heights of 4–5 μm per voxel, enabling stable multilayer stacking up to seven layers (~26 μm total height). The technology further enables SiC printing on both rigid silicon and flexible PET substrates, with printed micro-grids retaining mechanical integrity under ~5 mm bending radius. The ability to digitally print crystalline SiC microstructures of 25 μm thickness without high-temperature sintering and vacuum systems and marks a significant advancement in ceramic additive manufacturing. This laser micro-3D printing platform opens new pathways for miniaturized MEMS devices, high-temperature microsensors, micro-heaters, and flexible high-performance electronic components.



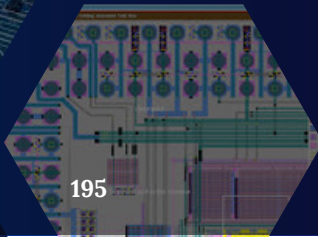
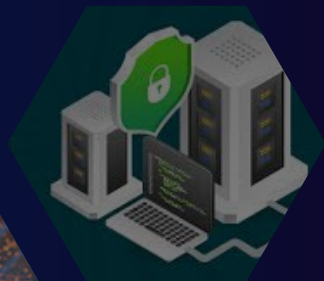
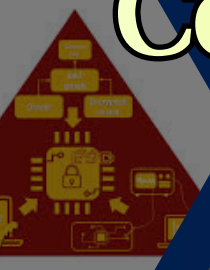
palaniia@iiti.ac.in

PATENT
Granted

RELEVANT INDUSTRIES
ISRO, Semiconductor Industries

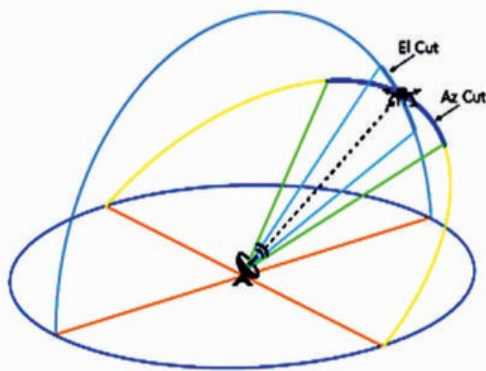
INVENTORS
Arpit Kumar Singh
Gaurav
Krishnpal Singh Tomar
Suhas S. Joshi
Palani Iyamperumal Anand

Next-Gen Communications



Low Frequency Antenna Characterization System for Space Application

Characterizing large antennas, essential for applications like radio astronomy and deep-space communication, is challenging due to their size, which complicates measurements of gain, polarization, and radiation pattern. To address this, we propose a drone-based antenna characterization system. The drone autonomously revolves around the antenna with a Radio Frequency (RF) transmitting (Tx) payload, while the large antenna acts as a receiver (Rx). The ground station collects data from the drone's RF Tx payload and positional information, mapping it to characterize the antenna. The RF Tx payload has been tested, and its integration with the drone is under testing. This approach promises advancements in communication, scientific research, and more.



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PATENT

Under Process

RELEVANT INDUSTRIES

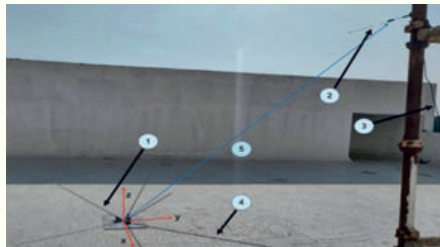
Communication Space Industry
Defense

INVENTORS

Harsha Avinash Tanti
Prof. Abhirup Datta
(Department of Astronomy,
Astrophysics and Space
Engineering)

Passive Radio Source Localisation System

Determining the direction of arrival (DoA) of electromagnetic signals at a radio antenna sensor is challenging due to interference, noise, and multiple signal superposition. Limited sensors and resources add to the complexity. We propose the Snapshot Averaged Matrix pencil method DoA (SAM-DoA) and ML-based DoA (ML-DoA) algorithms for passive radio source localization using tri-axial orthogonally co-located antennas. These algorithms were tested in simulations and practical scenarios (DOA: 10.1007/s10686-023-09897-6). Hardware design and prototyping are ongoing. Accurate DoA solutions benefit 5G, IoT, satellite communication, radar systems, and emergency services, reducing electromagnetic pollution and advancing technology and societal well-being.



(Image of practical verification from our published article DOI: 10.1007/s10686-023-09897-6)

experimental arrangement where, (1) is the Fabricated tripole antenna, the red arrows denotes the reference axis (x, y, z) and (2) is the synthetic source constitutes of a monopole and a RF generator (Keysight N5173B) set at frequency of 72 MHz and power of 10 dBm. (3) shows the RF line which connects monopole and RF generator. The data from the tripole at (1) is carried by RF line shown by (4) and is received using a DSO (Keysight Infiniium DSO9254A). (5) indicates line of sight of the source which is located at Az/EI - $\sim 41^\circ/\sim 51^\circ$ from the reference axis displayed in the image.

abhirup.datta@iiti.ac.in

PATENT

Nil

RELEVANT INDUSTRIES

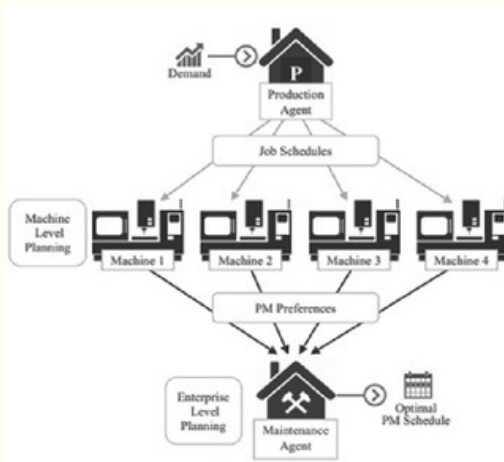
Communication Defence
Space Industries

INVENTORS

Harsha Avinash Tanti
Prof. Abhirup Datta
(Department of Astronomy,
Astrophysics and Space
Engineering)

Method and System for Providing Smart Communications for Distributed Operations Planning in an Industrial Network

This invention relates to a method and system of providing smart communications for distributed operations planning in an industrial network. More particularly, the present disclosure relates to a novel communication method facilitating intelligent communications and decision making for distributed operations planning, such as, but not limited to, maintenance scheduling, production scheduling/sequencing, inventory management, quality control etc., within the industrial network. The novel communication method helps in making faster, autonomous and more- informed decisions under dynamic conditions within any industrial environment. A software solution using this invention for industrial decision making is currently under development.



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PATENT

Filed, Indian Patent Application No.
201621007003

RELEVANT INDUSTRIES

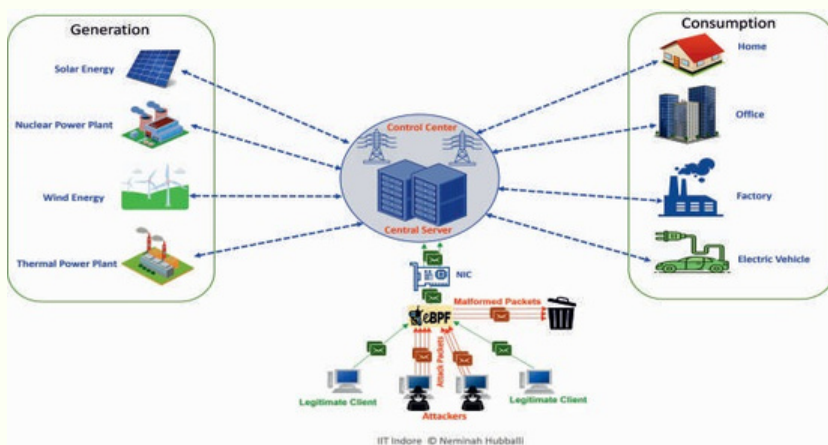
Any Manufacturing Industry

INVENTORS

Namit Agrawal, Miroojin Bakshi,
Kartikya Upasani, Prof.
Makarand S. Kulkarni, Dr.
Vibhor Pandhare, Prof. Bhupesh
Kumar Lad, Department of
Mechanical Engineering

