Jordanian Coin Quest
The Visual Journey

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Challenges

manual currency detection and counting pose significant challenges to businesses, banks, and financial institutions. The reliance on manual processes not only consumes valuable time and resources but also introduces risks and inefficiencies into currency management

Challenges faced include:

- Time-Consuming Processes.
- Human Error.
- Security Risks.

Our Goal :

1-Efficiently recognizing Jordanian coins from digital images to streamline financial transactions and enhance operational accuracy.

2- Automating the identification and classification of different denominations of Jordanian currency for improved currency handling.

3- Developing the system to be able to count the coins in the images

METHODOLOGY

- Data Collection
- Annotation
- Data Preprocessing
- Data Split
- Augmentation
- Modeling
- Evaluation
- Testing

Data Collection

Data Collection

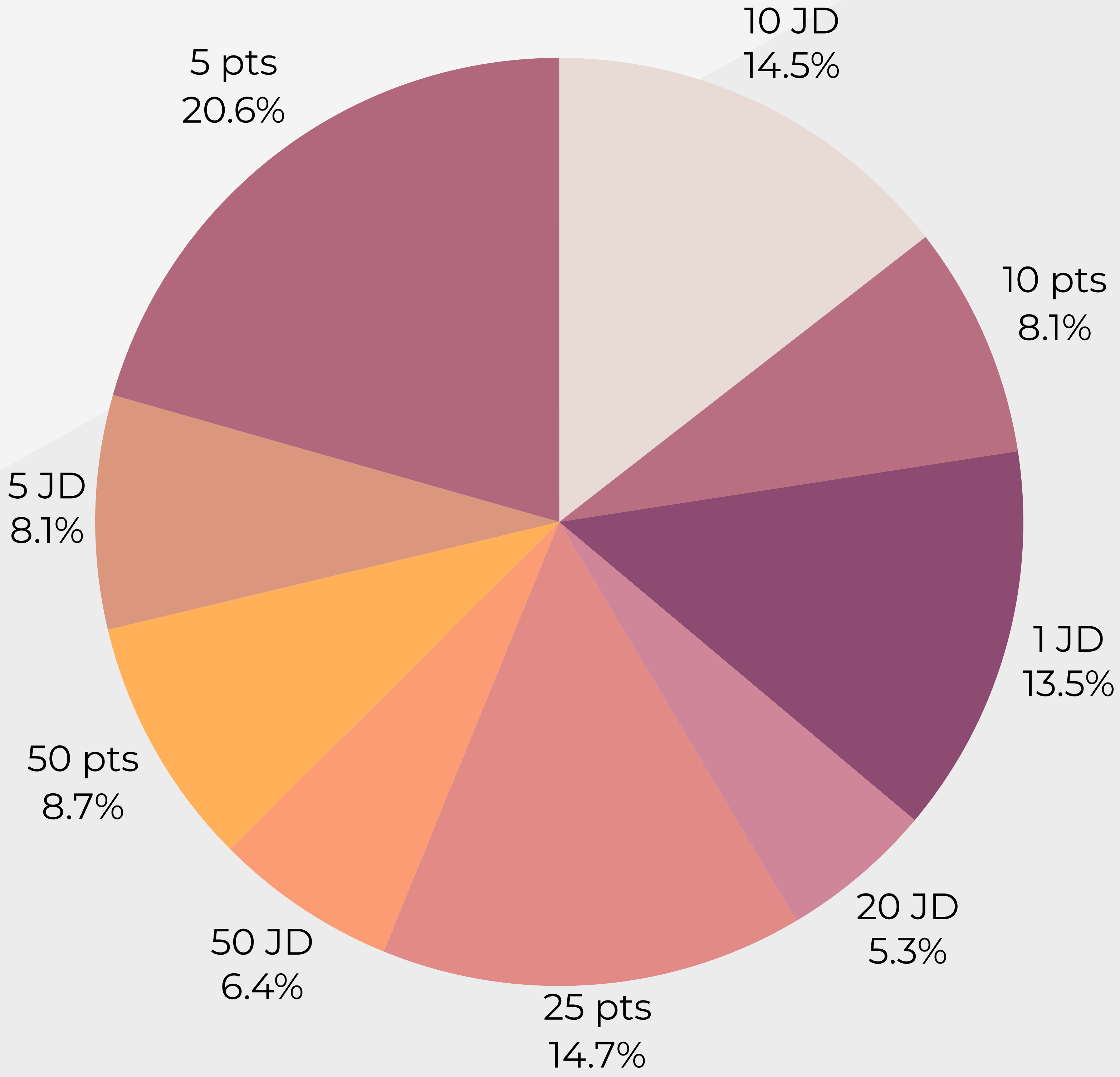
Our dataset for currency images was compiled from a diverse range of sources. Furthermore, a significant portion of our dataset was augmented through the manual capture of images using cameras to simulate varied conditions, ensuring comprehensive coverage and diversity in the dataset used for training and testing our currency detection and counting system.

Data Consist of 9 classes :

- **5pts**
- **10pts**
- **25pts**
- **50pts**
- **1JD**
- **5JD**
- **10JD**
- **20JD**
- **50JD**

IMAGES DISTRIBUTION

- **The dataset's currency distribution reveals a predominance of 10 JD and 1 JD images, suggesting a focus on higher-value notes. However, fewer instances of 20 JD and 50 JD notes highlight potential class imbalances, requiring attention to ensure model robustness**



