Call-for-Innovation

"ABHIYANTA 1.0"

On the auspicious occasion of Engineers Day, IIT Mandi iHub & HCi Foundation proudly announces the launch of the first edition of **"ABHIYANTA 1.0"** on September 15th, 2025. This initiative honours the legacy of ***Bharat Ratna Shri M. Visvesvaraya***, whose visionary contributions laid the foundation for modern Bharat's engineering and industrial excellence. His pioneering spirit and dedication to nation-building continue to inspire generations of engineers, innovators, and creators across Bharat.

Shri Visvesvaraya's devotion to the progress of Bharat was marked by groundbreaking innovations and infrastructural marvels that propelled the nation towards self-reliance and prosperity. Today, as we strive to realise the dream of ***Atmanirbhar Bharat***, this challenge offers a platform for startups, researchers, engineers, and passionate individuals alike to bring transformative ideas and solutions that can make Bharat stronger, more resilient, and globally competitive.

The **"ABHIYANTA 1.0"** is not just for engineers; it is an open invitation to all innovators who share the vision of empowering Bharat with homegrown technologies and solutions. Through this challenge, we aim to ignite the creative potential across diverse sectors, combining technology, research, and entrepreneurial spirit to address the pressing problems faced by our nation.

Participants will benefit from an accelerated selection process, funding support, expert mentorship, intellectual property guidance, and access to investor networks to advance their innovations from concept to impactful deployment. By fostering collaboration and enabling resource access, IIT Mandi iHub & HCi Foundation commits to nurturing an innovation ecosystem that embodies Shri Visvesvaraya's ideals of perseverance, ingenuity, and national pride.

Join us in celebrating the enduring legacy of ***Bharat Ratna Shri M. Visvesvaraya*** by contributing to the journey of ***Atmanirbhar Bharat***. Together, let us empower every innovator with the opportunity to build solutions that strengthen the nation, uplift communities, and reflect the true spirit of Indian engineering excellence.

The **"ABHIYANTA 1.0"** is a call to every dreamer and doer dedicated to shaping the future of Bharat through technology and innovation. Let us honour the heritage of our great engineers by creating a self-reliant, resilient, and prosperous Bharat.

— IIT Mandi iHub & HCi Foundation

1. Neurofeedback System for Learning Disability Detection and Intervention:

Objective: *"Create an integrated diagnostic and therapeutic platform for early detection and treatment of learning disabilities, including ADHD, dyslexia, autism spectrum disorders, and other similar disorders."*

Background: An estimated 10-15% of Bharat's children suffer from learning disabilities, with the majority remaining undiagnosed due to a lack of awareness and specialist services. Early intervention is crucial for optimal outcomes, but current diagnostic methods are expensive, time-consuming, and require specialised facilities unavailable in most regions. The National Education Policy 2020 emphasises inclusive education and early identification of learning differences.

Solution Required: Design an integrated system combining EEG monitoring, eye-tracking technology, and an IoT-enabled smart pen for a comprehensive assessment. The platform must include gamified assessment modules appropriate for children, AI algorithms for pattern recognition and diagnosis, neurofeedback therapy protocols, progress tracking capabilities, a multilingual interface supporting major Bharatiya languages, and teacher/parent training modules for continued support.

2. Prenatal Health Monitoring Device for Maternal and Fetal Care:

Objective: *"Develop a portable, user-friendly fetal monitoring system to improve maternal and infant health outcomes in underserved regions of Bharat."*

Background: Bharat accounts for 11% of global maternal deaths and 20% of child deaths worldwide. Rural areas face particular challenges with limited access to prenatal care and monitoring. Continuous fetal monitoring during pregnancy can detect complications early, enabling timely interventions that save both maternal and infant lives.

Solution Required: Develop a lightweight, wearable device for continuous monitoring of fetal heartbeat, movement patterns, and maternal vital signs. The system must provide comfortable 24/7 wear, a rechargeable battery with multi-day operation, AI algorithms for abnormal pattern detection, emergency alert systems for healthcare providers, a multilingual mobile application for patient education, and offline functionality suitable for areas with poor connectivity.

