INTELLICODE AI PORTFOLIO

Presented by

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1. Vehicle Speed Detection and Violation Enforcement

Problem Statement:

Enforcing speed limits in urban and highway settings is a major challenge for traffic departments. With limited resources for manual monitoring, many violations go undetected, leading to dangerous driving conditions and accidents. Moreover, the process of issuing penalties often involves manual verification, which is time-consuming.

Solution:

The AI-based speed detection system continuously monitors vehicle speeds and captures images of any violator along with their license plate. The system logs speed violations automatically and issues penalties without manual intervention.

Real Industry Issues Solved:

- Lack of Resources for Monitoring: By automating speed detection and violation enforcement, traffic authorities can enforce speed limits effectively with minimal human oversight.
- Delayed Penalty Issuance: The system instantly identifies violators and issues penalties, reducing delays and increasing compliance.
- Road Safety: Proactive speed enforcement reduces accidents by deterring drivers from exceeding speed limits.

Objective: Monitor and enforce speed limits by detecting violations and automatically issuing penalties.

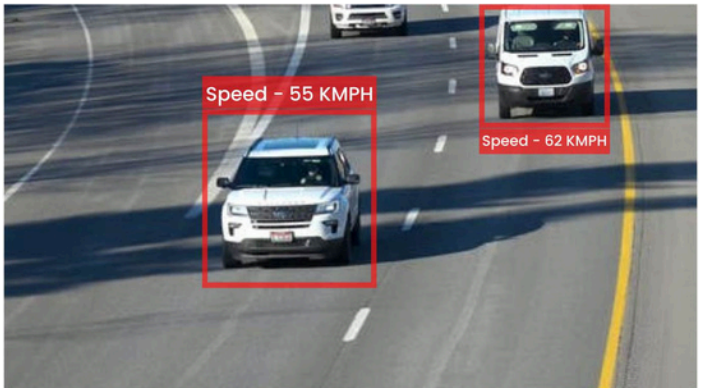
Technologies Used:

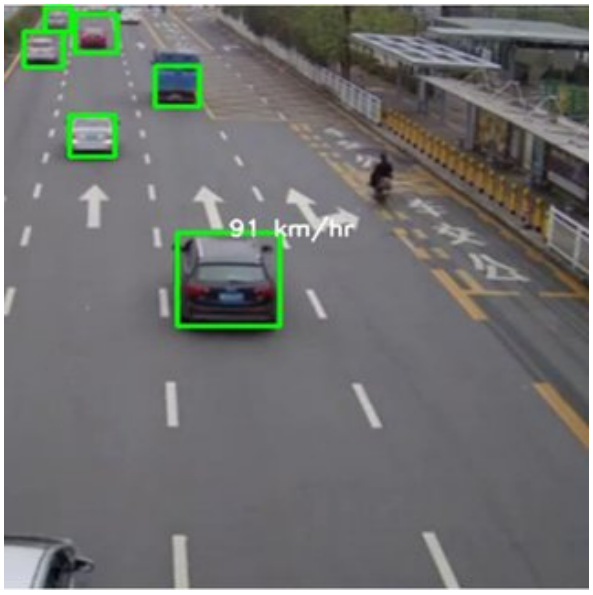
- Speed Detection Algorithms: Measures vehicle speeds.
- License Plate Recognition (LPR): Captures and identifies violators' vehicle numbers.

Features:

- Violation Detection: Automatically detects when a vehicle exceeds speed limits.
- Image Capture: Captures vehicle images and license plates of violators.
- Penalty Automation: Logs violations and generates penalties.

Outcome: Improves road safety by reducing manual monitoring and ensuring compliance with speed limits.





2. Document Scanning and Information Extraction

Problem Statement:

Manually extracting and entering data from physical documents is time-consuming and prone to errors. This creates inefficiencies in industries that rely heavily on documentation, such as banking, insurance, and government services.

Solution:

The Document Scanning System uses Optical Character Recognition (OCR) to automatically scan and extract key details (name, address, image) from documents.

Real Industry Issues Solved:

- Manual Data Entry: Automation reduces the time and errors associated with manual data entry.
- Data Accuracy: By extracting information directly from documents, the system improves accuracy and reduces the risk of errors in data processing.
- Operational Efficiency: Streamlines operations in industries like banking and insurance by digitizing and processing documents faster.

Objective: Extract information like name, address, and image from scanned documents.

Technologies Used:

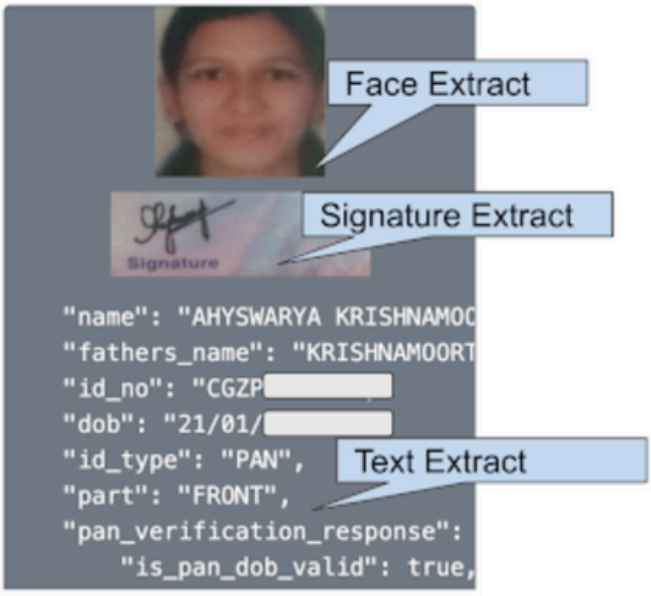
- Optical Character Recognition (OCR): For text extraction from documents.
- Data Extraction Algorithms: For structuring the extracted data.

