



Company Information

Company Name	<i>Honeywell International Inc.</i>	Date Submitted	<i>11/06/2025</i>
Project Title	<i>AI-Powered Scene Analysis for Enhanced Safety and Operational Efficiency (HONEYWELL_SCENE)</i>	Planned Starting Semester	<i>Spring 2026</i>

Senior Design Project Description

Personnel

Typical teams will have 4-6 students, with engineering disciplines assigned based on the anticipated Scope of the Project.

Please provide your estimate of staffing in the table below. The Senior Design Committee will adjust as appropriate based on scope and discipline skills.

Discipline	Number	Discipline	Number
Mechanical		Electrical	
Computer	4-6	Systems	

Company and Project Overview:

Honeywell helps organizations solve the world's most complex challenges in automation, the future of aviation and energy transition. As a trusted partner, we provide actionable solutions and innovation through our Aerospace Technologies, Building Automation, Energy and Sustainability Solutions, and Industrial Automation business segments – powered by our Honeywell Forge software – that help make the world smarter, safer and more sustainable.

This outlines a project to develop and implement an advanced AI-powered scene analysis system for various commercial domains, including retail, warehouses, hospitality, and distribution centers. The system will leverage computer vision and artificial intelligence to monitor and analyze real-time video feeds, identifying potential safety hazards, optimizing worker traffic, detecting obstructions, monitoring equipment for faults, and assessing environmental conditions. By providing actionable insights and real-time alerts, this technology aims to create safer, more efficient, and more productive environments. This initiative represents a shift from reactive to proactive safety and operational management, utilizing cutting-edge technology to prevent incidents before they occur.



Project Requirements:

Objective:

The primary objective of this project is to significantly enhance safety and operational efficiency across the target domains by deploying a comprehensive AI-driven scene analysis solution. The system will be designed to:

- Proactively Identify and Mitigate Safety Risks: Automatically detect and alert staff to potential hazards such as slips, trips, falls, blocked emergency exits, and improper use of personal protective equipment (PPE).
- Optimize Worker and Traffic Flow: Analyze the movement of people and equipment to identify bottlenecks, optimize routes, and reduce congestion, thereby improving productivity and reducing the risk of collisions.
- Ensure Clear and Safe Pathways: Detect and flag objects obstructing walkways, aisles, and operational areas to prevent accidents and ensure smooth workflow.
- Enable Predictive Maintenance: Monitor machinery and equipment for early signs of malfunction or abnormalities through visual and auditory analysis, allowing for timely maintenance and preventing costly breakdowns.
- Monitor and Manage Environmental Conditions: Assess environmental factors such as lighting, temperature, and air quality to ensure a safe and comfortable working environment.

Key Components:

- Intelligent Video Surveillance Network: A network of high-resolution cameras, potentially including thermal and depth-sensing cameras, strategically placed throughout the facilities to capture comprehensive visual data.
- AI and Computer Vision Engine: A powerful processing engine that utilizes advanced machine learning algorithms and deep neural networks to analyze video streams in real-time. This engine will be trained to recognize a wide array of objects, human behaviors, and environmental conditions specific to each domain.
- Real-Time Alerting and Notification System: An automated system that generates instant alerts and notifications to relevant personnel via mobile devices, dashboards, or integrated communication systems when a potential issue is detected.
- Data Analytics and Reporting Dashboard: A user-friendly dashboard that provides visualizations, historical data analysis, and actionable insights into safety trends, operational inefficiencies, and recurring issues. This will enable data-driven decision-making for continuous improvement.
- Integration with Existing Systems: The capability to integrate with existing business systems such as Warehouse Management Systems (WMS), building management systems, and incident reporting software to create a unified operational view.

Technical Aspects:

The core of the system will be a scalable and robust AI platform capable of processing multiple video streams simultaneously. This will involve:



- Computer Vision Algorithms: Utilizing state-of-the-art algorithms for object detection, tracking, and classification, as well as activity recognition and anomaly detection.
- Machine Learning Models: Training and deploying custom machine learning models tailored to the specific environmental and operational characteristics of each domain. These models will be continuously refined through ongoing learning.
- Sensor Fusion (Optional): In more advanced deployments, data from other sensors (e.g., LiDAR, acoustic sensors, temperature sensors) can be fused with video data to provide a more comprehensive and accurate analysis of the environment.
- Cloud and Edge Computing: A hybrid computing architecture will be employed, with edge devices performing initial processing to reduce latency and bandwidth usage, and cloud-based systems handling more complex analysis and data storage.

Expected Deliverables/Results:

- Reduction in Workplace Accidents and Injuries: Proactive hazard identification and real-time alerts will lead to a significant decrease in workplace incidents.
- Improved Operational Efficiency and Productivity: Optimized workflows, reduced equipment downtime, and more efficient use of space will lead to increased productivity and throughput.
- Enhanced Situational Awareness: A comprehensive and real-time understanding of the operational environment will empower managers to make more informed and timely decisions.
- Lower Operational Costs: Reduced accidents, predictive maintenance, and improved efficiency will contribute to significant cost savings.
- Strengthened Safety Culture: The implementation of a continuous and automated monitoring system will foster a stronger culture of safety and compliance among employees.
- Improved Sustainability: In domains like hospitality, AI-driven analysis can optimize energy consumption and waste management, contributing to sustainability goals.

Disposition of Deliverables at the End of the Project:

Students are graded based on their display and presentation of their team's work product. It is mandatory that they exhibit at the Expo, so if the work product was tested at the supporter's location, it must be returned to campus for the Expo. After the expo, the team and supporter should arrange the handover of the work product to the industry supporter. This handover must be concluded within 7 days of the Expo.

List here any specific skills, requirements, specific courses, knowledge needed or suggested (If none please state none):

- Interest in AI and Machine learning

