

HACKATHON

PROBLEM STATEMENTS

80 Innovative Challenges Across 4 Themes

6-Hour Innovation Sprint

Theme 1: Intelligent Energy & Power Systems

Theme 2: Mobility, Charging & Sustainable Transport

Theme 3: Connected Infrastructure & Digital Networks

Theme 4: Industry 5.0 & Smart Automation

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Theme 1: Intelligent Energy & Power Systems

Innovative approaches to energy generation, conversion, storage, and distribution

E01

Smart Microgrid Load Balancer

Problem Statement:

Design an AI-powered dashboard that simulates real-time load balancing for a residential microgrid with solar panels, battery storage, and EV charging stations. The system should optimize energy distribution based on demand predictions and renewable availability.

Domains: AI/ML | Energy Systems | IoT

Expected Outcome: Working prototype with visualization showing load distribution and optimization decisions

E02

Predictive Solar Panel Maintenance

Problem Statement:

Build a machine learning model that analyzes weather data, panel age, and historical performance to predict solar panel degradation and maintenance needs. Create an alert system for optimal cleaning and repair scheduling.

Domains: Machine Learning | Renewable Energy | Predictive Analytics

Expected Outcome: ML model with web interface showing maintenance predictions and cost savings

E03

Household Energy Footprint Analyzer

Problem Statement:

Develop an application that uses smart meter data patterns to disaggregate total household energy consumption into individual appliance usage without requiring separate sensors. Provide personalized energy-saving recommendations.

Domains: Data Science | Consumer Tech | Sustainability

Expected Outcome: App prototype showing appliance-level breakdown and actionable insights

E04

Peer-to-Peer Energy Trading Platform

Problem Statement:

Create a blockchain-inspired ledger system for neighborhoods to trade excess solar energy. Design the matching algorithm, pricing mechanism, and user interface for prosumers to buy/sell energy locally.

Domains: Blockchain | Energy Markets | P2P Systems

Expected Outcome: Simulation platform with trading interface and transaction history

E05

Wind Farm Output Forecaster

Problem Statement:

Build a hybrid model combining weather APIs and historical turbine data to forecast wind farm output 24-48 hours ahead. Include uncertainty quantification for grid operators to plan reserve capacity.

Domains: Weather Analytics | Forecasting | Grid Management

Expected Outcome: Forecasting tool with confidence intervals and accuracy metrics

E06

Smart Battery Degradation Optimizer

Problem Statement:

Design an algorithm that optimizes charging/discharging cycles for lithium-ion batteries to maximize lifespan while meeting user energy needs. Consider temperature, depth of discharge, and charge rate impacts.

Domains: Battery Tech | Optimization | Embedded Systems

Expected Outcome: Simulation showing battery life extension under different strategies

E07

Industrial Energy Waste Detector

Problem Statement:

Create a system that analyzes industrial facility power consumption patterns to identify energy waste from idle equipment, inefficient processes, or equipment malfunction. Generate automated alerts and ROI calculations.

Domains: Industrial IoT | Anomaly Detection | Process Optimization

Expected Outcome: Dashboard identifying waste sources with potential savings calculations

E08

Dynamic Electricity Pricing Advisor

Problem Statement:

Build an app that tracks real-time electricity prices, forecasts price trends, and automatically schedules flexible loads (dishwasher, laundry, EV charging) to minimize bills while respecting user constraints.

Domains: Smart Home | Economics | Scheduling Algorithms

Expected Outcome: Working scheduler with cost comparison against baseline usage

E09

Campus Energy Digital Twin

Problem Statement:

Develop a simplified digital twin of a university campus that models energy flows between buildings, renewable sources, and storage. Allow users to simulate scenarios like adding solar panels or changing HVAC schedules.

Domains: Digital Twin | Simulation | Building Energy

Expected Outcome: Interactive 3D visualization with scenario comparison tools

E10

Power Outage Prediction System

Problem Statement:

Create a model that combines weather forecasts, historical outage data, and grid topology to predict outage risks by area. Help utilities pre-position crews and alert consumers to prepare backup power.