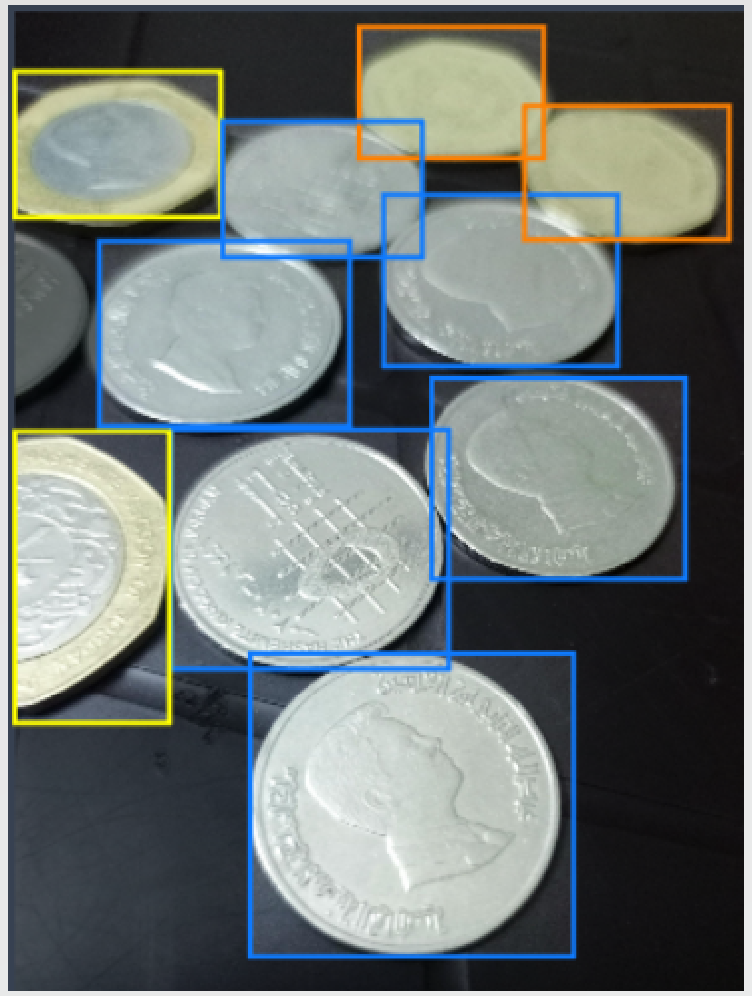
Data Samples

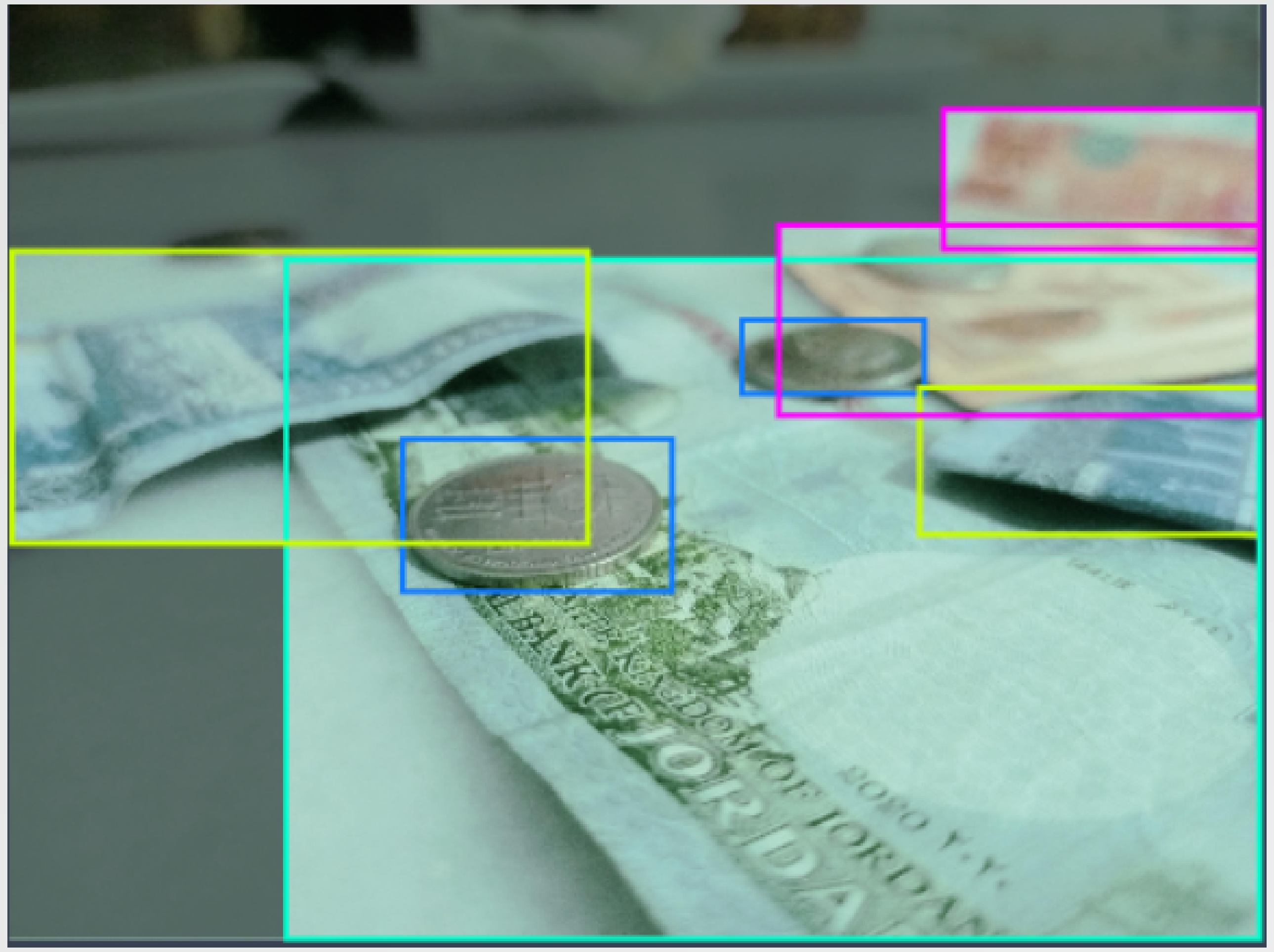
Data Annotation

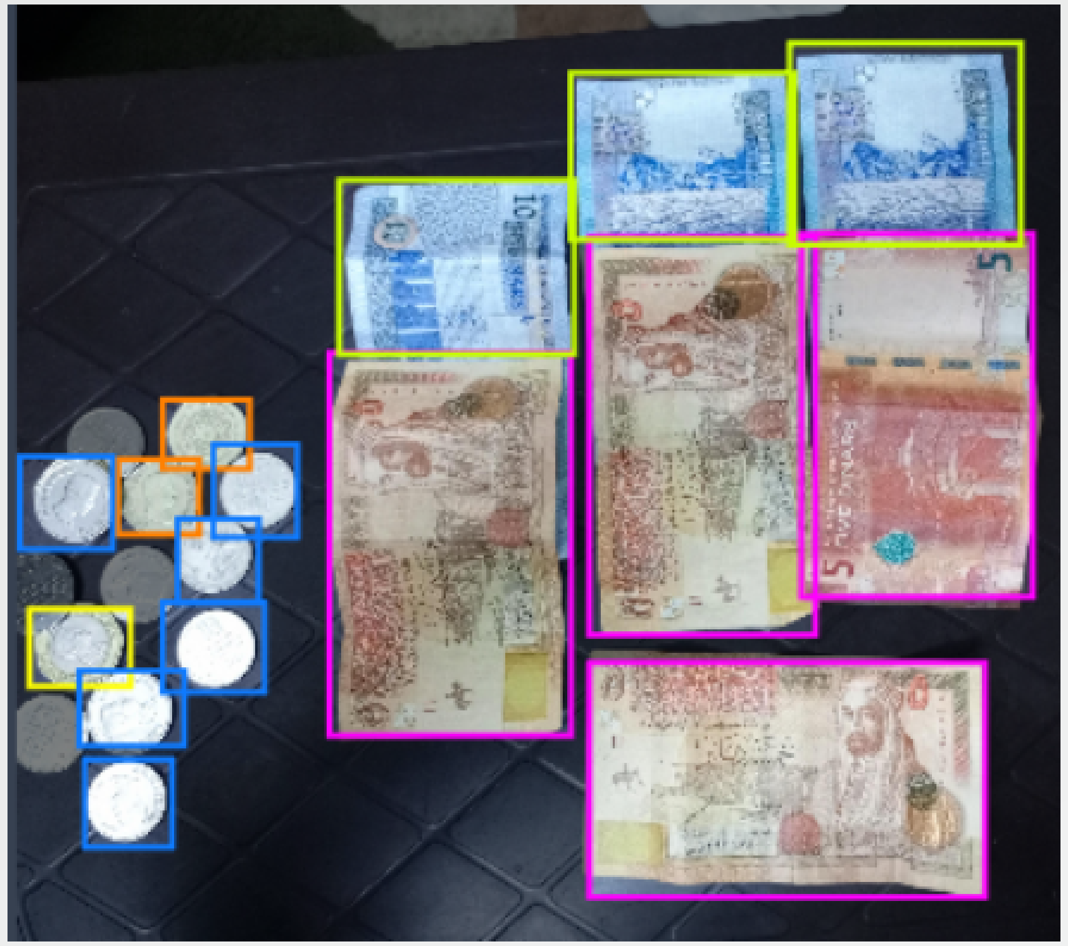
Data Annotation

We used Roboflow to annotate our dataset

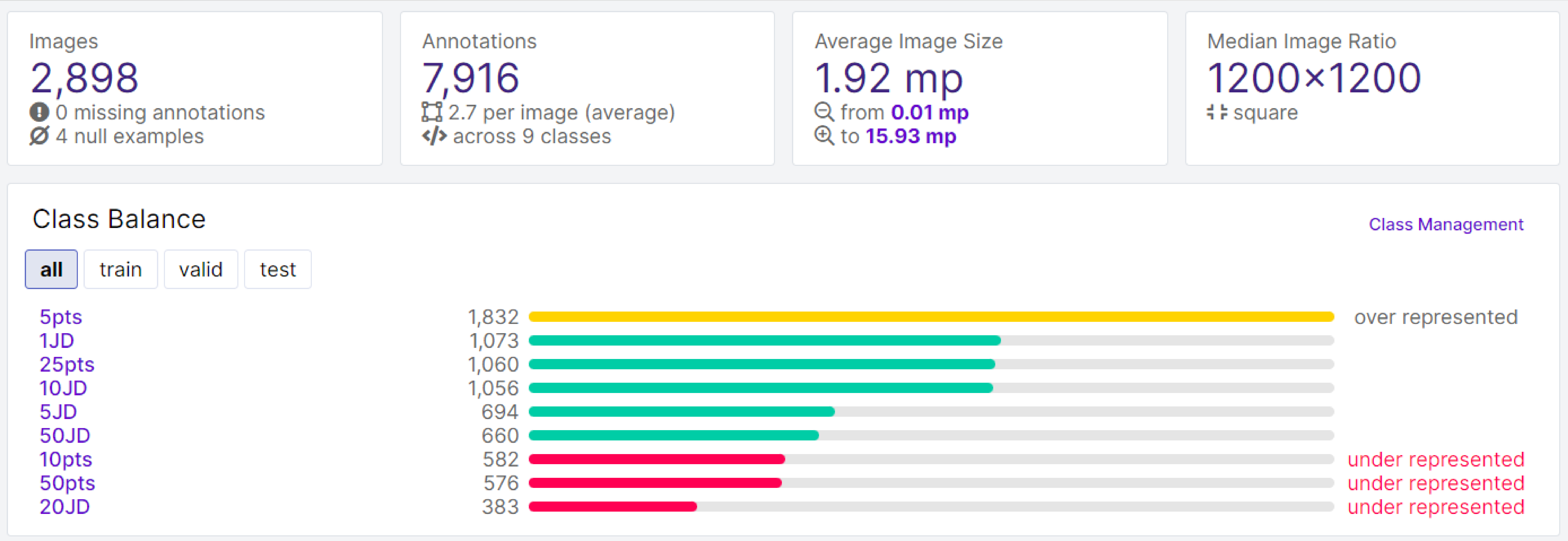
We used Bounded boxes tool







Data Information



Data Preprocessing

PREPARING IMAGES

Robust preprocessing techniques are pivotal for accurate money image detection. Steps such as resizing, noise reduction, color space conversion, and data augmentation are crucial for optimizing data quality and improving model performance, ensuring reliable results in the detection of currency in images.

PREPROCESSING STEPS

We used three preprocessing steps:

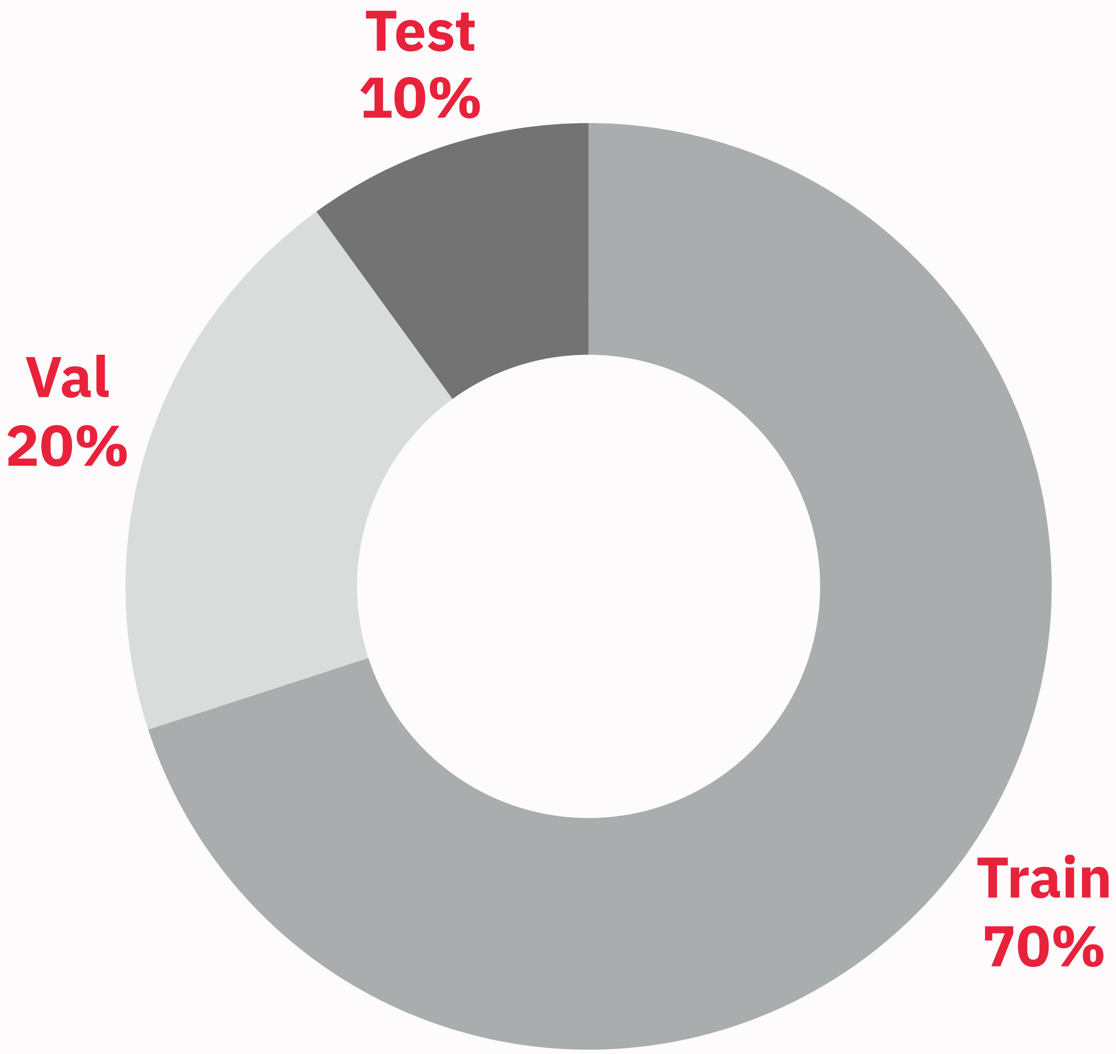
1- Auto-Orient
2-Resize(640*640)
3-Grayscale

