



NEW HORIZON COLLEGE OF ENGINEERING
Silver Jubilee Year Celebrations - Smart Horizon: 48 Hour International Hackathon
Organized by,
Department of Artificial Intelligence and Machine Learning
and
Department of Computer Science and Engineering

| ID | Theme | Problem Title | Problem Description |
|------------|-----------------------------------|--|--|
| SH-AGR-001 | Agriculture and Rural Development | Autonomous Farm-to-Field Advisory & Action Orchestration Agents | <p>Small and mid-scale farmers (especially in rural, connectivity-limited regions) struggle with fragmented decision-making across irrigation, nutrients, pest/disease control, and market timing. Advice is often generic, late, and not localized to a farm's micro-climate, soil condition, or crop stage leading to avoidable yield loss, water waste, and higher input costs. Despite IoT and remote-sensing potential, farming workflows remain reactive and manual: data sits in silos (soil sensors, weather feeds, drone imagery, local market prices) with no system that can continuously monitor risk, generate an action plan, and coordinate execution (alerts, task schedules, input recommendations, escalation to agronomists) end-to-end.</p> <p>Challenge: Design a multi-agent AI system that ingests sensor + weather + imagery + market signals to autonomously: • Detect risks (water stress, disease/pest likelihood, nutrient gaps) early • Generate and adapt field action plans (what/when/where) with constraints (cost, safety, weather windows) • Trigger tasks/alerts, track completion, and escalate to experts only when needed</p> <p>Impact: Higher yields, lower input/water wastage, faster interventions, reduced expert workload, and improved farm profitability.</p> |
| SH-AGR-002 | Agriculture and Rural Development | Farmers face crop losses due to incorrect input selection, unsafe usage, and counterfeit products driven by unreliable advisory sources. A multilingual, voice-enabled AI system is needed to recommend verified products and guide safe purchase and application workflows. | <p>Multilingual Voice Copilot & Input Orchestration Agents for Trusted Farm-Input Purchase + Safe Usage Farmers frequently lose money and crop yield due to wrong input selection (seed/fertilizer/crop protection), unsafe or incorrect application, and counterfeit/sub-standard products sold through informal channels. Today's advisory is scattered across shopkeeper suggestions, WhatsApp forwards, and generic guidance making decisions inconsistent, non-localized, and risky. There is no intelligent system that can understand the farmer's situation via voice, verify what product is appropriate and authentic, and then orchestrate the full 'buy + apply safely + follow-up' workflow with clear, simple explanations in local languages.</p> <p>Challenge: Design a multi-agent Agentic AI + Generative AI system that: • Provides a Multilingual Voice Copilot (speech-to-text + text-to-speech) for farmers to ask natural questions (symptoms, crop stage, budget, location) and get simple, step-by-step guidance. • Uses Input Orchestration Agents to: identify the likely issue, recommend the correct intervention window, and generate a safe application plan (dosage, precautions, weather checks, re-application rules). • Includes product recommendations from your company's product catalog (approved inputs only), with ranked alternatives and why this product's reasoning. • Adds an authenticity + risk check flow (scan/enter batch/QR + packaging photo) and escalates to a human agronomist only when confidence is low or safety risk is high.</p> <p>Impact: Fewer failed interventions, safer input usage, reduced losses from counterfeit/sub-standard products, faster decisions through voice-first local language access, and higher conversion through compliant, context-aware recommendations of your company's products.</p> |
| SH-AGR-003 | Agriculture and Rural Development | A Vision-Based Autonomous System for Smart Farming | <p>Design and develop a cost-effective, vision-based autonomous rover for agricultural applications that can monitor crops, detect issues, and assist farmers in decision-making to improve yield and productivity. The solution must leverage computer vision and automation while ensuring affordability and scalability for small and medium-scale farmers. Teams must also present a viable unit economics model to demonstrate commercial feasibility.</p> |
| SH-AGR-004 | Agriculture and Rural Development | Crop Shift Mitigation App for Promoting Oilseed Farming | <p>Background Farmers are increasingly shifting from oilseeds to crops like paddy, sugarcane, and maize, attracted by assured procurement and price stability. Oilseeds are often relegated to marginal, rainfed areas, limiting expansion and perpetuating dependence on imports. This trend threatens the sustainability of India's edible oil self-sufficiency roadmap.</p> <p>Detailed Description The challenge is to develop a digital platform that uses predictive analytics and market intelligence to make oilseed cultivation more attractive. The system should provide comparative crop economics, highlight long-term profitability, and integrate access to government support schemes like NMEO-OS. It should also address risk factors such as weak procurement systems by offering assurance tools and linkages with Farmer Producer Organizations (FPOs).</p> <p>Expected Solution An application offering real-time price alerts, virtual profitability simulations, and access to schemes and subsidies. It should feature crop economics dashboards, weather-based advisories, and market linkages to enable informed decision-making. Gamification and incentive-based features can encourage farmers to maintain or expand oilseed acreage.</p> |

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| SH-AGR-005 | Agriculture and Rural Development | Real time Groundwater resource evaluation using DWLR data | <p>Background</p> <p>Groundwater is central to India's drinking, agricultural, and industrial water needs. Despite covering an area of 3.3 million square kilometers and being home to 16% of the global population, India has only 4% of the world's freshwater resources. This limited availability, combined with uneven distribution, overexploitation in some regions, and changing climate scenarios, highlights the urgent need for sustainable groundwater management. Resource knowledge is integral to the effective management of resources.</p> <p>Proposed Solution</p> <p>To strengthen groundwater management, it is proposed to design a mobile application that utilizes data from 5,260 DWLR (Digital Water Level Recorder) stations spread across the country. These stations provide high-frequency water level data, which can be leveraged to:</p> <ul style="list-style-type: none"> - Analyze real-time water level fluctuations - Estimate recharge dynamically - Evaluate groundwater resources in real time <p>Key Features</p> |