Domains: Predictive Analytics | GIS | Emergency Management

Expected Outcome: Risk map interface with outage probability scores and alerts

E11

EV Fleet Charging Optimizer

Problem Statement:

Design a scheduling system for a delivery company's electric vehicle fleet that optimizes charging times based on route schedules, electricity prices, grid capacity, and battery health constraints.

Domains: Fleet Management | Optimization | EV Technology

Expected Outcome: Scheduling interface with cost and time optimization metrics

E12

Renewable Energy Certificate Tracker

Problem Statement:

Build a transparent system for tracking renewable energy certificates from generation to retirement. Enable businesses to verify their green energy claims and consumers to validate sustainability reports.

Domains: Sustainability | Verification Systems | Data Integrity

Expected Outcome: Tracking platform with certificate lifecycle visualization

E13

Smart Grid Cyber Threat Detector

Problem Statement:

Develop an anomaly detection system for smart grid data that identifies potential cyber attacks by analyzing unusual patterns in meter readings, control signals, or communication traffic.

Domains: Cybersecurity | Anomaly Detection | Critical Infrastructure

Expected Outcome: Detection system with simulated attack scenarios and alert mechanisms

E14

Demand Response Gamification App

Problem Statement:

Create a gamified mobile app that incentivizes users to reduce energy consumption during peak hours through challenges, rewards, and social competition while educating them about grid stability.

Domains: Gamification | Behavioral Science | Mobile Development

Expected Outcome: Mobile app prototype with reward system and leaderboards

E15 Hybrid Energy System Optimizer

Problem Statement:

Build a tool that helps rural communities design optimal hybrid energy systems combining solar, wind, batteries, and diesel backup. Consider local weather, load profiles, and budget constraints.

Domains: System Design | Rural Electrification | Optimization

Expected Outcome: Configuration tool with cost-benefit analysis and reliability metrics

E16 Building HVAC Energy Optimizer

Problem Statement:

Design an AI system that learns building thermal dynamics and occupancy patterns to optimize HVAC settings for comfort and efficiency. Include override capabilities and comfort feedback loops.

Domains: Building Automation | Thermal Modeling | AI Control

Expected Outcome: Control algorithm demo with energy savings projections

E17 Solar Installation Site Scorer

Problem Statement:

Create an application that uses satellite imagery and GIS data to automatically assess rooftop solar potential, considering shading, orientation, available area, and local regulations.

Domains: Computer Vision | GIS | Solar Assessment

Expected Outcome: Scoring tool with detailed installation recommendations

E18 Energy Poverty Identifier

Problem Statement:

Develop a data-driven tool that identifies households at risk of energy poverty by analyzing consumption patterns, payment histories, and demographic data. Connect them with assistance programs.

Domains: Social Impact | Data Analytics | Public Policy

Expected Outcome: Risk scoring system with intervention recommendations

E19 Grid Frequency Stability Monitor

Problem Statement:

Build a real-time monitoring dashboard that tracks grid frequency deviations and correlates them with renewable generation, demand changes, and grid events. Provide early warning for stability issues.

Domains: Power Systems | Real-time Monitoring | Signal Processing

Expected Outcome: Live dashboard with frequency analysis and alert system

E20

Carbon-Aware Computing Scheduler

Problem Statement:

Design a job scheduler for data centers that delays non-urgent computational tasks to times when the grid's carbon intensity is lowest, reducing the carbon footprint of cloud computing.

Domains: Cloud Computing | Carbon Accounting | Job Scheduling

Expected Outcome: Scheduler prototype with carbon savings calculator

Theme 2: Mobility, Charging & Sustainable Transport

Rethinking mobility ecosystems, charging infrastructure, and transport sustainability

M01

Smart Parking with EV Charging Finder

Problem Statement:

Create an app that helps EV drivers find parking spots with available charging stations, showing real-time availability, charging speeds, pricing, and estimated wait times. Include reservation capability.

Domains: Mobile Apps | Real-time Data | Urban Mobility

Expected Outcome: Working app prototype with map interface and booking flow

M02

Last-Mile Delivery Route Optimizer

Problem Statement:

Build an algorithm that optimizes last-mile delivery routes for electric cargo bikes, considering battery range, package weight limits, traffic patterns, and delivery time windows.