Features:

- Document Scanning: Automatically scans and extracts data from documents.
- Data Structuring: Organizes data such as personal details for easy retrieval.

Outcome: Streamlines the process of digitizing documents and extracting critical information.

Input Image



OCR Results

3. AI Fashion Model(GEN AI)

Problem Statement:

E-commerce sellers and dress manufracturer struggle with high model cost, photographer cost and setup cost for photoshoot of their products. User may discard products due to customers being unsure how clothing will fit or look on them.

Solution:

The AI Fashion Model allows users to upload an image of a dress, and any image of model of different pose, the system generates the model wearing that dress. This provides customers with a visual representation of how the clothing might look on a person, helping them make more informed purchasing decisions.And owner will get rid of those extra model hiring, photographer setup cost.

Real Industry Issues Solved:

- Customer Satisfaction: By providing a realistic preview of the clothing, customers are more confident in their purchases, improving their overall experience.
- Cost of Returns: The system reduces those extra cost on photoshoot.

Objective: Provide a virtual try-on of model by showing a model wearing user-uploaded dress images.

Technologies Used:

- Generative AI: For creating realistic images of models wearing the dress.
- Deep Learning: For dress and model image synthesis.

Features:

- Dress Upload: Users can upload dress images along with model image with different pose.
- Model Generation: The system generates an image of a model wearing the uploaded dress.

Outcome: Offers a new way for fashion brands and e-commerce stores to enhance the customer experience along with cost saving on photoshoot.

4. AI News Anchor

Problem Statement:

Traditional news broadcasting requires significant human resources to produce live news segments. It can also be costly to hire anchors for 24/7 news channels. Furthermore, engaging viewers with dynamic facial expressions and gestures is a challenge in fully automated news systems.

Solution:

The AI News Anchor can read scripted news with dynamic facial expressions and hand gestures. It mimics human-like movements and adjusts expressions based on the tone of the news, creating a more engaging experience for viewers.

Real Industry Issues Solved:

- High Production Costs: AI anchors can be used to broadcast news 24/7 without incurring the high costs of human labor.
- Consistency: The AI anchor ensures consistency in presenting news, reducing errors or fatigue common in human presenters.
- Viewer Engagement: The use of facial expressions and gestures helps retain viewer attention and delivers a more immersive experience.

Objective: Create an AI news anchor capable of reading news with realistic expressions and hand movements.

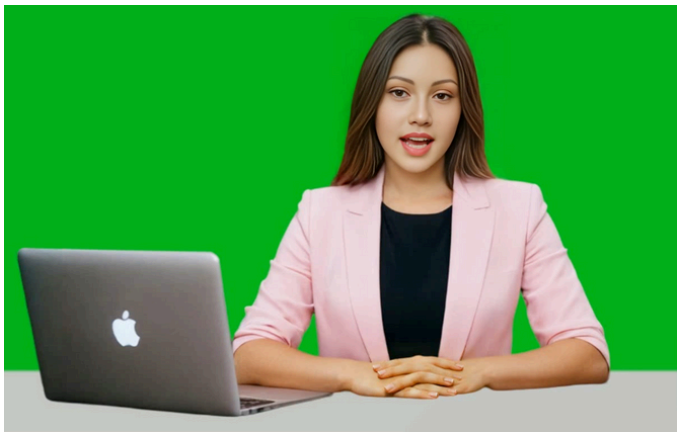
Technologies Used:

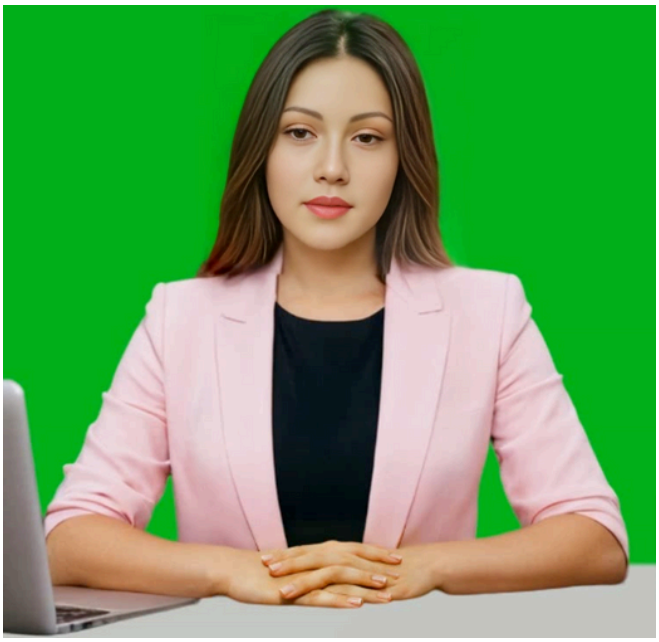
  - **Natural Language Processing (NLP):** For reading news text.
  - **Facial and Gesture Animation:** For simulating realistic facial expressions and hand movements.

Features:

  - **News Reading:** AI anchor reads news text.
  - **Facial Expressions & Gestures:** Matches facial expressions and hand movements to the news tone.

- **Outcome:** Automates news broadcasting while maintaining human-like presence and expression.





5. Automated Graphic Design Using Generative AI

Problem Statement:

Creating on-demand, custom visual content for digital marketing and branding purposes is expensive and time-consuming, requiring skilled graphic designers and multiple iterations.

Solution:

Developed an AI-driven graphic design tool that uses generative AI to create custom logos, banners, social media posts, and other visual assets based on user input and brand guidelines. The model enables the generation of high-quality designs within minutes.

Technologies Used:

- Generative Adversarial Networks (GANs): To create unique and customizable designs.
- Image Processing: For refining and enhancing visual quality.
- Deep Learning: For understanding brand guidelines and generating on-brand assets automatically.
-

Real Industry Issues Solved:

- On-Demand Design: Reduces the time and cost associated with creating custom designs for marketing campaigns.
- Design Scalability: Generates multiple design options quickly, allowing for easy customization.
- Creative Freedom: Provides marketing teams with the ability to generate a variety of designs tailored to specific campaigns.

