विज्ञान एवं
प्रौद्योगिकी मंत्रालय
MINISTRY OF
SCIENCE AND
TECHNOLOGY
सत्यमेव जयते

Quarterly Bulletin - April 2024

National Mission on
Interdisciplinary Cyber-Physical Systems (NM-ICPS)

DEPARTMENT OF
SCIENCE & TECHNOLOGY
Ministry of Science and Technology
Government of India
सत्यमेव जयते

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About
Interdisciplinary Cyber- Physical Systems(NM-ICPS)

The Union Cabinet has approved the National Mission on Interdisciplinary Cyber Physical System **(NM-ICPS)** in December, 2018 at a total outlay of Rs.3660 Crores for a period of five years to be implemented by Department of Science and Technology (DST).

Under the NM-ICPS, 25 Technology Innovation Hubs (TIHs) have been established in reputed institutes across the country. Each hub is a Section-8 Company, an independent entity within the Host Institute and has been assigned a Technology Vertical in the areas of advanced technologies such as Artificial Intelligence and Machine Learning; Technologies for Internet of Things & Internet of Everything; Data Banks & Data Services, Data Analysis; Robotics & Autonomous Systems; Cyber Security and Cyber Security for Physical Infrastructure; Quantum technologies etc.

The Mission aims at development of technology platforms to carry out R&D, translational research, product development, incubating & supporting start-ups as well as commercialization. The Mission is being implemented with all the TIHs undertaking activities under the four major categories i.e., **1. Technology Development 2. Entrepreneurship Development 3. Human Resource Development 4. International Collaborations.**

Objectives of the Mission:

1.Technology Development, translational research and commercialization in Cyber Physical Systems (CPS) and associated technologies
2.Adoption of CPS technologies to address India specific National / Regional issues.
3.Produce Next Generation skilled manpower.
4.Catalyze Translational Research.
5.Accelerate entrepreneurship and start-up ecosystem development in CPS technologies.
6.Give impetus to advanced research in CPS technologies and higher education in Science, Technology and Engineering disciplines.
7.Bring India at par with other advanced countries and derive several direct and indirect benefits.

NM-ICPS is a comprehensive Mission that brings together academia, industry, government and international organizations. The mission has created an ecosystem that fosters entrepreneurship, develops next generation skilled manpower, catalyses translational research and promotes the commercialization of CPS technologies. NM-ICPS is an ambitious initiative that has the potential to transform key sectors of the **Indian economy like healthcare, transportation, education, infrastructure & defence** make them more efficient, safe, and sustainable to place India at par with other advanced countries.

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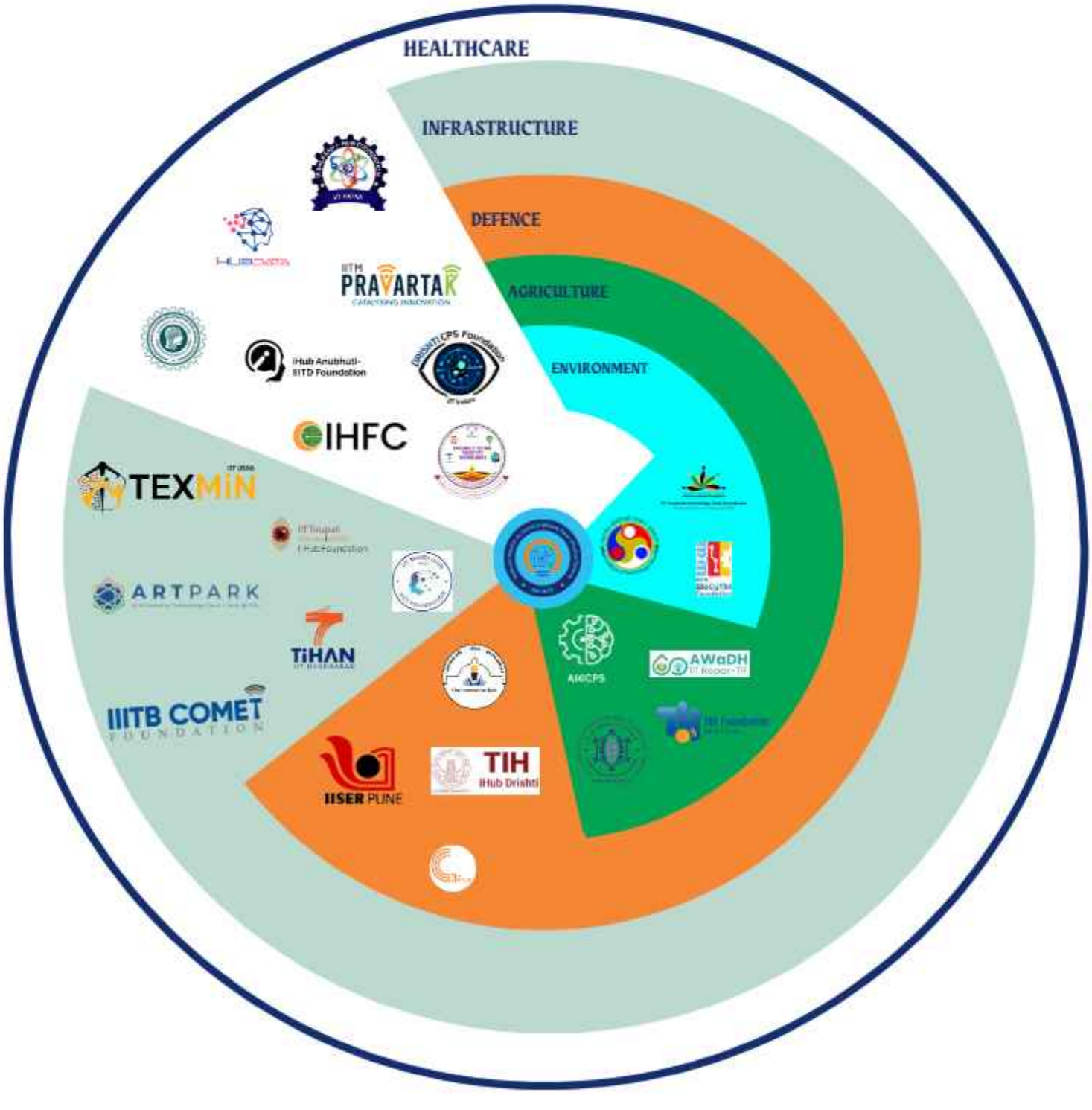
National Mission on Interdisciplinary Cyber-Physical Systems (NM-ICPS)

Sector Wise Map



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MINISTRY OF SCIENCE AND TECHNOLOGY

Content

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MINISTRY OF SCIENCE AND TECHNOLOGY

Theme: ENVIRONMENT

"Sustainable Solutions, Digital Evolution:
Nurturing Our Planet with Technology"

IIT PALAKKAD TECHNOLOGY IHUB FOUNDATION

IIT Palakkad

Theme: Environment

Scan QR to know more

Hub Overview:

IIT Palakkad Technology IHUB Foundation (IPTIF) on Intelligent Collaborative Systems (ICS) aims to create a strong foundation and a seamless ecosystem for Cyber-Physical Systems, attracting available nationwide potential and harnessing expertise to foster research innovation, technology, and product development. IPTIF is dedicated to enabling a vibrant innovation ecosystem by providing a reliable platform for developing technologies on ICS, with special focus on energy and safety domains, by innovators, entrepreneurs, and startups to engage in activities that create value for the local, national, and international ecosystem.

Project Updates :

Crop protection drones

- Integrated operations of two drones for crop protection.
- Nireeksh AG Drone is under development for collecting relevant farm data.
- FIA drones, with innovation in the nozzle for spraying pesticides and nutrients in a controlled manner, is fully developed.
- Targeting to implement an integrated system to increase the crop yields up to 50-60%.