GridProtect: Protecting the Electrical Grid Networks from Resource Depletion Cyber Attacks

Modern electric grids use Information and Communication Technology (ICT) for data exchange via TCP/IP networks. Communication protocols like Modbus and IEC-104 enable this process. A resource depletion attack, a Denial-of-Service variant, can overwhelm control centers with random application-layer messages, threatening grid safety. To counter this, we implemented custom screening code at programmable Network Interface Cards (NICs) to filter packets not adhering to protocol standards. By dropping illegal Modbus and IEC-104 packets at the NIC level, the solution significantly conserves control center resources, including CPU cycles and memory, ensuring the grid's resilience and security.



neminath@iiti.ac.in

PATENT

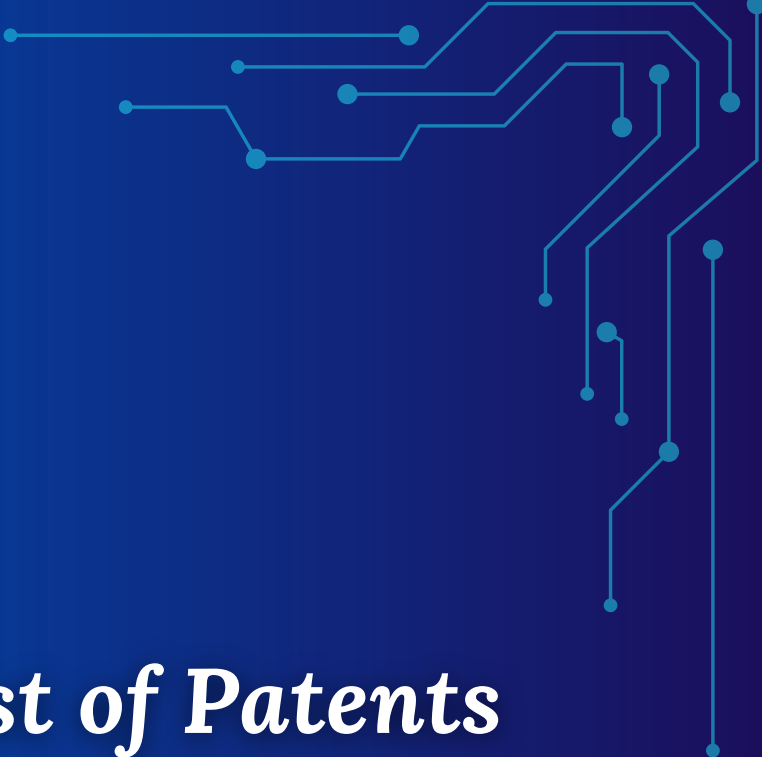
Nil

RELEVANT INDUSTRIES

Powergrid

INVENTORS

Dr. Neminath Hubballi,
Department of Computer
Science and Engineering



List of Patents of IIT Indore

List of Patents of IIT Indore (Filed)

S.No.	Title	Faculty Name
1	A Novel L-Asparaginase Enzymes to Mitigate Carcinogen Formation in Processed Food Products	Prof. Avinash Sonawane
2	Twin Gas Metal Arc Welding Based Additive Manufacturing System and Method Thereof	Dr. Dan Sathiaraj
3	Filed by DRDO (Patent Pending)	Prof. Devendra Deshmukh
4	Method and System for Identifying a Molecule of Artificial Deoxyribonucleic Acid (DNA) Nucleobase	Prof. Biswarup Pathak
5	Method and System for Identifying Disaccharide Isomers	Prof. Biswarup Pathak
6	A Portable Synthetic Jet-Based Evaporative Cooling Device	Dr. Harekrishna Yadav
7	A Shear Test System and Method	Prof. Neelima Satyam
8	A High-Entropy Li-Stuffed Garnet (HEG) Solid Electrolyte and Method Thereof	Dr. Sunil Kumar
9	A Composition and Method of Preparation of Layered Oxide Cathodes for Sodium-Ion Batteries	Dr. Sunil Kumar
10	High-Entropy Prussian Blue Analog Material and Process of Preparation for High Power Density Sodium-Ion Capacitor	Dr. Dharendra K. Rai
11	A System and Method for Controlling Drone and Performing Complicated Tasks by Easy Prompts	Dr. Vivek Kanhangad
12	A System and a Method to Measure Erosion and Entrainment Dynamics in Debris Flows	Prof. Neelima Satyam
13	Systems and Methods for Detecting One or More Cracks in Infrastructures Using Unmanned Vehicles	Prof. Abhirup Datta

List of Patents of IIT Indore (Filed)

S.No.	Title	Faculty Name
14	Glutathione-Guanosine Monophosphate Hydrogel with Inherent Antiviral, Antibacterial and Anticancer Activities and Method Thereof	Dr. Tridib Kumar Sarma
15	A Deformable Adaptive Mirror Assembly and a Method of Correcting Aberrations on a Deformable Mirror	Prof. I A Palani
16	A Multi-Modal Unmanned Vehicle	Prof. I A Palani
17	Method and System for Risk Assessment and Management for a Wetland	Prof. Manish Kumar Goyal
18	A System and Method for Mobile Microscopy for Point-of-Care White Blood Cell Histopathological Analysis	Dr. Puneet Gupta
19	A Hardware IP Protection Against IP Piracy Based on IP Vendor's Genomic Microsatellites for Forensic Hardware Watermark	Prof. Anirban Sengupta
20	Proteogenomic Biomarker Based HLS Watermark for Hardware IP Security	Prof. Anirban Sengupta
21	A Behavioral Synthesis Based Hardware IP Protection Using Microscopic Fingerprint Datum Lines and Star-Burst of IP Vendor	Prof. Anirban Sengupta
22	Advanced Drone System for Extended Monitoring with Tethered and Autonomous Power	Dr. Sumit Gautam
23	System and Method for Assessing a Flood Risk	Prof. Manish Kumar Goyal
24	A Sensor Device Based on Triboelectric Nanogenerator	Prof. I A Palani
25	Ultrasonic Solid-State Additive Manufacturing (USSAM) Apparatus and Technology for Multi-Material Laminates	Prof. Neelesh Kumar Jain
26	A Vanadium Based Cathode Material and a Process for Preparation Thereof	Dr. Dharendra K. Rai

List of Patents of IIT Indore (Filed)

S.No.	Title	Faculty Name
27	System and Method for Vacuum-Assisted μ -Plasma Powder Additive Manufacturing (VMPP-AM) for Metallic Depositions	Prof. Neelesh Kumar Jain
28	A System and a Method for Autonomous Vehicle Navigation Using Colour Sensors	Dr. Sumit Gautam
29	System and Method for Forecasting Air Quality	Prof. Manish Kumar Goyal
30	Methods and Systems for Joint Identification of Encoder and Interleaver in a Communication System	Dr. Swaminathan R
31	Methods and Systems for Identification and Control of Diseases and Pests in Crop	Dr. Aruna Tiwari
32	A Method for Grading Cement-Treated Soil Sample	Prof. Lalit Borana
33	A System and Method for Hardware-Efficient Hodgkin-Huxley Neuron Model Implementation with a Five-Stage Pipeline	Prof. Santosh Kumar Vishvakarma
34	Riparian Zone Extractor, Mapper and Condition Assessment Tool	Prof. Manish Goyal
35	System, Apparatus, and Method for Heart Rate Determination of a User Wearing a Face Mask	Dr. Puneet Gupta
36	System for Channel Estimation and Method Thereof	Prof. Vimal Bhatia
37	Ontology-Based Context Extraction and Scenario Generation System and Method for Manufacturing Simulation	Prof. Bhupesh Kumar Lad; Prof. Makarand S. Kulkarni
38	System and Method for Road Infrastructure Monitoring Using Ultrasonic Sensors	Prof. Vimal Bhatia
39	Agri-Genomics Data Management Platform, Method, and System for Plant Genome Analysis	Prof. Aruna Tiwari

