

# Gym Band Detection and Color Identification Project

## Overview

This project involves detecting gym bands and identifying their colors using computer vision techniques. The project is divided into several key phases, from data collection and augmentation to model training and local hosting.

## Steps and Methodology

### 1. Data Collection

- **Initial Dataset:** Started with 134 images.
- **Augmentation:** Increased dataset size to approximately 800 images using various augmentation methods. Employed Keras's `ImageDataGenerator` to apply different augmentation techniques like
  - `Brightness_range`,
  - `horizontal_flip`
  - `vertical_flip`
  - `shear_range`
  - `Zoom_range`
  - `rotation_range`

### 2. Data Annotation

- **Tool Used:** Labellmg library for annotating images.

### 3. Object Detection

- **Ultralytics open source**
- **Model Used:** YOLOv8 with the pretrained `yolov8s.pt` model.
- **Performance:** Achieved over 90% accuracy.
- **Epoch : 30**
- **Training validation raion : 80:20**

## 4. Band Color Classification

- **Ultralytics open source**
- **Model Used:** YOLOv8-classification with the pretrained [yolov8s-cls.pt](#) model.
- **Dataset:** Created a balanced dataset with cropped band images.
- **Colors Identified:** Blue, Green, Red, Yellow, Violet.
- **Performance:** Achieved over 90% accuracy
- **Epoch : 50**
- **Training validation raion : 80:20**

## 5. Local Hosting

- **Platform:** Streamlit for basic front-end UI experience.

## Challenges Faced

- **Color Identification Challenges:**
  - Initially used OpenCV methods, converting colors to HSV (high saturation value) color space and defining color values in HSV format.
  - Faced issues with background objects affecting analysis.
  - Switched to image classification, which performed better than the initial OpenCV methods.
- **Data Quality and Quantity:**
  - Encountered issues with the limited amount and quality of data.
  - Attempted to collect data from external sources like Google and Bing but primarily retrieved advertisement/marketing images, which were unsuitable for the project.
  - Resolved data scarcity with augmentation techniques.

## Conclusion

The project successfully integrates gym band detection and color identification with good accuracy metrics. Future improvements could benefit from more high-quality real-time data.

## GitHub Repository

For detailed code, please visit the [GitHub project link](#).