Domains: Logistics | Route Optimization | E-mobility

Expected Outcome: Route planning tool with efficiency metrics and battery management

M03

EV Battery Second-Life Assessor

Problem Statement:

Develop a system that evaluates used EV batteries for second-life applications (home storage, grid support) by analyzing degradation data and predicting remaining useful life and optimal use cases.

Domains: Battery Analytics | Circular Economy | Predictive Modeling

Expected Outcome: Assessment tool with second-life recommendations and value estimates

M04

Multimodal Journey Carbon Calculator

Problem Statement:

Create a journey planner that compares transportation options (car, bus, train, bike, walk) by time, cost, and carbon footprint. Suggest optimal combinations and gamify sustainable choices.

Domains: Transportation Planning | Carbon Tracking | UX Design

Expected Outcome: Journey planner with environmental impact visualization

M05

Predictive Charging Station Maintenance

Problem Statement:

Design a system that monitors EV charging station health data to predict failures before they occur, minimizing downtime and improving user experience through proactive maintenance.

Domains: Predictive Maintenance | IoT | Service Reliability

Expected Outcome: Monitoring dashboard with failure predictions and maintenance alerts

M06

Fleet Electrification Decision Tool

Problem Statement:

Build a calculator that helps businesses decide which vehicles in their fleet to electrify first, considering routes, charging infrastructure costs, fuel savings, and environmental impact.

Domains: Fleet Management | Decision Support | TCO Analysis

Expected Outcome: Decision tool with ROI projections and implementation roadmap

M07

Dynamic EV Charging Price Optimizer

Problem Statement:

Create a pricing algorithm for charging station operators that balances demand, grid load, renewable availability, and competition to maximize utilization while keeping prices fair.

Domains: Pricing Algorithms | Market Economics | Grid Integration

Expected Outcome: Pricing simulator with demand response and revenue analysis

M08

Shared Mobility Demand Predictor

Problem Statement:

Develop a model that predicts demand for shared bikes, scooters, or cars by location and time, helping operators reposition vehicles proactively and reduce empty trips.

Domains: Demand Forecasting | Shared Mobility | Operations Research

Expected Outcome: Prediction model with repositioning recommendations

M09

EV Range Anxiety Reducer

Problem Statement:

Build an intelligent range calculator that considers driving style, weather, terrain, HVAC usage, and charging station availability to give EV drivers accurate, confidence-building range estimates.

Domains: User Experience | Predictive Analytics | EV Technology

Expected Outcome: Range estimator with personalized factors and charging recommendations

M10

Urban Freight Consolidation Planner

Problem Statement:

Design a platform where multiple retailers can consolidate deliveries to reduce truck trips in urban areas, optimizing pickup routes and shared delivery scheduling.

Domains: Urban Logistics | Collaborative Platforms | Emissions Reduction

Expected Outcome: Consolidation platform with efficiency and emissions metrics

M11

Bicycle Infrastructure Gap Analyzer

Problem Statement:

Create a tool that uses cycling app data, accident reports, and city maps to identify dangerous gaps in bicycle infrastructure and prioritize improvements for city planners.

Domains: Urban Planning | Data Analysis | Cycling Safety

Expected Outcome: Gap analysis tool with prioritized improvement recommendations

M12

Vehicle-to-Grid Participation Optimizer

Problem Statement:

Build a system that helps EV owners decide when to participate in vehicle-to-grid programs, balancing income from grid services against battery degradation and personal driving needs.

Domains: V2G Technology | Decision Optimization | Energy Markets

Expected Outcome: Participation advisor with earnings projections and battery impact analysis

M13

Accessible Transit Route Finder

Problem Statement:

Develop a journey planner specifically for users with mobility challenges, considering elevator availability, step-free access, ramp conditions, and real-time accessibility disruptions.

Domains: Accessibility | Transit Planning | Inclusive Design

Expected Outcome: Accessible route planner with real-time disruption alerts

M14

Sustainable Commute Incentive Platform

Problem Statement:

Create a corporate platform that tracks employee commute choices, rewards sustainable options with points/perks, and provides HR with aggregate sustainability reporting.