| SH-AGR-006 | Agriculture and Rural Development | Image based breed recognition for cattle and buffaloes of India | <p>Background</p> <p>The Government of India is implementing the Bharat Pashudhan App (BPA) for systematic data recording of breeding, health, and nutrition of dairy animals. Field Level Workers (FLWs) are responsible for capturing animal data on the ground. However, despite multiple training programs, a recurring issue is the incorrect identification and registration of animal breeds of cattle and buffaloes. This misclassification significantly affects the integrity and usability of the data for research, policy planning, and targeted interventions.</p> <p>Description</p> <p>Breed identification errors in BPA often arise due to manual judgment and lack of breed-specific awareness among FLWs. India, being home to a diverse array of indigenous and crossbred cattle and buffalo breeds, presents a complex challenge for accurate breed identification. Incorrect entries compromise the value of collected data and, in turn, impact the effectiveness of genetic improvement, nutrition planning, disease control, and overall program outcomes.</p> <p>To address this, an AI-driven solution that can identify the breed of an animal using its image can prove extremely valuable. By using image recognition and machine learning techniques, the software can standardize breed identification and minimize manual errors. If successfully developed and validated, such a system can be integrated with the BPA to act as a decision-support tool for FLWs during registration.</p> |
| SH-AGR-007 | Agriculture and Rural Development | Citizens lack a neutral, data-driven, and easy-to-understand way to evaluate the real-world performance of political parties. This absence of a standardized evaluation system leads to subjective opinions, misinformation, and reduced accountability in governance. | <p>Citizens often struggle to assess political performance objectively because information is scattered, biased, or too complex to interpret. A clear, neutral, evidence-based evaluation system is needed to help the public understand real-world governance outcomes over time.</p> <p>Use real time data</p> |
| SH-AGR-008 | Agriculture and Rural Development | Automated Early Detection of Crop Diseases & Pests in Agricultural Fields Using Drone Imagery | <p>In many developing countries, farmers face huge crop losses (20-40%) due to diseases and pests because detection happens too late. Traditional manual scouting is slow, expensive, and inaccurate. Drones can capture high-resolution RGB and multispectral images quickly, but processing these large volumes of images manually is extremely time-consuming. There is a lack of fast, accurate, and low-cost automated systems that can detect diseases at an early stage directly from drone images.</p> |
| SH-DST-01 | Defence & SpaceTech | Satellite operations rely heavily on manual anomaly detection and response, leading to delays, higher costs, and risks as constellations scale. An intelligent multi-agent AI system is needed to autonomously monitor telemetry, diagnose anomalies, and generate validated recovery actions with auditable runbooks. | <p>Autonomous Satellite Mission Ops & Anomaly Response Agents</p> <p>Modern satellite and constellation operations are telemetry-heavy, but teams still rely on manual triage for anomalies, health assessment, maneuver planning, and resource scheduling. This slows response during on-orbit events and increases operational cost as constellations scale.</p> <p>Rule-based automation is often brittle and struggles with novel conditions and cross-subsystem dependencies. What's missing is an agentic mission-ops layer that can monitor telemetry trends, detect anomalies, propose recovery procedures, validate against mission constraints, and produce auditable rationale/runbooks.</p> <p>Challenge:</p> <p>Design a multi-agent AI system that:</p> <ul style="list-style-type: none"> Continuously analyzes telemetry + event logs to detect and diagnose anomalies Generates recovery options, simulates/validates outcomes using digital-twin context Routes approvals safely, executes procedures, and produces operator-ready runbooks <p>Impact:</p> <p>Faster anomaly resolution, fewer missed early warnings, safer operations, and reduced cost per satellite.</p> |

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| SH-DST-02 | Defence & SpaceTech | Deep learning based ALM (Audio Language Model), which Listen, Think, and Understand the speech and non-speech Together. | <p>Background Humans Lives in a multifarious environment of audio signals that include speech and non-speech sounds. The ability to accurately discern, interpret, and integrate these speech and non-speech audio elements, along with a profound comprehension of the relationship between them, constitute fundamental cognitive capability of humans. However, most existing machine learning models recognize either speech or audio events. Further while being strong in audio and speech perception, these models possess limited reasoning and understanding capabilities. This motivate to build ALM Model which will be able to simultaneously recognize and jointly understand speech and audio together with reasoning.</p> <p>Description The ALM (Audio Language Model) is an audio understanding problem statement describes a situation where thereâ€™s a need to automatically extract meaningful information or context from audio. The core challenge involves overcoming limitations such as background noise, overlapping speech, speaker variation, and the complexity of identifying specific elements like dialogue, music, sound effect, local context of language spoken reason wise and cultural contextual meaning.</p> <p>What Audio understanding entails: Speech recognition: Converting Spoken language into text, good quality of solution available for this sub task independently. Non-Speech Audio Understanding: Identifying sounds other than speech such as music, alarms, or environmental noises etc. Speaker Diarization: Differentiating between different speakers in an audio recording. Paralinguistic: Recognizing aspects of speech like emotion, tone, and hesitation that are not part of the words themselves. Audio Event Detection: Classifying specific audio events, such as a car honking, a dog barking, aircraft sound, Fighter jet sound, or other industrial machine sound. By Solving all these task together model can understand spoken text, paralinguistic, and non-speech audio events simultaneously to answer complex questions about an entire audio scene?</p> <p>Dataset used for model training should belongs to Asian Regions (Mandarin, Urdu, Hindi, Telugu, Tamil, Bengali etc.) along with English language.</p> |