List of Patents of IIT Indore (Filed)

S.No.	Title	Faculty Name
40	Cloud-Based Platform and Method for EEG-Based Diagnostic Analysis	Prof. M. Tanveer
41	EEG-Based System and Method for Multiclass and Multilabel Emotion Recognition	Prof. M. Tanveer
42	A System and Method for Fabricating a Multi-Layered Binder-Free Anode Architecture for Lithium-Ion Batteries	Dr. Sudeshna Chattopadhyay
43	A System and Method for a Switchable Modular Assembly for Requirement-Based Transformable (SMART) Mould	Prof. Sandeep Chaudhary
44	An Integrated Insole for Harvesting Energy	Prof. I A Palani
45	Self-Healing Hydrogel (UK Patent Application Number: 2210605.8)	Prof. Apurba K Das
46	Quality and Activity-Aware Atrial Fibrillation Detection in Wearable and Edge AI Applications	Prof. Ram Bilas Pachori
47	Quality-Aware Ventricular Tachycardia/Fibrillation Detection for Automated Defibrillators	Prof. Ram Bilas Pachori
48	Methods and Systems for Deep Learning Based ECG Noise Detection and Classification	Prof. Ram Bilas Pachori
49	Fused Pyridine Derivatives as Anticancer and Antimicrobial Agents	Prof. Venkatesh Chelvam
50	Novel Compound ANCHROFLA for IKKB Mediated Chronic Inflammatory Signaling	Dr. Mirza S Baig
51	Systems and Methods for Characterizing Low-Frequency Antennas	Prof. Abhirup Datta

List of Patents of IIT Indore (Filed)

S.No.	Title	Faculty Name
52	Bio-Admixture for Cement Composites Prepared from Food Waste and Bacteria	Dr. Sandeep Chaudhary
53	Multi-Fluid Diagnostic Kit for Early Post-Viral Thrombosis and Thyroid Dysfunction	Dr. Hemchandra Jha
54	A Kit for Determining the Presence of Neurodegenerative Disorder	Prof. Hem Chandra Jha
55	Estimating Adsorption Capacity of Solid Substrates Using Molecular Dynamic Simulations	Dr. Shailesh Kundelwal

List of Patents of IIT Indore (Granted)

S.No.	Title	Faculty Name
1	Design Space Exploration System and Method Thereof Using a Bacterial Foraging Optimization Mechanism	Dr. Anirban Sengupta
2	Method and System for Automatic Fault Recovery and True Output Extraction during High Level Synthesis	Dr. Anirban Sengupta
3	System and method for sign language gesture recognition	Dr. Aruna Tiwari
4	Design Space Exploration of Optimal k-Cycle Transient Fault Tolerant Datapath Based on Multi-Objective Power-Performance Tradeoff	Dr. Anirban Sengupta
5	Method and Apparatus for Embedded Systems based Intervention for Energy Conservation	Dr. Gourinath Banda
6	Improved Schedule Delay Estimation Process for Datapath during High Level Synthesis of Application Specific Processors	Dr. Anirban Sengupta
7	Vertical Falling Film Gas Liquid Tower	Dr. Ritunesh Kumar
8	Design Space Exploration of Optimal K-Cycle Transient Fault Secured Data-path System with Intelligent Cut Insertion	Dr. Anirban Sengupta
9	Design Space Exploration Of An Optimized Hardware Trojan Detectable/Secured Datapath During High Level Synthesis	Dr. Anirban Sengupta
10	Embedding Watermark Based on Multi-Variable Signature Encoding at Behaviour Level for Reusable IP Core Protection	Dr. Anirban Sengupta
11	Wheelchair equipped with Brain Computer Interface and Gesture Recognition	Dr. Gourinath Banda
12	A Scalable System and Method for Contact Tracing, Hotspot Detection and Safe Route Recommendation	Dr. Chandresh Kumar Mourya
13	Method And System For Providing Smart Communications For Distributed Operations Planning in an Industrial Network	Dr. Bhupesh Kumar Lad

List of Patents of IIT Indore (Granted)

S.No.	Title	Faculty Name
14	A Multi-Frequency Based Transceiver	Dr. Vimal Bhatia
15	Thermo-mechanical test bench for reliability estimation of Shape Memory Alloy (SMA) springs	Dr. I.A. Palani, Dr. Bhupesh Kumar Lad
16	P-N Tuned Differential 8T Static Random Access Memory (SRAM) Cell	Dr. Santosh Kumar Vishvakarma
17	System and method for emergency services	Dr. Vimal Bhatia
18	A mechanism of 2PRP-PRR Planar Parallel manipulator and a method thereof	Dr. Santhakumar
19	A REHABILITATION ROBOT FOR LOWER LIMB GAIT THERAPY	Dr. Santhakumar
20	Achieving super subthreshold swing (< 1 mV/decade) in multiple gate junctionless MOSFET through engineering the back gate position	Dr. Abhinav Kranti
21	A new spatial parallel platform based on 3-RPRS configuration	Dr. Santhakumar
22	Method and Apparatus for Recording, Archiving, Media Management and Playing back of a Telephone Call	Dr. Vimal Bhatia
23	Low cost, low power, and portable dual transceiver based on software defined radio	Dr. Vimal Bhatia
24	METHOD, DEVICE AND APPARATUS FOR MANAGING PHONE/DEVICE PROFILE BASED ON AN EVENT	Dr. Vimal Bhatia
25	Multiple Gate Tunneling Field Effect Transistor for Capacitorless Dynamic Random Access Memory Applications	Dr. Abhinav Kranti
26	Low leakage-high stability differential positive feedback controlled 10T (DPFC10T) SRAM cell	Dr. Santosh Kumar Vishvakarma

List of Patents of IIT Indore (Granted)

S.No.	Title	Faculty Name
27	Improved Performance of DG-TFET with Lateral Asymmetric Channel (LAC) Doping Profile and Underlap (UL) Feature	Dr. Santosh Kumar Vishvakarma
28	Offset Compensated Data Sensing Technique for Low Energy Embedded SRAM	Dr. Santosh Kumar Vishvakarma
29	System, Method and Apparatus for Low Complexity Non-Orthogonal Multiple Access (NOMA) Receiver for Mixed Constellation	Dr. Vimal Bhatia
30	Ultrafast Electrical Testing System	Dr. Anbarasu
31	Dual Ion Beam Sputtered Cost-Effective and Non-Volatile Resistive Memory Devices	Dr. Shaibal Mukherjee
32	A Cervical Collar	Dr. I.A. Palani
33	A Metal Inert Gas (MIG) Based Additive Manufacturing Technique for Fabricating Shape Memory Alloy Ring	Dr. I.A. Palani
34	A Method and Apparatus for Transferring Heat from Stationary/Moving Surfaces Using Impingement Jet	Dr. Santosh Kumar Sahu; Prof. S.C. Korea
35	An Ultra Low Power, Read Decoupled-Differential Write, 10T SRAM Cell with Larger Read/Write Noise Margin	Dr. Santosh Kumar Vishvakarma
36	Essential Amino Acid Based Biodegradable and Biocompatible Nanoparticles for Bio Medical Imaging and Targeted Drug Delivery Applications	Dr. Sharad Gupta
37	Design and Development of Self-Energized Solar Tracking System Using Textured Shape Memory Bimorph Substrate Based Thin Film Solar Panel	Dr. I.A. Palani
38	Read Recharge (RRC) Based Process Variation Tolerant 10T SRAM Cell	Dr. Santosh Kumar Vishvakarma
39	Design and Development of Tensile Testing Machine for Flexible Thin Films	Dr. I.A. Palani

