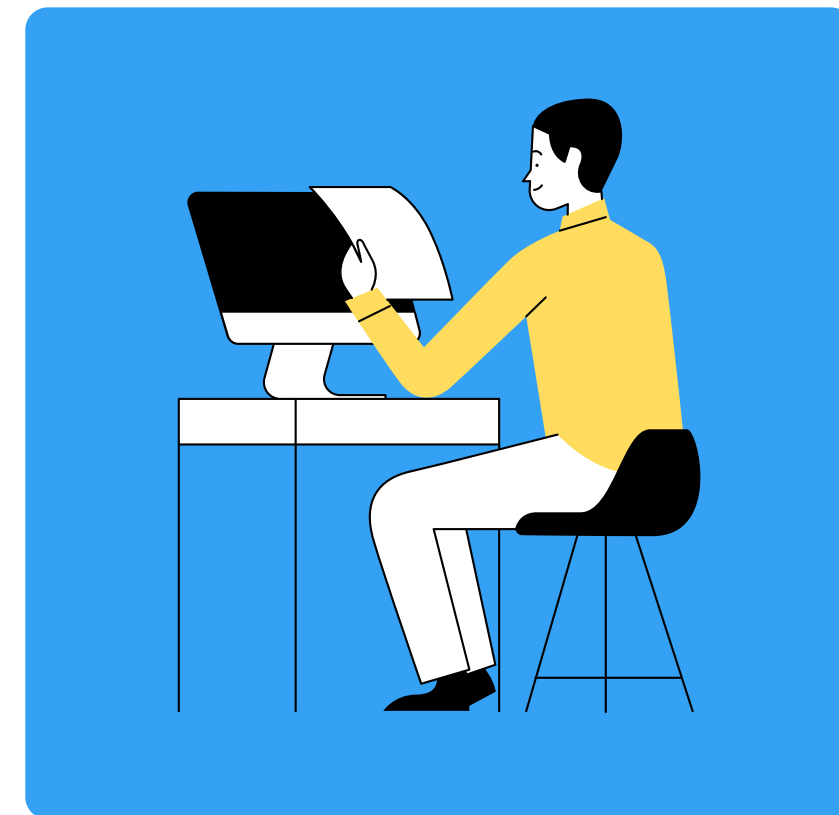
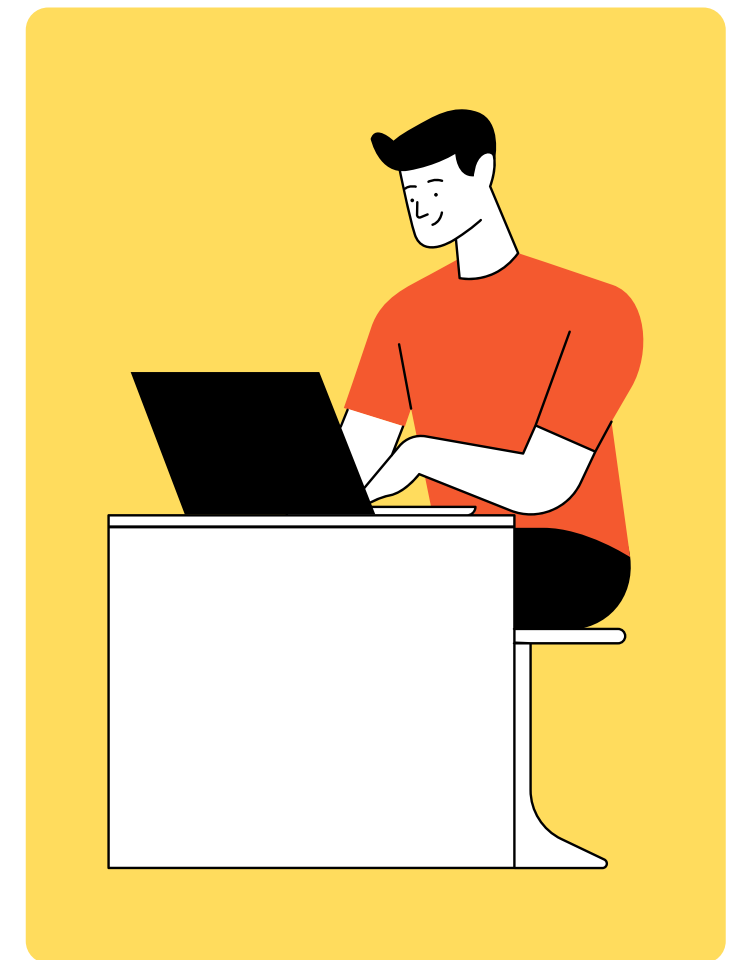


Vehicle Number Plate Detection

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Introduction

- Implementing VNPD in real-time is critical to fully serving the university needs.
- Traditional techniques rely on expensive and difficult-to-maintain specialized cameras and processing hardware.
- The VNPD pipeline begins with detecting vehicles in the frame using an object detection deep learning model, followed by localizing the license plate using a license plate detection model and finally recognizing the characters on the license plate.
- Deep neural network-based optical character recognition (OCR) is a popular technique to recognize characters in any language.