Domains: HR Tech | Gamification | Corporate Sustainability

Expected Outcome: Platform prototype with tracking, rewards, and analytics dashboards

M15

Smart Traffic Signal for Emergency EVs

Problem Statement:

Design a system that coordinates traffic signals to create green corridors for emergency electric vehicles, considering battery efficiency alongside response time optimization.

Domains: Traffic Systems | Emergency Services | Smart Cities

Expected Outcome: Simulation showing response time and energy improvements

M16

Public Transit Crowding Predictor

Problem Statement:

Build a model that predicts crowding levels on public transit routes, helping commuters choose less crowded options and operators plan service adjustments.

Domains: Transit Operations | Predictive Modeling | Passenger Experience

Expected Outcome: Crowding forecast interface with alternative route suggestions

M17

Electric School Bus Fleet Manager

Problem Statement:

Develop a management system for electric school bus fleets that optimizes routes, manages charging schedules around school hours, and provides real-time tracking for parents.

Domains: Education | Fleet Management | Parent Communication

Expected Outcome: Management dashboard with route optimization and parent app

M18

Cargo Bike Delivery Zone Optimizer

Problem Statement:

Create a tool for cities to design optimal cargo bike delivery zones, determining zone boundaries, micro-hub locations, and access policies to minimize van traffic in urban centers.

Domains: Urban Planning | Logistics | Policy Design

Expected Outcome: Zone planning tool with traffic impact projections

M19

Ride-Share Matching for Commuters

Problem Statement:

Build an algorithm that matches commuters with similar schedules and routes for ride-sharing, considering departure flexibility, detour tolerance, and user preferences for conversation/quiet.

Domains: Matching Algorithms | Social Computing | Commuter Solutions

Expected Outcome: Matching system with compatibility scoring and scheduling

M20

Charging Network Coverage Analyzer

Problem Statement:

Design a tool that identifies gaps in EV charging network coverage by analyzing road networks, traffic patterns, and existing stations. Recommend optimal locations for new installations.

Domains: Network Planning | GIS Analysis | Infrastructure Investment

Expected Outcome: Gap analysis with ranked site recommendations and coverage metrics

Theme 3: Connected Infrastructure & Digital Networks

Resilient and scalable infrastructure solutions for the connected world

I01

Smart Water Leak Detection Network

Problem Statement:

Design an IoT system using acoustic sensors and ML to detect water leaks in urban pipe networks. Create a dashboard showing leak probability, location estimates, and prioritized repair recommendations.

Domains: IoT | Acoustic Analysis | Utility Management

Expected Outcome: Detection system prototype with visualization and alert interface

I02

Bridge Health Monitoring Dashboard

Problem Statement:

Build a system that processes sensor data (vibration, strain, temperature) from bridges to assess structural health, detect anomalies, and schedule inspections based on condition-based criteria.

Domains: Structural Health | Sensor Networks | Asset Management

Expected Outcome: Health monitoring dashboard with anomaly alerts and inspection scheduler

I03

5G Network Slice Manager

Problem Statement:

Create a tool that helps network operators dynamically allocate 5G network slices based on application requirements, current demand, and SLA commitments across different service types.

Domains: 5G/Telecom | Resource Management | Network Slicing

Expected Outcome: Slice management interface with demand simulation

I04

Edge Computing Task Offloader

Problem Statement:

Design an algorithm that decides whether to process IoT data locally, at edge nodes, or in the cloud based on latency requirements, bandwidth costs, and computational complexity.

Domains: Edge Computing | Decision Algorithms | Distributed Systems

Expected Outcome: Offloading simulator with latency and cost comparisons

I05

Smart Streetlight Controller

Problem Statement:

Build a system that adaptively controls streetlight brightness based on pedestrian/vehicle presence, ambient light, weather conditions, and energy prices while ensuring safety standards.

Domains: Smart Cities | Energy Efficiency | Adaptive Control

Expected Outcome: Control system prototype with energy savings projections

I06

Fiber Network Fault Predictor

Problem Statement:

Develop a ML model that predicts fiber optic network faults by analyzing performance metrics, environmental data, and historical failure patterns to enable proactive maintenance.

