AURISTRA'26

PROBLEM STATEMENTS

SOFTWARE :

PS ID : TUAH4801S

Blockchain-Based Traceability for Organic Produce

Description:

Food supply chains often lack transparency, making it difficult for consumers to verify whether products labeled as organic are genuinely organic. Farmers, distributors, and retailers operate in disconnected systems, leading to data manipulation and lack of trust.

Case Study:

A blockchain-enabled platform records each stage of the agricultural supply chain, including cultivation, harvesting, transportation, storage, and retail delivery. Each transaction is immutable and verifiable through QR scanning. In a pilot cooperative network, farmers tagged produce with blockchain-enabled QR labels. Consumers scanning the label could view farm origin, certifications, and logistics details, resulting in increased consumer trust and higher product valuation.

PS ID : TUAH4802S

AI-Powered Pest and Disease Detection

Description:

Early identification of plant diseases is crucial to prevent large-scale crop damage. Farmers often rely on manual inspection, which delays detection and treatment.

Case Study:

A mobile-based AI system allows farmers to upload crop images for instant disease detection. The AI model identifies disease type, severity, and recommended treatment. In a regional pilot, early detection alerts reduced crop losses by 25% and improved productivity.

PS ID : TUAH4803S

Local Job & Skill Matching Platform

Description:

Many skilled workers in small towns struggle to find employment due to lack of verified skill representation and job visibility.

Case Study:

A digital platform conducts short skill assessments and verifies worker competencies. Employers can search verified candidates and post localized job opportunities. In deployment trials, thousands of workers secured employment locally, reducing urban migration.

PS ID : TUAH4804S

Digital Financial Literacy Assistant

Description:

A large segment of the population lacks awareness about budgeting, saving, and investment strategies, leading to financial instability.

Case Study:

A gamified mobile application teaches financial literacy concepts through challenges, expense tracking, and saving recommendations. Users who participated in pilot programs increased their monthly savings by measurable margins within three months.

PS ID : TUAH4805S

Personalized Learning Platform

Description:

Traditional learning systems provide the same curriculum pace for all students, ignoring individual learning speeds and styles.

Case Study:

An AI-driven adaptive learning system personalizes content delivery based on performance analytics, recommending targeted practice modules. Pilot results showed significant improvement in academic performance and retention rates.

PS ID : TUAH4806S

Hidden Academic Dropout Risk Detection System

Description:
Students often exhibit warning signs such as declining attendance or performance long before dropping out, yet institutions fail to detect them early.

Case Study:

A predictive analytics system analyzes attendance, grades, and engagement metrics to identify at-risk students and notify academic counselors. Institutions implementing the system reported reduced dropout rates due to early intervention.

PS ID : TUAH4807S

Smart Attendance System (QR / Face Recognition)

Description:
Manual attendance processes are inefficient and prone to proxy attendance.

Case Study:

An automated QR and face-recognition-based attendance system records attendance instantly and generates analytics dashboards for administrators. Pilot usage reduced manual workload and eliminated attendance fraud.

PS ID : TUAH4808S

Expense Tracking & Budget Management App

Description:
Individuals struggle to maintain consistent records of expenses, resulting in poor financial planning.

Case Study:

A mobile expense tracking app categorizes transactions automatically, generates spending reports, and provides budgeting insights. Early adopters improved spending awareness and savings discipline.

PS ID : TUAH4809S

Intelligent Campus Access Control Platform

Description:
Educational campuses require secure authentication systems for monitoring student and visitor entry.

Case Study:

A centralized access control platform integrates ID authentication, digital entry logs, anomaly detection, and real-time security alerts, improving campus safety and monitoring efficiency.

PS ID : TUAH4810S

Intelligent Hostel Complaint Management System

Description:
Hostel complaints are often tracked manually, causing delays and lack of accountability.

Case Study:

A complaint management system logs issues digitally, assigns priority levels automatically, and tracks resolution timelines transparently. Pilot deployments significantly reduced issue resolution time.

PS ID : TUAH4811S

AI-Based Interview Practice Platform

Description:
Candidates lack real interview experience and structured feedback mechanisms.

Case Study:

An AI-driven mock interview system evaluates responses, speech clarity, and confidence levels while providing improvement suggestions, helping candidates prepare effectively.

PS ID : TUAH4812S

Digital Skill Bridge for Women Entrepreneurs

Description:
Rural women entrepreneurs often lack digital resources and mentorship.

Case Study:

A voice-enabled AI platform offers business guidance, pricing assistance, and digital payment integration. Field deployments improved business participation and financial independence.

