



REAL-TIME SIGN LANGUAGE DETECTION

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TEAM INFO

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02

TASK DESCRIPTION

TASK DESCRIPTION

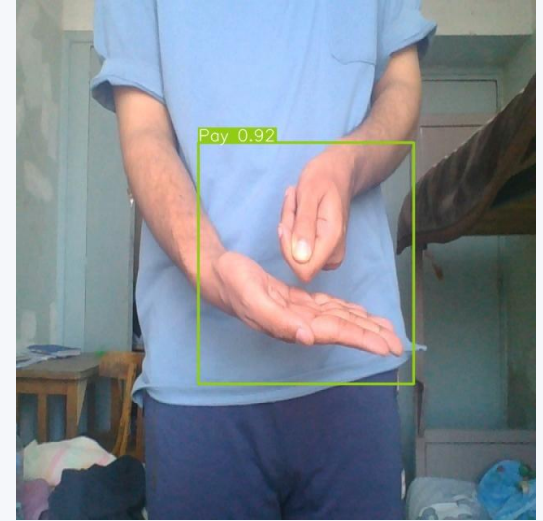
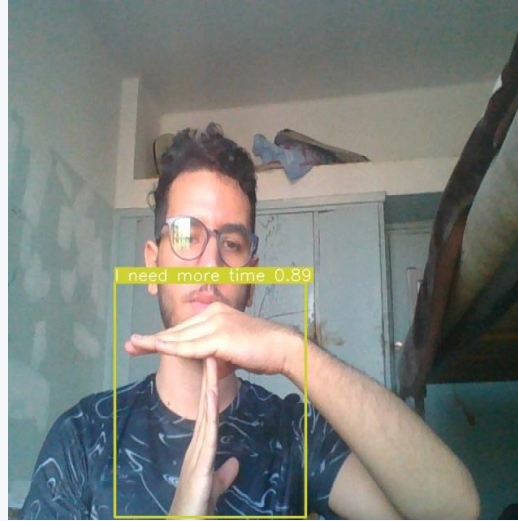
- **The project demonstrates the use of YOLOv8 for real-time sign language detection.**
- **It leverages a custom dataset to train the model and achieve accurate detection of various sign language gestures.**
- **The application provides real-time feedback on sign language gestures.**



03

DEMO OF APP

DEMO OF APP



GITHUB LINK: <https://github.com/MohamedBinSalman/Real-Time-Sign-Language-Detection>



04

CONTRIBUTION

CONTRIBUTION

- **Dataset Collection:**

- We gathered images for 9 different sign languages gestures.
- We utilized Roboflow's annotation tools to annotate the collected images with bounding boxes around the sign language gestures.

- **YOLOv8 Model Training:**

- We chosen YOLOv8 as the base model due to its efficiency in object detection tasks.
- We fine-tuned the model on the custom dataset of sign language gestures to adapt it to the specific task.

Derived from the mentioned contribution, multiple experiments have been conducted, focusing on two significant limitations:

- **Experiment 1:** Illumination Sensitivity: This experiment investigated the model's challenges in detecting gestures in images with low brightness levels, which often lead to potential errors.
- **Experiment 2:** Resolution Sensitivity: This experiment explored how the detection accuracy of the model is affected by variations in image resolution, particularly when images deviate from the standard size of 640x480, potentially resulting in missed gestures.



Figure: Experiment 1 with low brightness

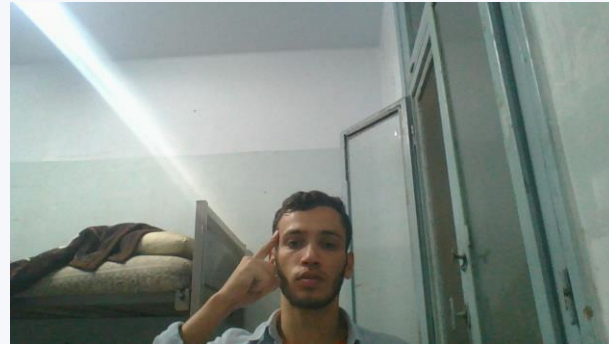


Figure: Experiment 2 with size of 1280x720



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DATA

DATA

Dataset:

- **The model is trained , validated, and tested on a custom dataset comprising 321 images with size of [640X480] of 9 sign language gestures.**
- **We divided the dataset into three units train, valid, test with 70% , 20% ,10% respectively .**



