**Hong Kong Institute of Vocational Education**

**Discipline of Information Technology**

**IT114116 – HD in Data Science and Analytics**

**Final Year Project – Big Data Analytics (ITP4870M)**

**Project Proposal (AY2021/22)**

**Project title:** Safety detection for the work of heights

**Group Members:**

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\* Sorted by name

\* Highlighted the group leader

**I****ntroduction to the proposed project (Statement of problem to be solved)**

Working at heights poses significant risks to the safety of individuals involved in various industries such as construction, maintenance, and infrastructure development. Accidents resulting from falls or other hazards can lead to severe injuries or even fatalities. Therefore, it is crucial to develop effective safety measures and tools to mitigate these risks and ensure the job security of workers.

The proposed project aims to address this problem by developing a safety detection system specifically designed for work at heights. This system will utilize advanced technologies such as computer vision and machine learning to identify potential safety hazards and provide real-time alerts to workers and supervisors.

**Background (Background of the problem)**

In reviewing the construction accidents occurred in public works contracts in recent years, Works Branch of Development Bureau notes that quite a number of them, especially the serious ones, could possibly be avoided if prior alerts could be timely issued to the site personnel concerned. SSSS (Smart Site Safety System) is readily available for monitoring high-risk construction activities continuously. This can help uplift the site safety performance through early identification of potentially dangerous incidents or dangers and taking immediate follow-up mitigation actions. In addition, by analysing the data collected by SSSS, the crux of the safety problems could be revealed for formulating enhancement measures.

**Outline of proposed solution**

Application Platform: System: Linux, Windows, macOS

Language: Python, Html, JavaScript, CSS, PHP …

(Reason: 1. Python is a rich machine learning ecosystem

2. To build a website's frontend and backend, we need to use HTML, JavaScript, CSS, and PHP.)

Software and technologies to be used in the project: Visual Studio Code

(Reason: We can train models and write code in different languages on Visual Studio Code.)

Algorithms that you may use: Yolov8 …

(Reason: It is efficient and fast, and it has Strong generalization capabilities)

Basic Features of your system/solution: Our model will detect whether the workbench complies with safety regulations and if the workers are wearing safety harnesses properly.

System Architecture:

Frontend:

1. Providing the user interface and interactive functions.
2. Using HTML、CSS and JavaScript
3. Provide an interface for an image player or video player, allowing users to view real-time detection.
4. If a worker is detected without wearing a safety harness or if the workstation does not meet safety requirements, it will be immediately displayed on the website.

Backend:

1. Responsible for handling requests from the frontend, managing the image data stream, and interacting with the image processing model.
2. Transmitting real-time image data stream to the frontend
3. Using PHP or Python

Detection model:

1. Running in the backend to perform real-time detection.

Data handled: Collecting from the internet and providing by company.

**Explanation of why proposed solution is appropriate**

To ensure that workers wear safety harnesses and safety platforms that meet safety standards during high-altitude operations, two methods can be employed. The first method is to assign employees to supervise the workers performing high-altitude operations. The second method is to develop a detection system that captures real-time data and transmits it to a website, allowing management personnel to remotely monitor whether workers are wearing safety harnesses and safety platforms that comply with safety standards. Comparing these two methods, implementing a detection model would be a more efficient and cost-effective approach. By installing cameras, the process of high-altitude operations can be monitored without the need to hire additional employees. Therefore, developing a detection system would be a great choice.

**Main development phases (Main Stages)**

1. data mining, model training, model real-world performance benchmark, GRPC server for hosting AI service.

2. back-end services for the dangerous alert, API for detect signal and camera streaming.

3. front-end services for the signal and streaming.

4. Improvement for the project, remote control the camera angle in backend service for auto tracking human objects. (undetermined)

**Main deliverables**

1. Source code
2. Trained model
3. Model real-world performance benchmark
4. A full-stack website (Front-end and back-end)

**The responsibilities of each member**

Data Collection and Model Training: Kwong Yiu Man, Lai Yuen Wang, Wong Lawrence James, Iltaf Shier Bano, Xie Suet Ying

Back-end: Kwong Yiu Man, Lai Yuen Wang, Wong Lawrence James

Front-end: Iltaf Shier Bano, Xie Suet Ying

(Tentative)

**Important Notes: After the proposal is accepted, please mail the softcopy to Project Supervisor and Project Coordinator.**