PS ID : TUAH4813S

AI-Based Career Compass

Description:
Students face difficulty choosing career paths aligned with emerging job markets.

Case Study:

An AI platform analyzes skills, personality traits, and industry trends to recommend career pathways. Institutions using the system reported improved training program enrollments.

PS ID : TUAH4814S

Real-Time Log Monitoring and Intrusion Detection

Description:
Organizations generate massive logs, making manual security monitoring impossible.

Case Study:

A real-time big-data pipeline processes log streams using anomaly detection algorithms and triggers alerts instantly, preventing cyber threats and system failures.

PS ID : TUAH4815S

Salary Benchmarking Tool

Description:
Employees often lack awareness of their market value and salary competitiveness.

Case Study:

A benchmarking tool compares salaries across industries, roles, and experience levels while providing negotiation insights, enabling informed career decisions.

PS ID : TUAH4816S

Blockchain-Based MSME Invoice Financing Platform

Description:
Small businesses face liquidity issues due to delayed invoice payments.

Case Study:

A blockchain-backed invoice financing system enables transparent invoice verification and discounting, improving access to working capital for MSMEs.

PS ID : TUAH4817S

Smart Travel Planner

Description:
Travel planning often requires manual research across multiple platforms.

Case Study:

An intelligent travel planner optimizes itineraries based on user preferences, budgets, and time constraints, delivering automated trip recommendations.

PS ID : TUAH4818S

Phish Hunter AI – Real-Time Scam Detection Platform

Description:
Phishing attacks are becoming increasingly sophisticated using AI-generated content.

Case Study:

An AI-powered system detects phishing emails, SMS, and malicious links in real time and explains risks using explainable AI, reducing successful scam attempts.

PS ID : TUAH4819S

Zero-Trust Personal Data Vault

Description:
Personal data stored across devices remains vulnerable to breaches.

Case Study:

A zero-trust vault encrypts files and grants access using behavioral authentication such as device usage patterns and typing behavior, ensuring high-level data protection.

PS ID : TUAH4820S

AI-Powered Intelligent Academic Timetable Optimization System

Description:

Academic timetables are often created manually or using basic software that only avoids scheduling conflicts. These systems ignore real-world constraints such as faculty workload balance, subject difficulty sequencing, classroom utilization efficiency, and last-minute changes. This leads to inefficient schedules, academic stress, and frequent manual corrections.

Case Study:

An AI-powered timetable system generates conflict-free schedules by analyzing faculty availability, subject difficulty levels, lab requirements, and classroom capacity. It prevents heavy subjects from being scheduled back-to-back, balances faculty workloads, and optimizes room usage. When a faculty member takes leave, the system automatically adjusts only the affected slots without disturbing the entire schedule, ensuring academic continuity and improved learning effectiveness.

PS ID : TUAH4801SI

Harnessing the Power of Student Innovation

Encouraging Young Minds to Develop Creative, Technology-Driven Solutions that Address Real-World Challenges, Foster Sustainable Development, and Shape a Smarter, More Connected Future.

HARDWARE:

PS ID : TUAH4801H

Drone-Based Pollution Source Locator

Problem Statement

Develop a drone-based system capable of identifying and triangulating the exact source of air pollution in industrial and urban zones instead of merely measuring air quality levels.

Description

Traditional AQI monitoring systems only indicate pollution levels without identifying the emission source. This drone integrates gas sensors, wind-direction analysis, and GPS mapping to detect pollutant concentration gradients and trace emissions to their origin using onboard edge processing.

Case Study

In an industrial region, frequent pollution complaints lacked actionable evidence. The drone conducted aerial grid scans and detected abnormal pollutant clusters. Wind vector analysis traced emissions to a specific exhaust source. Authorities used geotagged evidence to enforce compliance, reducing localized pollution significantly.

PS ID : TUAH4802H

Drone-Based Illegal Sand Mining Detection System

Problem Statement

Design an autonomous drone system to detect illegal sand mining activities in riverbeds using thermal imaging and geo-fencing.

Description

Illegal mining often occurs at night and across remote river stretches. The drone performs scheduled patrol flights, detects machinery heat signatures and excavation patterns, and sends real-time alerts with GPS coordinates to monitoring authorities.

Case Study

A monitored river zone deployed the drone for night surveillance. Within weeks, unauthorized activity detection improved response time drastically, reducing illegal mining operations and protecting river ecology.