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PROJECT ARCHITECTURE

PROJECT ARCHITECTURE

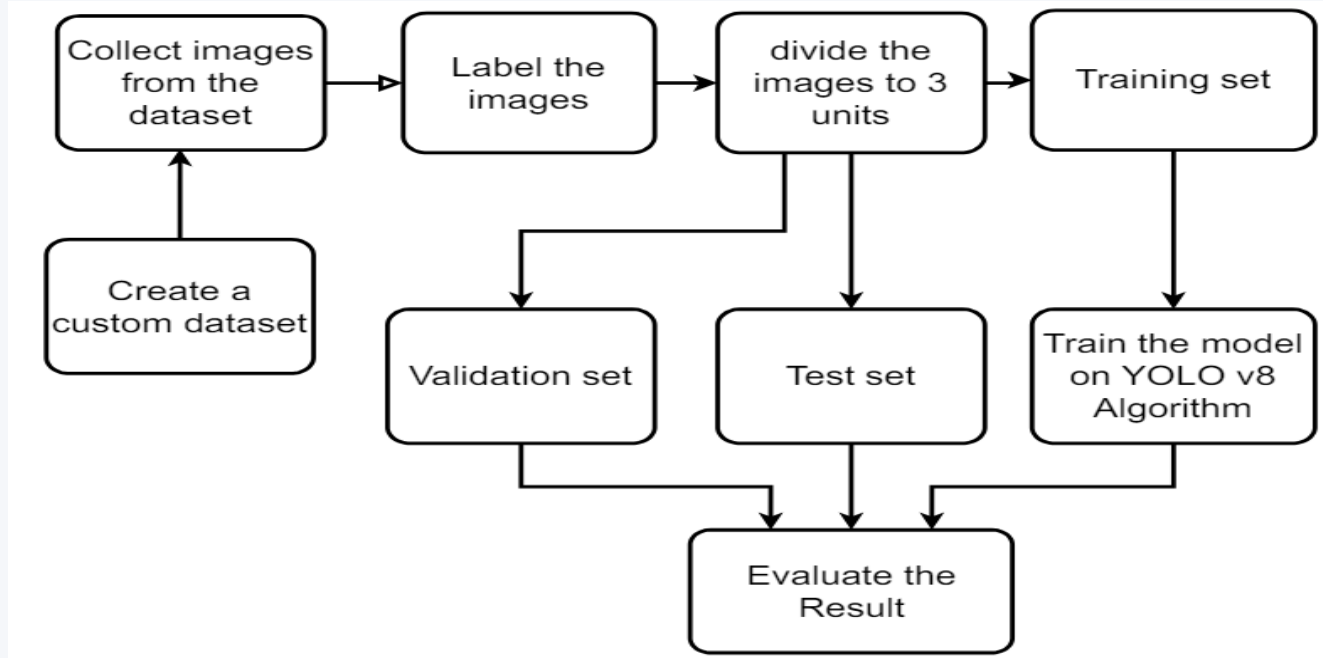


Figure: Workflow of the project



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METHODS

METHODS

1. Real-time Detection

- **Purpose:** To enable real-time detection of sign language gestures in video frames.
- **Functionality:** The model processes video frames efficiently, allowing for quick detection of sign language gestures as they occur.

2. Data Collection and Annotation

- **Purpose:** Gather diverse sign language gestures .
- **Functionality:** Collect a wide range of sign language gestures and annotate them with bounding boxes to indicate their locations within each frame.

3. Training the YOLOv8 Model

- **Purpose:** Develop a robust model for real-time sign language detection.
- **Functionality:** Customize the YOLOv8 model by fine-tuning it specifically on the unique characteristics of the custom sign language dataset.

4. Evaluation and Validation

- **Purpose:** Assess model accuracy and robustness.
- **Functionality:** Evaluate model performance using precision, mAP, and F1-score metrics. Validate accuracy on unseen data with varying conditions.



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RESULTS

RESULTS

Our model's performance is evaluated based on precision, recall, mAP50, and mAP50-95, with the results depicted in the following figure, providing a comprehensive overview of its accuracy.