3. AI-Powered Skin Disease Detection for Community Health Workers:

Objective: *"Empower frontline health workers with AI-driven dermatological screening capabilities to address the high burden of skin diseases in Bharat."*

Background: Skin diseases affect over 20% of Bharat's population, with conditions like fungal infections, eczema, and psoriasis being prevalent due to the tropical climate and limited access to dermatologists. Rural areas have virtually no specialist dermatological services, leading to delayed diagnosis and treatment. Community health workers, such as ASHA workers, serve as the first point of contact but lack diagnostic tools for skin conditions.

Solution Required: Develop a smartphone-based application utilising computer vision and machine learning for skin lesion analysis. The system must capture high-quality images using standard smartphone cameras, provide instant preliminary diagnosis with confidence scores, support multiple skin tones relevant to Bharatn demographics, offer treatment recommendations aligned with National Health Mission protocols, maintain patient privacy with encrypted data storage, and function effectively in low-bandwidth environments.

4. Stroke Rehabilitation Device for Neurological Recovery:

Objective: *"Develop a comprehensive rehabilitation system for stroke patients addressing India's growing stroke burden through accessible, technology-enabled therapy."*

Background: Bharat reports 1.8 million acute stroke cases annually, with limited rehabilitation infrastructure outside major cities. Stroke survivors require intensive, long-term rehabilitation for optimal recovery, but specialised facilities are scarce and expensive. Home-based rehabilitation solutions can significantly improve outcomes while reducing healthcare costs and family burden.

Solution Required: Design a portable rehabilitation device for motor function recovery, virtual reality therapy modules for cognitive rehabilitation, progress tracking through motion sensors and AI analytics, customizable therapy protocols based on stroke severity and type, gamified exercises to improve patient engagement, telemedicine integration for remote therapist consultation, multilingual interface with Bharatiya language support, and family training modules for caregiver assistance.

5. Rural Telemedicine IoT Device for Universal Healthcare Access:

Objective: *"Develop an integrated telemedicine device to bridge healthcare gaps in rural Bharat through AI-powered diagnostics and Ayushman Bharat Digital Mission (ABDM) connectivity."*

Background: Bharat faces severe healthcare disparities, with 70% of the population residing in rural areas, while 75% of healthcare infrastructure is concentrated in urban centres. The doctor-to-patient ratio in rural areas is 1:25,000, far below WHO's recommended 1:1000. With 86% of medical visits originating from rural areas and patients travelling over 100km for healthcare, there's an urgent need for point-of-care diagnostics. The ABDM framework, launched in 2021, has already created 400 million health accounts and provides the digital infrastructure for seamless health data exchange.

Solution Required: Design a portable, tabletop diagnostic device capable of measuring pulse, SpO2, blood pressure, weight, height, blood parameters, retinal imaging, ECG, digital stethoscope, basic ultrasound and other parameters. The device must integrate AI algorithms for preliminary diagnosis, require minimal training for operation by ASHA workers, deliver results within 15 minutes, support both local and cloud storage, and seamlessly connect with ABDM infrastructure for universal health coverage benefits under the Ayushman Bharat scheme.

6. Digital Stethoscope Attachment with AI Diagnostic Capabilities:

Objective: *"Transform traditional stethoscopes into innovative diagnostic tools through a clip-on device with Bluetooth connectivity and AI-powered analysis for enhanced primary healthcare delivery."*

Background: Bharat has a shortage of approximately 600,000 doctors, with the deficit most acute in rural primary health centres. Existing stethoscopes, while ubiquitous, provide limited diagnostic capabilities and rely heavily on practitioner expertise. Digital enhancement can democratise advanced cardiac and pulmonary diagnostics, mainly benefiting junior doctors and healthcare workers in remote areas.

Solution Required: Design a universal attachment compatible with standard stethoscopes, featuring high-quality audio capture, Bluetooth connectivity to smartphones/tablets, AI algorithms for detecting cardiac arrhythmias and pulmonary conditions, secure audio recording and sharing capabilities.