6. Volume Mapping System

Problem Statement:

Industries dealing with freight often face difficulties in estimating the volume of cargo loaded into trucks, wagons, or carts. This leads to under- or over-utilization of cargo space, which increases transportation costs and reduces operational efficiency.

Solution:

The AI-based Volume Mapping System analyzes the cargo inside wagons or trucks and accurately estimates its volume in real-time. This helps ensure proper space utilization and reduces inefficiencies in freight transportation.

Real Industry Issues Solved:

- Space Underutilization: Accurate volume measurement ensures that cargo space is used efficiently, minimizing transportation costs.
- Manual Estimation Errors: The AI system eliminates the need for manual volume estimation, reducing errors and time delays.
- Cost Reduction: By optimizing cargo volume, companies can reduce the number of trips and associated costs.

Objective: Estimate the volume of cargo inside wagons, trucks, or carts.

Technologies Used:

- **3D Vision:** For depth sensing and cargo volume estimation.
- **Volumetric Analysis:** To calculate and report cargo volumes.

Features:

- Cargo Volume Measurement: Accurately measures the volume of cargo in real-time.
- Adaptable for Irregular Shapes: Works with various cargo shapes and sizes.

Outcome: Helps in efficient cargo space utilization, reducing manual effort in volume estimation.

7. Parking Allocation System

Problem Statement:

Urban areas face parking shortages and inefficiencies in allocating available parking spots. Drivers often spend time searching for parking, which increases congestion and fuel consumption. Manual management of parking spaces is also prone to errors and inefficiency.

Solution:

The AI-based Parking Allocation System monitors parking lots in real-time using camera input and identifies vacant or occupied spots. It provides drivers with accurate parking availability, reducing the time spent searching for parking.

Real Industry Issues Solved:

- Parking Congestion: The system helps drivers find available spots faster, reducing traffic congestion in parking lots.
- Fuel Consumption: By providing accurate parking information, it minimizes the time drivers spend circling for spots, reducing fuel use.
- Manual Errors: The system eliminates human errors in parking space management, ensuring better utilization of available spots.

Objective: Identify and allocate vacant parking spots in real-time.

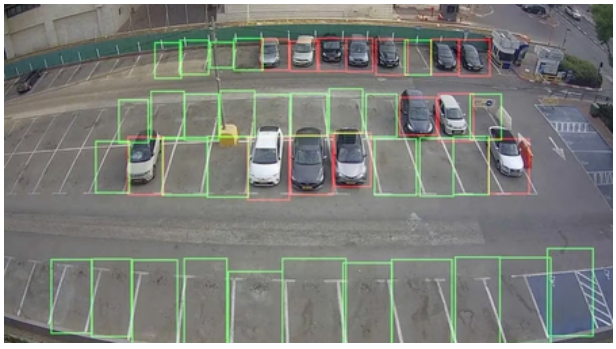
Technologies Used:

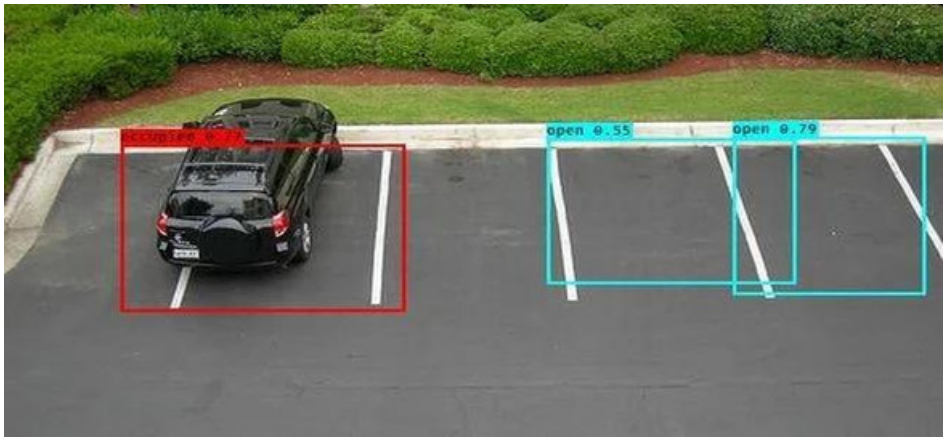
- Object Detection: To detect vehicles and parking spots.
- Real-Time Monitoring: Continuous monitoring of parking lots via camera input.

Features:

- Vacancy Detection: Automatically detects available parking spots.
- Guidance System: Helps drivers find available spots.

Outcome: Improves parking efficiency and reduces search time for parking spaces.





8. Face Recognition System

Problem Statement:

Traditional authentication methods like passwords or ID cards are susceptible to fraud, security breaches, and misuse. Additionally, they can be inconvenient and time-consuming for users, especially in high-security environments.

Solution:

The Face Recognition System authenticates users by scanning their faces, providing a secure and contactless way to verify identity.

Real Industry Issues Solved:

- Security Breaches: Face recognition adds an extra layer of security, reducing the risk of unauthorized access.
- Fraud Prevention: It is difficult to fake or replicate someone's face, making this system more secure than passwords or cards.
- User Convenience: The system offers a seamless, contactless authentication process, improving the user experience.

Objective: Authenticate individuals through facial recognition technology.