The first two steps are applied in all versions but the third one applied only in two versions

Data Split

Data Spliting

By implementing a systematic data splitting strategy, we aim to achieve a balance between model training, validation, and testing, facilitating robust performance assessment and generalization



Data Augmentation

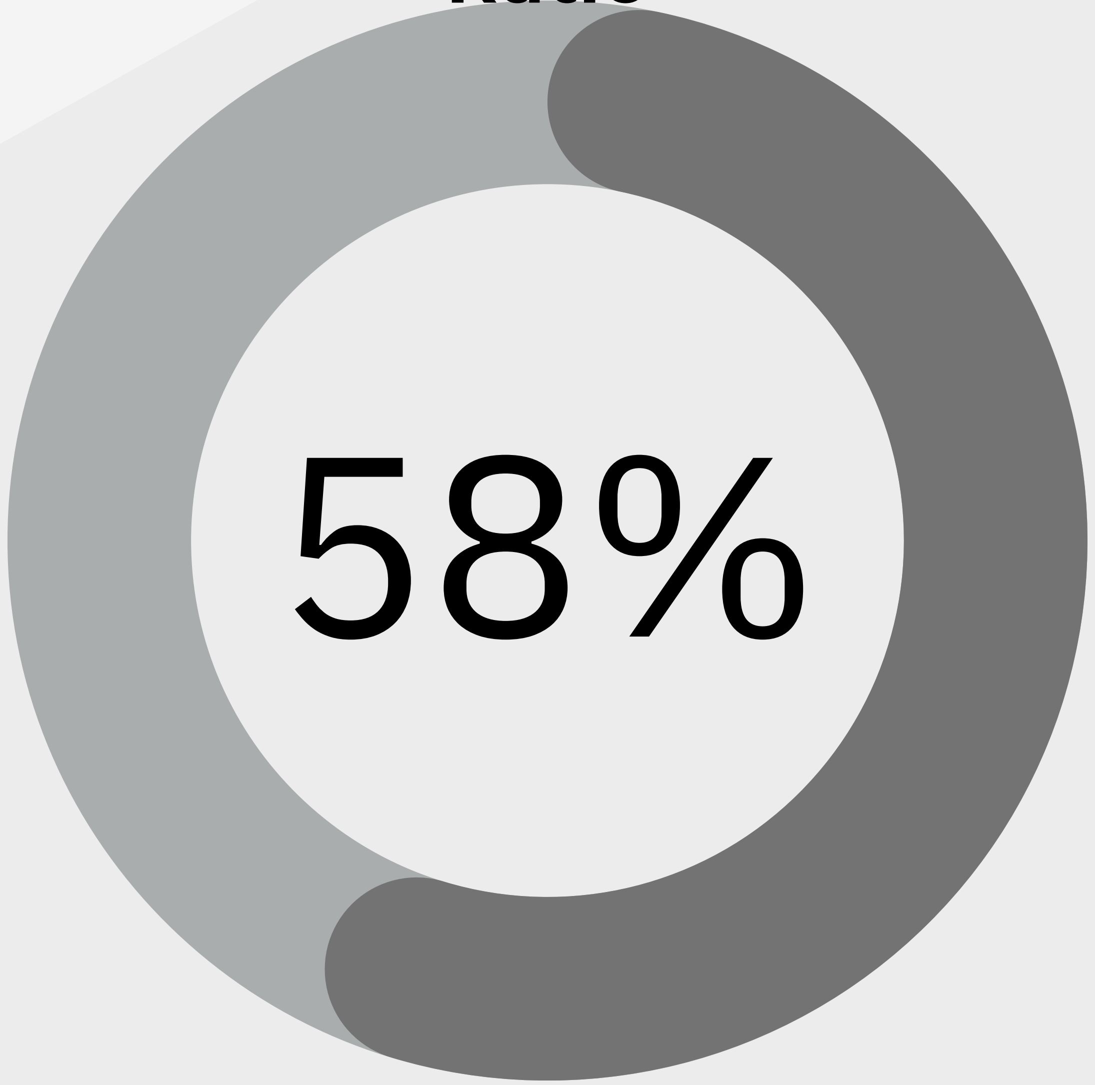
IMAGES AUGMENTATION

- We used Roboflow augmentation capabilities capabilities to increase our training dataset samples

This step varies from one version to another

2900 → **6920**

Image Augmetation Ratio



VERSIONS

Version1

Preprocessing	Auto-Orient: Applied Resize: Stretch to 640x640
Augmentations	No augmentations were applied.

Preprocessing	Auto-Orient: Applied Resize: Stretch to 416x416
Augmentations	Outputs per training example: 3 Rotation: Between -15° and +15° Shear: ±10° Horizontal, ±10° Vertical Grayscale: Apply to 15% of images Hue: Between -15° and +15°

Version2

VERSIONS

Version3

Preprocessing	Auto-Orient: Applied Resize: Stretch to 640x640
Augmentations	Outputs per training example: 3 Shear: ±13° Horizontal, ±13° Vertical Hue: Between -115° and +115° Brightness: Between -36% and +36% Blur: Up to 2.5px

Version4

Preprocessing	Auto-Orient: Applied Resize: Stretch to 640x640
Augmentations	Outputs per training example: 3 90° Rotate: Clockwise, Counter-Clockwise, Upside Down Rotation: Between -15° and +15° Brightness: Between -25% and +0% Noise: Up to 1.96% of pixels

VERSIONS

Version5

Preprocessing	Auto-Orient: Applied Resize: Stretch to 640x640 Grayscale: Applied
Augmentations	Outputs per training example: 3 Flip: Horizontal, Vertical 90° Rotate: Clockwise, Counter-Clockwise, Upside Down Shear: ±10° Horizontal, ±10° Vertical Blur: Up to 3.1px

Version6

Preprocessing	Auto-Orient: Applied Resize: Stretch to 640x640 Grayscale: Applied
Augmentations	Outputs per training example: 3 Flip: Horizontal, Vertical 90° Rotate: Clockwise, Counter-Clockwise, Upside Down Shear: ±10° Horizontal, ±10° Vertical Grayscale: Apply to 15% of images Blur: Up to 3.1px

Modeling Section

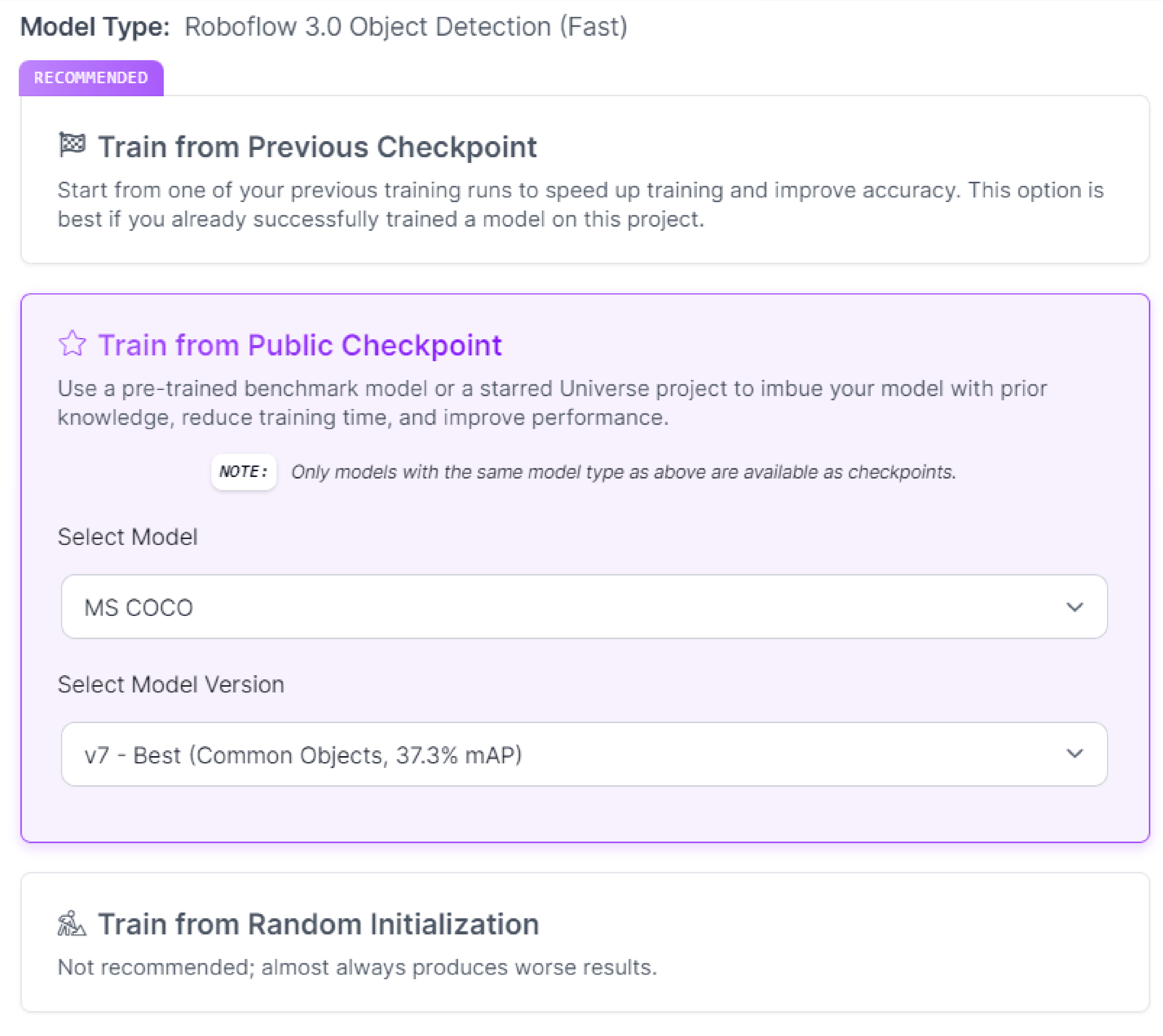
Roboflow Model

The MS COCO (Microsoft Common Objects in Context) model by Microsoft is a pre-trained deep learning model utilized for object detection, segmentation, and captioning tasks. Leveraging the MS COCO dataset with annotated images. Renowned for its versatility, it finds applications across various domains, serving as a benchmark in computer vision.