PS ID : TUAH4803H

Cognitive Fatigue Detection & Regulation Wearable

Problem Statement

Students experience mental overload during long study sessions, but there is no real-time hardware tool to detect and regulate cognitive fatigue.

Description

The proposed wearable monitors physiological signals such as heart rate variability, skin conductance, and head posture to detect early cognitive fatigue. The system provides real-time vibration alerts, micro-break suggestions, and focus analytics.

Case Study

During exam preparation, students using the device showed improved focus consistency and reduced burnout. Adaptive break suggestions increased productivity without extending study hours.

PS ID : TUAH4804H

Smart Footstep Energy Harvesting Tile

Problem Statement

Design a flooring system that converts pedestrian footstep pressure into usable electrical energy in high-footfall public areas

Description

Using piezoelectric modules embedded inside floor tiles, the system captures kinetic energy and stores it for low-power lighting or charging applications.

Case Study

Installed in a transit corridor, prototype tiles powered LED signboards during peak footfall hours, demonstrating sustainable micro-energy generation.

PS ID : TUAH4805H

Adaptive Road Damage Detection Module

Problem Statement

Create a vehicle-mounted hardware device that automatically detects and maps potholes and road surface damage.

Description

Using accelerometers, gyroscopes, and vibration sensors, the device identifies abnormal shock signatures and classifies road condition severity in real time with GPS tagging.

Case Study

A city fleet pilot generated a digital pothole heatmap, enabling authorities to prioritize repairs and reduce road accident risks.

PS ID : TUAH4806H

Intelligent Wildlife Highway Alert System

Problem Statement

Develop a roadside detection system that identifies wildlife approaching highways and alerts drivers in real time.

Description

The system uses thermal imaging and motion sensors to detect animal movement near roads and activates dynamic warning signals powered by solar energy.

Case Study

Deployment near a forest-border highway reduced night-time wildlife collisions and improved road safety.

PS ID : TUAH4807H

Autonomous River Plastic Collector Bot

Problem Statement

Design a compact autonomous floating robot capable of detecting and collecting plastic waste from river surfaces.

Description

The bot navigates using obstacle sensors and identifies floating plastic debris for collection into an onboard storage unit.

Case Study

A pilot deployment collected measurable plastic waste from a canal within days, proving scalability for environmental restoration efforts.

PS ID : TUAH4808H

Smart Power Theft Detection Module

Problem Statement

Develop a hardware module that detects abnormal electricity consumption patterns indicating potential power theft.

Description

The device monitors current flow and compares it against expected consumption behavior models, flagging irregular patterns for inspection.

Case Study

Trial deployment in a semi-urban locality reduced distribution losses and improved revenue monitoring.

PS ID : TUAH4809H

Energy Harvesting Self-Powered IoT Node

Problem Statement

Design a battery-free sensor node that harvests environmental energy and operates autonomously for long-term deployment.

Description

Using solar or vibration energy harvesting modules, the node powers temperature and environmental sensors, transmitting data wirelessly without battery replacement.

Case Study

Installed in outdoor monitoring stations, the device demonstrated uninterrupted operation without maintenance costs.

PS ID : TUAH4810H

Smart Micro-Climate Personal Cooling Wearable

Problem Statement

Develop a wearable device that monitors body temperature and creates a localized cooling micro-environment for outdoor workers.

Description

The system detects body heat and environmental humidity and activates thermoelectric cooling or airflow modules dynamically to reduce heat stress.

Case Study

Field testing among outdoor workers showed improved endurance and reduced heat exhaustion symptoms during peak summer conditions.

PS ID : TUAH4811H

AI-Based Smart Construction Safety Helmet

Problem Statement

Develop a wearable smart helmet that detects falls, fatigue, and unsafe zone exposure in real time to prevent fatal accidents at construction sites.

Description

The helmet integrates impact sensors, motion tracking, GPS, and geo-fencing technology to continuously monitor worker safety. It detects sudden falls, abnormal head movement indicating fatigue, and entry into restricted areas, triggering instant alerts to supervisors through a wireless monitoring system.

Case Study

During pilot deployment at a multi-storey construction site, the smart helmet detected fall incidents immediately and reduced emergency response time. Fatigue alerts enabled better shift management, and geo-fencing warnings minimized restricted area violations, significantly improving overall site safety.

PS ID : TUAH4801HI

Empowering Hardware Innovation for Real-World Impact

Inspiring students to design intelligent, sensor-driven, and embedded hardware solutions that solve critical real-world problems, enhance sustainability, improve safety, and build smarter physical systems for a technologically advanced and resilient future.