Domains: Telecom | Predictive Maintenance | ML Operations

Expected Outcome: Prediction model with maintenance scheduling recommendations

I07

Underground Utility Mapping Tool

Problem Statement:

Create an application that crowdsources and consolidates underground utility data from multiple sources, helping construction crews avoid accidental damage during excavation.

Domains: GIS | Crowdsourcing | Construction Safety

Expected Outcome: Mapping interface with data integration from multiple utility providers

I08

Smart Bin Collection Optimizer

Problem Statement:

Design a system that uses fill-level sensors on waste bins to optimize collection routes, reducing unnecessary trips while ensuring bins don't overflow. Include dynamic route recalculation.

Domains: Waste Management | Route Optimization | IoT

Expected Outcome: Collection optimizer with route visualization and efficiency metrics

I09

Network Resilience Simulator

Problem Statement:

Build a simulation tool that tests infrastructure network resilience against various failure scenarios (cyber attacks, natural disasters, equipment failures) and suggests hardening priorities.

Domains: Network Security | Simulation | Risk Assessment

Expected Outcome: Resilience testing tool with vulnerability reports and mitigation suggestions

I10

Air Quality Monitoring Mesh

Problem Statement:

Create a low-cost mesh network of air quality sensors for urban areas, with data visualization, pollution source identification, and health advisory generation for affected zones.

Domains: Environmental Monitoring | Mesh Networks | Public Health

Expected Outcome: Monitoring dashboard with pollution maps and health advisories

I11

Digital Twin for Water Treatment

Problem Statement:

Develop a simplified digital twin of a water treatment plant that simulates process changes, predicts chemical consumption, and optimizes energy use while maintaining water quality standards.

Domains: Digital Twin | Process Control | Water Treatment

Expected Outcome: Interactive simulation with optimization recommendations

I12

Cellular Coverage Gap Finder

Problem Statement:

Build a tool that uses crowdsourced signal strength data to identify cellular coverage gaps and dead zones, helping carriers prioritize network investments and users find reliable spots.

Domains: Telecom Analytics | Crowdsourcing | Network Planning

Expected Outcome: Coverage mapping tool with gap analysis and investment prioritization

I13

Smart Parking Guidance System

Problem Statement:

Design a system that uses sensors or camera analytics to guide drivers to available parking spots in real-time, reducing circling time and associated emissions in parking structures.

Domains: Smart Parking | Computer Vision | Traffic Reduction

Expected Outcome: Guidance system prototype with availability display and navigation

I14

Remote Tower Monitoring System

Problem Statement:

Create a dashboard for monitoring remote telecom towers that integrates power status, equipment temperature, security alerts, and environmental conditions with predictive maintenance alerts.

Domains: Remote Monitoring | Telecom Infrastructure | Predictive Analytics

Expected Outcome: Unified monitoring dashboard with alert prioritization

I15

Smart Irrigation Controller

Problem Statement:

Design an intelligent irrigation system that uses soil moisture sensors, weather forecasts, and plant water requirements to optimize watering schedules, reducing water waste in parks and farms.

Domains: Agriculture Tech | Water Conservation | IoT

Expected Outcome: Irrigation controller with water savings projections

I16

Traffic Flow Anomaly Detector

Problem Statement:

Build a system that analyzes traffic camera feeds or sensor data to detect unusual traffic patterns (accidents, road work, events) and automatically adjusts signal timing or alerts authorities.

Domains: Traffic Management | Anomaly Detection | Computer Vision

Expected Outcome: Detection system with alert generation and response recommendations

I17

Satellite Imagery Change Detector

Problem Statement:

Create an automated system that compares satellite imagery over time to detect infrastructure changes (new construction, damage, encroachment) for utility companies and city planners.

Domains: Remote Sensing | Computer Vision | Change Detection

Expected Outcome: Change detection tool with classified alert categories

I18

IoT Device Security Scanner

Problem Statement:

Design a tool that scans IoT devices on a network, identifies vulnerabilities (default passwords, outdated firmware, open ports), and generates remediation recommendations.