List of Patents of IIT Indore (Granted)

S.No.	Title	Faculty Name
40	Method and Apparatus for Low Complexity Natural Gradient Based OFDM Channel Estimator	Dr. Vimal Bhatia
41	Method and Apparatus for Detection of Active Taps Location in OFDM System	Dr. Vimal Bhatia
42	A Method of Fabricating Zinc Oxide Based Heterostructure for High Electron Mobility Transistor	Dr. Shaibal Mukherjee; Dr. Abhinav Kranti
43	Hybrid Underwater Vehicle for Ocean Observations	Dr. Santhakumar Mohan
44	A Method of Fabricating High Two-Dimensional Electron Gas Density Yielding Zinc Oxide Heterostructure	Dr. Shaibal Mukherjee; Dr. Abhinav Kranti
45	Method and Apparatus for Low Power Source Spectrum Sensing	Dr. Vimal Bhatia
46	Strained SMA Bimorph & Spring Based Condition Monitoring System for Fluid Leak Detection in Hydraulic Hoses	Dr. I.A. Palani
47	Ultrasonic Atomizer Based Ultrafine Silk Nanoparticles with Long Shelf Life for Targeted Drug Delivery and Diagnostics	Dr. Sharad Gupta
48	A Method for Synthesizing Nanoparticle or Microsphere	Dr. Abhijeet Joshi; Dr. Sharad Gupta
49	π Conjugated Compound for Resistive Switching, Device, and Method of Fabrication	Dr. Apurba K Das
50	Magnetic Field Assisted Micro-Plasma Transferred Arc Powder Additive Layer Manufacturing Process	Prof. Neelesh Kumar Jain
51	Metal-Free, Solvent-Free Synthesis of Fused-Pyrido Heterocycles: Biological Efficacy Against Cancer and Multi-Drug Resistant Pathogens	Dr. Chelvam Venkatesh
52	Catalyst for Low Temperature Hydrogen Production	Dr. Sanjay Kumar Singh

List of Patents of IIT Indore (Granted)

S.No.	Title	Faculty Name
53	A Standalone, Portable Blood Pressure Measurement Device with Remote Monitoring	Dr. Devendra Deshmukh; Dr. Shilpa Raut
54	Method and Apparatus for Anti-Theft Fingerprint Biometry	Dr. Vimal Bhatia
55	Hybrid Mesoporous Composites Gas Sensors	Dr. Shaibal Mukherjee
56	Catalytic Process for Hydrogen Production from Polymeric Polyethylene Terephthalate (PET) Waste	Dr. Sanjay Kumar Singh
57	Novel Mutant L-Asparaginases	Dr. Avinash Sonawane
58	Organo-Acidified Zinc Oxide Carbon Monoxide Sensor	Dr. Shaibal Mukherjee
59	Swarf-Based Substrata for Wire Arc Additive Manufacturing	Dr. Yuvraj Madhukar
60	Method and Apparatus for Secure Ear Biometric Recognition Using Single Shot Fringe Projection Thermography	Dr. Vimal Bhatia
61	Third Generation Tubulysin Analogues and Process of Preparation Thereof	Dr. Chelvam Venkatesh
62	A Device for Assessment of Seed Priming Treatments Using Biospeckle Analysis	Dr. Vimal Bhatia
63	Bio-Chem-Reactor for Biocementation and Method Thereof	Dr. Neelima Satyam
64	Ground Improvement Technique Using Indigenous Bacteria for Biocementation of Expansive Soil Subgrades	Dr. Neelima Satyam
65	Portable Standalone Vaccine Carrier Box with Long Duration Temperature Maintenance, Monitoring and Location Tracker	Dr. Shilpa Raut

List of Patents of IIT Indore (Granted)

S.No.	Title	Faculty Name
66	Ultrasensitive Nitrogen Dioxide Sensor Based on S, N Doped Carbon Dot Functionalized Tungsten Oxide	Dr. Shaibal Mukherjee
67	Development of Portable Sensor Based Canine Pregnancy Detection System	Dr. Debasis Nayak; Prof. Ram Bilas Pachori
68	Portable Biosensing Systems for Milk Spoilage and Adulteration Deduction	Dr. Abhijeet Joshi
69	A Kit for Screening of Early Phase Detection of Epstein-Barr Virus Induced Alzheimer's Disease	Dr. Hemchandra Jha
70	A Method of Maintenance for High-Performance Machineries Employing Axial Piston Pumps and Multiple Cylinders	Dr. Ankur Miglani
71	Cathode Tool Design and Development for Spur Gear Tooth Flank Modification by Electrochemical Machining	Prof. Neelesh Kumar Jain
72	A Sanitization Device for a Protective Article	Dr. Ankur Miglani
73	Silicon Compatible Yttria-Based Memristive Crossbar Array and a Method of Fabrication Thereof	Dr. Shaibal Mukherjee
74	Wideband Power Divider Using Substrate Integrated Waveguide for Millimeter-Wave Applications	Dr. Saptarshi Ghosh
75	A System for Acquiring Real-Time Photoacoustic Signal with High-Speed Signal Conditioning and Method Thereof	Dr. Srivatsan Vasudevan
76	A Multi-Wavelength Pulsed Laser Excitation Photoacoustic (PA) Screening Apparatus	Dr. Srivatsan Vasudevan
77	A Wide Range Variable Resistance Readout Circuit	Prof. Shaibal Mukherjee
78	Inchworm Inspired Shape Memory Alloy Bimorph-Based Stewart Platform for Opto-Mechatronic System and Method Thereof	Prof. I.A. Palani

List of Patents of IIT Indore (Granted)

S.No.	Title	Faculty Name
79	Apparatus, Systems and Methods for Quality-Aware Energy-Efficient Respiration Rate Estimation from Photoplethysmography (PPG) Signal	Prof. Ram Bilas Pachori
80	Apparatus, Systems and Methods for Noise-Aware Energy-Efficient ECG Signal Analysis and Cardiovascular Disease Diagnosis and Prediction	Prof. Ram Bilas Pachori
81	Apparatus, Systems and Methods for Quality-Aware Energy-Efficient PPG Signal Analysis and Cardiovascular Disease Diagnosis and Prediction	Prof. Ram Bilas Pachori
82	System and Method for Quantifying the Angular Stability Status of a Power Grid	Prof. Trapti Jain
83	Apparatus, Systems and Methods for Contextual Information Aware Physiological Parameter Analysis and Intelligent Human Disease Prediction and Diagnosis Networks	Prof. Ram Bilas Pachori
84	A Method and System for Detection and Determination of Failure of a Fluid-Power System	Prof. Pavan Kumar Kankar
85	Large-Scale, Flexible Electrochromic Devices (ECDs) and Its Method of Synthesis	Prof. Rajesh Kumar
86	Recombinant Organophosphate Hydrolyzing Enzyme Immobilized Fluorescent Composites for the Detection and Degradation of Organophosphates Compounds	Dr. Abhijeet Joshi
87	A Molten Salt Solid-State Reaction-Based Process to Obtain a High Purity $\text{Ti}_{-3}\text{AlC}_{-2}$ MAX Phase	Dr. Rupesh Devan
88	Secure Hardware IP of GLRT Cascade Using Color Interval Graph Based Embedded Fingerprint for ECG Detector	Dr. Anirban Sengupta
89	Nanophotonic Resistive Switch Based on Tapered Copper-Silicon Structure with Low Power and High Extinction Ratio	Prof. Mukesh Kumar
90	System and Method for Monitoring and Detecting Leakage of Toxic Gases to Enable User Alerts	Prof. Shaibal Mukherjee

