TED UNIVERSITY

Faculty of Engineering

Department of Computer Engineering

CMPE 491

<u>WorkerSecure</u>

Project Specifications Report

by

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1. Introduction

1.1.   Description

Construction and factory sectors are still very popular today, and they employ hundreds of workers. When factory and construction workers do not take adequate safety precautions, they can experience serious accidents.

The project, **WorkerSecure**, aims to detect workers who do not wear necessary equipment such as helmets from camera footages by using image processing techniques. It will be used to warn them immediately when they are detected. It is hoped that WorkerSecure will decrease the industrial accidents and bring awareness.

1.2.   Constraints

There are multiple constraints that the team might encounter:

Real-Life Data Constraints: The placement of the camera in the working area might be a constraint since it can lead to blind spots. Also, even if the camera angles are fine, the frame quality might be a constraint since it will depend on the lighting and resolution.

Definition Constraints: Helmets come in different styles and the system needs to recognize all of them. The system should not confuse helmets with other round objects and should be able to define them accurately.

Data Training Constraints: There needs to be enough training dataset that is good quality so that the algorithms are trained effectively.

Social and Ethical Constraints: There project should respect the privacy of the workers, and the alarms should not have negative impact on the work environment.

Environmental Constraints: The project should aim to reduce energy consumption as much as possible when using alarm systems, cameras etc.

Political Constraints: The project should obey the regulations such as General Data Protection Regulation.

Manufacturability Constraints: The technology used in the project should be able to meet the demand and be available.

1.3.   Professional and Ethical Issues

The system uses real-time monitoring for managing the work safety. Therefore, it might lead to various professional and ethical issues.

• The workers will be constantly monitored with a security camera. Because of this live monitoring, there might be privacy issues. Some workers may be disturbed by this.

• In addition, the live monitoring process may require data storage of a worker, or a moment caught by cameras which may cause privacy issues.

• The system's accuracy or bias might change depend on how it has been trained. Therefore, there might be injustice among workers.

• Constant live monitoring may stress some workers and decrease their productivity.

• In case of any external cyber-attack on the system, recordings and videos of the workers can be used by malicious people without any permission.

2. Requirements

2.1.   Functional Requirements

Switching Between Recordings: The user should be able to switch between different camera recordings.

Alarm: Workers detected on camera who is not wearing a hard hat should be warned instantly or their names should be stored in the database.

Detailed View: The user should be able to use zoom and taking screenshot while watching camera recordings.

Camera Locations: The user should know what camera is from what part of the factory.

Search Option: Users should be able to search and filter the camera recordings based on date, time, location, and detected violations.

2.2.   Non-Functional Requirements

Performance: The system should detect workplace safety violations in real time, providing results fast.

Accuracy: The model should achieve a high level of accuracy in helmet detection, and it should provide low rate of false positives and false negatives.

Reliability: The system should have a high level of reliability, ensuring consistent performance for long number of times.

Usability: The user interface should be easy to use for workplace management and monitoring.

Adaptability: The system should adapt to different environmental and lighting scenarios such as day and night.

Responsiveness: The system should provide acceptable response times for system alerts and notifications in case of safety violations.

3. References

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