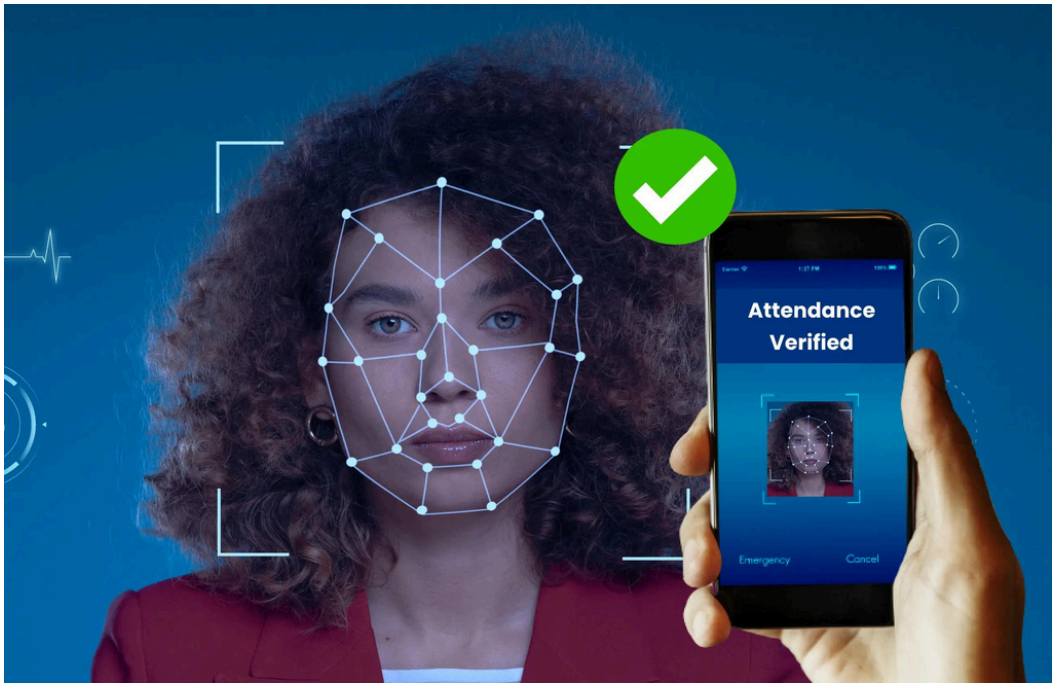
Technologies Used:

- Deep Learning: For training facial recognition models.
- Facial Recognition: To authenticate users based on face scans.

Features:

- Real-Time Authentication: Scans faces and authenticates users.
- Security Layer: Adds a secure, fast, and contactless authentication method.

Outcome: Enhances security systems with AI-powered face recognition, reducing reliance on traditional methods.



09. Question-Answering AI Model (with Document Analysis)

Problem Statement:

Accessing and retrieving relevant information from large documents (like reports, manuals, or research papers) is time-consuming and inefficient. Manually searching through PDFs for answers can lead to missed details and wasted effort.

Solution:

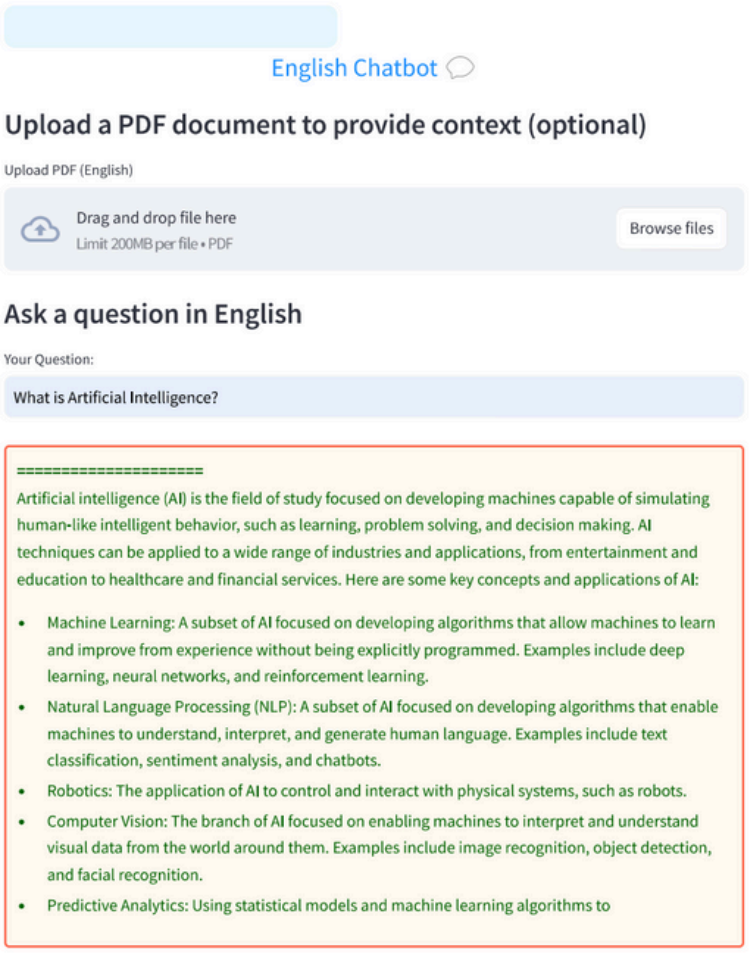
This AI model allows users to ask any type of question, and it responds based on its training or the input provided. Users can also upload PDFs, and the AI will scan and extract relevant information from the documents to answer the questions.

Technologies Used:

- Natural Language Processing (NLP): To understand and respond to user questions.
- Optical Character Recognition (OCR): For reading and extracting text from PDFs.
- Text Summarization and Search Algorithms: For finding and summarizing relevant information from documents.

Real Industry Issues Solved:

- Document Search Efficiency: Automates the process of retrieving information from lengthy documents, improving productivity in industries like legal, research, and education.
- Faster Information Retrieval: Reduces the time spent manually searching for answers in large volumes of text.
- Improved Accessibility: Makes complex information more accessible by summarizing and answering questions directly from documents.



10. Disease Prediction Using 8-Angle Patient Images

Problem Statement:

Accurate diagnosis of certain hair or skin diseases can be difficult and may require multiple consultations. Traditional methods rely on manual examination, which can be time-consuming and subjective.