| SH-DST-03 | Defence & SpaceTech | To develop AI/ML based models to predict time-varying patterns of the error build up between uploaded and modelled values of both satellite clock and ephemeris parameters of navigation satellites | <p>Background The accuracy of Global Navigation Satellite Systems (GNSS) is fundamentally limited by errors in satellite clock biases and ephemeris (satellite orbit) predictions. These errors, if not accurately modeled and predicted, can lead to significant deviations in positioning and timing solutions. This challenge tasks participants with developing and applying generative Artificial Intelligence (AI) and Machine Learning (ML) methods to model and predict the differences between uploaded (broadcast) and ICD based modelled values. The goal is to produce highly accurate error predictions for future time intervals, enhancing the reliability and precision of GNSS applications.</p> <p>Detailed Description Participants will be provided with a seven-day dataset containing recorded clock and ephemeris errors between uploaded and modeled values from GNSS satellites in both GEO/GSO and MEO. The models must be capable of predicting these errors at 15-minute intervals for an eighth day that is not included in the training data. Evaluation will focus on the accuracy of these predictions over various validity periods: 15 minutes, 30 minutes, 1 hour, 2 hours, and up to 24 hours into the future from the last known data point. Competitors are encouraged to explore a wide range of generative AI/ML techniques, including but not limited to: Recurrent Neural Networks (RNNs), such as Long Short-Term Memory (LSTM) and Gated Recurrent Units (GRUs), for time-series forecasting. Generative Adversarial Networks (GANs) for synthesizing realistic error patterns. Transformers for capturing long-range dependencies in the data. Gaussian Processes for probabilistic modeling of errors.</p> <p>Expected Solution â€¢ Successful models will demonstrate robust performance across all prediction horizons and provide insights into the underlying dynamics of GNSS errors. â€¢ The error distribution from the proposed model will be evaluated in terms of closeness to the normal distribution. Closer the error distribution to the normal distribution, better will be the performance.</p> |
| SH-DST-04 | Defence & SpaceTech | LunaBot: Autonomous Navigation of Robot for Lunar Habitats | <p>Background With future lunar missions aiming for sustained human presence, autonomous robotic systems that ensure habitat safety and operational reliability are vital. Given the Moonâ€™s absence of GPS, challenging environments, constrained habitat spaces, and extreme conditions, robots must navigate autonomously and perform routine maintenance tasks to support astronauts and reduce human workload. ROS (Robot Operating System) enables modular development of robotics applications and is well-suited for prototyping autonomous navigation, mapping, and maintenance functionalities.</p> <p>Detailed Description Design and develop a ROS-based autonomous robot prototype capable of: Navigating indoor and outdoor lunar habitat environments. Mapping and localizing in constrained environments using sensor fusion (LIDAR, cameras, IMU). Detecting obstacles and hazards for safe path planning. Monitoring habitat environmental parameters (like temperature and O2 level, etc.) Demonstrating basic maintenance tasks such as routine patrol and alert signaling.</p> <p>Participants must develop algorithms and ROS packages for robust autonomous navigation combined with maintenance monitoring, validated in a simulation environment with modelled lunar habitat conditions.</p> |
| SH-DST-05 | Defence & SpaceTech | Manual search operations in disaster-hit, forested, or conflict-prone regions are slow and risky for personnel. There is a growing need for autonomous drones that can operate as a coordinated swarm, map regions, detect survivors, monitor activity, and relay intel without continuous human control. The challenge is to design an AI-driven swarm control system that can handle path planning, obstacle avoidance, task distribution, and secure data sharing, even in GPS-denied environments. | <p>Background Search, rescue, and reconnaissance missions in disaster-affected, forested, or hostile environments demand rapid response and continuous situational awareness. Traditional methods rely heavily on human teams navigating dangerous, inaccessible, or unpredictable terrains, which slows down rescue efforts and exposes personnel to significant risks. Single-drone operations, while helpful, are limited in coverage, endurance, and scalability.</p> <p>The proposed solution focuses on developing an Autonomous Drone Swarm System capable of operating collaboratively with minimal human intervention. Unlike single UAV systems, a swarm leverages multiple drones working together to achieve broader area coverage, faster mapping, and smarter decision-making. Each drone in the swarm will be equipped with sensors for visual, thermal, and environmental data collection. Using AI-driven algorithms, the swarm will coordinate tasks such as area scanning, survivor detection, threat identification, obstacle navigation, and dynamic region allocation. The system aims to operate reliably even in GPS-denied or communication-challenged environments by using alternative localization and mesh networking techniques.</p> <p>The solution's objective is to significantly improve mission efficiency, reduce response time, and enhance the safety of rescue teams. This autonomous swarm system can serve as a force multiplier for search and rescue agencies, disaster-response teams, and security forces, making operations faster, safer, and more intelligent.</p> |