Research & Development:

A Novel Inductive Sensor for Simultaneous Linear and Angular Displacement Measurement

- Smart agriculture needs cost-effective and reliable sensor systems.
- A prototype of a Noncontact Inductive Sensor that can measure linear and angular displacement is developed.
- One of the planned applications of this sensor is to be integrated into pest alert stations and its solar panel.
- The information from the sensors will guide the actuators and will also serve as data for training AI models.
- The systems essentially function as a cyber-physical system, contributing to improved crop data estimation performance through various means.

Startup:

Warbler EV

- Warbler EV is a Modular Electric three-wheeler.
- Addressing the issues of long charging time in EVs with Safe, Liquid-Immersion Cooling (LIC) battery-pack.
- Bharat DC-001 charging socket is used in the vehicle for utilizing the highly developed charging standard in the country.
- A power train of 72V rather than the generally used 48V system reduces the current consumption and improves vehicle range and performance in all terrains.
- A fully functional prototype is developed and is awaiting certification and homologation.

TECHNOLOGY INNOVATION & DEVELOPMENT FOUNDATION

IIT Guwahati

Theme: Environment

Scan QR to know more

Hub Overview:

The Technology Innovation & Development Foundation, IIT Guwahati, is set up in technology vertical for underwater exploration. The Hub proposes projects on the development of underwater robots, which may be used for underwater tracking, surveillance, and monitoring purposes. Monitoring of cracks in ship hulls, in industrial pipes, and so on is another application area of this project. The Hub deals with the development of an apparatus for underwater operations like cleaning, cutting, etc. at a lower cost than that available today.

Project Updates :

Micro-inspection Remotely Operated Vehicle (ROV)

The TIH has crafted a micro-ROV for surface health monitoring of underwater structures and for efficient inspection of ship hulls. It carries a 5 kg payload to depths of 30m, utilizes AI-based image/video inspection for anomaly detection, and integrates an acoustic curvature-tracking system for precise navigation along the hull. It finds application in ship maintenance and inspection, Underwater surveillance, prevention of oil spills and other environmental accidents, search and rescue operations.

Translational Research:

Multifarious Shape Memory Alloy (SMA) Structures towards the Development of Bio-inspired Soft Robots

The project aims to develop soft robotics systems for underwater use, employing Shape Memory Alloy (SMA) actuators. It involves designing and fabricating a Soft Jellyfish Robot (SJFR) using SMA and smart materials, along with creating an accelerated life testing setup for assessing component longevity. The project also investigates failure causes in SMA structures and electronic components. Integration with an IoT-based health monitoring system enables real-time performance monitoring.

Collaborations::

The TIH has successfully developed and delivered the Vehicle Alignment System for Smooth Entraining of Military Vehicles to the Indian Army. This cutting-edge technological solution promises to revolutionize the process of entraining military vehicles onto trains and CHTs (Container Handling Trailers), enhancing efficiency and safety in crucial military logistics operations. The Vehicle Alignment System represents a significant advancement in military transport technology, addressing the challenges faced by drivers when manoeuvring vehicles onto narrow ramps.

BITS BIOCYTIH FOUNDATION

BITS Pilani

Theme: Environment

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Hub Overview:

BITS BioCyTiH Foundation is a Sec-8 Company of BITS Pilani aims "To foster Research, Innovation, Skill Development & Training in Bio-CPS through mentoring and nurturing startups and entrepreneurs, and industry-academia collaborations to undertake cutting edge research and provide affordable solutions in the areas of healthcare, agriculture, water and environment".

Project Updates :

Heamoprobe

In association with DAIT, Pune & Navyukti Innovations Pvt. Ltd., the TIH has developed a non-invasive hemoglobin detector, which can be used by any consumer at his home. It is useful to hospitals and doctors for quick diagnosis of anemia conditions of their patients. It does not require venipuncture and no blood is required to be removed from the human body.

Fig: Heamoprobe.

Startups:

Nirvesh Enterprises Pvt. Ltd., a start-up supported under the TIH has developed **Synapsil** an IoT based brain health monitoring system. It is an integrated, multimodal wearable system which senses brain waves using the in-Ear Electroencephalography (EEG) method and cerebral bloodflow using the Functional Near-Infrared Spectroscopy (FNIRS) method which is complementary to fMRI to improve the Quality of Life (QoL) of a stroke person.

Ramja genosensor Pvt. Ltd., a start-up supported under the TIH has developed and patented an ultra-fast accurate infection detection method using AI based sensors. This technology could alleviate delay in infection results, thus reducing the use of broad-spectrum antibiotic which leads to antimicrobial resistance.

Fig: Brain health monitoring system.

Theme:

AGRICULTURE

"Innovative technology in agriculture enables farmers to optimize efficiency, reduce waste, and increase yields"

IIT BHILAI INNOVATION AND TECHNOLOGY FOUNDATION

IIT Bhilai

Theme: Agriculture

Scan QR to know more

Hub Overview:

IIT Bhilai Innovation and Technology Foundation (IBITF), operates in the Fintech domain, identifying impactful solutions employing emerging technologies like Blockchain, IoT, AI/ML, and e-payments with primary emphasis of application of these technologies to the Agriculture sector.

Project Updates :

Digital Agri-Village

Digital Agri Village - Advancing the digital transformation of agriculture in tribal dominated areas of Chhattisgarh, deployed in PoC basis in Chhattisgarh through Krishi Vigyan Kendras. At the heart of this initiative lies a comprehensive vision to revolutionize farming practices and empower Self-Help Groups (SHGs) and farmers through an amalgamation of cutting-edge technologies and collaborative knowledge-sharing platforms. The deployed PoC encompasses:

(i) Mobile App based Geographic Information System (GIS) technology to provide farmers with insightful business intelligence, enabling informed decision-making and optimizing farm management practices.

(ii) Kiosk-based centers and collaborative platforms that serve as hubs for knowledge-sharing among farmers, fostering a culture of collaboration, learning, and technological advancement within digital villages.

(iii) Empowering SHGs and farmers through interactive collaborative platforms, fostering community engagement, knowledge sharing, and collective problem-solving, thus creating a supportive ecosystem for continuous learning and growth.

(iv) IoT-Enabled Sensor, Device Design and Development for Precision Agriculture.

IHUB AGRICULTURE AND WATER TECHNOLOGY DEVELOPMENT HUB (AWADH)

IIT Ropar

Theme: Agriculture

AWaDH IIT Ropar-TIF

Scan QR to know more

Hub Overview:

The goal of iHub - AWaDH is development of technologies to support environmentally sustainable and profitable agriculture, quality food for all, and the preservation of biodiversity. It aims at providing technological solutions to the Agricultural & Water related issues through deployment of CPS in Food Processing, Rural Development, Fisheries, Textiles, Electronics, Fertilizer, Atomic Energy etc.

Project Updates :

CO2 Gas Sensor

The TIH has developed a CO2 gas sensor, using the Non-Dispersive Infrared (NDIR) principle to detect the existence of CO2 in the air, with good selectivity. The device could be used to measure the concentration of Carbon Dioxide (CO2) gas in the surrounding environment. These sensors are commonly used in various applications such as indoor air quality monitoring, HVAC systems, industrial processes, agriculture, and environmental monitoring.

Fig: CO2 Gas Sensing Device.

Rotten Onion Detection System

It aims to minimize onion storage losses in India by early detection of rot through monitoring temperature, humidity, and gases (ammonia, sulfur dioxide, hydrogen sulfide, carbon dioxide) indicative of rotting. Utilizing sensors and a microcontroller, the system alerts users to the onset of rot via visual and auditory signals, and predefined gas concentration and temperature thresholds.

Startups:

Aryav EcoFriendly Resources

DeepTech startup for manufacturing the most energy efficient air to water generating machines across globe through its patented technology.

