ABSTRACT

Child street vending in India is a critical issue exposing vulnerable children to exploitation and hindering their education. Current efforts by government and NGOs are hampered by a lack of automated monitoring, making real-time identification and rescue challenging.

This project proposes an AI/ML-based system to address this. It will leverage existing CCTV footage from traffic signals to:

1. **Detect Child Street Vending:** Using advanced AI/ML models like YOLOv8, the system will identify children engaged in vending activities.
2. **Log and Geospatial Map:** Detected incidents will be logged with precise location and time, enabling geospatial analysis.
3. **Generate Hotspots and Alert NGOs:** The system will create dynamic hotspot maps, visually representing areas with high child vending prevalence. These hotspots will trigger automated alerts to nearby NGOs, enabling rapid and targeted interventions.

The technological framework will include object detection for child identification, a geospatial analysis engine for clustering activity and generating heatmaps, and an automated notification system to dispatch real-time alerts.

Anticipated outcomes include strengthened child protection efforts, empowered NGOs with improved rescue capabilities, support for government initiatives, and ultimately, a significant reduction in child exploitation on Indian streets. This technological intervention offers a promising pathway towards a safer future for vulnerable children.

INTRODUCTION

Children selling flowers, balloons, and other items at traffic signals is a common sight in many Indian cities, exposing them to exploitation, accidents, and unsafe conditions. Despite ongoing government and NGO initiatives, there is still no systematic, real-time solution to identify and protect such vulnerable children. Leveraging Artificial Intelligence (AI) and Machine Learning (ML), this project aims to use traffic CCTV footage for automatic child detection, hotspot mapping of frequent locations, and NGO alerting for timely intervention. This not only showcases the practical application of AI and ML beyond theoretical domains but also demonstrates their potential for creating meaningful social impact by safeguarding children's welfare and contributing to humanitarian solutions.Furthermore, the system can serve as a data-driven tool to assist policymakers in designing targeted interventions, while also enabling NGOs to allocate their resources more effectively.

LITERATURE REVIEW

Existing research demonstrates the growing role of computer vision and AI in enhancing pedestrian safety and child protection. Datasets such as **CityPersons** and **JAAD** have been widely used for pedestrian detection and behavior prediction in traffic environments, while initiatives like **ITWILLBE's digital ID for children** and **GMCNgine's AI-based missing child search** highlight the use of AI for safeguarding vulnerable populations. In India, platforms such as the **Baalswaraj portal** enable citizen reporting of children in street situations, and mobile applications like **YTH StreetConnect** connect homeless youth to resources. However, these approaches rely heavily on **manual reporting and user input**, which often results in delays and limited scalability. Current computer vision research, including gender-based child pedestrian tracking and age detection in surveillance videos, shows promise in automating child-focused monitoring but has not yet been fully applied to street vending or real-time NGO interventions. The key gap lies in the absence of an **automated, real-time, and location-aware system** that leverages CCTV surveillance to detect children, identify hotspots, and directly connect findings with NGOs. This project addresses that gap by integrating **computer vision, geospatial analysis, and automated alert systems** to enable faster, data-driven interventions for vulnerable children in traffic environments.

In addition, recent advancements in deep learning architectures such as **HarDNet/HAREDNet**, **YOLOv8**, and **Wide ResNet** have significantly improved the efficiency and accuracy of pedestrian detection, tracking, and age classification in surveillance settings. Studies leveraging these models have demonstrated high performance in real-world applications like autonomous driving, smart city surveillance, and child-focused monitoring. Despite these advancements, most works remain confined to experimental setups or narrowly defined use cases, without integration into broader **social intervention frameworks**. By adopting these cutting-edge models and embedding them into a scalable system that links directly with NGOs, the proposed project bridges the gap between **technical research** and **social impact**, offering a novel approach to child protection in urban traffic environments.

OBJECTIVE

The main objective of this project is to design and develop an AI-based system that can automatically detect children engaged in street vending at traffic signals through CCTV surveillance, classify them by age group and gender for more accurate identification, and map hotspot areas where such activities occur frequently. The system further aims to notify nearby NGOs for timely intervention and provide a centralized monitoring dashboard that visualizes detected activity, hotspot patterns, and intervention progress.

To achieve these objectives, the project will integrate state-of-the-art methods inspired by recent research, including HarDNet/HAREDNet for efficient real-time pedestrian detection, YOLOv8 combined with ByteTrack for multi-object tracking and gender-based child detection, and Wide ResNet-based models for age estimation in surveillance video. Tools and technologies such as Python, OpenCV, TensorFlow/PyTorch (deep learning frameworks), PostgreSQL with PostGIS (geospatial database), and Flask/React (for dashboard and NGO integration) will be employed.

For data collection, the project will leverage publicly available datasets such as JAAD, CityPersons, and Open Images, along with India Driving Dataset and annotated traffic video samples from YouTube. The collected data will be preprocessed, augmented, and analyzed to train and fine-tune the detection models, while CCTV metadata (camera location) will support geospatial hotspot mapping.

Furthermore, scalability will be a key focus—designing APIs for integration with NGO platforms and government child welfare portals, ensuring the system can be deployed across multiple cities. The final outcome is expected to be a socially impactful tool that bridges AI-driven child detection with on-ground NGO intervention for reducing child exploitation on streets.