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| SH-DST-06 | Defence & SpaceTech | India lacks a fully indigenous, modular turbojet platform for UAVs/UCAVs and loitering munitions, resulting in high dependency on imports, increased costs, and limited IP control. There is a need to develop a physics-driven, GTRE-validated, test-ready indigenous turbojet engine to support defence applications with cost efficiency and export potential. | >80-90% import dependency in 1-10 kN segment causes high costs (3-5x), delays, geopolitical risks, & no right-sized engines for Indian missions. Private capability near-zero. Fully indigenous, modular turbojet (physics-driven, GTRE-validated assembly, test-ready). Offers IP control, 3-5x lower costs, faster delivery, export potential. Indian defence (DRDO, HAL, GTRE, private OEMs like Tata/Adani) for UAVs/UCAVs/loitering munitions. ~\$1,000 Cr small turbine market over 20 yrs. Early EOLs from Aminuteman & Flying Wedge. |
| SH-FIN-01 | FinTech | Autonomous Financial Crime Investigation Agent | Financial institutions detect millions of fraud signals daily, but investigation workflows remain manual, slow, and expensive. Compliance teams must analyze contextual data, justify decisions to regulators, and manage large backlogs. Challenge: Build an autonomous investigation system composed of multiple agents that detect anomalies, gather contextual evidence, assess regulatory risk, generate audit-ready explanations, and recommend actions such as blocking, monitoring, or escalation. Impact: Faster investigations, reduced false positives, improved compliance readiness, and lower fraud losses. |
| SH-FIN-02 | FinTech | AI-Driven IT Operations Resilience & Incident Intelligence Platform | Enterprise IT environments are becoming increasingly complex due to hybrid infrastructure, distributed applications, and continuous deployments. Incident detection and root cause analysis still rely heavily on manual correlation, static thresholds, and reactive firefighting. This leads to prolonged outages, alert fatigue, and inconsistent service quality. The challenge is to build an AI-driven platform that continuously learns from logs, metrics, events, and past incidents to predict failures, identify probable root causes, and recommend corrective actions. The system should reduce noise, prioritize incidents based on business impact, and improve system resilience while integrating with existing ITSM and monitoring tools. |
| SH-FIN-03 | FinTech | AI-Powered Cloud Cost Optimization & Resource Intelligence Platform | Cloud adoption has shifted infrastructure costs from capital expense to variable operating expense, making cost control difficult. Many organizations lack visibility into inefficient resource usage, idle workloads, and misaligned capacity planning, resulting in unpredictable cloud spend. The challenge is to create an AI-powered platform that analyzes usage patterns, workload behavior, and business demand to forecast costs, recommend resource right-sizing, and automate optimization actions without impacting performance. The solution should provide actionable insights for engineering, finance, and leadership teams. |
| SH-FIN-04 | FinTech | Blockchain-Enabled Cross-Border Financial Tools: Implement smart contracts for seamless, low-fee remittances and multi-currency wallets that handle real-time conversions while ensuring compliance with international regulations (e.g., GDPR in Europe, RBI guidelines in India). Incorporate decentralized identity verification to reduce fraud in global gig marketplaces. | The blockchain-enabled cross-border financial tools component of the FinGuard platform is designed to address the unique challenges faced by gig economy workers who operate across international borders. These workers often deal with fluctuating currencies, high remittance fees from traditional banking systems, regulatory hurdles in different countries, and risks of fraud in decentralized gig marketplaces. By integrating blockchain technology, this tool aims to provide secure, efficient, and compliant financial solutions that empower users with greater control over their earnings. At its core, the system utilizes blockchain's decentralized ledger to enable seamless remittances and multi-currency management. Smart contractsâ€”self-executing code deployed on a blockchain network like Polygon or Ethereumâ€”automate the transfer process. For instance, when a gig worker in the US completes a task for a client in India, the smart contract can instantly verify the completion (via integrated APIs from gig platforms), convert the payment from USD to INR using real-time exchange rates, and transfer the funds with minimal fees. This is achieved through stablecoins (e.g., USDC for USD-pegged value or similar for other currencies), which maintain stability and reduce volatility risks associated with cryptocurrencies. Key features include: Low-Fee Remittances: Traditional cross-border transfers via banks or services like Western Union can charge 5-10% in fees and take days to process. Blockchain-based smart contracts cut this to under 1% by eliminating intermediaries, with transactions settling in seconds to minutes. Users initiate transfers directly from their app-integrated wallet, where the contract handles escrow (holding funds until conditions are met) to ensure trust. Multi-Currency Wallets with Real-Time Conversions: The wallet supports holding and transacting in multiple currencies simultaneously, such as USD, EUR, INR, or even local stablecoins. Real-time conversions are powered by oracles (e.g., Chainlink), which fetch live market data from reliable sources without compromising the blockchain's security. For example, if a freelancer earns in euros but needs to pay bills in rupees, the system automatically converts the exact amount needed at the current rate, minimizing exposure to exchange rate fluctuations. Compliance with International Regulations: To operate legally across jurisdictions, the tool embeds regulatory checks into the smart contracts. For GDPR in Europe, it emphasizes data privacy by using zero-knowledge proofs, allowing verification of user details (like age or residency) without storing or revealing personal information on the blockchain. In India, adherence to RBI guidelines