Solution:

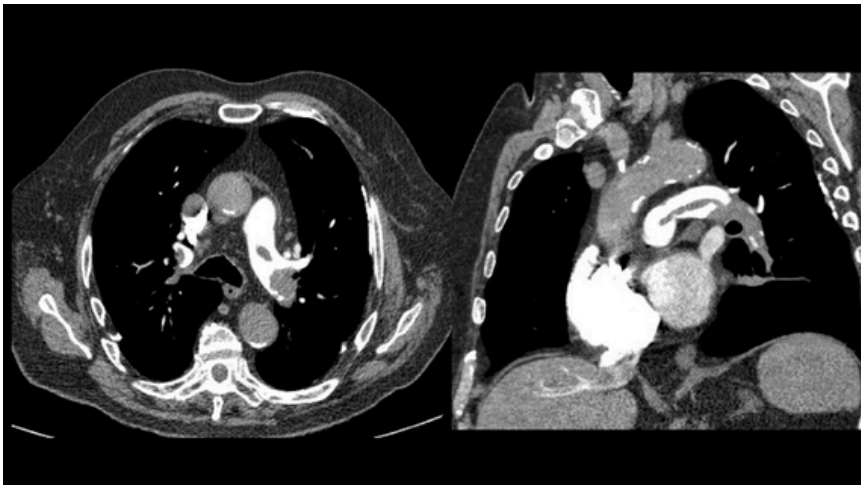
The Disease Prediction AI model analyzes images of patients taken from eight different angles. This approach helps detect diseases based on patterns in hair or skin, improving diagnosis accuracy for dermatological conditions.

Technologies Used:

- Computer Vision: To process multi-angle images and detect visual indicators of diseases.
- Convolutional Neural Networks (CNNs): For image recognition and pattern detection in hair or skin diseases.
- Medical Image Processing: For analyzing features specific to dermatology.

Real Industry Issues Solved:

- Improved Diagnostic Accuracy: Reduces the chances of misdiagnosis by providing a more thorough analysis of patient images.
- Early Detection: Helps detect diseases early by analyzing images from multiple angles, improving treatment outcomes.
- Remote Diagnosis: Provides a solution for remote consultations, especially in areas with limited access to specialists.



11. AI Image Generator Using Generative Adversarial Network (GAN)

Problem Statement:

Creating realistic images, such as product visuals or character designs, requires significant manual effort, creativity, and artistic expertise.

Solution:

Developed an image generation model using GANs, which generates photorealistic and high-quality images by learning from existing datasets and creating new images that resemble the training data.

Technologies Used:

- Generative Adversarial Networks (GANs): For generating realistic images from random noise or structured input.
- Deep Learning (PyTorch): To train the GAN model on a dataset of images.
- Image Processing: For refining and enhancing the quality of generated images.
-

Real Industry Issues Solved:

- Realistic Image Creation: Generates highly realistic images, reducing the need for manual photography or art creation.
- Efficient Product Visualization: Allows businesses to create product images automatically, cutting down on costs and time.
- Creative Freedom: Enables rapid exploration of different image styles and variations based on training data.

12. AI-Based Product Recommendation System
Problem Statement:

Online retailers often struggle to provide personalized product recommendations to users. This lack of personalization can lead to lower customer satisfaction and missed sales opportunities.

Solution:

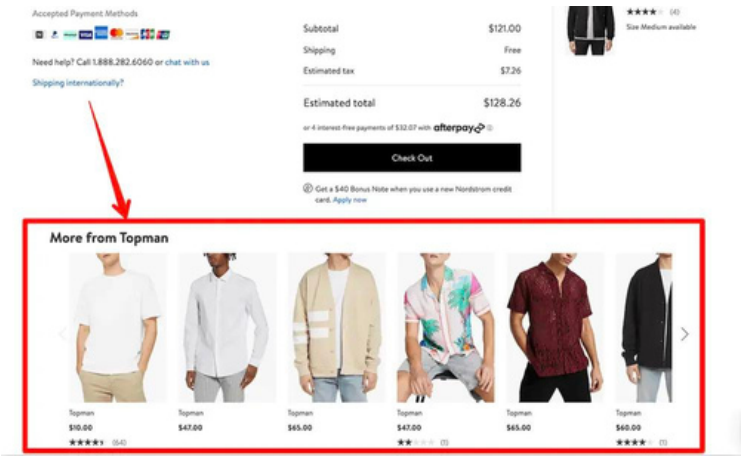
The AI-powered recommendation system analyzes user behavior, preferences, and browsing patterns to suggest products that the user is more likely to purchase. The system provides personalized suggestions based on individual needs and interests.

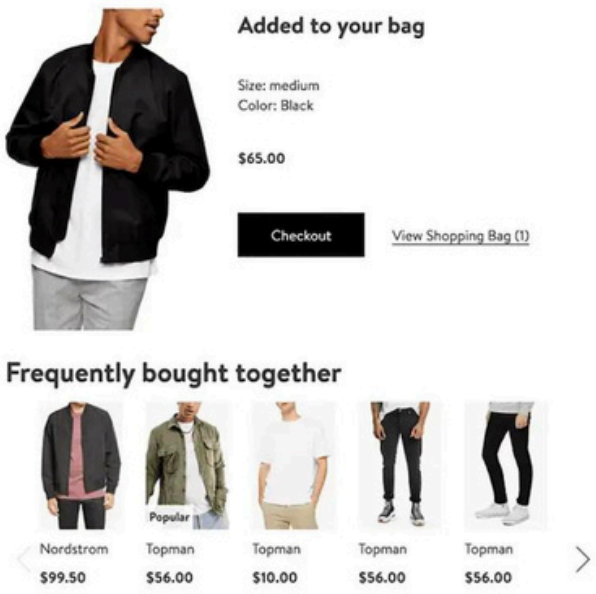
Technologies Used:

- Machine Learning Algorithms: For analyzing user behavior and preferences.
- Collaborative Filtering & Content-Based Filtering: To recommend products based on similar users' choices or item characteristics.
- Reinforcement Learning: For continuously improving recommendations based on feedback and interactions.