Domains: Cybersecurity | IoT | Vulnerability Assessment

Expected Outcome: Scanner with vulnerability report and remediation guide

I19

Noise Pollution Monitoring Network

Problem Statement:

Build a network of noise sensors that maps urban noise levels, identifies sources, tracks patterns over time, and helps enforce noise ordinances and plan quieter neighborhoods.

Domains: Environmental Monitoring | Urban Planning | Sensor Networks

Expected Outcome: Noise mapping dashboard with source identification and trend analysis

I20

Power Line Vegetation Manager

Problem Statement:

Develop a system using drone imagery or satellite data to identify vegetation encroaching on power lines, prioritize trimming locations, and schedule maintenance crews efficiently.

Domains: Utility Management | Image Analysis | Asset Management

Expected Outcome: Vegetation analysis tool with prioritized trimming schedules

Theme 4: Industry 5.0 & Smart Automation

Human-centric automation and next-generation manufacturing technologies

A01

Collaborative Robot Task Allocator

Problem Statement:

Design an algorithm that dynamically assigns tasks between human workers and collaborative robots based on task complexity, worker fatigue levels, robot availability, and production priorities.

Domains: Human-Robot Collaboration | Task Scheduling | Manufacturing

Expected Outcome: Task allocation interface with efficiency and safety metrics

A02

Predictive Quality Control System

Problem Statement:

Build a system that uses sensor data from manufacturing equipment to predict product quality issues before they occur, enabling parameter adjustments to prevent defects.

Domains: Quality Assurance | Predictive Analytics | Process Control

Expected Outcome: Quality prediction dashboard with parameter adjustment recommendations

A03

AR-Guided Assembly Assistant

Problem Statement:

Create an augmented reality application that guides workers through complex assembly procedures, highlighting next steps, showing 3D part placement, and verifying correct completion.

Domains: Augmented Reality | Worker Training | Assembly Guidance

Expected Outcome: AR prototype demonstrating guided assembly workflow

A04

Factory Energy Consumption Optimizer

Problem Statement:

Design a system that coordinates production scheduling with energy management, shifting energy-intensive operations to off-peak hours while meeting production deadlines.

Domains: Production Planning | Energy Management | Optimization

Expected Outcome: Scheduling tool with energy cost and carbon savings projections

A05

Worker Ergonomics Monitor

Problem Statement:

Build a computer vision system that monitors worker postures and movements, identifies ergonomic risks, and provides real-time feedback to prevent repetitive strain injuries.

Domains: Occupational Health | Computer Vision | Worker Safety

Expected Outcome: Monitoring system with risk alerts and posture correction suggestions

A06

Digital Work Instructions Generator

Problem Statement:

Create a tool that automatically generates step-by-step digital work instructions from engineering documents, CAD models, or video recordings of expert workers performing tasks.

Domains: Knowledge Capture | Document Generation | Worker Training

Expected Outcome: Instruction generator with multimedia output capabilities

A07

Smart Tool Tracking System

Problem Statement:

Design a system that tracks tool locations, usage patterns, and condition in a factory, reducing search time, preventing loss, and scheduling maintenance based on actual use.

Domains: Asset Tracking | Tool Management | Operational Efficiency

Expected Outcome: Tracking dashboard with location maps and maintenance alerts

A08

Production Line Bottleneck Detector

Problem Statement:

Build an analytics tool that processes production data to identify bottlenecks in manufacturing lines, simulate improvement scenarios, and recommend capacity balancing strategies.

Domains: Production Analytics | Simulation | Process Improvement

Expected Outcome: Bottleneck analysis tool with improvement simulations

A09

Supplier Risk Assessment Dashboard

Problem Statement:

Create a dashboard that aggregates multiple data sources to assess supply chain risks, including supplier financial health, geopolitical factors, and historical delivery performance.

Domains: Supply Chain | Risk Management | Data Integration

Expected Outcome: Risk dashboard with early warning indicators and mitigation suggestions

A10

Machine Learning Defect Classifier

Problem Statement:

Develop an image classification system that automatically categorizes manufacturing defects from camera images, helping quality inspectors focus on ambiguous cases.