ARYAV
Pure Water . Pure Air

AniMeta Agritech

It is a dairy farming platform addressing the challenge of limited veterinary support in remote areas through its physical solution. The mobile app, equipped with an auto disease diagnosis BOT, offers instant herbal ethnoveterinary remedies for 250 dairy cow diseases, ensuring comprehensive animal healthcare. Additionally, the platform features an auto-feed calculator to optimize feeding practices and boost milk production, reducing veterinary costs by ₹500 to ₹1500.

YOURFARM

TECHNOLOGY INNOVATION HUB FOR IOT AND IOE

IIT Bombay

Theme: Agriculture

Scan QR to know more

Hub Overview:

The goal of the TIH is to create a self-sustaining IoT and IoE entrepreneurship ecosystem, increase Technology Readiness Levels (TRLs) in IoT R&D to build and commercialize reliable IoT products. Technology developments are currently aligned with the needs of the industry and has also developed a uniquely structured four-level IoT course.

Project Updates :

Hexacopter

The TIH has developed a prototype of a Hexacopter featuring a diagonal length of 120cm, anti-gravity motors, with a payload capability of 4kg. The USP of the developed hexacopter is fault-tolerant control based on the IoT concept. It has an endurance of 60 minutes with 380 kV motors and 16-inch propellers, outperforming quadcopters in both payload capacity and flight time.

Startup:

Krishigati Pvt. Ltd., a startup supported under the TIH has developed IP based climate resilient farm mechanization for marginal farmers thereby helping them save 20 to 70% on operational costs.

Event:

TIH IoT unveiled its three products SAMBHAV, SOHAM, and iSARATHI app at the Technology-Demonstration Day and Scientist-Farmer's dialogue at Mirajgaon, Ahmednagar district, Maharashtra which was attended by 200+ farmers. The apps were downloaded, and farmers registered them on these apps.

AI4ICPS
I-HUB FOUNDATION
IIT Kharagpur

Theme: Agriculture

AI4ICPS

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Hub Overview:

IIT Kharagpur AI4ICPS Innovation Hub integrates AI and ML into ICPS, addressing societal challenges and delivering public good across various sectors including Healthcare, Agriculture, Transportation, Infrastructure, Education, Environment and others. It aims to develop AI powered, cutting-edge technology products across these domains by linking translational projects from Academia with Industry and Startups. AI4ICPS hub acts as center for skill and knowledge development in the area of Artificial Intelligence and its application in ICPS.

Project Updates :

Ultrasonic Time-of-Flight Diffraction (ToFD) method identifies weld defects by capturing and cleansing diffracted signals with Hilbert transformation, emphasizing Tip Diffracted Waves (TDW) and excluding lateral and backwall waves. Using density-based clustering, it identifies defect clusters, then calculates the defects' dimensions by measuring distances between cluster edges. This approach ensures accurate defect sizing and characterization in welds. A technology product iToFD software has been developed based on this technology.

Collaborations:

TIH signed a MOU with Synopsis on the project Safe Reinforcement Learning for Neural Network-Controlled Autonomous CPS. The partner institution will be providing their Formal VC tool licenses worth $5.5 million under this MoU.

Human Resource and Skill Development:

The IIT Kharagpur AI4ICPS I- Hub Foundation, in collaboration with TCS iON, organized the online certification course "Hands-on AI for Real-Word Application (HAAI)". Top 200 performers of this event were awarded a Certification of Merit (CoM).

Theme:

DEFENCE

"The integration of advanced technology in defense is crucial for national security, strategic advantage, and civilian protection"

IHUB NTIHAC FOUNDATION (C3IHUB)

IIT Kanpur

Theme: Defence

Scan QR to know more

Hub Overview:

C3iHub (Cybersecurity and Cybersecurity for Cyber-Physical Systems Innovation Hub) addresses cybersecurity issues of the cyber-physical systems and devises technologies to protect. C3iHub focuses on verticals: critical infrastructure-security, automotive-security, UAV-security, tamper-proof data storage and cybercrime prevention, and associated horizontal layers: hardware security, network security, firmware security, etc

Project Updates :

C3iHub SOC installed at NHAI headquarter has been updated with

- Organization Cyber Risk Calculation Tool.
- Host & Network IntrusionDetection Systems (HIDS & NIDS).
- Asset Vulnerability and Patch Management Platforms.
- Compliance Management Platform.

Fig: Updated C3iHubSOC Dashboard at NHAI.

Startups:

eGyanam Technologies, a startup supported by the TIH launched ISMS (Information Security Management System) platform in January 2024 with a consolidated view, providing insights into security posture, compliance, and governance. The platform constitutes vulnerability aggregation, lifecycle management, compliance aspects, audit features, and enhances decision-making by presenting comprehensive data on these critical dimensions of information security management.

Fig: Dashboard of eGyanam ISMS Platform.

Patent:

A Patent granted on kernel-level active darknet monitoring and threat intelligence collection by active engagement with threat actors (No. 506825, Date of Grant 05/02/2024).

Collaborations:

International Financial Services Centres Authority (IFSCA) and C3iHub signed MoU to facilitate cooperation and mutual assistance in the areas of cyber security and cyber resilience, inter alia, including threat intelligence systems, cybersecurity audits & assessments, capacity building & training initiatives and other areas related to cyber security.

I-HUB QUANTUM TECHNOLOGY FOUNDATION

IISER Pune

Theme: Defence

I-HUB QUANTUM TECHNOLOGY FOUNDATION

Scan QR to know more

Hub Overview:

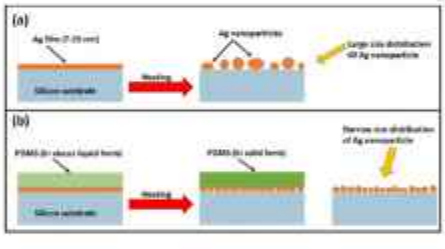
I-HUB Quantum Technology Foundation is a section-8 company hosted by IISER Pune and is one of the 25 technology hubs funded by the Department of Science and Technology, Government of India under the National Mission for Inter-disciplinary Cyber-Physical Systems.

I-HUB Quantum Technology Foundation (I-HUB QTF) promotes development of Quantum Technologies through four verticals: Quantum Information & Metrology, Quantum Communications, Quantum Materials & Devices, and Enabling Technologies, and via these aims to harness the quantum phenomena to develop advanced computing systems as well as for more immediate applications in precision sensors, navigation devices for GPS, geological mapping, atomic clocks, encrypted communication, and novel materials. Beyond technology development, the Hub facilitates technology translation, incubation, and human resource development.

Project Updates :

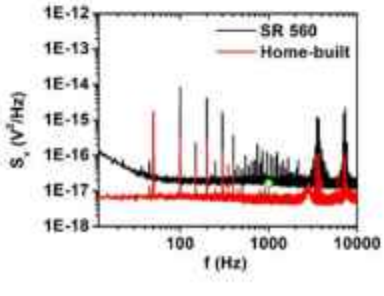
Confined-dewetting method of metal thin films for the fabrication of high-density, low-dispersity metal nanoparticles

The TIH has invented an easy, scalable, cost effective, low thermal budget synthesis of metal nanoparticles like Ag, Au and Ag-Au mixture. The method uses an ingenious technique of performing dewetting of thin metal film under confined environment. The synthesis resulted in very high density, low-dispersity, metal nanoparticles having strong Surface Plasmon Resonance (SPR) absorption in the visible range. High density and strong SPR facilitates in designing SPR and Surface Enhance Raman scattering (SERS) based sensitive detection. Plasmonic nanoparticles having interparticle gap less than 5 nm, which show coupled plasmon absorbance, which finds important application in various sensors like DNA sensors.



Ultra low-noise voltage pre-amplifier

The TIH has designed and developed a low cost voltage pre-amplifier which has a very low internal noise level. To compare it with commercial voltage pre-amplifiers, the noise level of a widely used voltage pre-amplifier from Stanford Research Systems SRS 560 was plotted. This system can find its application where very tiny signals are to be amplified and measured. In many electronic devices internal noise can kill the overall performance of the same. The designed instrument could be used to measure the internal noise of electronic devices. This could find applications in semiconductor industries and as well as in future quantum technologies.