EXPECTED OUTCOME

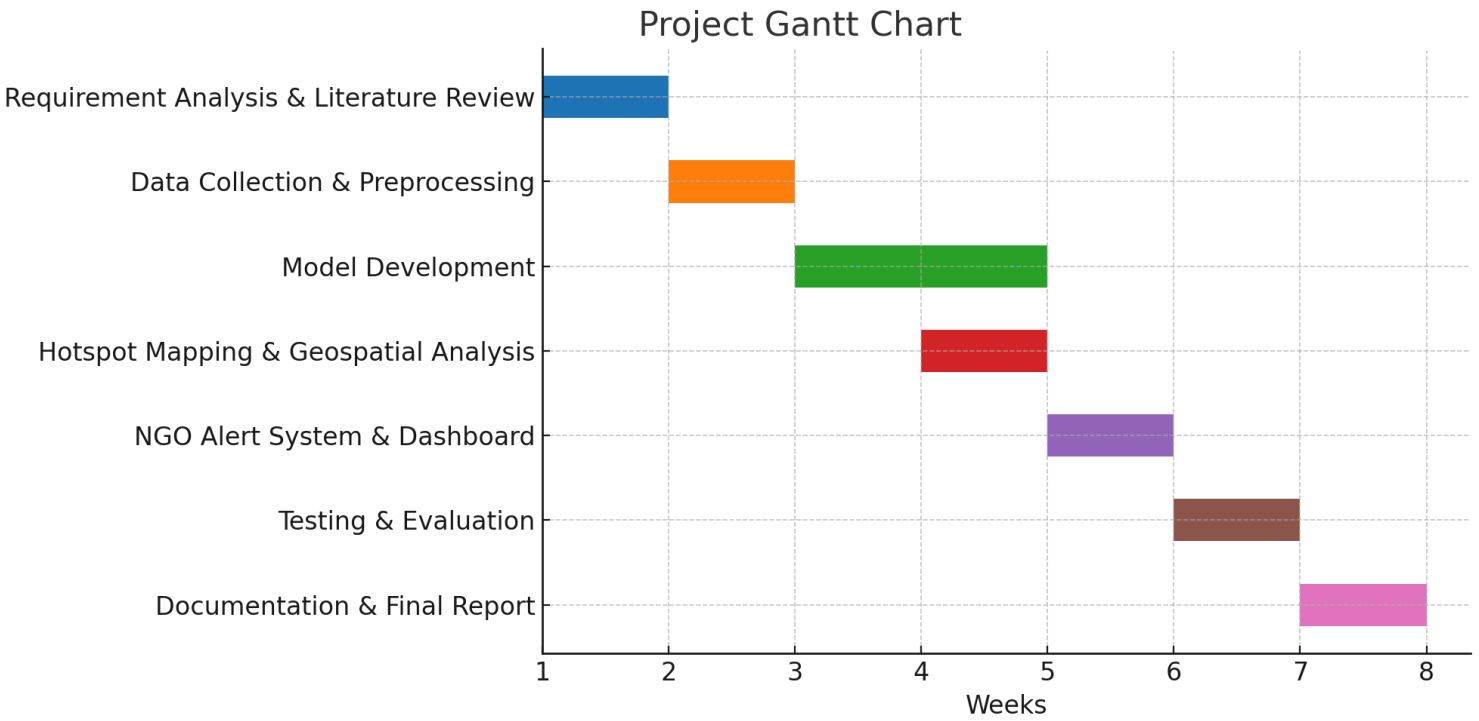
By the end of this project, the system is expected to automatically detect children engaged in street vending activities at traffic signals from CCTV footage, generate geospatial hotspot maps highlighting frequently affected locations, and notify nearby NGOs for timely intervention. The project aims to demonstrate the successful application of AI and ML in addressing a pressing social issue by creating a working prototype that combines computer vision, geospatial analysis, and real-time alerting. Beyond detection, the system will provide a user-friendly dashboard for NGOs to visualize hotspots, track interventions, and analyze long-term activity patterns. This will not only improve operational efficiency but also ensure accountability and data transparency in rescue and rehabilitation initiatives.

The potential impact of this project includes improving child safety by enabling faster rescue and support,

assisting NGOs in resource allocation through hotspot mapping, and contributing towards data-driven policymaking for child protection. Furthermore, the system could serve as a foundation for collaborations between government agencies, NGOs, and law enforcement, creating a coordinated ecosystem for child welfare.

In the long term, such a system could be scaled to multiple cities, integrated with smart city surveillance infrastructure, and extended to detect other forms of child exploitation in public spaces, such as forced begging or hazardous labor. Ultimately, this project aspires to showcase how AI and ML can be used not just for technological advancement, but also for creating a measurable positive social impact.

TIMELINE



Week 1–2: Requirement analysis, literature review, problem statement, NGO & dataset identification

Week 3–4: Data collection, preprocessing, video annotation, training/test set prep

Week 5–6: Model development (YOLOv8 training & testing)

Week 7: Hotspot mapping & geospatial analysis (PostgreSQL + PostGIS, heatmaps)

Week 8: NGO alert system, dashboard, testing, and final documentation

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