involves mandatory KYC/AML (Know Your Customer/Anti-Money Laundering) protocols, such as integrating with Aadhaar for identity checks where permitted, and reporting suspicious activities. The system also supports FATF (Financial Action Task Force) standards for cross-border transfers, ensuring traceability while protecting user anonymity through pseudonymized addresses. Decentralized Identity Verification for Fraud Reduction: Fraud, such as fake client profiles or payment disputes in global gig platforms (e.g., Fiverr or local equivalents), is mitigated via Decentralized Identity (DID) verification. Smart cities rely on interconnected digital systems such as traffic management, public utilities, healthcare platforms, financial services, and citizen portals. While these systems improve efficiency and quality of life, they also significantly expand the cyber-attack surface, making cities vulnerable to data breaches, service disruptions, and critical infrastructure failures. The challenge is to design an AI-driven solution that can detect, prioritize, and visualize cyber risks across smart city digital assets using security telemetry, system logs, and behavioral data. Participants should build a minimum viable product (MVP) that: =>Ingests structured or semi-structured data (logs, alerts, asset metadata, user behavior). =>Uses AI/ML techniques to identify anomalies, potential threats, or risk patterns. =>Provides actionable insights such as risk scores, alerts, or dashboards for city administrators or security teams. =>Aligns with SDGs, particularly SDG 9 (Industry, Innovation & Infrastructure) and SDG 11 (Sustainable Cities & Communities). |
| SH-FIN-05 | FinTech | AI-Driven Cyber Risk Detection for Smart City Digital Infrastructure | Smart cities rely on interconnected digital systems such as traffic management, public utilities, healthcare platforms, financial services, and citizen portals. While these systems improve efficiency and quality of life, they also significantly expand the cyber-attack surface, making cities vulnerable to data breaches, service disruptions, and critical infrastructure failures. The challenge is to design an AI-driven solution that can detect, prioritize, and visualize cyber risks across smart city digital assets using security telemetry, system logs, and behavioral data. Participants should build a minimum viable product (MVP) that: =>Ingests structured or semi-structured data (logs, alerts, asset metadata, user behavior). =>Uses AI/ML techniques to identify anomalies, potential threats, or risk patterns. =>Provides actionable insights such as risk scores, alerts, or dashboards for city administrators or security teams. =>Aligns with SDGs, particularly SDG 9 (Industry, Innovation & Infrastructure) and SDG 11 (Sustainable Cities & Communities). |

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| SH-HLT-01 | Health Tech | Autonomous Care Coordination & Follow-Up Agent | <p>Healthcare providers worldwide struggle with fragmented care coordination, especially after patient discharge. Missed follow-ups, medication non-adherence, and delayed interventions lead to avoidable readmissions, increased costs, and poor patient outcomes.</p> <p>Despite electronic health records, care workflows remain reactive and heavily manual. There is no intelligent system continuously monitoring patient risk and autonomously coordinating follow-ups across stakeholders.</p> <p>Challenge: Design a multi-agent AI system that ingests EHRs, discharge summaries, prescriptions, lab schedules, and appointment data to autonomously coordinate post-discharge care. The system should identify high-risk patients, schedule follow-ups, send reminders, monitor adherence, and escalate to clinicians only when intervention is required.</p> <p>Impact: Reduced readmissions, improved patient outcomes, lower operational costs, and better utilization of clinical staff.</p> |
| SH-HLT-02 | Health Tech | An AI-Based Transformer for Real-Time Skin Disease Classification | <p>An AI-based real-time skin disease classification system is proposed to assist users in identifying common dermatological conditions using uploaded images or live camera input.</p> <p>The system will handle real-world variations such as lighting changes, camera quality differences, background noise, and multiple viewing angles.</p> <p>It will use advanced deep learning models like Vision Transformers or hybrid CNN-Transformer architectures to capture both global and fine-grained skin texture patterns.</p> <p>The model will output multi-class disease predictions with probabilistic confidence scores while managing uncertainty in ambiguous cases.</p> <p>This solution aims to improve early awareness, reduce delayed treatment, and act as a secure decision-support tool rather than a replacement for professional diagnosis.</p> |
| SH-HLT-03 | Health Tech | Intelligent Service & Maintenance Prediction for Scientific Instruments | <p>Biologic and analytical instruments are mission-critical assets for modern laboratories. Their reliability directly impacts research timelines, regulatory compliance, and operational costs. Lack of data-driven visibility into instrument health and performance, resulting in unplanned downtime, delayed experiments. Service requests are predominantly raised after an instrument failure occurs, leading to reactive maintenance and higher service costs. There is a need to transition from this reactive approach to a predictive and proactive maintenance model. The objective of this problem is to design an intelligent service and maintenance prediction solution. 1. Monitor and reflect near real-time instrument health, identify instruments at risk of failure, 2. Integrate seamlessly with the enterprise service management system, create a case, 3. Timely Order the consumables and parts for service 4. Recommend timely preventive maintenance actions.</p> |
| SH-HLT-04 | Health Tech | Test Management, ERP & Automation Integration | <p>Fragmented System Silos Three separate tools operate independently creating inefficiencies due to lack of system integration.</p> <p>Manual Data Reconciliation Testers manually review automation outputs and update test management tools, causing delays and errors.</p> <p>Limited Visibility and Delays Lack of real-time status updates impacts decision making and slows regression cycles.</p> <p>Impact on Productivity and Releases Administrative overhead reduces QA productivity and delays release timelines.</p> |
