**A Raspberry Pi and Arduino-Based Edge AI Framework for Real-Time PPE Violation Detection and Servo-Actuated MCB Shutdown.**

Dataset Description Report

This project leverages the **Construction Site Safety Image Dataset (Roboflow)** available on [Kaggle](https://www.kaggle.com/datasets/snehilsanyal/construction-site-safety-image-dataset-roboflow), aimed at enabling real-time safety compliance monitoring through object detection techniques.

The dataset contains a total of **2,801 images**, annotated in **YOLOv8 format**, making it well-suited for training object detection models. The dataset is divided into three subsets:

* **Training Set:** 2,605 images
* **Validation Set:** 114 images
* **Test Set:** 82 images

Each image is accompanied by a .txt file that holds annotation details for bounding boxes. The annotation format follows the YOLO standard:  
<class\_id> <center\_x> <center\_y> <width> <height>  
All values are normalized between 0 and 1 relative to image dimensions.

The dataset features **10 object classes** relevant to construction site safety:

1. Person
2. Hardhat
3. NO-Hardhat
4. Safety Vest
5. NO-Safety Vest
6. Mask
7. NO-Mask
8. Safety Cone
9. Machinery
10. Vehicle

Preprocessing and data augmentation techniques have been applied to increase robustness and variability, including horizontal flips, mosaic augmentation, grayscale conversion, rotations, exposure adjustments, and cutouts. Images have been resized to **640×640 pixels**.

Overall, this dataset provides a diverse and realistic set of construction site images, making it ideal for training deep learning models to identify both compliance and violations of safety protocols. The annotated data facilitates supervised learning, and the inclusion of “NO-” classes enables the model to distinguish safety violations explicitly.

This project will use this dataset to develop and deploy a lightweight YOLOv8 model on edge devices (e.g., Raspberry Pi), enabling real-time detection and notification for construction site safety enforcement.