DIVYASAMPARK IHUB ROORKEE FOR DEVICES MATERIALS & TECHNOLOGY FOUNDATION

IIT Roorkee

Theme: Defence

Scan QR to know more

Hub Overview:

iHUB DivyaSampark at IIT Roorkee is a Technology Innovation Hub that aims to enable innovative ecosystem in CPS and becoming the source for the next generation of digital technologies, products and services by promoting translational research, enhancing core competencies, capacity building, training to provide solutions for national strategic sectors and becoming a key contributor to 'Digital India' and 'AatmaNirbhar Bharat'.

The Hub is working as a networked platform, acting as a cushion between different stakeholders like researchers, industry, start-ups, policymakers, investors (Angel, VC, PE) and opening doors for global partnerships to push the boundaries of innovation.

Project Updates :

Rethink! Tinkering Lab

Dedicated to research and innovation in Cyber Physical Systems this cutting-edge space is equipped with state-of-the-art features such as Motion Sensing Cameras and drone kits, alongside comprehensive support for drone parts manufacturing. It represents a significant milestone in advancing exploration and innovation in emerging technologies.

Startup:

DTown Robotics and IDR Research & Development showcased its expertise in Nano Drones, highlighting their potential advantages for the Indian army at "India International Science Festival (IISF 2023)." Additionally, it presented its innovative Grenade Launcher Drone, which could potentially revolutionize the Indian Army's combat strategies.

Event:

The TIH co-organized 4th Global Ceramic Leadership Roundtable focusing on ceramics for the frontier sector (CerAP 2024) in association with the Centre for Space Research IITR and Cognizance 2024 at IIT Roorkee.

TECHNOLOGY INNOVATION HUB - IHUB DRISHTI FOUNDATION

IIT Jodhpur

Theme: Defence

TIH iHub Drishti

Scan QR to know more

Hub Overview:

The TIH on Computer Vision and Augmented and Virtual Reality (CV and ARVR), named as iHub Drishti Foundation focuses on the core research areas of Seeing and Sensing, Dependability, Real-time Computer Vision Systems, and Data Collection, Curation, and Annotation. iHub Drishti has identified the following application areas for developing technologies: Computer Vision for Autonomous Systems; Computer Vision for Better Living: Healthcare and Biosphere; Imaging for Document Analysis; CV and VR for Industry 4.0; Dependable AR-VR for X (including games).

Project Updates :

History Tale AR: Reviving History by Paintings

A cutting-edge Augmented Reality (AR) application prototype has been developed, focused on reviving ancient stories and legends through ancient painting scanning. By blending historical narratives with interactive digital experiences, the project aims to create an engaging platform for users interested in exploring and learning about ancient stories. The technology developed is at TRL-6. The key feature includes development of technological novel pipeline for the optimization of 3D content to make it compatible with AR devices.

Hub for Radiogenomics Research and Service

A Radio-genomics research hub has been created within iHuB Drishti Foundation that collects and curates' Indian patients' radio-genomics data. The radio-genomics research hub will further carry out research in novel artificial intelligence (AI) and computer vision (CV) based learning models over this data to predict disease diagnosis and prognosis for patient treatment as part of the precision medicine workflow.

Fig: Searchable Radiogenomics Data Portal Developed by iHub Drishti.

Startup:

Unicorniz Innovations Pvt. Ltd.

The Start-up has developed a cutting-edge XR technology solution that offers immersive experiences to drive positive change in rural areas. It is designed to cater to the specific needs and requirements of various sectors and industries, including education and gaming. By leveraging virtual and augmented reality, it creates engaging and customizable solutions that empower rural communities. The product would be deployed to provide immersive experience of Cellular Jail.

Theme:

INFRASTRUCTURE

"Infrastructure is the backbone of economic growth. It improves access to basic services such as clean water and electricity, creates jobs and boosts business"

I-HUB
AND HCI FOUNDATION
IIT Mandi

Theme: Infrastructure

Scan QR to know more

Hub Overview:

iHub and HCI Foundation is a Technology Innovation Hub (TIH) established by IIT Mandi as part of the National Mission on Interdisciplinary Cyber-Physical Systems (NM-ICPS) scheme of Department of Science and Technology, Govt. of India. The Hub is focused on Human-Computer Interaction with a vision to nurture research in the area, enable technology translation for industry, and build scale in skill development.

Project Updates :

Driver's Alertness Management System (DAMS)

The developed application is a Computer-Vision based, device-led technology based on deep technologies like Computer Vision and ML algorithms. The unique features of the technology are:

- Use of Indian dataset for the first-time in bringing in a revolution in the safety of public transportation with respect to risks.
- First time the use of optimal and light weight combinatorial algorithm in Computer Vision with respect to Device-Led Technologies in HCI.
- The successful pilot deployed at Chandigarh Transport Undertaking (CTU). Commissioning across 438 buses will be underway from next FY 2024-25.

The technology will enable the prevention of fatal accidents by providing timely and personalized alerts to the driver.

Digital reconstruction of Indian culture

The TIH is revitalizing Kangra Fort in Himachal Pradesh through the innovative application of Augmented Reality (AR). It is utilizing Large Language Models (LLMs) to deliver comprehensive information about the sites to visitors so as to bring in homogenization and restoration of Indian culture.

Human Resource and Skill Development:

IIT Mandi iHub has introduced a specialized project to skill marginalised youth (SC category) of India on HCI based technologies. The students are provided training in the areas of IoT Technology, Human-Drone Interface Technology and HCI for renewable energy (Solar PV panel Interface Technology).

Collaborations:

- Signed an MoU with Hero Moto Corporation (HMC, India). The partnership is in the emerging areas of automobiles with focus on HCI for translating innovative research into real-world solutions.
- Partnered with Inventin Design Private Limited for advancing translational research and bridging the gap between prototypes and real-world products.

TECHNOLOGY INNOVATION IN EXPLORATION & MINING FOUNDATION (TEXMIN)

IIT Dhanbad

Theme: Infrastrucutre

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Hub Overview:

TEXMiN (Technology Innovation in Exploration & Mining) Foundation is a section 8 company, the Mining Technology Innovation Hub of IIT (ISM) Dhanbad, with the funding support of the Department of Science and Technology (DST), GoI under National Mission for Inter-disciplinary cyber-physical Systems (NMiCPS) to address the issues and challenges of the mining and exploration industry.

Project Updates :

Three Centres of Excellence from leading Global Mining Giants for augmenting the capabilities of Indian mining professionals have been established. These centers shall provide access to cutting-edge services and innovation-led solutions to help meet the most pressing needs of mining and metal businesses today and in the future.

- TEXMiN- ESRI India Geospatial Excellence Centre: For augmenting Geospatial capabilities through latest technologies of ESRI, US.
- TEXMiN - Dassault Mining Technology Excellence Centre: For augmenting Mine planning capabilities through latest technologies of Dassault Systemes, France.
- TEXMiN-Carlson Geodesy Lab: For augmenting Geodesy capabilities through state-of-art US-based Carlson.

Collaborations:

MoA has been signed between TEXMiN and Hexagon. This MoA shall result in the establishment of an innovative Centre of Excellence known as "TEXMiN - HxGN Centre of Excellence," also known as "Centre for Digital Transformation & Excellence in Mining & Monitoring (CDTEM2)."

Capacity Building Activities:

- TEXMiN collaborated with **MOIL LIMITED,** to host a two-day workshop titled "Digitalization of Mining Processes and Digital Mining Technologies" in February 2024.
- TEXMiN, IIT (ISM) Dhanbad organized a week-long Continuous Professional Development (CPD) program, focusing on "**Advanced Mining Technologies and Personal Effectiveness**" for senior executives of Odisha Mining Corporation Ltd. (OMC) through various mediums, interactive sessions, and problem-solving activities based on real-world scenarios.