Class	Images	Instances	Box(P	R	mAP50	mAP50-95)
all	63	63	0.975	0.995	0.995	0.731
Close	63	8	0.978	1	0.995	0.702
Correct	63	7	0.972	1	0.995	0.751
Friend	63	7	0.959	1	0.995	0.757
Headache	63	7	0.968	1	0.995	0.865
I need more time	63	6	0.968	1	0.995	0.792
Keeping your secret	63	7	1	0.957	0.995	0.585
Pay	63	7	0.987	1	0.995	0.684
Quote	63	7	0.964	1	0.995	0.74
Think	63	7	0.983	1	0.995	0.702

Figure: Model Performance Metrics

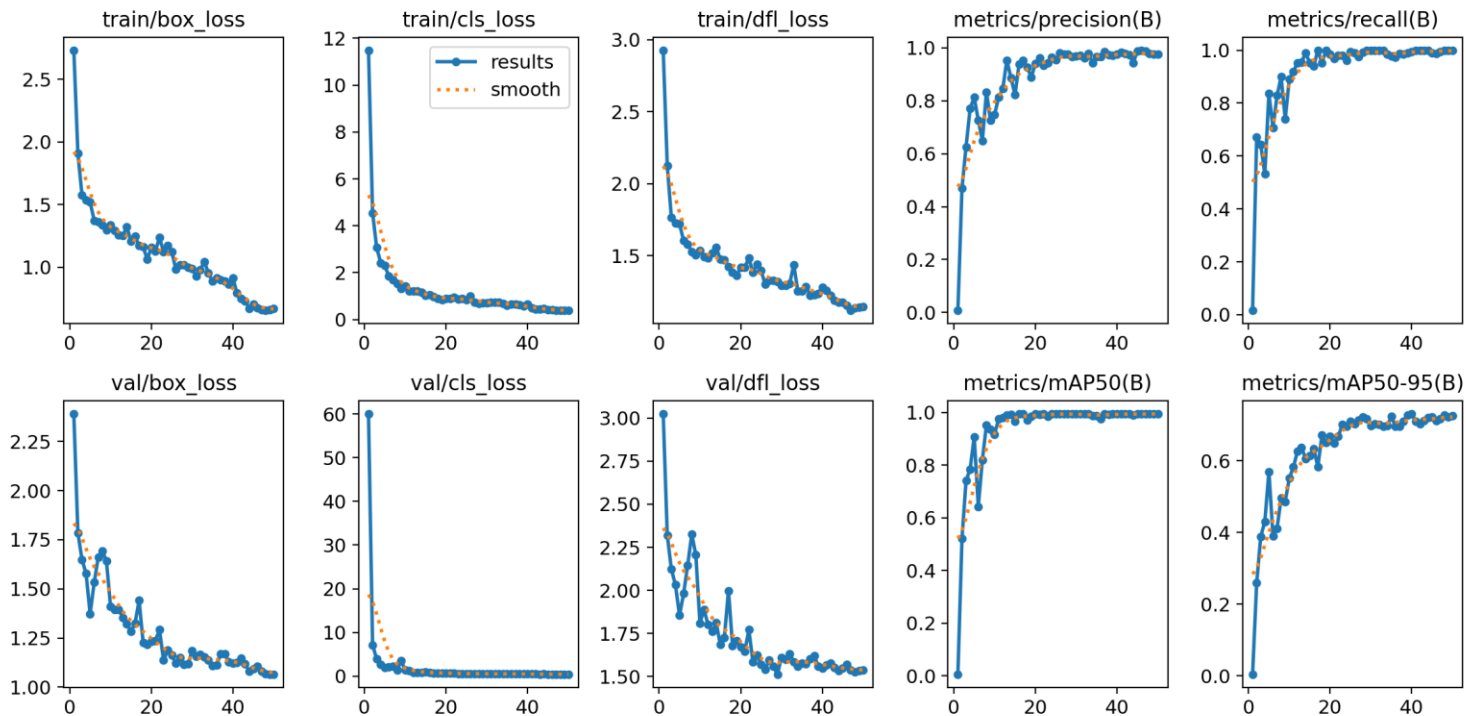


Figure: Multi-Graph Analysis: mAP, Precision,...etc.

The background is a light blue gradient. It features several geometric shapes: a blue circle on the left, a pink circle on the right, a blue cylinder-like shape in the top right, and pink and blue triangular shapes in the bottom corners.

THANKS!

DO YOU HAVE ANY QUESTIONS?