List of Patents of IIT Indore (Granted)

S.No.	Title	Faculty Name
91	System and Method for Direct Ink Writing	Dr. Girish Verma
92	A Phase Change Composite and Process for Preparation Thereof	Dr. Santosh Kumar Sahu
93	System and Method for Point-of-Care Diagnosis and Monitoring of Uric Acid Levels	Prof. Shaibal Mukherjee
94	A Method to Control Two Dimensional Electron Gas Mobility and Carrier Density of Oxide-Based Heterostructure	Prof. Shaibal Mukherjee
95	Peptides-Based Drug and Method Thereof	Prof. Amit Kumar
96	Conductive Polymer Embedded Biomolecular Hydrogels (CPBHs) and Method Thereof	Dr. Tridib Kumar Sarma
97	Stable Oxide-Hydroxide Complex Based on Vanadium Transition Metal Oxide and Method Thereof	Prof. Rajesh Kumar
98	A Method for Uniform Placement of Unit Cells on a Curved Frequency Selective Surface	Dr. Saptarshi Ghosh
99	A Thermoelectric Generator Based Portable Power Generation Unit	Dr. Devendra Deshmukh
100	A Thin Film Rechargeable Battery and Method Thereof	Prof. Sudeshna Chattopadhyay
101	A System and a Method for Monitoring Soil Fertility, Detecting Disease and Generating Suggestions	Prof. Shaibal Mukherjee
102	A Drug Composition/Combination for Effective Therapeutic Treatment and Method Thereof	Prof. Amit Kumar
103	A Drug Combination for Effective Therapeutic Treatment and Method Thereof	Prof. Amit Kumar

List of Patents of IIT Indore (Granted)

S.No.	Title	Faculty Name
104	A Gesture-Controlled SMA-Actuated Robotic Gripper System and Method Thereof	Prof. I. A. Palani
105	Multichromatic Superhydrophobic Fluorescent Carbon Quantum Dots for AI-Enabled Anti-Counterfeiting and Coating Applications	Dr. Mrigendra Dubey
106	A Sensor-Based System to Detect Heavy Metal Ions in Water Samples	Prof. Shaibal Mukherjee
107	A Process for Green Hydrogen Production Based on Magnetic Field Driven Overpotential Reduction in Electrodeposited Ni-Co and Ni-Fe Alloy Electrodes	Dr. Ajay Kumar Kushwaha
108	Continuous Ultra-Fast Compressed Imaging with Simultaneous Referencing	Dr. Devendra Deshmukh
109	A Method of Printing Pixelated Silicon Carbide Segments	Prof. I. A. Palani
110	Process for Industrial-Scale Production of Pure Ti_{2}AlC MAX Phase at Ambient Pressure Conditions and $\text{Ti}_{2}\text{C-T}_{x}\text{MXene}$ Thereof	Prof. Rupesh Devan
111	A System and a Method for Monitoring Water Quality of a Wetland	Prof. Manish Kumar Goyal
112	Apparatus and Methods for Noise-Aware and Energy-Efficient Pulse Rate Variability and Heart Rate Variability Analysis	Prof. Ram Bilas Pachori
113	System and Method for Speech-to-Text Translation Based on Continual Learning Technique	Prof. Chandresh Kumar Maurya
114	Multi-User Downlink NOMA Communication System and Method Thereof	Prof. Vimal Bhatia
115	A System and Method for End-to-End Continual Speech-to-Speech Translation	Prof. Chandresh Kumar Maurya

List of Patents of IIT Indore (Published)

S.No.	Title	Faculty Name
1	Bacterial Mortar Composition and Process for Preparation Thereof by Using Food Waste Derived Nutrient Media	Dr. Sandeep Chaudhary
2	A Controlled Explosion Testing System for Analysis of a Specimen	Dr. Devendra Deshmukh
3	A Process for Developing a Zirconia (ZrO_2) Based Wide Bandgap High-K Dielectric Material	Dr. Sudeshna Chattopadhyay
4	Biomarkers for the Detection of Infection Driven Dysbiotic Gut and Neurological Diseases	Dr. Hemchandra Jha
5	Biomarkers for the Detection of Antibiotic-Resistant Bacterial Infections Derived Neurological Deformities	Dr. Hemchandra Jha
6	Hardware Implementation of Memristor Based Logic Gates on a Portable System	Prof. Shaibal Mukherjee
7	Non-Invasive Biomarker Detection for Screening, Diagnosis and Staging of Oral Squamous Cell Carcinoma	Dr. Hemchandra Jha
8	Salivary Biomarkers for Early Screening and Monitoring of Oral Submucous Fibrosis	Dr. Hemchandra Jha
9	Methods and Systems for Predictive Maintenance of a Rotary Machine	Prof. Trapti Jain
10	A Portable Repetitive Plate Load Test System for Pavements	Dr. Baadiga Ramu
11	Methods and Systems for Interleaver Identification in a Communication System	Dr. Swaminathan R
12	Systems and Methods for Monitoring a Physical Event in an Equipment Testing Environment	Dr. Devendra Deshmukh
13	A Catalyst for One-Pot Synthesis of Hydrogen and Lactic Acid from Glycerol	Dr. Sanjay Kumar Singh

List of Patents of IIT Indore (Published)

S.No.	Title	Faculty Name
14	A Supramolecular Hydrogel Composition for the Delivery of a Cancer Drug	Dr. Tridib Kumar Sarma
15	An Aerial Vehicle	Prof. Anand Parey
16	An Omnidirectional Robotic Device	Prof. I. A. Palani
17	System and Method for Navigating Mobile Furniture Units	Prof. I. A. Palani
18	Method and System for Fabricating a Cell Separator Using Coaxial Electrospinning	Dr. S Janakiraman
19	High-Strength Geopolymer Composition (HSGPC) and a Preparation Process Thereof	Dr. Abhishek Rajput
20	A Photocatalytic Material, a Process of Preparation and Applications Thereof	Prof. Parasharam M. Shirage
21	A Pyrocatalyst Composite Film and a Process for Preparation Thereof	Dr. Satyanarayan Patel
22	A System and Method for Horizontal Rotary-Sonic Stack Integration in Solid-State Additive Manufacturing of Multi-Material Laminates	Prof. Neelesh Kumar Jain
23	Green Synthesis of Biocompatible and Near Infrared Active Iron Oxide Nanoparticle for Deep Tissue Imaging and Therapy	Dr. Sharad Gupta
24	New Small Molecule Inhibitors/Ligands for Early Diagnosis and Therapy of Prostate Specific Membrane Antigen (PSMA+) Cancers and Neurodegenerative	Dr. Chelvam Venkatesh
25	Enhancing Indocyanine Green's Bioimaging by Encapsulating in Virally-Derived Nano Vessels	Dr. Debasis Nayak; Dr. Sharad Gupta
26	Engineered Nanophotonic Structure Based on Electrically Controlled Composite Materials for Biochemical Sensing	Dr. Mukesh Kumar

List of Patents of IIT Indore (Published)

S.No.	Title	Faculty Name
27	Multivariate Iterative Filtering Based Parkinson's Disease Detection from EEG Signals	Prof. Ram Bilas Pachori
28	Development of Improved Ballistic Performance Concrete Slab by Incorporating Different Geometrical Shapes as Reinforcement Subjected to Projectile Impact	Dr. Abhishek Rajput
29	Synthetic Jet Device and Method for Performing Thermal Management and Harvesting Electrical Energy	Dr. Harekrishna Yadav
30	System and Method for Detection of Inter and Intra Adulteration in Grain Sample	Prof. Ankur Miglani

List of Patents of IIT Indore (Under Examination)