I-HUB FOR ROBOTICS AND AUTONOMOUS INNOVATION SYSTEMS FOUNDATION

IISc Bengaluru

Theme: Infrastructure

ARTPARK

Scan QR to know more

Hub Overview:

I-HUB for Robotics and Autonomous Innovation Systems Foundation (ARTPARK-IISc - AI & Robotics Technology Park) is a unique non-profit (section-8) organization promoted by the Indian Institute of Science (IISc) to foster innovations in AI & Robotics by bringing together the best of the startup, industry, research, and government ecosystem. It is seed funded by the Department of Science & Technology (DST), Govt. of India, under the National Mission on Interdisciplinary Cyber-Physical Systems (NM-ICPS) and the Govt. of Karnataka. ARTPARK is driving advances in robotics, autonomous systems and AI through translational R&D in areas of intelligent healthcare, automation for logistics and skilling for the AI age.

Project Updates :

Comrado Aerospace

The supported start-up under the TIH has developed **Comrado ATLAS**, a mid-range delivery drone that has a variable payload capability of up-to 50kg and the aircraft can be utilized to deliver multiple time-sensitive cargos at different locations in a single mission. It could be deployed in mountains, deserts or sea and with its long operational range, aircraft is capable to deliver different types of cargo, for example:

- One time Meal and 250 ml Water for 65 people.
- 5 INSAS Rifles + 15 loaded magazines + 10 Shivalik Hand Grenades
- Other strategic payloads.
- The aircraft is designed to be able to drop heavy munitions with high accuracy and return fast, making them suitable to be utilized as reusable munition carriers.

A - THON

The supported start-up under the TIH has developed **AdbhutBot**, a versatile, fluidic multi-functional platform redefining agricultural operations. It employs affordable, robust, networked assisted autonomous systems (Robotics/AI) facilitating collaboration in farming tasks. It features a 6x6 platform designed for hostile terrains, integrating tracks and spider wheels for large farms. Powered by an internal combustion engine (ICE), combined with hydraulics, electric power generation, and mechanical drives it offers end-to-end solutions for the crop life cycle with high traction, ground clearance, and all-wheel drive. The product is capable of handling various terrains, soil conditions, crop types, and growth stages, including weed control, water management, and disease prevention. Active study on field is in progress, A-THON & ArtPark teams have made field visits on client locations.

VS Robotics

The supported start-up under the TIH has developed the **KissanBot** which combines advanced mechanical and software engineering. The mechanical aspect includes a compact, modular, powerful and resilient robot platform with high-performance brushless hub motors for robust locomotion. On the software side, the robot utilizes an SOC-based processor integrated with other microcontrollers for system management. It employs state-of-the-art deep learning algorithms for precise navigation and advanced crop management, and a user-friendly UI for comprehensive monitoring and control.

IIITB COMET FOUNDATION
IIIT Bangalore

Theme: Infrastrucutre

IIITB COMET FOUNDATION

Scan QR to know more

Hub Overview:

IIITB COMET Foundation, in this quarter, continued to make strong progress along its two main endeavors (picked up based on inputs from the Department of Telecom, DoT): 5G-Advanced Base Station - indigenously built massive MIMO 5G- Advanced base station leveraging Open-RAN Reconfigurable Intelligent Surfaces (RIS) to create smart radio environments - foundational for 6G.

Startup:

Mantiswave Networks Pvt. Ltd. is a start-up spun-off from one of the COMET funded projects, which has come up with a portable plug-and-play Private 5G box (Mantis Private 5G Box). The company has been incubated at IIITB's Innovation Center and is supported actively by IIITB COMET Foundation.

The Mantis Private 5G Box represents a revolutionary advancement in telecommunications, offering unparalleled security and reliability for businesses and organizations. Functioning as a dedicated network hub, it ensures exclusive and robust connectivity, safeguarding sensitive data from external threats. This compact yet powerful device empowers enterprises with customizable network management capabilities, optimizing performance and efficiency. By deploying the Mantis Private 5G Box, companies can establish a closed-loop communication infrastructure, enhancing productivity and privacy. Its seamless integration with existing systems streamlines operations, enabling seamless data transmission across various platforms. In an era of heightened digital vulnerabilities, the Mantis Private 5G Box emerges as a beacon of innovation, reshaping the landscape of connectivity.

Skill Development /Conferences:

IIITB COMET Foundation was an official sponsor of the 2024 edition of COMSNETS, a premier international conference in the field of communications and networking.

NAVAVISHKAR
I-HUB FOUNDATION
IIT Tirupati

Theme: Infrastructure

IIT Tirupati Navavishkar I-Hub Foundation

Scan QR to know more

Hub Overview:

The IIT Tirupati Navavishkar I-Hub Foundation (IITTNIF) is set up to host Technology Innovation Hub (TIH) focusing on cutting-edge technology in Positioning and Precision Technologies (PPT) which includes Positioning, Navigation, Timing, GIS, Remote Sensing and other non-invasive technologies. IITTNIF core aim includes developing advanced technology solutions.

Project Updates :

Geographic Information System (GIS) lab

IITTNiF established a Geographic Information System (GIS) lab. This lab serves as a hub for geospatial research and innovation, providing technical and research support to students, researchers, and all innovators interested in exploring the potential of GIS technologies.

Design and Fabrication of Hyperspectral camera for remote sensing

The TIH in partnership with Karunya University envisages to fabricate a cost effective, indigenous, hyperspectral camera for remote sensing applications through image sensor based on fore optics, light management based optical coating of lenses, and 3D printed console design of camera.

Startup:

Thazhal Geospatial Analytics has developed LeadGen, a prototype of a dataset for the real estate sector like paint and steel companies to get leads for their business.

Human Resource Development:

IITTTNiF recently hosted the first-ever national seminar on "NavIC – The Game Changer," a landmark event focused on India's indigenous Navigation Satellite System (NavIC). The seminar served as a crucial platform for bringing together all stakeholders involved with NavIC.

In-depth discussions explored the advantages of NavIC technology and its potential for widespread adoption. The event also offered a valuable opportunity for networking and business interactions, with presentations showcasing the latest products and solutions from leading startups and industry players in the NavIC space. This successful seminar has positioned itself as a significant step forward in promoting NavIC's integration and future applications.

NMICPS TECHNOLOGY INNOVATION HUB ON AUTONOMOUS NAVIGATION FOUNDATION

IIT Hyderabad

Theme: Infrastrucutre

Scan QR to know more

Hub Overview:

TiHAN at IIT Hyderabad focuses on Autonomous Navigation Technologies that play a critical role in enabling vehicles and robots to navigate safely and efficiently in a wide range of environments, from urban streets and highways to off-road terrain and indoor facilities. "Autonomous Navigation Technology Development at TiHAN IITH" was awarded First Rank of the three innovative Ideas by the International Road Federation – India Chapter (IRF-IC) in the National Conference on "Revolutionizing Road Infra with Modern Equipment, Technologies, Sustainable Materials, and Policy Guidelines", held from 29th February – 01st March 2024, at Manekshaw Centre, New Delhi.

Project Updates :

Structural Condition Assessment of Bridges Using UAVs - Development of Guidelines and Field Implementation

Conventional bridge inspection uses heavy equipment like a mobile inspection unit and requires the closure of bridges for hours. The study employs non- contact measurement techniques utilizing UAVs integrated with cameras.

Fig: 3D model with localized defects.

Startup:

Heavity Automation Private Limited, Ahmedabad.

India's first automatic weight powered staircase load carrier with automatic weight balancing with minimal efforts has been developed. The technology envisages to revolutionize the way heavy materials are moved on staircases with our cutting-edge solution. Automatic weight balancing for effortless lifting for loads up to 500 Kg have been demonstrated.

Fig: Powered staircase load carrier.