ROBOFLOW MODEL

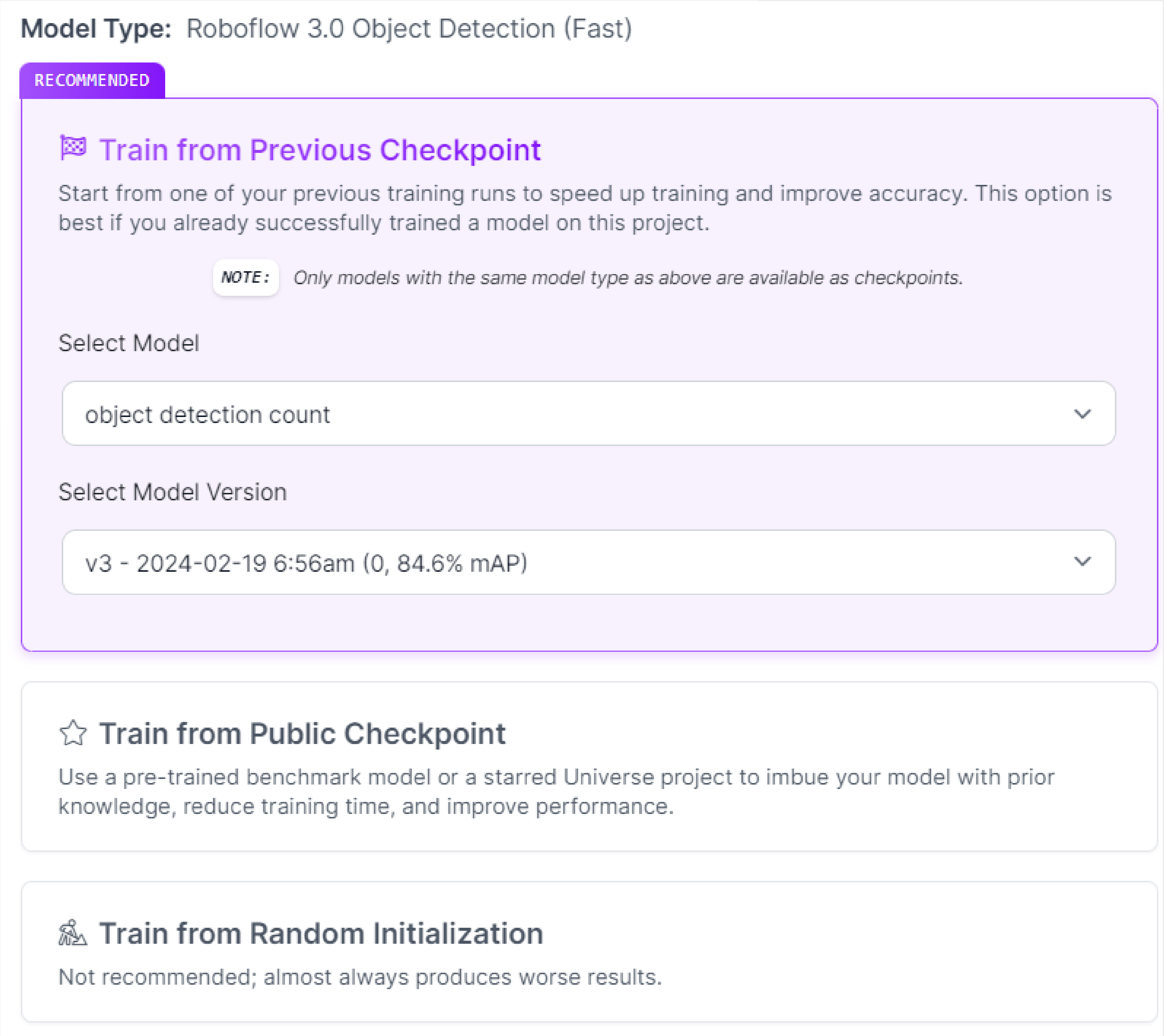
We used the Roboflow capabilities to train Model in two ways :

1- Train from public check point



ROBOFLOW MODEL

2- Train from the previous checkpointt



YOLOV8 MODEL

We trained the YOLO model for 20 epochs on Google Colab, the performance of the trained YOLO model did not meet our expectations. The achieved accuracy did not exceed 64% on the validation set, indicating suboptimal performance.Due to the model's performance falling below our desired threshold, we made the decision not to upload the results to Robo Flow.

Results

VERSIONS RESULTS:

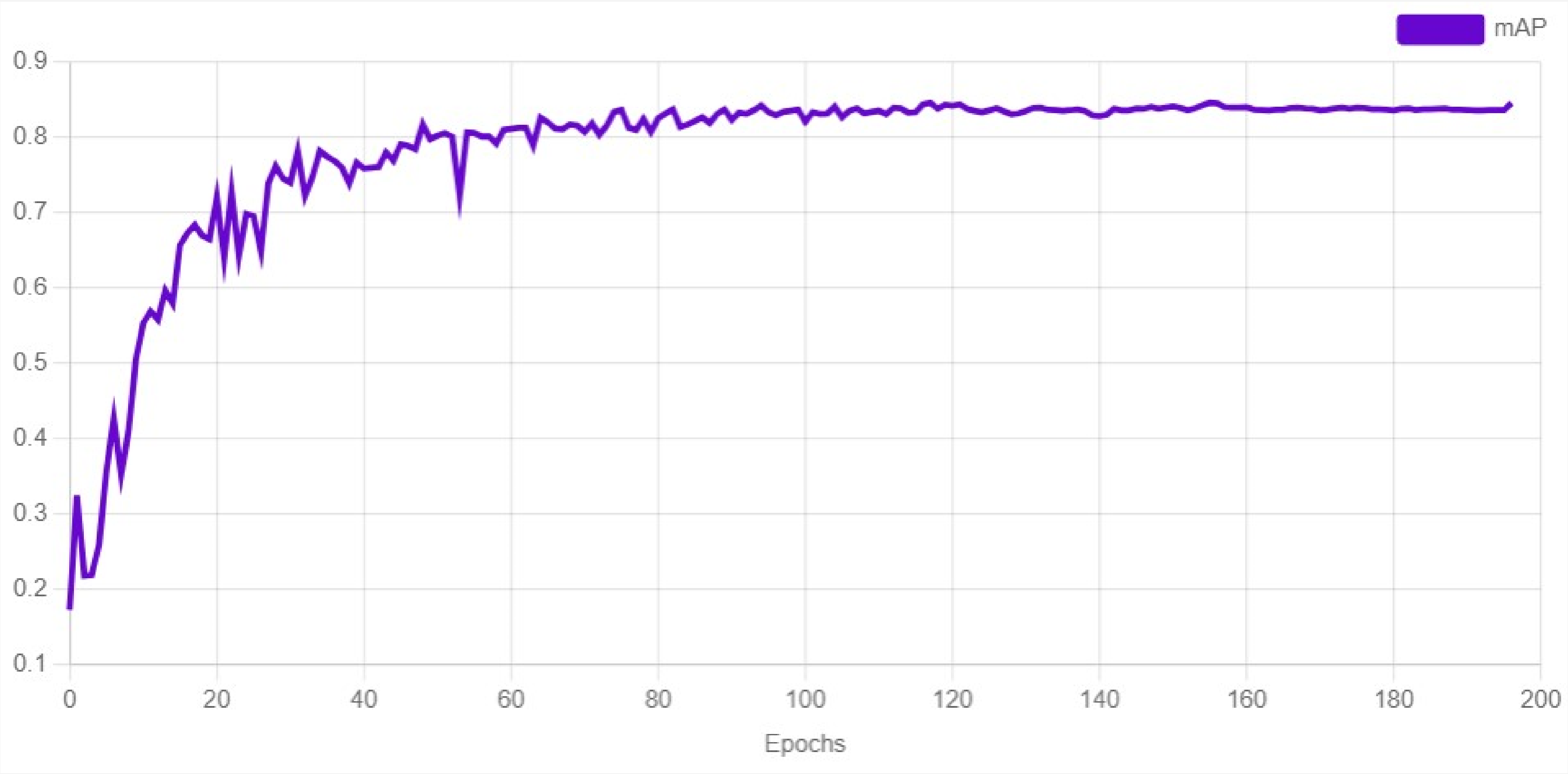
	mAP	Precision	Recall
Version1	63.4%	75.4%	60.8%%
Version2	59.3%	71.6%	53%
Version3	65.5%	78.2%	58.6%

