SCHOOL OF ENGINEERING

DEPARTMENT OF INFORMATION AND TECHNOLOGY

HACKATTACK

IoT Challenge Board

From Vision to Reality

HEALTHCARE

A. Smart Hospital Asset Management

Problem: Inefficiencies in tracking and managing critical medical equipment lead to delays. These delays can increase costs associated with equipment usage and maintenance. Furthermore, the lack of proper management can result in equipment shortages or misplacement. This often disrupts hospital operations and workflow. Ultimately, these issues can negatively impact patient care and outcomes.

Solution: Implement IoT-enabled sensors (e.g., RFID, Bluetooth) to monitor the location and status of medical equipment. These sensors can also track maintenance schedules to ensure timely servicing. This technology enhances real-time visibility and helps optimize equipment management.

Impact: Enhances resource availability and reduces costs by preventing equipment loss. Ensures timely maintenance, minimizing downtime and maximizing equipment lifespan. Ultimately, this improves patient outcomes by ensuring critical equipment is always ready for use.

B. Monitoring Sleep Patterns for Improved Health

Problem: Sleep disorders significantly impact overall health, leading to issues such as fatigue, reduced cognitive function, and increased risk of chronic conditions like heart disease and diabetes. However, these disorders are often underdiagnosed because there is limited tracking and insights into sleep patterns. Without proper monitoring tools, many symptoms go unnoticed, and early interventions are missed. This lack of comprehensive tracking prevents healthcare providers from making accurate diagnoses and offering timely treatments.

Solution: IoT-based wearable or non-wearable devices can monitor sleep metrics like heart rate, respiratory rate, and movement in real-time. This continuous data collection helps detect abnormalities, such as sleep apnea or irregular heart rhythms. By analyzing this data, sleep disorders can be identified early, leading to more accurate diagnoses and timely interventions. Personalized treatment plans can be created based on the individual's sleep patterns.

Impact: Providing real-time insights allows for continuous monitoring of health metrics, enabling healthcare providers to identify potential issues as they occur. This immediate data access facilitates early intervention, allowing for quicker responses to any irregularities or abnormalities. With accurate,

real-time information, treatment can be personalized to address the specific needs and conditions of the individual. By tailoring interventions based on data, healthcare providers can improve the effectiveness of treatments and help prevent more serious health issues from developing.

DIGITAL EDUCATION

A. Tracking Student Movement for Safety

Problem: Ensuring student safety on large campuses is challenging due to the size and complexity of the environment. In emergencies like medical incidents or natural disasters, quickly identifying student locations and responding can be difficult. Unauthorized movements, such as wandering into restricted areas, also pose safety risks. Effective tracking and real-time alerts are essential to protect students and enable swift responses.

Solution: IoT-enabled badges or wearables, such as RFID or GPS devices, can track student locations in real-time across large campuses. These devices send continuous data to a central system, allowing staff to monitor movement and quickly respond during emergencies. The system helps pinpoint students' locations and sends alerts to staff, ensuring swift action. It also helps monitor unauthorized movements, enhancing overall campus safety.

Impact: IoT-enabled tracking systems enhance security by monitoring student locations and ensuring they stay within designated areas. In emergencies, these systems improve response times with real-time data, enabling quick action. This provides peace of mind to parents, knowing their child is safe, and helps staff respond more effectively, creating a safer campus environment.

B. Data-Driven Resource Allocation

Problem : Schools struggle with inefficient allocation of educational resources due to the lack of data on student engagement and performance. Without insights into how students interact with lessons or their understanding of key concepts, it's challenging to adjust teaching methods. This leads to ineffective use of resources, as some students may not receive the support they need, affecting their overall learning out comes..

Solution: IoT-enabled devices track the usage of textbooks, digital tools, and classroom activities, providing real-time data on how resources are used. This data helps educators understand which tools

are most effective, where students need more support, and which resources are underutilized. By analyzing this information, schools can optimize resource allocation for better learning outcomes and informed decision-making..

Impact: Optimizing resource allocation ensures that educational tools and materials are used where they are most needed, improving efficiency. Personalized learning is enhanced by tailoring resources to meet individual student needs. This approach leads to better student outcomes by providing targeted support and improving academic performance.

FINTECH

A. Real-Time Transaction Monitoring

Problem: Security concerns in touchless IoT-enabled payment systems include vulnerabilities in NFC, RFID, and Bluetooth, which can be exploited for hacking or data interception. Fraud risks such as skimming and unauthorized access can expose personal information, leading to identity theft. To address these risks, robust security measures like encryption, two-factor authentication, and monitoring are necessary for safe transactions.

Solution: Smart POS systems, RFID sensors, and real-time analytics enhance security by monitoring transactions and detecting fraud. POS systems ensure secure payments, RFID sensors track payment devices, and analytics identify suspicious activity. This integrated approach helps detect fraud quickly and protect both businesses and customers.

Impact: Smart POS systems, RFID sensors, and real-time analytics ensure secure transactions, detect fraud, and streamline inventory management. They enhance customer experiences by enabling faster transactions and personalized services, boosting satisfaction and loyalty.

B. Personalized Banking Services

Problem: A lack of tailored banking experiences causes customers to feel disconnected and underserved. When services aren't personalized to meet individual needs, satisfaction decreases, and customers may seek alternatives. This leads to reduced engagement and potential loss of business. Personalized banking, such as customized products and proactive support, strengthens relationships and boosts customer loyalty.

Solution: AI-driven IoT solutions help banks personalize financial products by analyzing customer data from IoT devices. This enables tailored offers like loans, savings plans, and investment advice, while predicting future needs for proactive recommendations. It enhances customer satisfaction and engagement.