Real Industry Issues Solved:

- Personalized Shopping Experience: Provides a more tailored shopping experience, increasing customer satisfaction.
- Increased Sales: By recommending relevant products, the system improves conversion rates and boosts sales for retailers.
- Improved User Engagement: Keeps users engaged by offering recommendations that align with their preferences and browsing history.





13. PPE Detection System

Problem Statement:

In industries such as manufacturing, construction, and healthcare, ensuring that workers wear Personal Protective Equipment (PPE) is crucial for safety. Manual monitoring is inefficient and prone to human error, leading to increased workplace accidents and regulatory violations.

Solution:

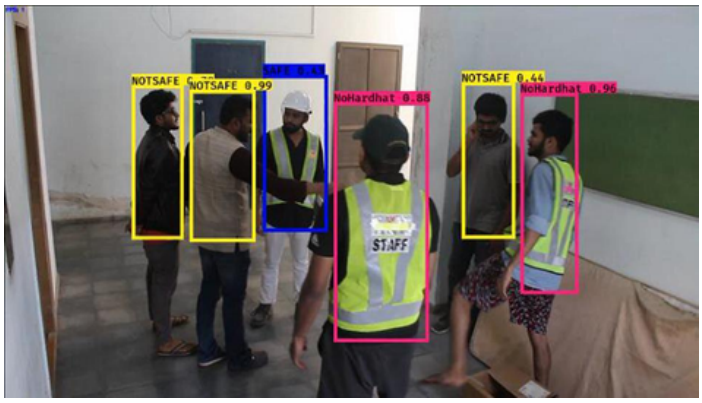
The PPE Detection AI system continuously monitors workers in restricted zones using cameras. If it detects a person without the required PPE (e.g., helmet, gloves, face shield, or full PPE kit), the system triggers an alert, notifying supervisors or halting operations.

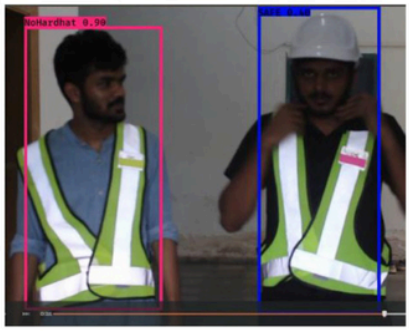
Technologies Used:

- **Computer Vision & Deep Learning:** For detecting PPE compliance in real time.
- **YOLO Algorithm:** For fast and accurate object detection.
- **Edge AI & IoT:** For real-time monitoring and integration with existing security systems.
- **Alert & Notification Systems:** To send warnings via alarms, email, or SMS.

Real Industry Issues Solved:

- **Workplace Safety Compliance:** Ensures adherence to safety regulations by automating PPE monitoring.
- **Reduced Accidents & Injuries:** Prevents workplace hazards by identifying non-compliance in real-time.
- **Operational Efficiency:** Eliminates the need for manual PPE inspections, allowing security personnel to focus on other critical tasks.





14.Human Detection in Restricted Zones

Problem Statement:

Unauthorized personnel entering restricted areas pose security risks and safety hazards in industries such as manufacturing plants, airports, and military zones. Manual monitoring is inefficient and prone to oversight.

Solution:

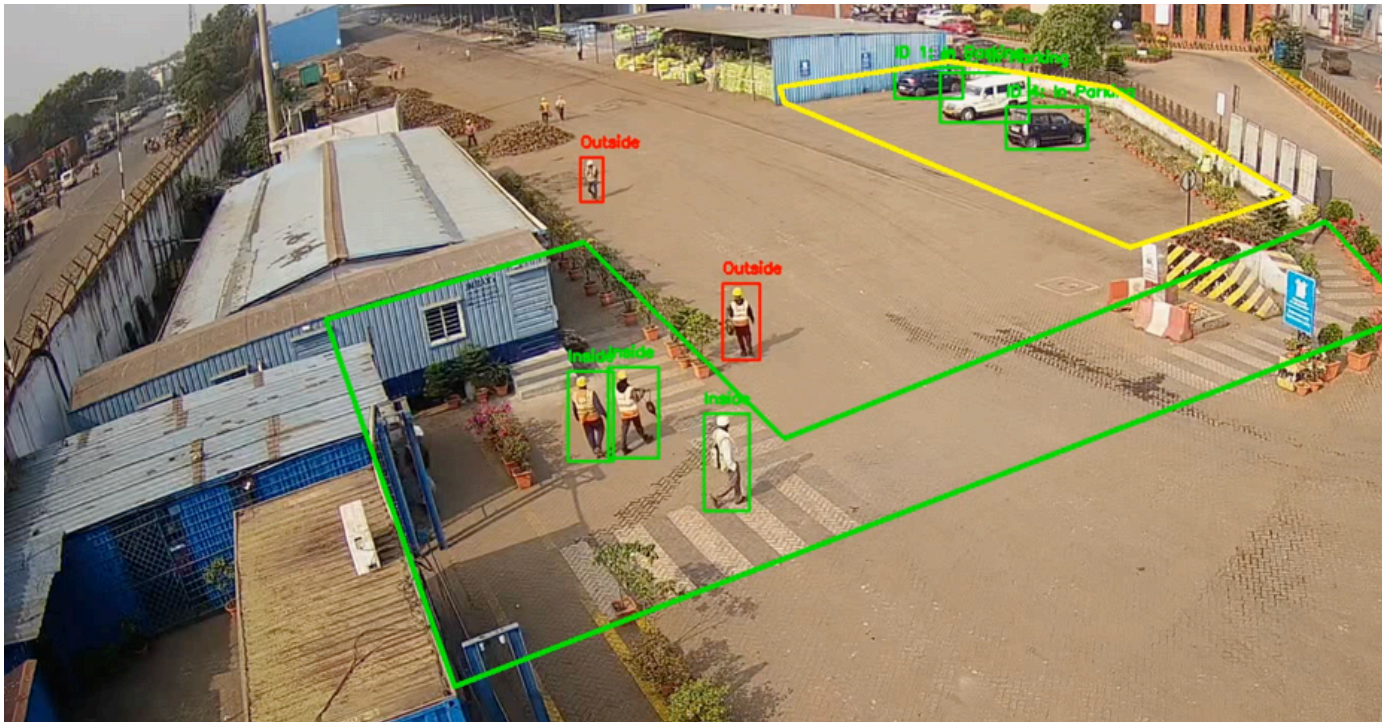
The AI-powered Human Detection System continuously scans restricted zones. If it detects a person walking outside designated paths, it triggers an alert, notifying security teams or activating automated deterrents like alarms.