Skill Development:

TiHAN IIT Hyderabad conducted a "Discovering Drone Innovations" upskilling program at Rajiv Gandhi University of Knowledge Technologies (RGUKT), Nuzvid Campus, Andhra Pradesh wherein more than 1051 participants attended the program and honed their skills.

Theme:

HEALTHCARE

"Technology has the potential to bring about positive changes in healthcare and improve the lives of millions"

I-DAPT
HUB FOUNDATION
IIT BHU Varanasi

Theme: Healthcare

Scan QR to know more

Hub Overview:

I-DAPT Hub Foundation at IIT (BHU), Varanasi was set up to address the emerging needs of the country in the area of Interdisciplinary Data Analytics and Predictive Technologies (I-DAPT). I-DAPT Hub Foundation aims to use the interdisciplinary nature of data analytics and predictive technology to fulfill the modernization of socio-technical systems and services with disruptive innovations. I-DAPT Hub Foundation at IIT (BHU) is presently working on five thrust areas i.e Telecommunications, Power, Road Transport and Highways, Defence Research and Development, and Health and Family Welfare with a focus on technology or product development.

Project Updates :

Design and development of 3D printed surgical guides for prosthetic driven placement of implants (TRL 4)

I-DAPT Hub Foundation's translational research is in the process to determine the optimum dimension, orientation and location of implants for a partially/ completely edentulous patient. By the use of CAD, a surgical guide is being designed to create CT scan file to generate 3D print of it in PLA (Poly Lactic Acid) which is biocompatible and biodegradable material. The 3D printed customized surgical guide will be used to place the implants of predefined dimensions in prescribed location and orientation rather than being arbitrary. CT scan will be useful in deciding the relative position of soft and hard tissues in jaw bone and to decide the size/orientation of implants from this information.

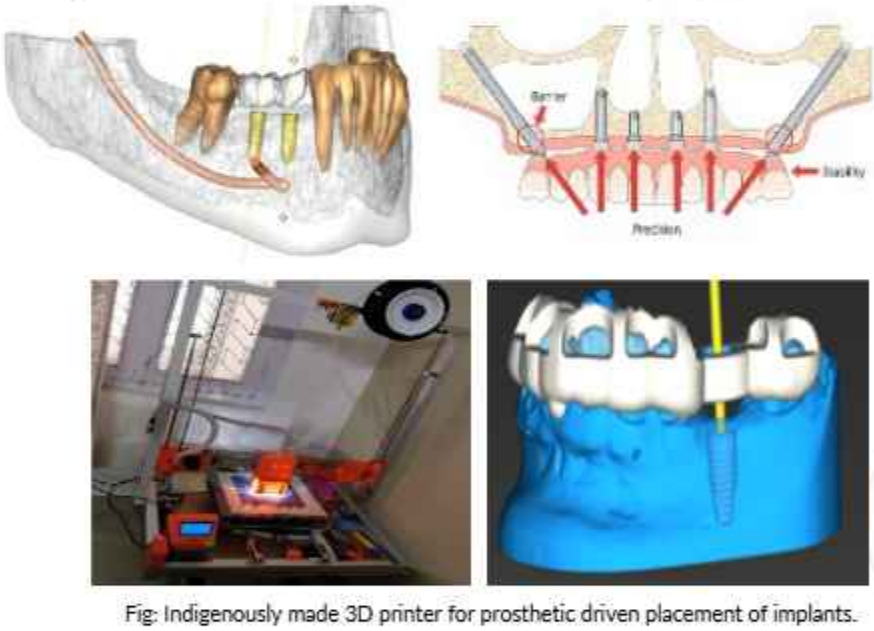


Fig: Indigenously made 3D printer for prosthetic driven placement of implants.

Capacity Building:

I-DAPT Hub Foundation, IIT(BHU), Varanasi sponsored a Short-Term-Course (STC) on Introduction to Quantum communication and Machine Learning. The aim of the STC was to achieve secure communication for wireless networks in the presence of quantum technologies with the emphasis on learning basic introduction and background knowledge of Machine learning, Statistical modelling of ML algorithms, Use of ML for AI in communication system, Introduction & Background of Quantum communication, Quantum communication-based system design, quantum information theory, applications to quantum communication, etc.

IHUB
ANUBHUTI FOUNDATION
IIIT Delhi

Theme: Healthcare

iHub Anubhuti-
IIITD Foundation

Scan QR to know more

Hub Overview:

iHub Anubhuti - IIITD Foundation thrived on nurturing tech innovation through robust R&D and Strategic Collaborations. The quarter showcased dynamic projects, celebrated Successes, and provided essential incubation support for startups.

Startups:

The supported start-up **Precision Health Innovations Pvt. Ltd. (Sugarstrings AI)** is an AI/ML-based clinical genomics platform for the diagnosis, treatment, and prevention of genetic diseases and cancers. The Start-up has developed HEALTH STRING™, which is an advanced preventive health product crafted through extensive clinical research and AI based solutions. It is designed to empower users by uncovering health risks at the DNA level, with a goal of saving lives and unlocking the full potential of optimal health.

The TIH supported start-up **Briota** with it's Pulmonary Function Test In A Box™ is making early screening and precise diagnosis of CRDs possible in Primary Care settings. Briota's PFT As a Service offering - Spirometry Assisted Virtually Early (SAVE™) is now established under the framework and guidelines of India's National Program on NCD - 2023-30.

Capacity Building and Skill Development:

Under the established Medical Cobotics Centre (MCC) following skill building activities were undertaken:

- Simulation based training for 12 doctors from various Hospitals/ Institutes.
- AHA Certified - Basic Life Support (BLS) and Advanced Cardiovascular Life Support (ACLS) training conducted in Medical Cobotics Centre (MCC) by Vidyanta Skills Institute, marked a significant milestone in enhancing the skills and proficiency of 10 paramedic staff members from various Hospitals/Institutes.
- Simulation based training for Anaesthesiologists from various Hospitals/ Institutes.
- Maulana Azad Medical College (MAMC) hosted a dynamic training session focused on simulation techniques in collaboration with the Medical Cobotics Centre (MCC) which was attended by 79 surgeons (General) from various hospitals. The session served as a platform to enhance surgical proficiency and explore cutting-edge technologies.

VISHLESAN
I-HUB FOUNDATION
IIT Patna

Theme: Healthcare

Scan QR to know more

Hub Overview:

The multidisciplinary Vishlesan I-Hub Foundation at IIT Patana under Technology Incubation Hub (TIH) targets to leverage Research and Engineering capabilities of Sustainable Development Goals and achieve the mandate of National Mission On Interdisciplinary Cyber Physical Systems. The Vishlesan I-Hub at IIT Patna also encourages to leverage other related areas for technology development , innovation, professional education, entrepreneurship, brand building, technology commercialization, and product management for the dissemination and deployment of intellectual property, and for public outreach.

Startups:

TruVoice.ai

It offers a versatile conversational AI engine supporting numerous languages and communication channels, presenting a compelling alternative to established solutions.

Digiclinics Research & Services Pvt. Ltd.

The start-up is providing the AI-driven Breast Cancer Digital Pathology Grading Platform which enhances breast cancer diagnosis and treatment decisions using advanced technologies.

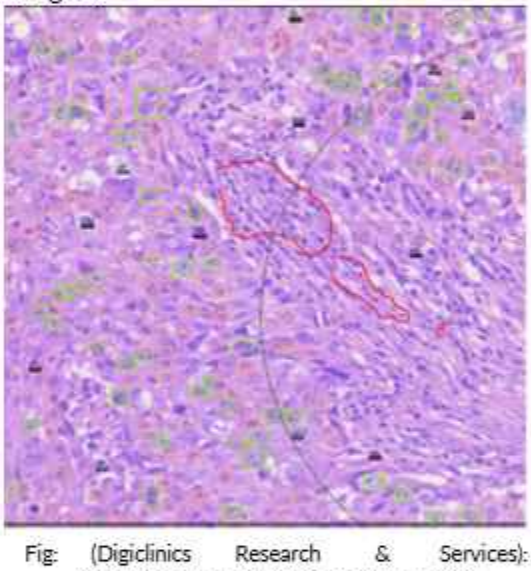


Fig: (Digiclinics Research & Services): Nottingham Breast Cancer Grading System.