Impact: Bespoke financial solutions through AI-driven IoT technologies enhance customer loyalty, satisfaction, and retention by addressing individual needs. Personalized recommendations, like tailored loans or savings plans, make customers feel valued and strengthen trust. This leads to higher engagement, long-term loyalty, and improved retention rates.

SMART CITY PLANNING

A. Smart Energy Management

Problem: Rising energy demands and costs make it crucial to monitor and optimize energy use efficiently. Without proper tracking, excessive consumption leads to higher costs and environmental impact. Using smart technologies like IoT sensors and AI, energy consumption can be monitored in real-time, enabling better decision-making, cost reduction, and sustainable energy usage.

Solution: IoT sensors and smart meters enable real-time tracking of energy usage, providing detailed insights into consumption patterns. These devices can automate energy-saving actions, such as adjusting lighting or heating during off-peak times. This optimization reduces energy waste, lowers costs, and promotes sustainable practices.

Impact: Reducing energy costs is achieved through real-time monitoring and automation, optimizing energy use and minimizing waste. This enhances efficiency by ensuring energy is only consumed when needed. It also promotes sustainability by lowering consumption, reducing carbon footprints, and supporting environmental goals.

B. Smart Waste Management

Problem: Inefficient waste collection leads to pollution by allowing waste to accumulate in public spaces, contaminating soil, water, and air. It also poses health risks by attracting pests and spreading diseases. Furthermore, disorganized systems increase operational costs, requiring more labor, fuel, and resources, putting additional financial strain on local governments and organizations.

Solution: Installing IoT sensors in bins allows real-time monitoring of fill levels, enabling waste management systems to optimize collection routes. This reduces unnecessary trips, saving fuel and costs, while preventing overflowing bins and improving sanitation. It leads to more efficient waste collection and promotes sustainable practices.

Impact: Improving city cleanliness is achieved by preventing overflowing bins and ensuring timely waste collection, reducing pollution and health risks. Reducing collection costs comes from optimizing routes, cutting unnecessary trips, and saving fuel. It also promotes sustainability by lowering emissions and improving resource efficiency, making cities cleaner and more eco -friendly.

AGRI-INNOVATE

A. IoT-Enabled Smart Agriculture

Problem: Farmers face challenges in managing resources due to unpredictable environmental factors like sudden weather changes, droughts, or floods. These conditions can lead to crop damage, inefficient use of water, fertilizers, and pesticides, and disrupt planting or harvesting schedules. Without accurate data, farmers may waste resources or incur higher costs, affecting yields and profitability. Advanced tools are needed to help farmers optimize resource use and adapt to changing conditions.

Solution: Deploying IoT sensors enables real-time monitoring of soil moisture, temperature, and weather conditions, allowing farmers to optimize resource use. These sensors help manage irrigation, prevent overwatering, and predict weather-related risks like frost. By using accurate, real-time data, farmers can reduce waste, improve crop yields, and increase efficiency.

Impact: IoT sensors increase crop yields by ensuring optimal conditions for water, nutrients, and care. This reduces resource waste by preventing over-irrigation and excessive chemical use. The approach lowers costs, minimizes environmental impact, and promotes sustainability through water conservation, reduced runoff, and improved soil health.

B. Real-Time Agricultural Monitoring

Problem: Lack of real-time insights prevents farmers from quickly identifying and addressing crop issues, such as pests or nutrient deficiencies. Without immediate data,

problems may worsen, leading to higher costs and potential crop loss. Real-time insights help farmers act promptly, improving crop management and outcomes.

Solution: IoT sensors collect real-time data on crop health, soil moisture, temperature, and weather, offering insights into environmental conditions. This allows farmers to make precise decisions on irrigation and fertilization, optimizing resource use. By reducing water and fertilizer waste, this approach boosts crop yields, lowers costs, and supports sustainable farming practices.

Impact: IoT sensors boost productivity by providing real-time data for better irrigation and fertilization decisions, leading to higher crop yields. They reduce costs by minimizing waste and optimizing resource use. This approach supports efficient farming practices, improving sustainability and profitability.

IDEA FLEX

A. IoT-Enhanced Traffic Management

Problem: Urban traffic congestion causes delays, frustration, and increased fuel consumption. It leads to higher pollution levels, contributing to poor air quality and health issues. Additionally, congestion strains city infrastructure, reducing overall quality of life. Effective traffic management solutions are needed to alleviate these problems.

Solution: IoT sensors at intersections monitor traffic flow in real-time, adjusting signal timings to optimize traffic movement and reduce delays. These sensors also provide real-time updates to drivers, helping them avoid congestion and find alternative routes. This improves traffic efficiency, lowers fuel consumption, and reduces pollution..

Impact: IoT sensors reduce commute times by optimizing traffic flow, leading to less congestion and smoother travel. This lowers fuel consumption and emissions, contributing to cleaner air and reduced pollution. By improving traffic efficiency, it supports urban sustainability, conserving energy and promoting eco-friendly transportation.

B. Scalable Business Solutions

Problem: Businesses struggle to adapt to market changes due to slow response times and inefficient inventory management. This leads to stock outs, overstocking, and missed sales, causing wasted resources and higher costs. Real-time inventory management systems can help optimize stock levels, improve responsiveness, and meet customer demands more effectively.

Solution: iot-integrated systems with Idea Flex allow businesses to track inventory in real-time and predict demand by analysing trends and consumer behavior. This dynamic forecasting helps optimize stock levels, reducing overstocking and stock outs. The integration streamlines inventory management, improves efficiency, and aligns stock with actual demand, enhancing cost savings and customer satisfaction.

Impact: Improves operational efficiency, reduces costs, and enhances customer satisfaction.