S.No.	Title	Faculty Name
1	A Novel Process on Quantification of Hydrologic Resilience Potential and Its Attributions	Dr. Manish Kumar Goyal
2	A Novel E.coli L-Asparaginase (ECA) Variant of Acute Lymphoblastic Leukemia (ALL)	Dr. Avinash Sonawane
3	Implementation of Laser Decal Transfer Towards u-3D Printing	Prof. I.A. Palani
4	Myelin Protein Antigenic Epitopes Presented by Major Histocompatibility Complexes, a Driver to Multiple Sclerosis	Dr. Hem Chandra Jha
5	Constant Transconductance Bias Technique to Reduce PVT Variation in Oscillators	Prof. Santosh Viswakarma
6	A Cost-Effective Synthesis of Reduced Graphene Aerogels Doped with Titanium Nanoparticles for Adsorption of Gases	Dr. Shailesh Kundelwal
7	Method and System for Determining Spatiotemporal Characteristics and Predicting the State of Atmospheric Rivers (AR)	Dr. Manish Kumar Goyal
8	Medical Emergency Portable Stretcher and Method Thereof	Dr. Ashish Rajak
9	Novel Synergistic Combination Therapy Based on Levofloxacin and Dorzolamide for the Treatment of Sepsis	Dr. Mirza S Baig
10	Security Aware Design Methodology for Designing Secure Hardware Accelerators for Implantable Cardiac Pacemaker	Dr. Anirban Sengupta
11	Antifungal and Antibacterial Hydrogel and Method Thereof	Dr. Apurba K. Das
12	IoT-Based Smart Sanitary Pad for Menstrual Health Monitoring	Prof. I.A. Palani
13	Photoconductive Device for THz Emission and Detection with Metal-Semiconductor and Metal-Insulator-Semiconductor Contact	Dr. Abhishek Singh

List of Patents of IIT Indore (Under Examination)

S.No.	Title	Faculty Name
14	Respiratory Motion Phantom for Radiotherapy Treatment Using Moving Platform	Prof. Srivathsan Vasudevan
15	Novel Compound and Method Thereof to Address the TIRAP Mediated Chronic Inflammatory Signalling	Dr. Mirza S. Baig
16	A Portable Dispenser of Food Grains, Pulses, Millets, and Nuts and Method Thereof	Dr. Ankur Miglani
17	An Automatic Agrocommodity Sorting and Quality Indexing System	Dr. Ankur Miglani
18	Cow Dung-Based Lightweight Construction Materials and Method Thereof	Dr. Sandeep Chaudhary
19	A Portable Kit for Visible Light Photodynamic	Dr. Debayan Sarkar
20	System and Method to Customize Acceptor/Donor Type Counter Ions for Selective Enhancement of Electrochromic Device	Prof. Rajneesh Misra; Prof. Rajesh Kumar
21	Design and Development of Triboelectric Nanogenerator Based Machine Skin Integrated with Smart Controller for Digital Twin Development	Prof. I.A. Palani
22	A Drug Combination for the Treatment of Severe Neurodegenerative Diseases	Prof. Amit Kumar
23	A Drug Composition/Combination for the Effective Therapeutic Treatment and Method Thereof	Prof. Amit Kumar
24	Drug Composition/Combination for the Treatment of Huntington's Disease (HD) and Spinocerebellar Ataxia	Prof. Amit Kumar
25	Drug Composition/Combination for Effective Therapeutic Treatment and Method Thereof	Prof. Amit Kumar
26	MA-Based Bioinspired Water Strider Robot and Method Thereof	Prof. I.A. Palani

List of Patents of IIT Indore (Under Examination)

S.No.	Title	Faculty Name
27	A Composition for the Treatment of Epstein-Barr Virus Mediated Brain Diseases and Its Method of Preparation	Dr. Hemchandra Jha
28	Multiaxial Diamond Anchored Octagonal Geogrid (MDAOG)	Dr. Baadiga Ramu
29	Multiaxial Concentric Octagonal Geogrid (MCOG)	Dr. Baadiga Ramu
30	An Underwater Robotic Device for Sampling Microplastics	Dr. I. A. Palani
31	Benzothiazole-Phenothiazine Derivative Based Lung Cancer Therapeutic and Method Thereof	Prof. Rajneesh Misra
32	System and Method for Wirelessly Charging Nano-Drones Using a Solar-Powered Tethered Drone Platform	Dr. Sumit Gautam
33	IoT-Enabled Multifunctional Digital Storage Oscilloscope Device and Method Thereof	Prof. Shaibal Mukherjee
34	Low Cost Identification of Road Congestion for Traffic Management	Dr. Vimal Bhatia
35	Robust Remote Photoplethysmography Estimation by Denoising Eulerian and Lagrangian Pulse Signals Using Contrastive Learning	Dr. Puneet Gupta
36	All Optical Modulation in Engineered Indium Tin Oxide Based Vertically Ring Resonator Employing Epsilon Near Zero State	Prof. Mukesh Kumar
37	A Modular Reactor Chamber for Measurement of Hydrogen Gas Adsorption Capacity of the Nano Structures	Dr. Shailesh Kundelwal
38	System and Method for Summarization of Speech to Text/Speech Translation	Prof. Chandresh Kumar Maurya

List of Patents of IIT Indore (Under Process)

S.No.	Title	Faculty Name
1	Physics and Hybrid Reinforcement Learning Based Random Positioning Platform for Simulated Altered Gravity	Dr. Hitendra Kumar
2	IoT Enabled Condition Monitoring of Hydraulic Systems Using NiTiCu SMA-Coated Optical Fiber Sensor Integrated with SMA-Coated Kapton Polyimide Structure	Prof. I. A. Palani
3	An Economic Nucleotide-Based Supramolecular Hydrogel as a Bifunctional Electrocatalyst for Alkaline Water Splitting	Dr. Tridib Kumar Sarma
4	Smart Programmable Laboratory Furnace with Wireless and IoT Control with Modular Replaceability and Remote Visual Monitoring	Prof. Somaditya Sen
5	Design for a Configurable Interlocking Masonry System with Optional Functional Attachments	Prof. Sandeep Chaudhary
6	Recombinant Aminopeptidases and Their Compositions for Detection and Degradation of Ethyl Paraoxon	Prof. Prashant Kodgire
7	A Mobile Recognition System for Early-Stage Soybean Leaf Disease Detection	Prof. Shaibal Mukherjee
8	Design and Development of a Helmet-Based X-Ray Device for 3D Radiographic Screening of Teeth and Jaw Using an Artificial Neural Network	Dr. Lokesh Basavarajappa
9	Pathological Aggregation Potential of Helicobacter Pylori Derived Peptide Inducing Alzheimer's Disease-Like Neuropathology	Prof. Hem Chandra Jha
10	A Method for Generating Surface Grids on Complex 3D Surfaces for Periodic Placement of Frequency Selective Surface Elements	Dr. Saptarshi Ghosh
11	Standardized Methodological Framework for Conducting Water Audit in Water Utilities and Development of Water Audit Application	Prof. Manish Kumar Goyal
12	Automated Groundwater Monitoring and Predictive Intelligence System	Prof. Aruna Tiwari

List of Patents of IIT Indore (Under Process)

S.No.	Title	Faculty Name
13	System and Method for Speech-Driven, Scene-Aware AI Guidance for Visually Impaired Individuals	Prof. Vivek Kanhangad
14	Surface Modified Rotary Drum for Improved Abrasive Cleaning of Recycled Aggregates	Prof. Sandeep Chaudhary
15	Dual-Cell Biomarker System for Detecting Infection, Co-Infection, and Neuroimmune Activation Using Neuronal and Microglial Responses to Secretome Derived from Pathogen-Infected Gastric Epithelial Cells	Prof. Hem Chandra Jha
16	Energy-Autonomous, Real-Time and Portable Soil Health Monitoring System with a Multi-Modal LoRa Network	Prof. Shaibal Mukherjee
17	Dual-Section Parallel Plate Waveguide for Wideband Electromagnetic Device Characterization	Dr. Saptarshi Ghosh
18	Modular Three-Axis Positioning System with Compressive Force Applied Along Electro-Pneumatically Controlled Z-Axis for Ultrasonic Continuous Joining of Multi-Material Sheets	Prof. Neelesh Kumar Jain

A stylized graphic of a circuit board with white lines and dots on a dark blue background, framing the central text.