Zykrr Technologies

It provides an enterprise SaaS platform for customer feedback analysis, adaptable across industries.

IIIT-H DATA
I-HUB FOUNDATION
IIIT Hyderabad

Theme: Healthcare

Scan QR to know more

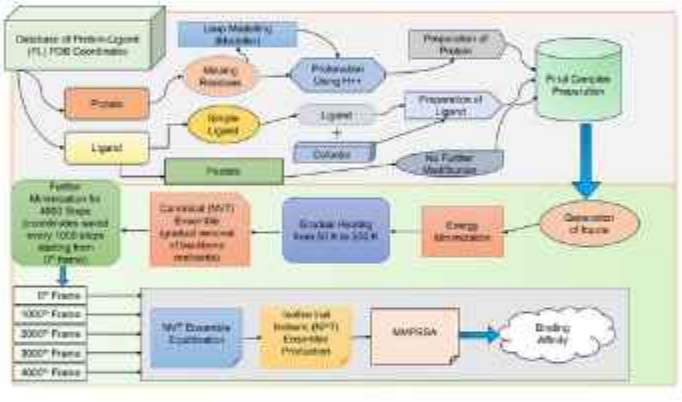
Hub Overview:

iHub - Foundation for Data (iHub-Data) is dedicated to enhancing national research and deploying solution in data banks, data services, data analytics. The Hub aims at putting together large-scale datasets as well as developing solutions based on such datasets through applied research. The research is primarily focused towards creating the highest global academic standards for the betterment of society.

Project Updates :

PLAS-20k

The TIH has developed and published PLAS-20k dataset, an extension of its previously developed PLAS-5k, with 97,500 independent simulations on 19,500 different protein-ligand complexes. This is the largest data set of its kind today that can pave the way for accelerating ground-breaking drug discoveries. Several pharma companies are now in discussions with IHub-Data, IIIT Hyderabad to leverage this dataset for AI-driven drug discovery research. An article about the dataset has been published in the Nature journal in February 2024.



Enterprise Grade Data Center (TRL 9) is being proposed with the following configuration: 4 DGX H100s (32 Enterprise grade GPUs), Lustre Parallel File System, Infiniband network backbone, 4 multiple Xeon Gold processor-based head and storage servers to manage compute and storage nodes. The current Data Foundation system implemented is at a PoC stage (TRL level 5) and hosts 52 unique datasets (32 TB).

Patent:

A Patent on "Road Quality Index" was granted for mobility R&D work using 2-wheeler platform supported by the hub. Efforts to take the technology through productization are being carried out.

Collaborations:

The Hub has signed MoU and SOW with ICMR, NIN (National Institute of Nutrition) to collaborate on healthcare related initiatives.

IITI DRISHTI
CPS FOUNDATION
IIT Indore

Theme: Healthcare

Scan QR to know more

Hub Overview:

IITI DRISHTI CPS Foundation, a Technology Innovation Hub was set up at IIT Indore with an overarching objective of becoming a one-stop shop for CPS solutions with a specific focus on system simulation, modelling and visualization. DRISHTI CPS currently supports over 67 research projects led by faculties, students, and researchers from various Indian academic institutions. The foundation also nurtures more than 62 startups, offering financial assistance ranging from INR 3 Lacs to INR 100 Lacs, with a focus on Digital Healthcare and Manufacturing.

Project Updates :

Identification and management of High-Risk Pregnancies (HRPs), by implementing a comprehensive care program at PHCs to enhance maternal and child health services at the grassroots level

The project tackles significant challenges in maternal and child health, particularly focusing on the identification and management of high-risk pregnancies (HRPs) in rural India. Expected outcomes of the project include better preparation of expecting mothers for childbirth, timely interventions to manage complications, targeted counselling and education, facilitation of timely referrals, and data-driven decision-making for future interventions and policies.
Current TRL: TRL 5.
Deployment/Commercialization Status: Currently under pilot deployment in 3 PHCs of Dewas.

Startup:

Vigorus Healthtech Pvt. Ltd.

The start-up supported under the TIH has developed Chikitsa which is providing a patient data management and visualization solution that enhances healthcare providers and patients' efficiency, privacy, and security, resulting in improved patient outcomes and reduced costs. The technology is currently at TRL 7. It is a blockchain-based automated medical data repository with modelling and visualization capabilities to secure stored data, and users can retrieve them through the application interface. Additionally, the startup is working on an IoT device, dubbed the "Notepad," which facilitates the direct transmission of handwritten prescriptions to the blockchain network, seamlessly integrating with the mobile application for storage and accessibility.

Deployment: The product has been deployed in multiple private hospitals of Jaipur and is being supported by NHA for further implementation through DRISHTI CPS active support.

IITM PRAVARTAK TECHNOLOGIES FOUNDATION

IIT Madras

Theme: Healthcare

Scan QR to know more

Hub Overview:

IITM Pravartak focuses on new knowledge in Sensors, Networking, Actuators, and Control Systems (SNACS) through extensive and application-oriented research and gladly prepares young India for the next generation of world-class technologies. With initiatives supporting entrepreneurs, IITM Pravartak has seeded 5 startups in this quarter.

Theme SpecificProgress:

IITM Pravartak Technologies Foundation incubates startups that develop products having a large-scale impact in the healthcare domain. There are currently 12 healthcare & assistive health technologies startups incubated at IITM Pravartak.

Project Updates :

Smart and Connected Assistive Technology- Plug and Train Rehabilitation Robot (PLUTO)

PLUTO (TRL9) helps train fine motor skills for persons with stroke, spinal cord injury with the robot, assisting and resisting the user. The training is gamified, and the device is portable allowing advanced rehabilitation technology to reach the doorsteps of users who need it. User trials completed with 1000 users.

Ultra-light Wheelchair

The Ultra-light Wheelchair heelchair (TRL7), weighing only 8kg, is designed for ease of use and maximum portability, catering specifically to the needs of individuals with mobility challenges. It emphasizes not just functionality but also the independence and lifestyle of its users. User trials for the technology developed is underway.

Collaborations:

IITM Pravartak Technologies Foundation has partnered with NACIN (National Academy of Customs, Indirect Taxes and Narcotics – an apex institute of Government of India for capacity building in the field of indirect taxation) and is establishing a "Cyber Forensic Center of Excellence" at Palasamudram, AP, and Bangalore in NACIN campus. This program is valued at about 17 crores and involves setting up of state-of-the-art cyber forensic lab, training facility, hardware, software, and necessary skilling in cutting edge technologies.

I-HUB FOUNDATION FOR COBOTICS (IHFC)

IIT Delhi

Theme: Healthcare

IHFC

Scan QR to know more

Hub Overview:

I-Hub Foundation for Cobotics (IHFC), Technology Innovation Hub of IIT Delhi, was established partnering with the Department of Science & Technology (DST), Ministry of Science and Technology, Govt. of India under National Mission on Interdisciplinary Cyber Physical Systems (NM-ICPS). IHFC focuses under its 3 major pillars of success from Academia, Government and Industry bringing forward Research & Development of novel technology in the areas of AI, ML, Communications, Robotics and Cobotics to serve sectors across like Defence, Medical, agriculture and Industry 4.0.

Project Updates :

Development of A Cost-EffectiveEMG Controlled Prosthetic Hand for Multiple Grasp Patterns (ENRICH)

A cost-effective Electromyogram controlled five fingered prosthetic hand ENRICH developed under the TIH is currently used by three users during daily living activities for the last one year. Discussions on technology transfer for commercial manufacturing are ongoing. The current TRL of the technology is 4.