About the dataset

UFPR-ALPR dataset

This dataset includes 4,500 fully annotated images (over 30,000 license plate characters) from 150 vehicles in real-world scenarios where both the vehicle and the camera (inside another vehicle) are moving.

<https://web.inf.ufpr.br/vri/databases/ufpr-alpr/>

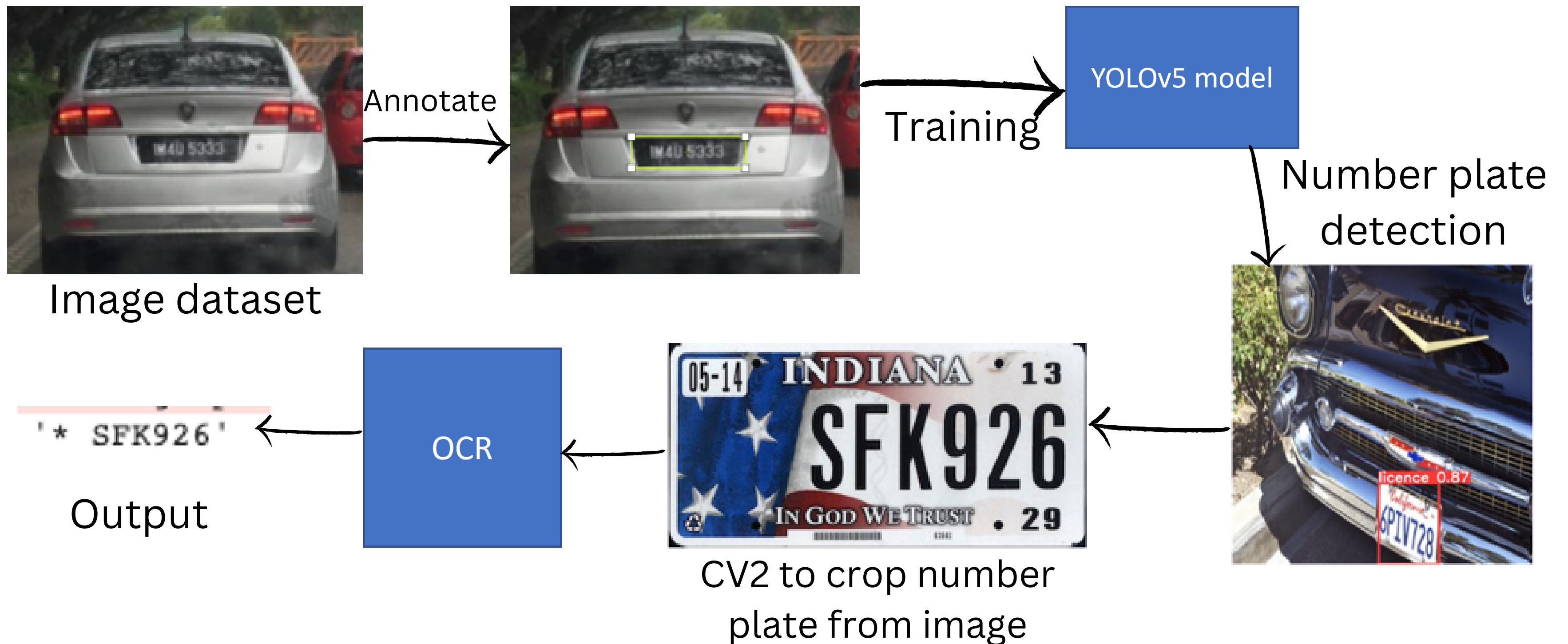
About the dataset

ALPR Dataset

This include the 300 annotated images to train YOLOv5 model. We have used Roboflow which stores, annotates and converts into file format required to train the YOLOv5 model.