7. Smart Airbag System for Elderly Fall Prevention and Protection:

Objective: *"Create an intelligent wearable airbag system to detect and mitigate fall-related injuries among Bharat's rapidly ageing population."*

Background: Bharat's elderly population (60+ years) is projected to reach 194 million by 2031. Falls are the leading cause of injury-related deaths among seniors, particularly the elderly who are living alone, and are vulnerable due to limited immediate medical care. Traditional fall detection systems only alert caregivers post-incident, leaving a critical gap in injury prevention during the actual fall event.

Solution Required: Develop a lightweight, wearable device integrating accelerometers, gyroscopes, and AI algorithms for real-time fall prediction. The system must deploy protective airbags within milliseconds of detecting an imminent fall, incorporate mobile communication for GPS for location tracking, include emergency communication features for family/healthcare providers, operate on long-lasting batteries, and be culturally acceptable for elderly users in Bharat's households.

8. Biometric Payment System for Making Device Free Payments:

Objective: *"Enable secure, cashless transactions through robust biometric authentication."*

Background: India's digital payment ecosystem is rapidly evolving, driven by widespread smartphone adoption, expanding internet connectivity, and a robust fintech infrastructure. Biometric payment systems leveraging fingerprints, facial recognition, iris, and palm scans are becoming integral for secure, convenient authentication across urban and semi-urban areas alongside rural regions. Supported by the government's digital identity framework and innovative banking solutions, biometrics are enhancing payment security and simplifying access for a broad user base. These systems reduce reliance on traditional PINs and passwords, making digital payments faster and safer for millions of Indians across diverse socio-economic backgrounds. Device-Free

Solution Required: Develop a portable biometric payment terminal using fingerprint, palm scan, iris recognition, or facial recognition technologies. The system must integrate with the Aadhaar database for authentication, the pilot should work on an in-app wallet and later on integration with the UPI or digital currency platform, function in offline/low-connectivity environments with sync capabilities, include vernacular language support, provide audio-visual feedback for illiterate users, ensure robust security protocols, and offer solar charging capabilities for areas with unreliable power supply.

9. Interactive STEM Education Kit with AR/VR Integration:

Objective: *"Transform STEM education in Bharat's schools through immersive, interactive learning experiences aligned with the National Education Policy 2020 and the NCERT curriculum."*

Background: NEP 2020 emphasises experiential learning and STEM education from foundational stages. However, many schools lack adequate laboratory facilities and trained teachers for hands-on science education. Interactive technology can democratize quality STEM education, making it accessible across urban and rural schools while addressing the shortage of qualified science teachers.

Solution Required: Develop a comprehensive STEM kit featuring cardboard VR headsets, interactive electronic components, AR-enabled mobile applications, and AI-powered learning platforms. The system must include 100+ experiments mapped to the NCERT curriculum from grades 1-12 (like mobile phone-based microscope), virtual field trips and laboratory simulations through VR with voice interaction capabilities (making the mobile phone based VR headset is also an experiment), career exploration features, multilingual support in major Bharatiya languages, teacher training modules for non-expert educators, offline functionality for areas with limited internet, and cost-effective pricing suitable for government and private schools.

10. Aerial Infrastructure Maintenance and Assessment System:

Objective: *"Deploy crane-mounted robots in partnership with drones for comprehensive infrastructure cleaning and health monitoring using AI-powered analytics."*

Background: Bharat's infrastructure maintenance challenges are massive, with bridges, buildings, and urban structures requiring regular inspection and cleaning. Traditional methods are labour-intensive, dangerous, and often ineffective for high-rise structures. With initiatives like the National Infrastructure Pipeline requiring ₹111 lakh crore investment, efficient maintenance systems are crucial for asset longevity and public Safety.

Solution Required: Develop a suspended robotic system that can be deployed from small mobile cranes and integrated with drone technology for comprehensive infrastructure assessment. The system must include high-resolution cameras and sensors for structural analysis, AI algorithms for crack detection and degradation assessment, cleaning mechanisms for various surface types, real-time data transmission capabilities, precise positioning, automated report generation with structural health recommendations, and compliance with Bharat's infrastructure safety standards.

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