Initiative for Translational Research Fellowship

Translational Research Fellowship: A step towards Lab to Market Ecosystem

To inculcate a translational research ecosystem among the students, a Translational Research Fellowship scheme has been initiated by IIT Indore. The main objective of the Fellowship is to encourage students who have developed technologies and are aspiring for upgrading the technology for potential commercialization under the respective faculty member's mentorship. This fellowship is open for undergraduate, post graduate and Ph. D. students who are on the verge of completing their degree. Twenty six students have been awarded with Translational Research Fellowship till date. Out of which 15 new applicants have been offered the fellowship under TRF scheme in the year 2025.



Initiative for Translational Research

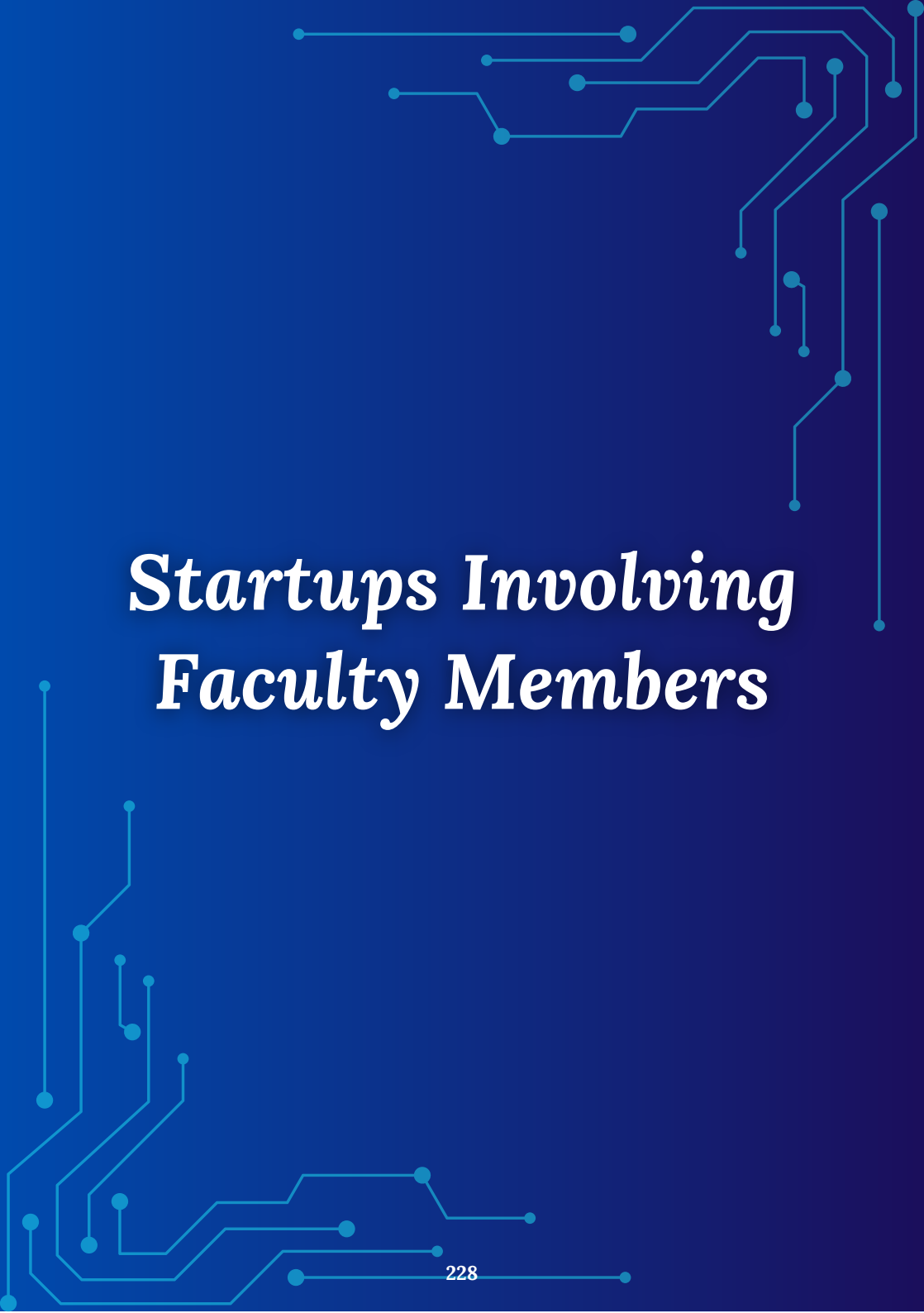
S.No.	Mentor/TRF	Project Title	Theme	Year
1	Mr. Rahul Chaurasia; Prof. Anirban Sengupta	Design Space Exploration of Secure Optimal K-Cycle Fault Tolerant Data Path Processor with Embedded Enervated Protein Molecular Biometric	Semiconductors	2023
2	Mr. Gyanesh Patnaik; Dr. Abhishek Rajput	Multilayer Hybrid Composite Armor System	Space and Defence	2023
3	Mr. Chandrabhan Patel; Prof. Shaibal Mukherjee	IoT-Enabled Ultrasensitive and Selective Gas Sensor	Smart Cities & Mobility	2023
4	Mr. Anikeit Sethi; Prof. Aruna Tiwari	Intelligent Surveillance System for Highway Using Novel Deep-Learning Method	Smart Cities & Mobility	2023
5	Mr. Sanchit Gupta; Prof. Sandeep Chaudhary	GOBAiR – A Novel Cow Dung Based Foaming Agent for Sustainable Lightweight Construction Materials	Advanced Materials, Rare-earth & Critical Minerals	2023
6	Mr. Mayank Kumar Singh; Dr. Dharendra K. Rai	Design and Development of Hybrid Sodium-Ion Capacitor for Electrochemical Energy Storage	Advanced Materials, Rare-earth & Critical Minerals	2024
7	Mr. Rahul Dev Mishra; Prof. Mukesh Kumar	Nanophotonic Devices for Switching and Sensing Applications	Semiconductors	2024
8	Mr. Milan Jena; Prof. Biswarup Pathak	Development of an Artificially Intelligent (AI) Nanopore for Rapid DNA Sequencing	Biotechnology	2024
9	Dinesh; Dr. Harekrishna Yadav	Synthetic Jet with Smart Material for Energy Harvesting and Enhanced Cooling	Energy, Sustainability & Climate Change	2024
10	Suresh Kumar Pandey; Prof. Mukesh Kumar	Plasmonic Tunable Absorber for Image Enhancement (Visible to IR Conversion)	Advanced Materials, Rare-earth & Critical Minerals	2024
11	Harsha Avinash Tanti; Prof. Abhirup Datta	Low Frequency Antenna Characterization System for Space Application	Next-Gen Communications	2024