<https://universe.roboflow.com/license-x4xlz/alpr-bfdif>

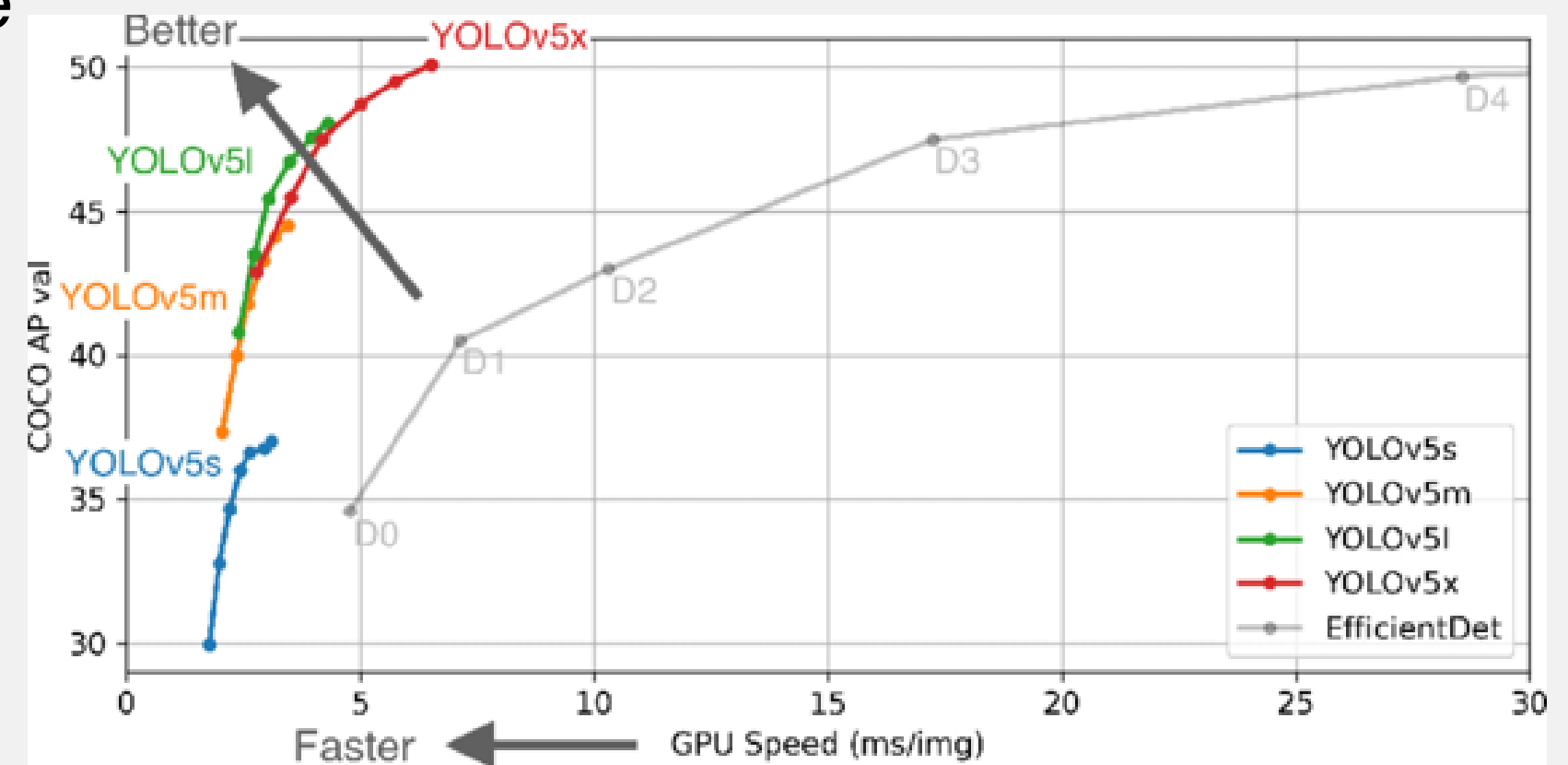
Architecture Diagram



About Models: YOLOv5

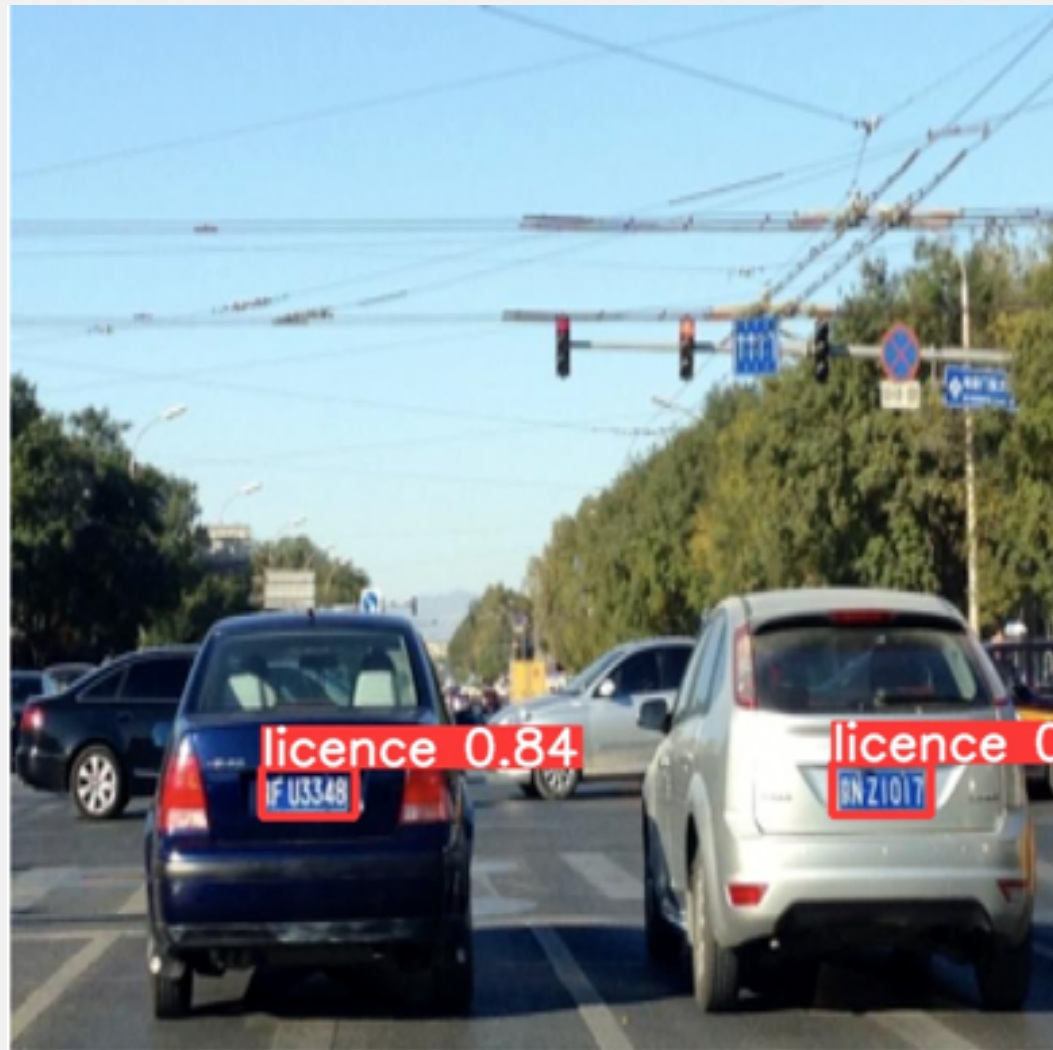
YOLOv5 for detecting the number plate

- It achieves state-of-the-art results in the object detection field.
- YOLOv5 is simple and reliable. It needs much less computational power than other architectures, while keeping comparable results [and performing much faster than other
- YOLOv5 has four versions, due to GPU usage we have trained our model on YOLOv5s.



About Models: YOLOv5

YOLOv5 performance test data images with average precision of 86%.



About Models: EasyOCR

Easy OCR: Recognition of number plate

- **Easy OCR** is a font-dependent printed character reader based on a template matching algorithm.
- It has been designed to read any kind of short text (part numbers, serial numbers, expiry dates, manufacturing dates, codes) printed on labels or directly on parts.



About Models: TrOCR

- TrOCR is an end-to-end Transformer-based OCR model for text recognition with pre-trained CV and NLP models.
- It leverages the Transformer architecture for both image understanding and wordpiece-level text generation.
- It first resizes the input text image into 384×384 and then the image is split into a sequence of 16 patches which are used as the input to image Transformers.



```
ocr_printed_image(invoice_image1)
```

```
The attention mask and the pad token id were not  
mentioned in the documentation to obtain reliable results.  
Setting `pad_token_id` to `eos_token_id`:2 for  
unconditional generation.
```