| SH-HLT-05 | Health Tech | AI-Enabled Early Cancer Detection, Misdiagnosis Prevention, and Screening Awareness System for Timely Intervention | <p>A major contributor to cancer-related mortality and family distress is late diagnosis, often caused not by lack of treatment, but by ignored early symptoms, repeated misdiagnosis, and delayed or missed screening. Many individuals, across urban and rural populations, seek medical attention multiple times before cancer is suspected, resulting in lost critical time and advanced-stage detection.</p> <p>Current healthcare systems lack a systematic, risk-aware, and symptom-driven mechanism that tracks symptoms over time, accounts for age and family history, and escalates screening recommendations when early warning signs persist. This gap is particularly severe in rural and underserved communities, where awareness is low, access to specialists is limited, and preventive screening is underutilized.</p> <p>There is an urgent need for a scalable, ethical, and explainable AI-based decision-support and awareness system that helps ensure early signs are not ignored, reduces misdiagnosis and diagnostic delays, and promotes mandatory or strongly recommended screening pathways for high-risk individuals while remaining accessible for everyday public use.</p> <p>Challenge: Design a proof-of-concept AI-enabled platform that:</p> <ol style="list-style-type: none"> Assesses cancer risk using age, family history, lifestyle, and known indicators Tracks symptoms longitudinally to identify persistence or escalation |
| SH-HLT-06 | Health Tech | AI-Powered Digital Twin for IT Infrastructure | <p>Business Problem: Leaders struggle to visualize the impact of infra changes before implementation (migrating on-prem workloads to cloud or KOB, AP repositioning etc). This problem becomes especially critical where the risks and dependencies multiply.</p> <p>AI Approach: Build a digital twin of Waters IT infrastructure using predictive analytics and simulation.</p> <p>Data Required: CMDB, monitoring data, network topology, workload metrics.</p> <p>Expected Outcome: Leaders can simulate "what-if" scenarios (ex. Cloud migration, network upgrades, outages) and see business impact before execution. Moves IT from reactive monitoring to strategic scenario planning.</p> |
| SH-HLT-07 | Health Tech | AI-Powered Application & Infra Optimization | <p>Business Problem: Current monitoring detects issues but doesn't auto-resolve anomalies or predict failures.</p> <p>AI Approach: Automated root cause analysis, anomaly detection, predictive analytics</p> <p>Data required: CPU, memory, packet loss data</p> <p>Expected Outcome: Auto remediation of CPU/memory spikes, predictive alerts for packet loss and connectivity issues</p> |

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| SH-HLT-08 | Health Tech | AI Tool for Early-Stage Dementia Detection | <p>Background Dementia often goes undiagnosed in early stages due to subtle cognitive decline, leading to late interventions and poorer outcomes.</p> <p>Description There is a need for a low-cost, accessible AI-based screening tool that analyses speech, behaviour, and cognitive patterns to detect early dementia signs.</p> <p>Expected Solution Students may design a mobile or web-based cognitive screening app with built-in AI analytics.</p> <p>A dementia detection system that: Assesses cognitive tasks, memory, and speech</p> |
| SH-HLT-09 | Health Tech | AI-Powered Mobile Platform for Democratizing Sports Talent Assessment | <p>Background Identifying and assessing athletic talent in a country as vast and diverse as India is a significant challenge. Aspiring athletes, particularly from rural and remote areas, often lack access to standardized assessment facilities or opportunities to showcase their talent. The absence of reliable and scalable talent assessment models hinders the discovery of potential athletes who could benefit from Government support. A set of standard fitness assessment tests - including height, weight, vertical jump, shuttle run, sit-ups, and endurance runs (Annexure A) - provides a scientific method to evaluate talent. However, the reach and implementation of such tests remain limited due to infrastructure constraints.</p> <p>Problem Description The Sports Authority of India (SAI) requires an innovative, mobile-based solution to democratize sports talent assessment. The proposed platform should:</p> <ol style="list-style-type: none"> 1. Enable athletes to download an app and record videos of their performance in the prescribed fitness assessment tests. 2. Use AI/ML-based on-device verification to analyze the recorded videos for accuracy and authenticity (e.g., detecting jump height, counting sit-ups, or measuring time/distance in runs). 3. Securely submit verified data to SAI servers for further evaluation and athlete profiling. 4. Be low-cost and lightweight, ensuring accessibility even on entry-level smartphones and low-bandwidth networks. <p>Innovative Features</p> <ol style="list-style-type: none"> 1. AI-based Cheat Detection: Identify anomalies or manipulations (e.g., tampered videos or incorrect movements) to ensure fair assessments. 2. Offline Video Analysis: Perform preliminary performance analysis directly on the device without requiring continuous internet connectivity. |
| SH-HLT-10 | Health Tech | Develop a blockchain-based system for botanical traceability of Ayurvedic herbs, including geo-tagging from the point of collection (farmers/wild collectors) to the final Ayurvedic formulation label. | <p>Background The Ayurvedic herbal supply chain in India is characterised by fragmented networks of smallholder farmers, wild collectors and multiple intermediaries, leading to challenges in ensuring consistent quality, authenticity and sustainable sourcing of medicinal plants. Variations in harvesting practices, environmental conditions and manual record-keeping introduce risks of mislabeling, adulteration and over-harvesting of vulnerable species, undermining consumer trust and compliance with regulatory standards. Geographic provenance is often undocumented or opaque, making it difficult for manufacturers and regulators to verify that herbs originate from approved regions or follow sustainable collection guidelines.