Technologies Used:

- **Computer Vision & Deep Learning:** For real-time human detection.
- **YOLO (You Only Look Once) Algorithm:** For quick and accurate identification of unauthorized personnel.
- **Motion Tracking & Heatmaps:** To analyze movement patterns and detect anomalies.
- **Edge AI & IoT Integration:** For seamless monitoring and immediate alerts.

Real Industry Issues Solved:

- **Enhanced Security:** Prevents unauthorized access to restricted areas.
- **Improved Workplace Safety:** Ensures workers follow designated paths, reducing accident risks.
- **Automated Monitoring:** Reduces reliance on manual surveillance, improving operational efficiency.



16.Rail Container Survey System

Problem Statement:

In rail transport, tracking and verifying container positions, numbers, and ISO codes manually is time-consuming and prone to errors. Misplaced containers, incorrect tracking, and inefficient reporting lead to logistical issues and operational delays.

Solution:

The AI-powered Container Survey System automates container tracking on rakes. The system:

- Counts containers on a rake in real-time.
- Determines the exact position of each container.
- Uses OCR (Optical Character Recognition) to extract container numbers and ISO codes.
- Generates a detailed report for each train entry and exit to ensure accurate documentation.

Technologies Used:

- **Computer Vision & Deep Learning:** For detecting and tracking containers.
- **OCR (Tesseract/PaddleOCR):** For extracting container numbers and ISO codes.
- **Edge AI :** For real-time monitoring and integration with logistics platforms.
- **Automated Reporting System:** For generating entry/exit reports with precise container details.

Real Industry Issues Solved:

- **Accurate Container Tracking:** Reduces misplaced or miscounted containers.
- **Operational Efficiency:** Automates container survey, reducing manual effort.
- **Compliance & Documentation:** Ensures regulatory compliance with detailed reports.
- **Enhanced Logistics Management:** Provides real-time visibility into container movements.

17)AI-Powered Port Berth Safety Surveillance System

Problem Statement

In port operations, strict safety regulations prohibit human movement near a berthed ship during loading/unloading. However, workers often unconsciously cross the safety line — while distracted on phones or unaware of the risks — creating the potential for Severe Injury or Fatality (SIF).Traditional monitoring methods rely on manual supervision, which is error-prone, inconsistent, and incapable of covering long jetty distances (up to 450 meters).

The challenge was to design an automated embedded system that:

- Detects humans crossing the restricted zone,
- Triggers an instant hooter alarm,
- Works in offline mode without dependency on internet or external servers,
- Provides long-range coverage (200–300 m) both day and night.

Solution

We developed an offline, standalone AI-powered surveillance system consisting of:

1. High-Resolution PTZ Cameras (4MP, 45× zoom, 300m IR range) placed at both ends of the berth to cover the full 450m stretch.
2. Edge AI Processor (NVIDIA Jetson Orin Nano) running:
   - Human detection model (YOLO/DeepStream).
   - Virtual safety line logic for violation detection.
   - PTZ auto-zoom controller (ONVIF-based).
3. Microcontroller Layer (Raspberry Pi 5) for:
   - Relay control of industrial hooters.
   - Watchdog monitoring of AI box.
   - Local event logging.
4. Hooters/Buzzers triggered instantly when a person crosses the line.
5. Optional Storage (500 GB SSD) to store event snapshots and 10-second clips, instead of continuous video balancing evidence with cost and compliance.

Technical Highlights

- Long Range Coverage: 250 m person recognition, even at night.
- Smart PTZ Control:
  - Wide-angle sub-stream for detection.
  - Zoomed main stream for evidence.
- Relay-Based Safety Outputs: Faster and more reliable than IP speakers.
- Event-Only Storage: Snapshots + clips saved, reducing storage needs.
- Ruggedized Hardware: IP67 cameras, surge-protected power, UPS backup.

Benefits

- Safety: Eliminates risk of SIF incidents near berthed ships.
- Compliance: Fully aligned with port safety regulations.
- Efficiency: No need for manual monitoring teams.
- Scalability: Deployable across multiple berths.
- Cost Savings: Reduces penalties, downtime, and manual overhead.

AI-Powered HR Coil Tracking & Yard Visualization System

Problem Statement

In large steel yards, Hot Rolled (HR) coils are placed across different positions using cranes. Often, coils are stacked in pyramid formations up to 3 levels. With hundreds of coils being moved daily, the operations team struggles to track and record the exact location of each coil in real time.

Challenges faced:

- Coils are placed randomly without fixed slot marking.
- Tracking depends heavily on crane operators' memory.
- Pyramid stacking makes visibility and identification more difficult.
- Manual recording of positions is error-prone, slow, and inefficient.
- Retrieval of a specific coil consumes significant time, impacting overall yard operations.

Proposed Solution

We designed an AI-powered Computer Vision solution that integrates cameras, coil-slot mapping, and yard visualization models to track coils in real time.