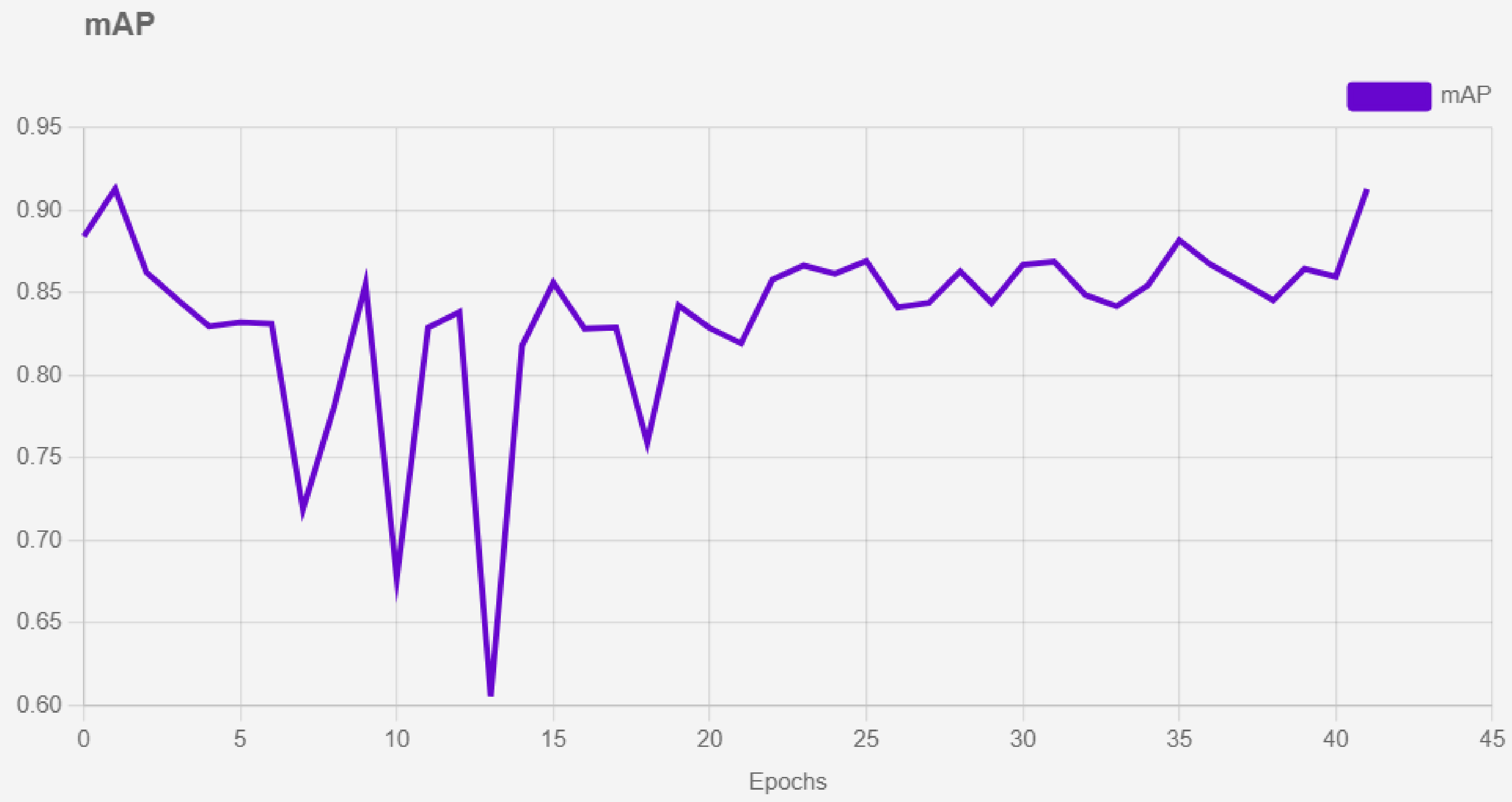
Versions Results:

Version	mAP	Precision	Recall
Version5	84.6%	80.4%	80.8%
Version6	91.3%	90%	85.1
Version4	71.4%	76%	68.8%

TRAINING CURVE :

The fluctuations in the (mAP) curve are specifically related to the last training checkpoint, it suggests that the model's performance may vary at different stages of training.



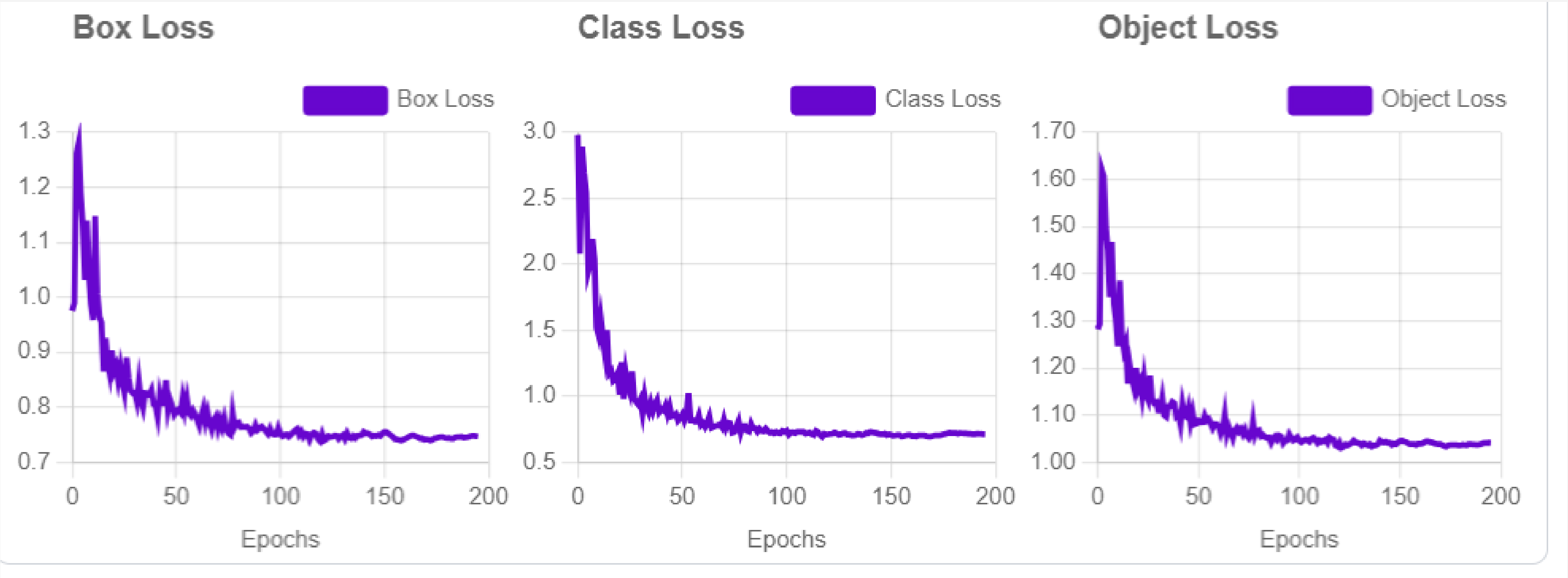


Version 5

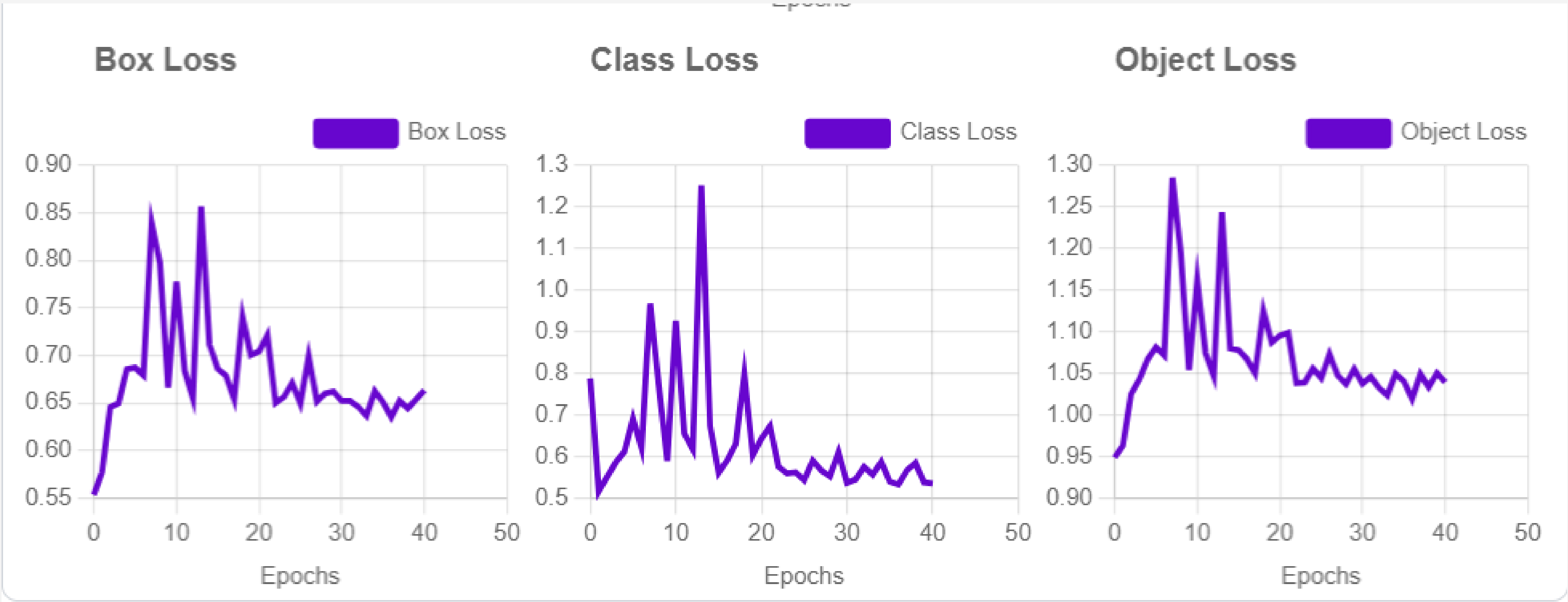
Version6

LOSSES CURVES :