Domains: Computer Vision | Quality Inspection | ML Classification

Expected Outcome: Defect classifier with confidence scores and inspector interface

A11

Predictive Maintenance Scheduler

Problem Statement:

Design a system that combines equipment sensor data with production schedules to optimally time maintenance activities, minimizing both unexpected failures and unnecessary downtime.

Domains: Predictive Maintenance | Scheduling | Asset Management

Expected Outcome: Maintenance scheduler with downtime and cost optimization

A12

Worker Skill Gap Analyzer

Problem Statement:

Build a platform that assesses worker skills against job requirements, identifies training needs, and recommends personalized learning paths for Industry 4.0/5.0 capabilities.

Domains: HR Tech | Skills Assessment | Learning Management

Expected Outcome: Skills assessment tool with personalized training recommendations

A13

Sustainable Packaging Optimizer

Problem Statement:

Create a tool that suggests optimal packaging designs and materials to minimize waste, shipping volume, and environmental impact while ensuring product protection.

Domains: Packaging Design | Sustainability | Optimization

Expected Outcome: Packaging advisor with environmental impact comparisons

A14

Voice-Controlled Machine Interface

Problem Statement:

Design a voice interface for factory equipment that allows operators to query machine status, report issues, and access documentation hands-free while working.

Domains: Voice UI | Human-Machine Interface | Accessibility

Expected Outcome: Voice interface prototype with natural language command processing

A15

Production Carbon Footprint Tracker

Problem Statement:

Build a system that calculates real-time carbon footprint of production activities by tracking energy use, material consumption, and waste generation across manufacturing processes.

Domains: Carbon Accounting | Manufacturing Analytics | Sustainability

Expected Outcome: Carbon tracking dashboard with reduction opportunity identification

A16

Autonomous Mobile Robot Fleet Coordinator

Problem Statement:

Design a coordination system for multiple autonomous mobile robots in a warehouse, managing traffic, preventing collisions, optimizing routes, and handling dynamic obstacles.

Domains: Robotics | Multi-agent Systems | Warehouse Automation

Expected Outcome: Fleet coordinator with simulation and visualization

A17

Smart Safety Gear Monitor

Problem Statement:

Create an IoT system that monitors whether workers are wearing required safety gear in hazardous zones and alerts supervisors to compliance issues in real-time.

Domains: Workplace Safety | IoT | Compliance Monitoring

Expected Outcome: Safety monitoring system with zone-based compliance tracking

A18

Recipe Optimization for Process Industries

Problem Statement:

Build a system that optimizes manufacturing recipes (chemicals, food, pharmaceuticals) by analyzing historical batch data to identify parameter combinations that maximize yield and quality.

Domains: Process Optimization | Data Mining | Manufacturing Science

Expected Outcome: Recipe optimizer with yield improvement projections

A19

Remote Expert Assistance Platform

Problem Statement:

Design a platform that connects on-site technicians with remote experts through video, AR annotations, and shared sensor data to solve complex equipment problems without travel.

Domains: Remote Assistance | AR/VR | Expert Systems

Expected Outcome: Remote assistance prototype with annotation and data sharing

A20

Circular Economy Material Tracker

Problem Statement:

Create a system that tracks materials through the product lifecycle, enabling manufacturers to recover and reuse components, manage take-back programs, and report circularity metrics.

Domains: Circular Economy | Material Tracking | Sustainability Reporting

Expected Outcome: Material tracking platform with circularity dashboards

Summary Statistics

Category	Count
Theme 1: Intelligent Energy & Power Systems	20
Theme 2: Mobility, Charging & Sustainable Transport	20
Theme 3: Connected Infrastructure & Digital Networks	20
Theme 4: Industry 5.0 & Smart Automation	20
TOTAL PROBLEM STATEMENTS	80

Selection Guidelines for Participants

Each problem statement is designed to be achievable within the 6-hour hackathon timeframe. Teams should consider the following when selecting their challenge:

Team Expertise: Choose problems that align with your team's technical skills and domain knowledge.

Available Resources: Consider the tools, APIs, and data sources you can access during the event.

Scope Management: Focus on delivering a working prototype demonstrating core functionality rather than a complete product.

Innovation Focus: Prioritize creative approaches and novel solutions over polished interfaces.