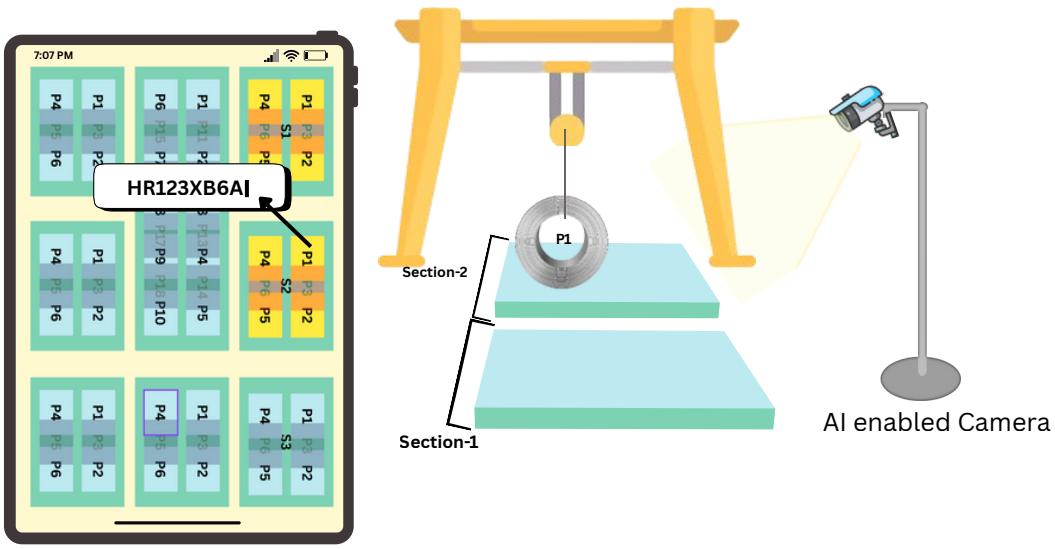
Key concept:

- Camera-based monitoring → Each section of the yard is covered by one or more fixed cameras.
- Slot-based division → Every section is divided into predefined coil slots (e.g., 2 on left, 2 on right, stacked levels on top).
- AI-driven detection → When the crane places a coil, the camera detects the slot being occupied.
- Digital yard visualization → A 2D/3D digital model of the yard updates in real time.
- Coil identification → The system prompts the operator to enter the coil number, linking it with the detected slot.
- Real-time access → All authorized users can view the exact position and ID of coils on mobile, tablet, or web applications.

System Workflow

1. Crane places a coil → Pre-installed cameras continuously monitor each section.
2. AI Model detects slot occupancy → The computer vision algorithm identifies the section and slot where the coil is placed.
3. User inputs coil ID → Once placement is detected, the interface prompts the operator to enter the coil number.
4. Yard visualization updates → A 2D/3D yard view reflects the coil's real-time position with its unique ID.
5. Data available to all users → Supervisors, managers, and staff can view coil positions instantly via their devices.

This solution transforms a traditionally manual and error-prone coil tracking process into a digitally automated and intelligent yard management system. By combining Computer Vision, 2D/3D visualization, and real-time data accessibility, it gives steel plants and logistics teams unparalleled control and visibility over coil placement and retrieval.



AI-Powered 360° Vehicle Safety System for Warehouses

Problem Statement

In warehouses, vehicles such as forklifts and loaders often move in confined spaces with limited driver visibility. The biggest safety risk arises when a person or object is present at the backside or blind spots of the vehicle—the driver cannot see it, increasing chances of accidents and workplace hazards.

Solution Overview

We developed an AI-based real-time vehicle safety system that provides 360° monitoring using 4 cameras, detects obstacles around the vehicle, and gives in-vehicle sound alerts when an object or person is too close.

Key features:

- 4 Cameras mounted on all four sides of the vehicle (front, back, left, right).
- Live Video Display inside the vehicle showing all camera feeds.
- Real-Time Alerts via a speaker inside the vehicle when an object is detected.
- Dynamic Proximity Warning – Alert sound increases in intensity as the object gets closer.
- On-Device AI Processing – All detection is processed in real-time on an edge device (NVIDIA Jetson / Raspberry Pi) without requiring a video server.
- Fail-Safe Design – Works completely offline, ensuring uninterrupted safety monitoring even without internet.

How It Works

1. Camera Input – Each side of the vehicle is covered by a wide-angle HD camera.
2. AI Detection Model – Computer Vision models (e.g., YOLOv8) process the camera feeds in real time to detect humans and obstacles.
3. Proximity Mapping – Distance estimation algorithms determine how close the object is.
4. Alert System – A speaker inside the vehicle generates beeps that increase in frequency as the object moves closer.
5. Driver Dashboard – All four camera feeds are displayed on a compact monitor inside the vehicle for continuous awareness.

Technical Architecture

- Hardware:
  - 4 x HD Cameras (wide-angle, IP/USB)
  - 1 x Edge AI Device (NVIDIA Jetson Nano / Xavier or Raspberry Pi 5)
  - 1 x In-Vehicle Monitor (7–10 inch display)
  - 1 x Speaker (for beeping alerts)
- Software & AI:
  - YOLO-based Object Detection Model
  - Distance Estimation Algorithms
  - Edge Inference Optimization (TensorRT / OpenVINO)
  - Real-Time Stream Processing Pipeline (GStreamer/OpenCV)
- Installation:
  - Cameras mounted on all four sides of the vehicle
  - Edge device and display installed inside the vehicle cabin
  - Speaker integrated for real-time alerts

Benefits

Reduces warehouse accidents by eliminating blind spots
Provides 360° real-time awareness for vehicle operators
Completely offline system — no dependency on servers or cloud
Cost-effective and easy to retrofit on existing warehouse vehicles
Scalable and customizable for different vehicle types

Impact

This solution directly addresses a critical workplace safety gap by ensuring that drivers are alerted instantly to nearby risks, thereby minimizing accidents, protecting workers, and improving operational efficiency.

Thank You

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