Initiative for Translational Research

S.No.	Mentor/TRF	Project Title	Theme	Year
12	Sumit Chaudhary; Prof. Shaibal Mukherjee	IoT-Enabled Real-Time Mercury Ion Detection in Water	Energy, Sustainability & Climate Change	2025
13	Rajnish Prakash Modanwal; Dr. Dan Sathiraj	Additive Manufacturing FeCoNiMnAl Based High-Entropy Alloy by Novel Combined Twin Wire Arc Additive Manufacturing	Manufacturing & Industry 4.0	2025
14	Sayantan Sarkar; Prof. S. Mukhopadhyaya; Prof. Rajesh Kumar	Development and Industrial Upscaling of Pre-Synthesized Viologen-Based Low-Cost Electrochromic Porous Organic Polymers for Electronic Curtains	Advanced Materials, Rare-earth & Critical Minerals	2025
15	Bhawale Rajesh Tabajee; Dr. Umesh A. Kshirsagar	Green Methodologies for Carbon-Carbon and Carbon-Heteroatom Bond Formation: Sustainable Strategies and Innovations	Biotechnology	2025
16	Love Bansal; Prof. Rajesh Kumar	Developing Multicolor Electrochromic Electrochemical Energy Storage Device from Vanadium Oxide-Hydroxide Complex	Advanced Materials, Rare-earth & Critical Minerals	2025
17	Aditya Anshul; Prof. Anirban Sengupta	CAD-Based DNA Fingerprint as Watermark Countermeasure for Hardware Cybersecurity of VLSI Applications	Semiconductors	2025
18	Manish Kumar Tiwari; Prof. Parasharam M. Shirage	Development of a Smart Gas Sensor for Real-Time Monitoring of Ammonia (NH ₃) Emissions in Agricultural Environments	Agri & Food Technologies	2025
19	Darakshan Parveen; Dipak Kumar Roy	Efficient and Affordable Strategy for Diphosphene Synthesis: A Greener Approach	Advanced Materials, Rare-earth & Critical Minerals	2025
20	Kaushal Gangwar; Prof. I. A. Palani	Design and Fabrication of NiTi SMA Thin-Film-Based Stewart Platform Assembly with Feedback Circuit Towards Optical Beam Steering	Advanced Materials, Rare-earth & Critical Minerals	2025
21	Vidhi Agarwal; Dr. Tridib Kumar Sarma	Development of Nucleotide-Based Hydrogels as a Universal Delivery Vehicle for Therapeutics and Theranostics	Biotechnology	2025

Initiative for Translational Research

S.No.	Mentor/TRF	Project Title	Theme	Year
22	Nirmiti Mate; Prof. Shaikh M. Mobin	Development and Industrial Upscaling of Sustainable Carbon-Dots-Based Photothermal Membrane for Solar-Driven Interfacial Clean Water Production	Energy, Sustainability & Climate Change	2025
23	Anup Kumar Gupta; Dr. Puneet Gupta	SEHAT: Smartphone-Enabled Remote Heart Rate Assessment and Tracking	Healthcare & MedTech	2025
24	Mr. Nikhil Ji Tiwari; Prof. Rajneesh Misra	Naphthalimide Functionalized Push-Pull Chromophores for Orange-Red Thermally Activated Delayed Fluorescence (TADF)	Advanced Materials, Rare-earth & Critical Minerals	2025
25	Mr. Mohd. Wazid; Prof. Rajneesh Misra	Synthesis of Perylenediimide Cathode Materials Sustainable for High-Performance Ammonium and Lithium-Ion Battery	Advanced Materials, Rare-earth & Critical Minerals	2025
26	Mr. Vivek Saxena; Prof. Santosh K. Sahu	Development of Next-Generation Phase-Change Composite for Thermal Management of Electric Vehicle Battery Modules	Energy, Sustainability & Climate Change	2025

An abstract graphic of a circuit board pattern in a lighter blue color, set against a dark blue background. The pattern consists of various lines, right-angle turns, and small circular nodes, resembling a printed circuit board (PCB) layout. It is positioned in the top right and bottom left corners of the slide.

Startups Involving Faculty Members

Startups Involving Faculty Members

S. No.	Name of Startup	Faculties Involved	Theme
1	<i>Erets space reserach labs pvt ltd</i>	Prof Abhirup Datta	Space and Defence
2	Orbital Perception Pvt. Ltd	Prof. Bhargav Vaidya	Space and Defence
3	Help Yourself	Dr. Hem Jha	Healthcare & MedTech
4	Praxiatech Pvt. Ltd.	Prof. M Tanveer	Healthcare & MedTech
5	Automated Patient Screening Services Pvt. Ltd.	Dr. Ayan Mondal	Healthcare & MedTech
6	Bio Tech Avant-Garde (B-TAG)	Prof. Mobin Shaikh	Healthcare & MedTech
7	Fourier Imagine Pvt. Ltd	Prof. Devendra Deshmukh	Energy, Sustainability & Climate Change
8	Chemgreen Pvt Ltd	Dr Debayan sarkar	Energy, Sustainability & Climate Change
9	Nexergy Tech Private Limited	Prof Devendra Deshmukh	Energy, Sustainability & Climate Change

Startups Involving Faculty Members

S. No.	Name of Start-up	Faculties Involved	Theme
10	IMSense Private Limited	Prof. Trapti Jain	Manufacturing & Industry 4.0
11	SyncPhasorAI Pvt Ltd	Prof Trapti Jain	Manufacturing & Industry 4.0
12	Techwarium India Pvt Ltd	Prof. Bhupesh Kumar lad	Manufacturing & Industry 4.0
13	Tulsi Tech	Prof. Santosh K. Vishwakarma	Semiconductors
14	THz-Innovations Pvt. Ltd	Dr. Abhishek Singh	Semiconductors
15	Scas Technology	Prof. Santosh K. Vishwakarma	Smart Cities & Mobility
16	QuanTechL2M Private Limited	Dr. Shaibal Mukharjee	Advanced Computing (Supercomputing, AI, Quantum Computing)
17	Vedblockchain Systems Pvt. Ltd	Dr. Gourinath Banda	Advanced Computing (Supercomputing, AI, Quantum Computing)
18	Digitraws Pvt Ltd	Dr. Gourinath Banda	Advanced Computing (Supercomputing, AI, Quantum Computing)

An abstract graphic of a circuit board pattern in a lighter blue color, set against a dark blue background. The pattern consists of various lines, dots, and right-angle turns, resembling a printed circuit board (PCB) layout. It is positioned in the top right and bottom left corners of the page, framing the central text.

Technologies Transferred to Industries

Technologies Transferred to Industries

S. No.	Inventor	Technology	Brief About Technology
1	Prof. Aruna Tiwari	Ground Water Management App	A digital tool for farmers and planners to monitor, manage, and optimize groundwater usage in agriculture, promoting sustainable water use.
2	Prof. Sandeep Chaudhary	Compressed Coloured Bi-layered Bricks	An eco-friendly, low-cost construction solution using fly ash, offering both structural strength and aesthetic appeal, ideal for sustainable infrastructure.
3	Prof. Santosh Kumar Sahu	A Novel Shape Stable and Flame Retarding Phase Change Composite for Thermal Management	A smart thermal management material designed for energy storage systems, especially in electric vehicle batteries, enhancing both safety and efficiency.
4	Prof. Sanjay K. Singh	Catalysts for Low Temperature Hydrogen Production	A clean energy innovation enabling efficient hydrogen generation from methanol at lower temperatures, supporting the hydrogen economy.
5	Prof. Palani I.A.	Laser decal transfer based μ S-3D Printer	Enables high-precision, material-efficient micro 3D printing using Laser Decal Transfer (LDT); useful for micro-electronics, wearables, and sensors.
6	Prof. Avinash Sonawane	Novel recombinant asparaginases for ALL therapeutics	A drug for leukemia treatment with reduced side effects and enhanced stability, capable of eliminating over 85% of leukemic cells.
7	Dr. Baadiga Ramu	Multiaxial Concentric Octagonal Geogrid & Multiaxial Diamond Anchored Octagonal Geogrid	Eco-friendly geogrids made from waste or recycled polymers that enhance soil stability for climate-resilient infrastructure.



THE TECHNOLOGY HANDBOOK

A compendium of Ideas, Innovations
& Technologies of IIT Indore

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