</p> <p>A blockchain-based traceability system, augmented with geo-tagging technology, can address these gaps by creating an immutable, decentralised ledger that records every step of the herb's journeyâ€”from on-site GPS-tagged collection events through processing, testing and formulation. Smart contracts on a permissioned network (e.g., Hyperledger Fabric) can enforce sustainability criteria and automate quality validations, while IoT-enabled devices capture real-time location and environmental data at remote collection points, even via SMS-over-blockchain gateways where connectivity is sparse. By integrating FHIR-style metadata bundles (e.g., "CollectionEvent," "QualityTest," "ProcessingStep") and QR-code scanning at aggregation nodes, stakeholders gain end-to-end visibility, enabling rapid verification of provenance, streamlined certification for export and robust audit trails to support both biodiversity conservation and supply-chain efficiency. When herbs are formulated into finished products, unique, serialised QR codes generated by the blockchain platform could be affixed to each package. End customers scan these codes with a mobile app or web portalâ€”powered by the same blockchain ledgerâ€”to retrieve a FHIR-style provenance bundle detailing each upstream event: farm of origin, harvest conditions, intermediary custody, laboratory certificates and batch formulation parameters. This consumer-facing transparency not only verifies authenticity and builds trust, but also supports ethical marketing, enables rapid recall management and fosters incentives for sustainable collection practices by linking premium pricing to verified harvest data. Over time, analytics on consumer scans can feed back into</p> |
| SH-HLT-11 | Health Tech | Comprehensive Cloud-Based Practice Management & Nutrient Analysis Software for Ayurvedic Dietitians, Tailored for Ayurveda-Focused Diet Plans | <p>Background Currently, in Ayurvedic hospitals, diet charts are prescribed manually by doctors in handwritten form, tailored to each patient's needs. Existing software solutions primarily focus on macro- and micro-nutrient tracking but fail to align with Ayurvedic nutritional concepts. This gap creates inefficiencies, reduces accuracy, and makes it harder for practitioners to deliver holistic dietary care rooted in Ayurveda.</p> <p>Detailed Description The problem envisages the development of a dedicated Ayurvedic Diet Management Software designed to efficiently create, manage, and organize patient-specific diet charts with both accuracy and ease. Unlike conventional nutrition tools, the platform will integrate modern nutritional metrics with Ayurvedic dietary principlesâ€”such as caloric value, food properties (Hot/Cold, Easy/Difficult to digest), and the six tastes (Rasa).</p> <p>Expected Solution The proposed solution should provide an intuitive platform tailored for Ayurvedic dietitians, enabling quick food input, comprehensive nutrient tracking, and Ayurvedic dietary categorization.</p> <p>Key Features:</p> |

| ID | Theme | Problem Title | Problem Description |
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| SH-SVA-01 | Smart City, Vehicles and Automation | Autonomous Traffic Flow Optimization & Road-Safety Response Agents (V2X + Multi-Modal Signals) | <p>Urban corridors suffer from congestion, slow emergency response, and inconsistent road-safety enforcement because traffic operations rely on siloed signals (CCTV, signal timing plans, incident hotlines, weather feeds) and manual interventions leading to delayed clearance, secondary accidents, and avoidable emissions. What's missing is an agentic traffic-control system that interprets multi-modal inputs, generates safe intervention plans (signal timing changes, lane closures, emergency corridors), coordinates with responders, and produces explainable narratives for operators and public communication.</p> <p>Challenge: Design a multi-agent AI system that: • Detects incidents and predicts spillover impact using multi-modal signals • Proposes and validates interventions under safety and policy constraints • Coordinates responder actions and generates operator/public-ready explanations</p> <p>Impact: Reduced congestion and clearance times, fewer secondary incidents, improved emergency response, and lower emissions.</p> |
| SH-SVA-02 | Smart City, Vehicles and Automation | Commercial fleets suffer from downtime, inefficient dispatch, and compliance burdens due to disconnected vehicle, driver, and maintenance data systems. An intelligent multi-agent AI solution is needed to predict failures, automate maintenance and routing decisions, and generate compliance documentation autonomously. | <p>Autonomous Fleet Operations, Predictive Maintenance & Safety Compliance Agents Commercial fleets lose uptime due to preventable breakdowns, inefficient dispatch, delayed maintenance, and compliance documentation overhead. Vehicle health, driver behavior, route conditions, and workshop capacity exist but aren't unified into a system that can act autonomously and continuously. Most solutions provide analytics but don't close the loop. The missing capability is an agentic fleet ops layer that predicts failures, schedules maintenance, re-routes vehicles, coordinates parts procurement, and generates compliance artifacts using generative AI to convert events into explainable decisions and operator-ready instructions.</p> <p>Challenge: Design a multi-agent AI system that: • Predicts failure risk from telemetry + service history and schedules maintenance • Orchestrates dispatch/re-routing with capacity and SLA constraints • Auto-generates compliance docs (inspection summaries, incident narratives, audit trails)</p> <p>Impact: Higher fleet uptime, lower maintenance cost, faster operations, and improved regulatory readiness.</p> |