Implementation

Future Work

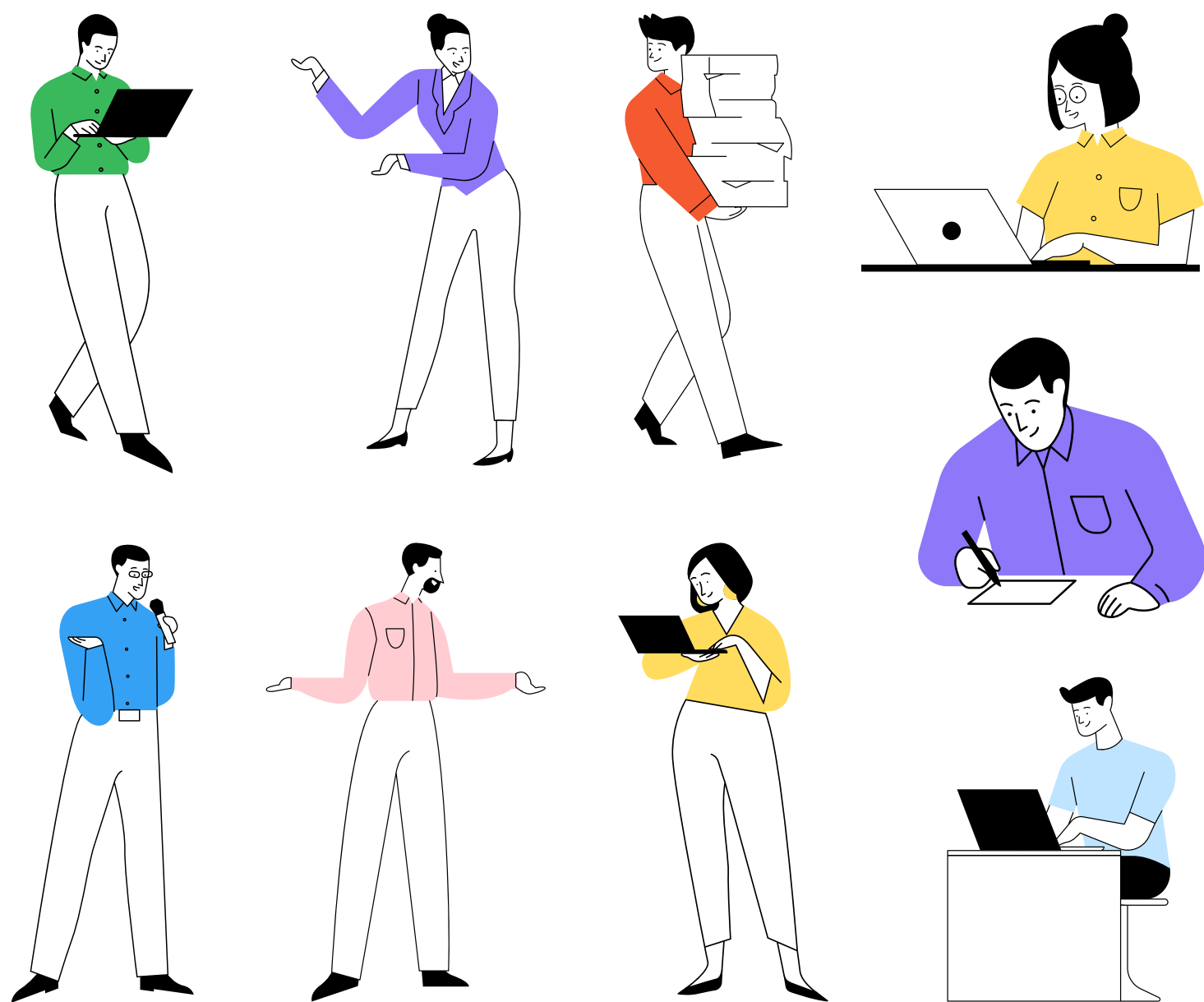
- To be able to detect parked vehicle occupying more than one spot or making parking difficult for neighboring vehicles.
- To be able to assign car owner name to the detected number plate.
- To improvise and re-train the model to work on low resolution to provide better accuracy.

Good & Bad Experiences

- Got to learn a lot about YOLO versions and OCR models.
 - More comfortable working with Github.
- Planning meetings with UPD, IT services.
 - Working with IT services to find a way to access the security cameras without violation any rules.

References

- <https://ieeexplore.ieee.org/document/9068049>
- <https://www.kaggle.com/datasets/andrewmvd/car-plate-detection>
- <https://public.roboflow.com/object-detection/license-plates-us-eu>
- <https://github.com/deepakat002/numberplaterecognition>
- <https://medium.com/geekculture/real-time-automated-number-plate-recognition-system-1820b5e42bae>
- <https://www.youtube.com/watch?v=6xkIN4iiA0Q>



THANK YOU!