Version5

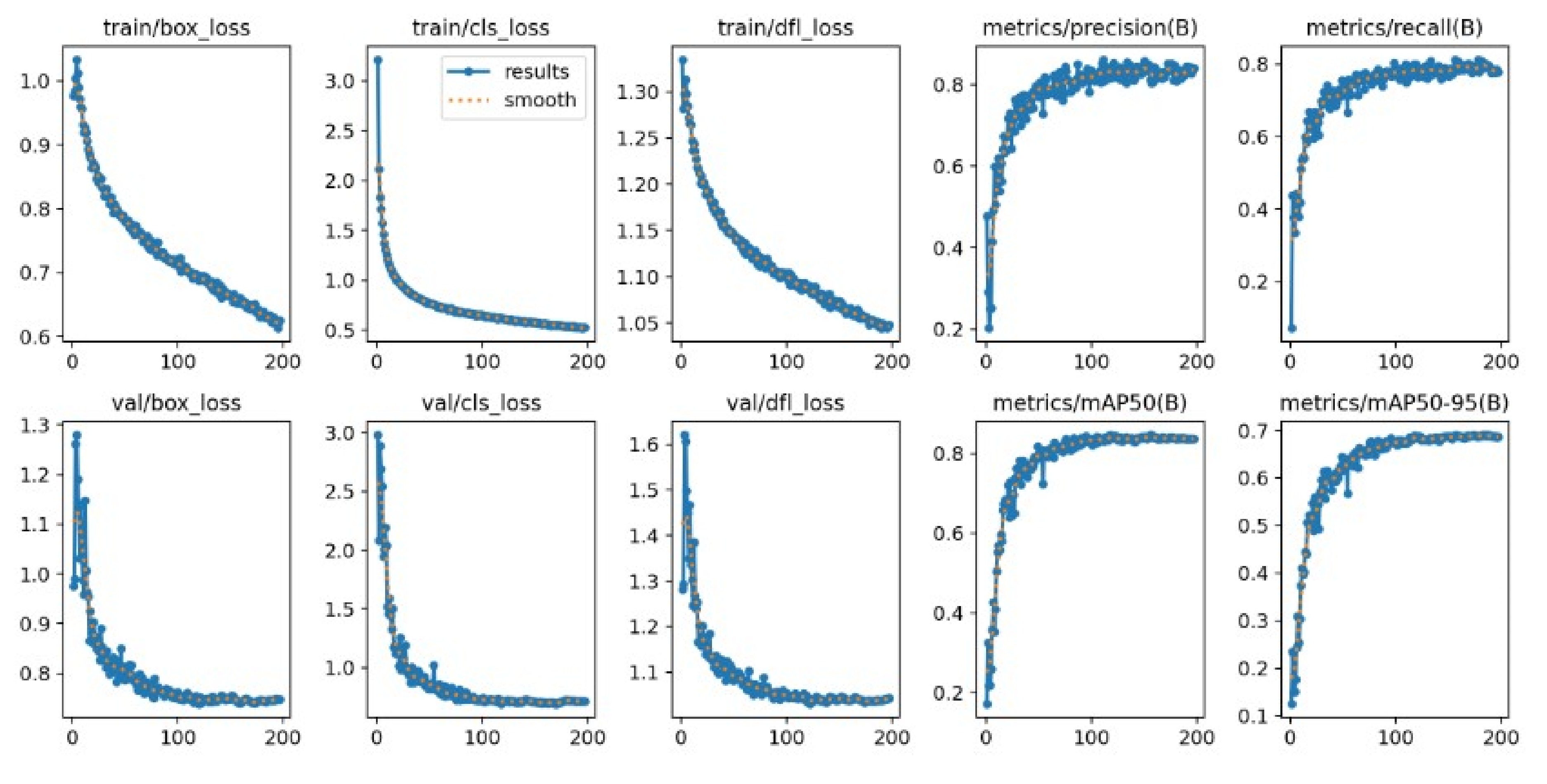


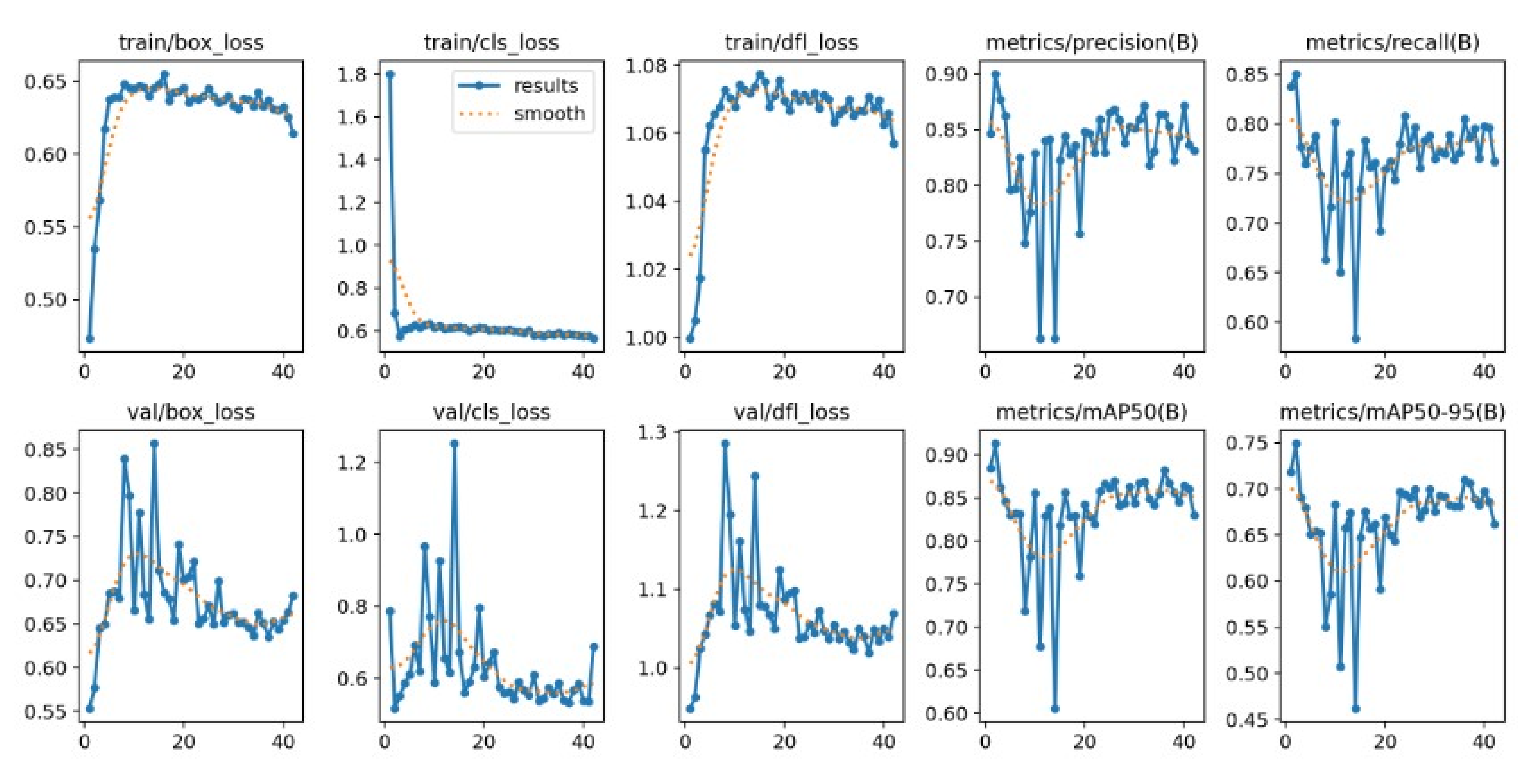
Version6



TRAINING GRAPHS :

Version5



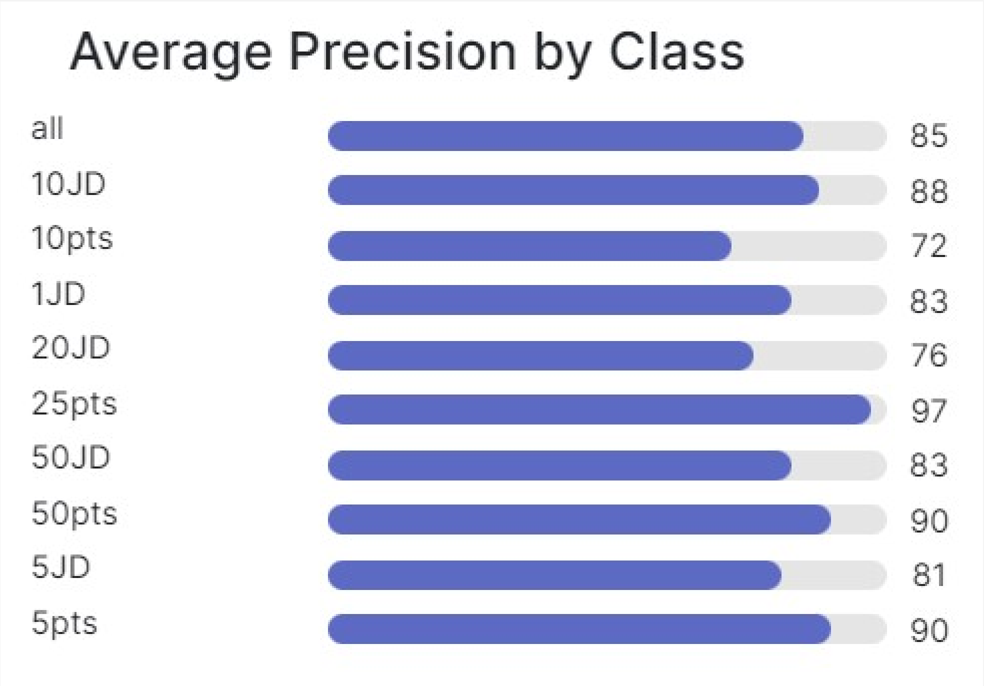


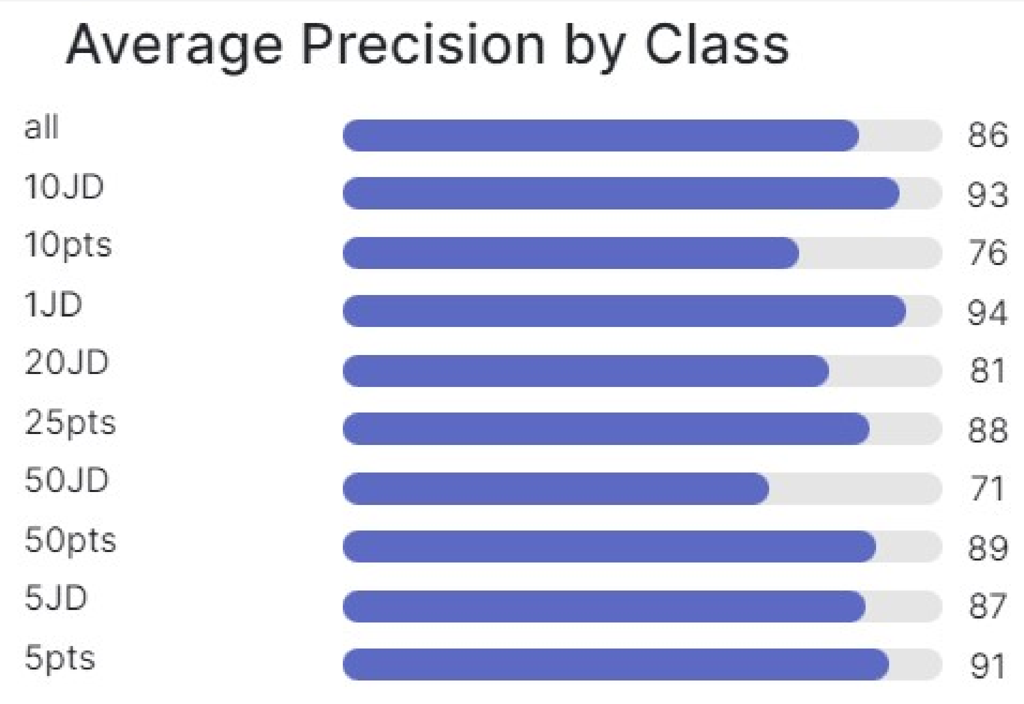
Version6

AVERAGE PRECISION BY CLASS :