| SH-SVA-03 | Smart City, Vehicles and Automation | Urban infrastructure management is fragmented across departments, leading to delayed incident detection, inefficient response, and increased operational costs. A multi-agent AI system integrated with a city digital twin is needed to autonomously prioritize incidents, coordinate actions, and ensure timely, compliant resolution. | <p>City-Scale Infrastructure Maintenance & Incident Response Agents (Digital Twin + Multi-Agency Coordination) Cities face chronic delays in detecting, prioritizing, and resolving infrastructure issues (water leaks, road defects, public asset failures, station crowding, energy inefficiencies). Data exists across departments and vendors, but response is fragmented causing downtime, preventable risks, and inefficient spending. Most smart-city systems stop at dashboards and alerts. There is no autonomous system that can plan and coordinate actions across stakeholders work orders, crew allocation, scheduling, validation, and compliance-ready reporting while keeping humans in the loop for approvals and safety gates.</p> <p>Challenge: Design a multi-agent AI system on top of a city digital twin that can: • Detect and prioritize incidents with SLA, budget, and safety constraints • Generate work orders, allocate crews/vendors, and optimize schedules • Validate resolution (before/after signals), and auto-generate audit reports</p> <p>Impact: Faster incident resolution, reduced downtime and risk, improved service quality, and better budget utilization.</p> |
| SH-SVA-04 | Smart City, Vehicles and Automation | Advanced RAG Solution for Domain-Specific Document Intelligence. | <p>The existing RAG v1.0 system has exhibited significant limitations that are actively impeding user adoption and eroding trust in the platform. Most critically, users have reported multiple incidents where the system returned answers derived from outdated document versions, leading to decisions made on the basis of stale or incorrect information. The customer requires an advanced RAG solution capable of extracting precise, high fidelity insights from domain-specific document types.</p> |
| SH-SVA-05 | Smart City, Vehicles and Automation | Automated Book Reading System Using OCR and Text-to-Speech. | <p>Currently, individuals with visual impairments, literacy difficulties, or other reading challenges lack an accessible, affordable, and intelligent system that can autonomously read a physical book aloud while maintaining reading continuity and tracking progress. Design and develop an intelligent, automated book reading system for visually impaired people.</p> |

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| SH-SVA-06 | Smart City, Vehicles and Automation | Forecasting materials demand with machine learning for supply chain planning, procurement, and inventory optimization. | <p>Background POWERGRID is executing huge number of projects across India. These projects are of national importance. Delay in completion of projects must be avoided.</p> <p>Description The goal is to plan and predict goods and materials demand to help the business stay as profitable as possible. Based on various factors, a forecasting solution should provide the quantity of materials to be procured on a periodic basis to avoid project time and cost overruns.</p> <p>Key input factors include: Budget Upcoming project locations Tower types and sub-station types Geographic locations Taxes</p> |
| SH-SVA-07 | Smart City, Vehicles and Automation | Smart PPE Compliance Monitoring and Reporting System for Underground Coal Mines | <p>Background Ensuring that mine workers wear appropriate Personal Protective Equipment (PPE) before entering hazardous underground environments is a critical safety requirement in coal mining operations. Despite existing manual checks, inconsistencies in compliance and lack of real-time monitoring often lead to increased vulnerability to accidents and legal non-compliance. A digitally enabled, automated system for PPE verification can significantly improve mine safety standards and accountability, while reducing human error.</p> <p>Description The problem envisages the development of a smart, automated system to check whether each worker is equipped with all mandatory PPE, such as helmet, cap lamp, safety boots, reflective vest, gas detector, and self-rescuer, before entering underground coal mines. The solution must ensure real-time verification of PPE using technologies such as computer vision (AI-based cameras), RFID/NFC tags, or wearable sensors, integrated at access points to the mine.</p> <p>The system should be able to detect missing PPE, issue audio-visual alerts, and optionally deny entry to the non-compliant worker. It must also record individual worker-wise PPE compliance data to generate daily/monthly reports, analyze safety trends, and identify repeat offenders or regular safety practitioners. The platform should support dashboards for mine management and include notification modules (e.g., SMS/email/app-based alerts) to flag issues or appreciate safety champions.</p> <p>Expected Solution</p> |
| SH-SVA-08 | Smart City, Vehicles and Automation | In smart cities, pervasive urban noise silently harms public health and quality of life, yet current monitoring systems remain static and disconnected from real-time city operations. Develop an AI-powered, privacy-first crowdsourced acoustic platform that creates dynamic noise heatmaps, predicts hotspots, and autonomously triggers targeted interventions to build quieter, healthier urban environments. | <p>In bustling smart cities, the cacophony of urban noise—from construction sites, traffic horns, and nightlife—contributes to widespread health issues like stress, sleep disturbances, and hearing loss, affecting over 30% of city dwellers according to global health reports. Traditional noise monitoring relies on sparse, static sensors that fail to capture dynamic, hyper-local sound patterns or integrate with real-time urban systems. Challenge: Design an innovative, AI-driven acoustic mapping platform that leverages crowdsourced audio data from smartphones and IoT devices to create a real-time "noise heatmap" of the city. The system should predict noise hotspots using machine learning algorithms, automatically trigger interventions such as adaptive traffic rerouting, dynamic sound barriers (e.g., via smart signage or temporary zoning), or personalized alerts for vulnerable populations like the elderly or shift workers. Ensure privacy-preserving data collection, scalability for megacities, and integration with existing smart city APIs for sustainability metrics, such as correlating noise levels with air quality or energy consumption. Participants must prototype a minimum viable product (MVP) demonstrating data ingestion, predictive analytics, and at least one intervention mechanism, with bonus points for incorporating emerging tech like edge computing or blockchain for secure data sharing. The goal is to foster quieter, healthier urban environments while empowering citizens as active contributors to city well-being.</p> |