ENRICH

Self-Powered Sensor System for Soft Robotics and Human-Machine Interaction

The TIH is focusing on the development of an indigenous, flexible, haptic feedback sensor & hybrid mechanical energy harvesting system. This indigenously designed self-powered sensor system is intended for use in soft robotics and human-machine interaction.

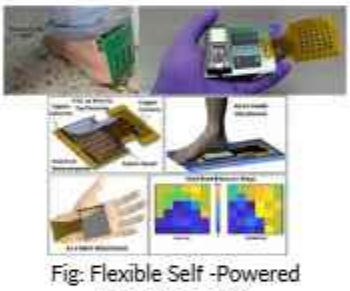


Fig: Flexible Self -Powered Magnetic Sensor.

Startup:

Mountford a startup supported under the TIH has developed a life-saving medical tool to help doctors better perform a critical procedure called tracheal intubation, which is necessary before a patient can be put on a ventilator.

Human Resource & Skill Development:

IHFC conducted a Lab to Market: Workshop cum Training Program for professional development for Faculties, Project Directors, CEOs, or representatives from TIHs on strategies for commercialization of prototypes/technologies. With 55 participants across TiH's this program gave them in depth knowledge on go-to- market strategy.

INSTITUTE OF DATA ENGINEERING, ANALYTICS AND SCIENCE (IDEAS) FOUNDATION

ISI Kolkata

Theme: Healthcare

Scan QR to know more

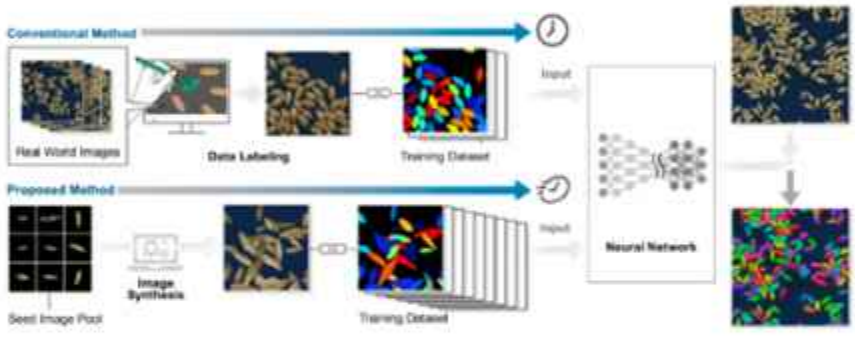
Hub Overview:

IDEAS Institute of Data Engineering, Analytics and Science Foundation is the Technology Innovation Hub set up at ISI Kolkata under the aegis of National Mission on Interdisciplinary Cyber-Physical Systems (NM-ICPS). The hub is committed to design and develop effective and scalable algorithms distributed machine learning models to solve real life problems and help in decision making for businesses and the government.

Project Updates :

UnivillageAgro Pvt. Ltd.

A Computer Vision Based AI-driven system has been developed which enables precise and rapid crop quality assessment. Moreover, the startup plans to integrate Blockchain to empower agro-food companies in tracking crop quality, batch test reports, and other vital parameters. By leveraging blockchain, transparent and immutable traceability throughout the supply chain of agricultural products could be ensured.



Kheti Samaj

It has developed an IoT based platform harnessing real-time agricultural data to enhance productivity, sustainability, and traceability of farmlands. Through optimizing resource utilization, such as water, fertilizers, and pesticides, this technology strives to make farming more efficient and sustainable.

Skill Development:

Launched online certificate course on Business Analytics and Machine Learning, featuring instructors from the Indian Statistical Institute and industry experts. The course envisages to empower participants with essential skills in data analytics and machine learning.

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25 Technology Innovation Hubs (TIHs) established under NM-ICPS

Special Support

NMICPS Technology Innovation Hub on Autonomous Navigation Foundation, IIT Hyderabad

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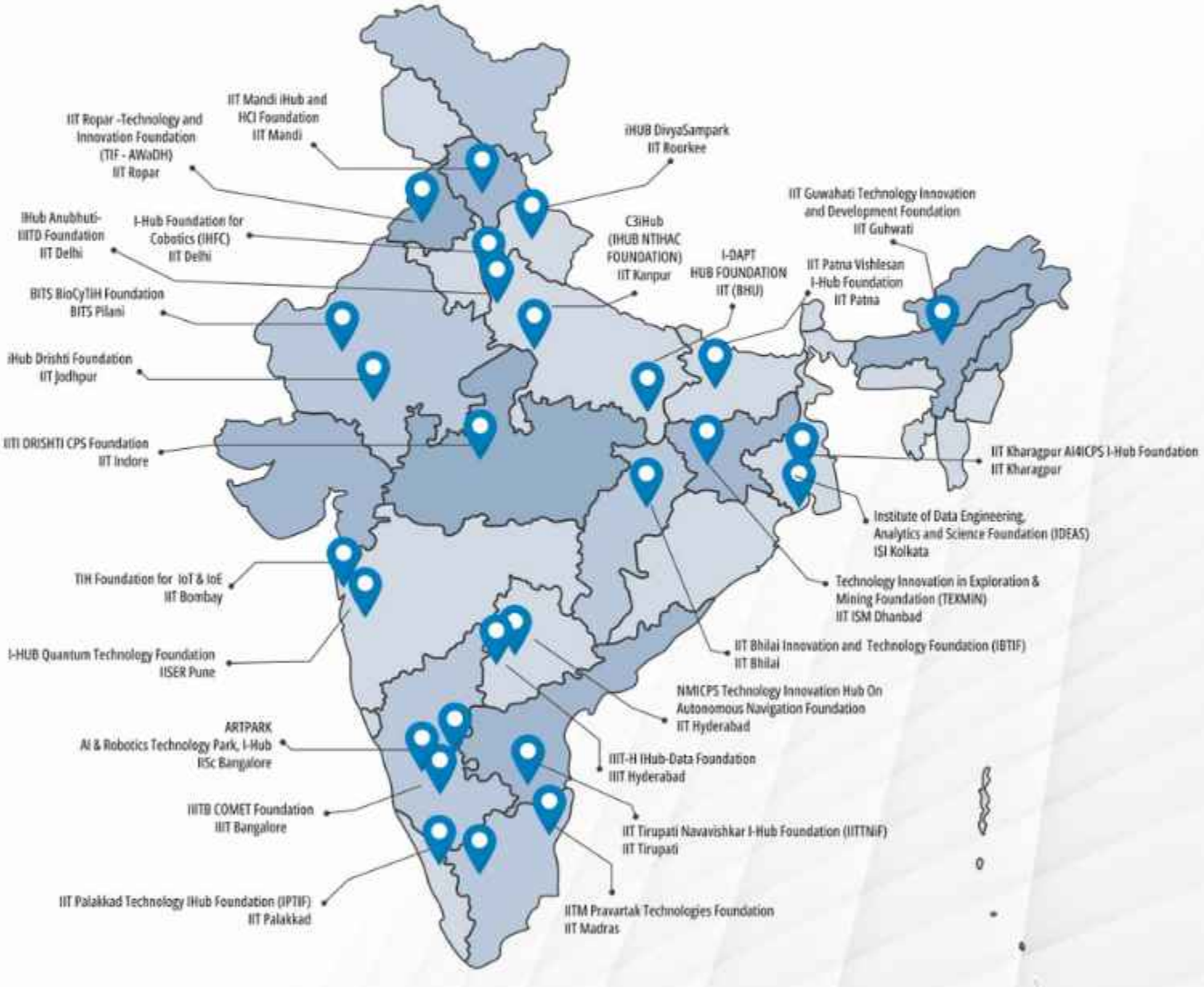
25 Technology Innovation Hubs Across the Country



NATIONAL MISSION ON INTERDISCIPLINARY CYBER-PHYSICAL SYSTEMS NM-ICPS

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Ministry of Science and Technology
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2024