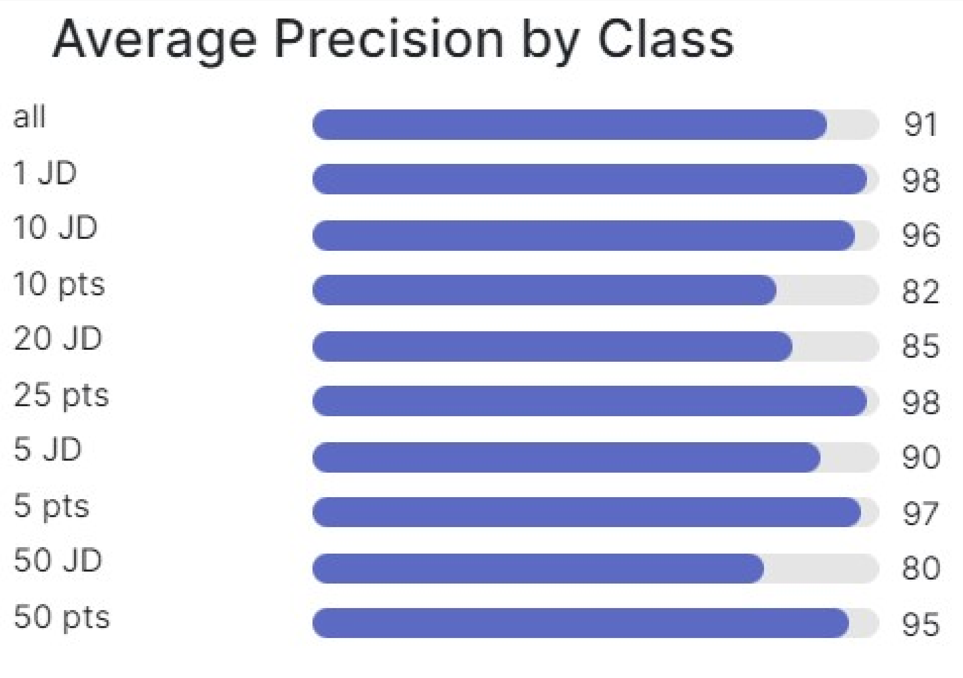
Validation | Test

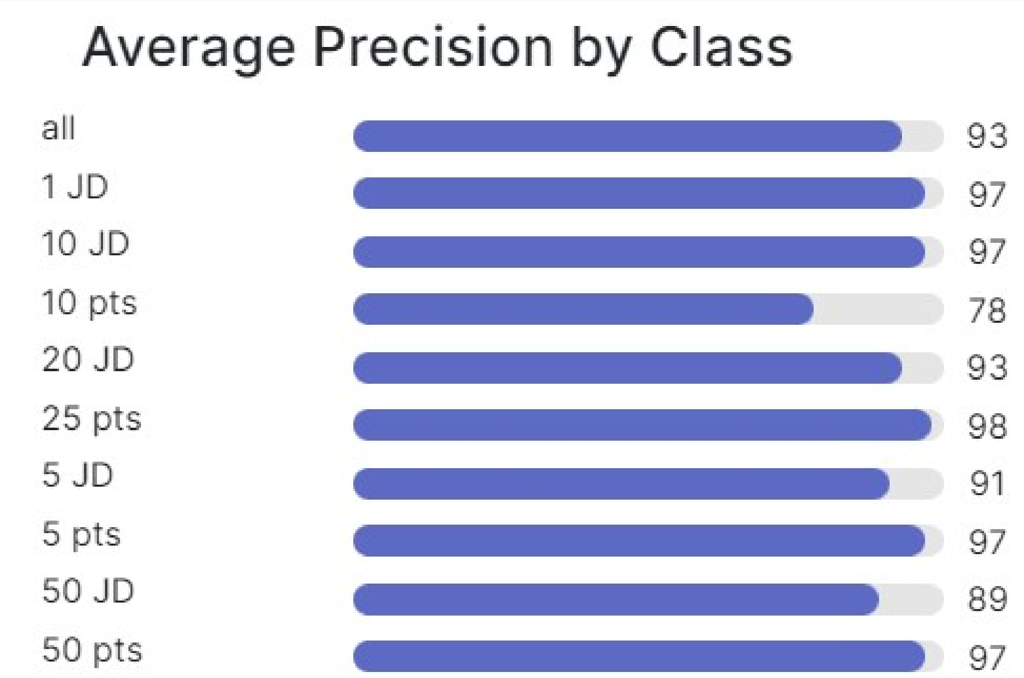
Version5



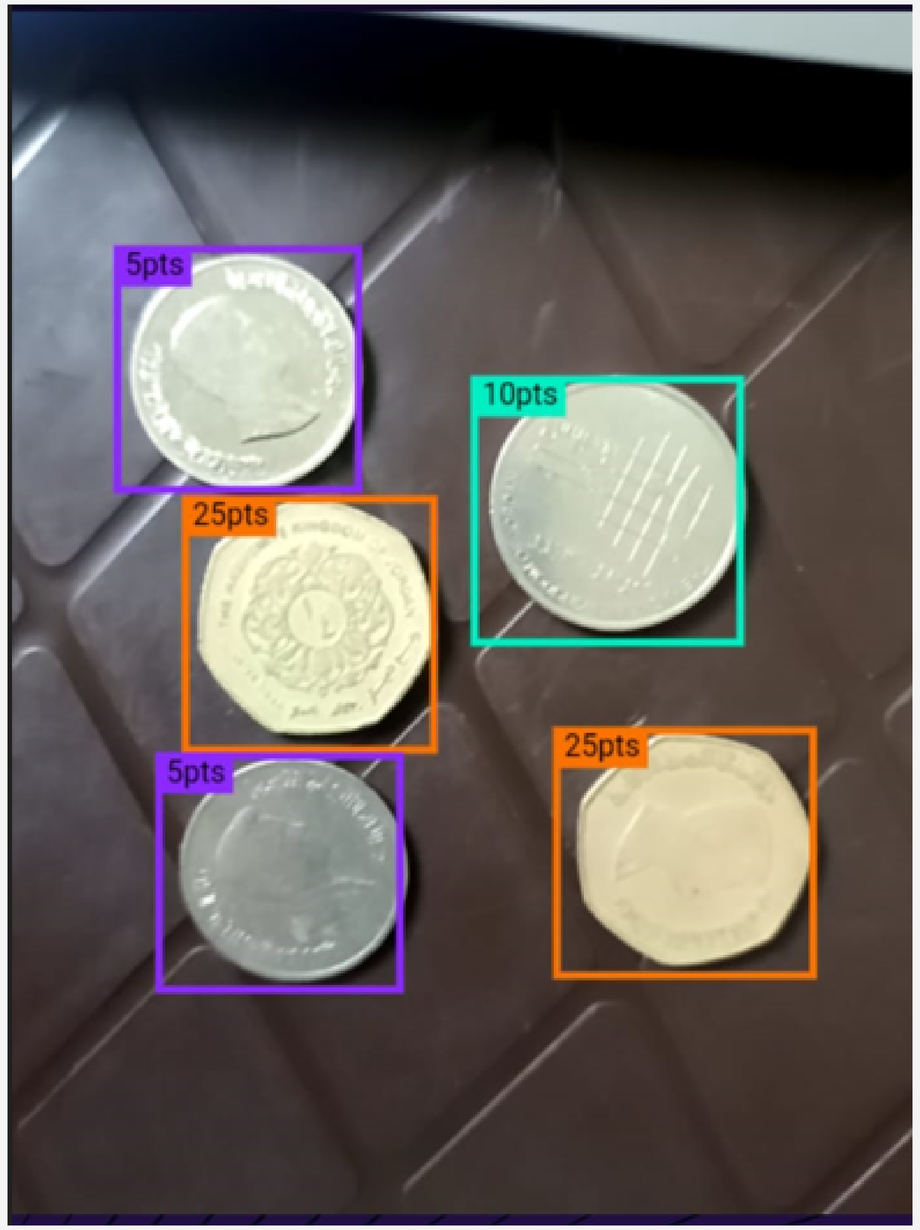


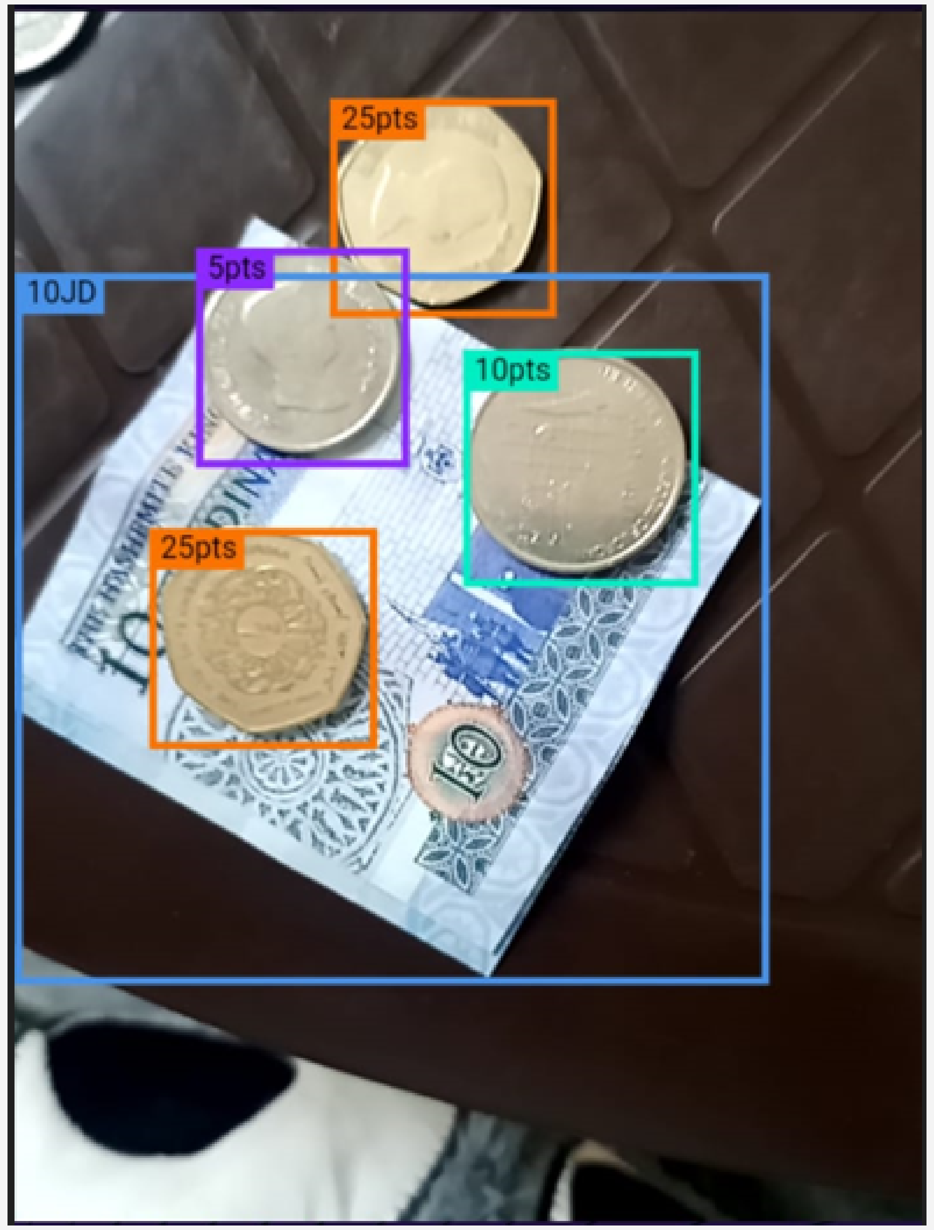
Version6



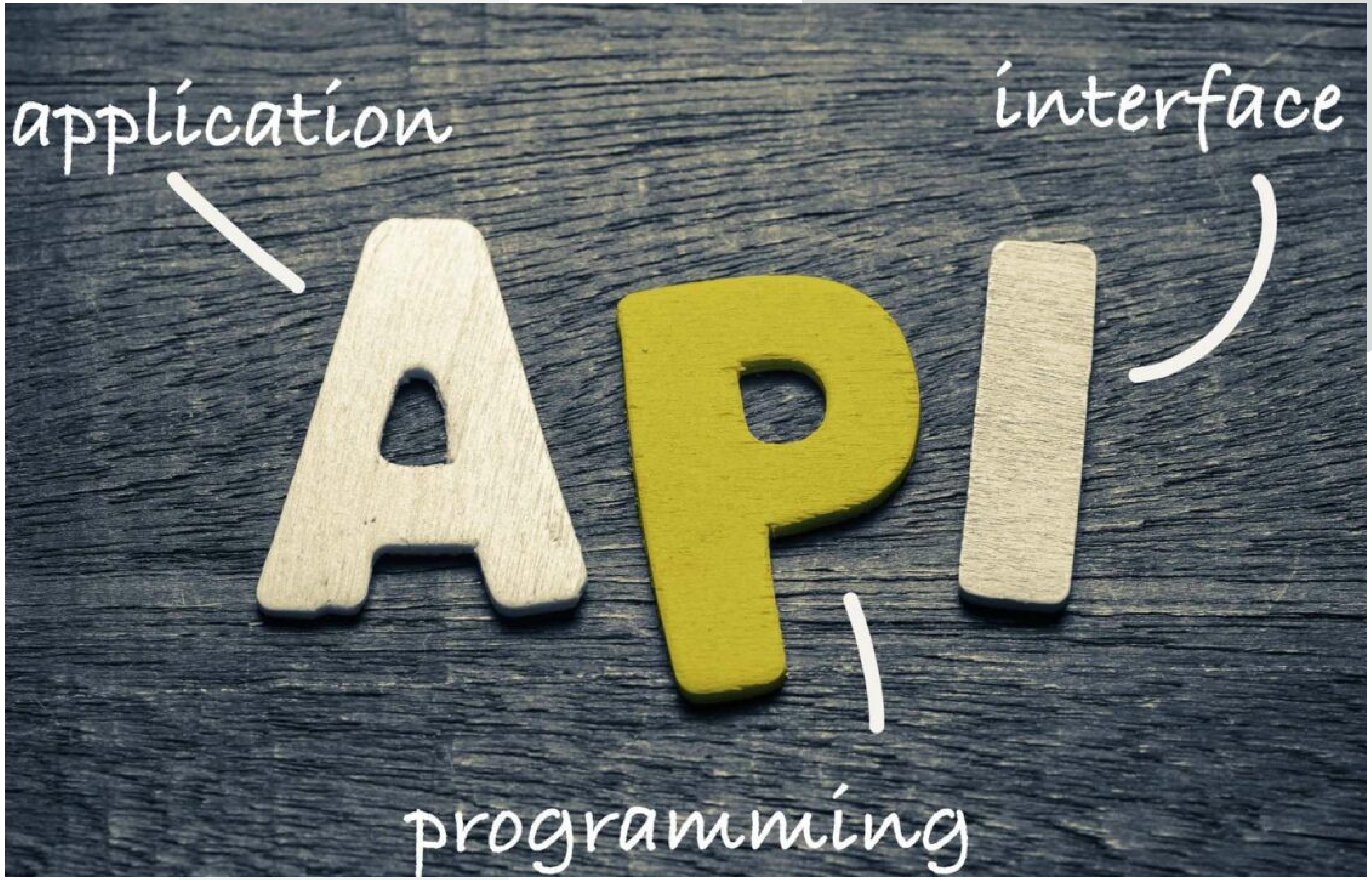


SAMPLES FROM OUTPUT:

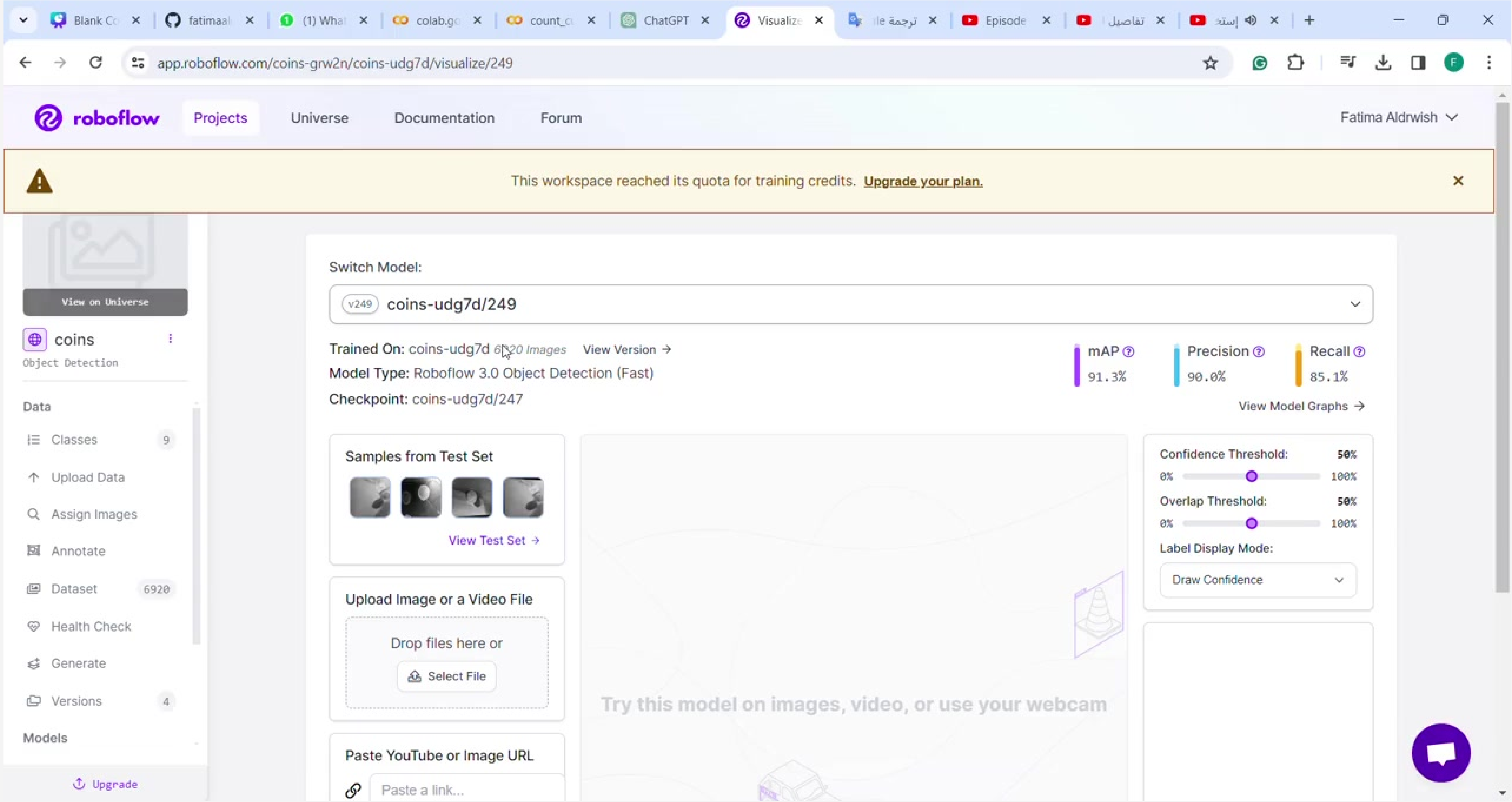




Through execution of the model trained on Roboflow using its API, particularly Roboflow's, serve as the backbone of this integration, providing a standardized interface for seamless interaction between our model and Roboflow's platform.Additionally, this cohesive connection allows for the implementation of sophisticated counting techniques, empowering our model with advanced capabilities, such as efficient currency counting.




DEMO



Blank Co
fatimaal
(1) What
colab.go
count_c
ChatGPT
Visualize
Episode
app.roboflow.com/coins-grw2n/coins-udg7d/visualize/249
roboflow
Projects
Universe
Documentation
Forum
Fatima Aldrwish
This workspace reached its quota for training credits. Upgrade your plan.
View on Universe
coins
Object Detection
Data
Classes 9
Upload Data
Assign Images
Annotate
Dataset 6920
Health Check
Generate
Versions 4
Models
Upgrade
Switch Model:
v249 coins-udg7d/249
Trained On: coins-udg7d
View Version →
Model Type: Roboflow 3.0 Object Detection (Fast)
Checkpoint: coins-udg7d/247
mAP 91.3%
Precision 90.0%
Recall 85.1%
View Model Graphs →
Samples from Test Set
View Test Set →
Upload Image or a Video File
Drop files here or
Select File
Paste YouTube or Image URL
Paste a link...
Try this model on images, video, or use your webcam
Confidence Threshold: 50%
0% 100%
Overlap Threshold: 50%
0% 100%
Label Display Mode:
Draw Confidence

COUNTING

COUNTING IN IMAGE:

COUNTING IN VIDEO:

COUNTING IN VIDEO:

Try on mobile

Future Work

1. **Localization and OCR**
   Integrate optical character recognition (OCR) capabilities to extract and recognize text such as serial numbers

2. **Security and Fraud Detection**
   Explore techniques for detecting counterfeit currency notes or fraudulent activities.

3. **Multi-Currency Suppor**
   Extend the training dataset and model architecture to support multiple currencies beyond Jordanian currency.

THANK YOU

FOR LISTENING