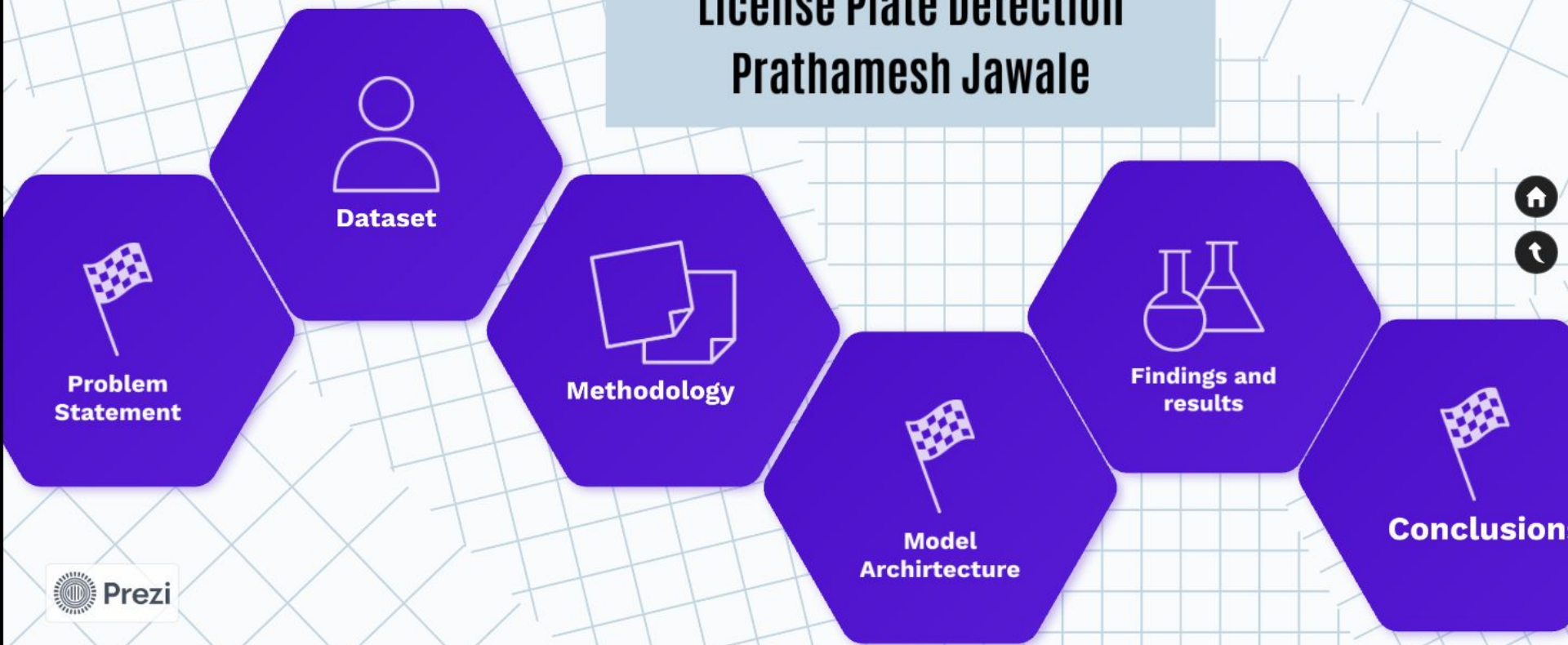


# Capstone Project

## License Plate Detection Prathamesh Jawale



## Problem Statement

Guided By Mentors:

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- Amit Jadhav
- Sahil Bansal

**Problem  
Statement**

## **Problem Statement**

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- 1 Use YOLO/SSD/RetinaNet to train a License Plate Detector.**
- 2. Use a Segmentation Technique to Extract the Text on the License Plate.**
- 3. Use a Recognition Method/OCR to Recognize the Text on the License Plate.**
- 4. Test out your Solution on Images you Click of License Plates**
- 5. Try to Minimize the Latency of the Solution as much as Possible**

## **Information regarding the Dataset**

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- VOC Pascal dataset (vietnamese) of License Plates
- The Dataset is bifurcated into two types
  - 1 Images
  - 2 Annotations
- These Annotations contain Xml formats of the respective images

Theres a need to convert these in yolo format by extracting information out of the xml files  
<class><xmin , xmax> <ymin,ymax>,<width,height>



## Solution Flow

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- 1 Loading the VOC Dataset
- 2 Converting the dataset into YOLOv8 format
3. By this YOLO labeling create a function to plot bounding boxes around the license plates
4. Using Object detection algorithms like YOLO, SSD, RetinaNet
- 5 Text recognition using above models and training it.
- 6 Character Segmentation using the EasyOCR library to extract the text
- 7 converting the model into TensorFlow Lite, ONNX runtimes for better latency

## **Algorithms Used:**

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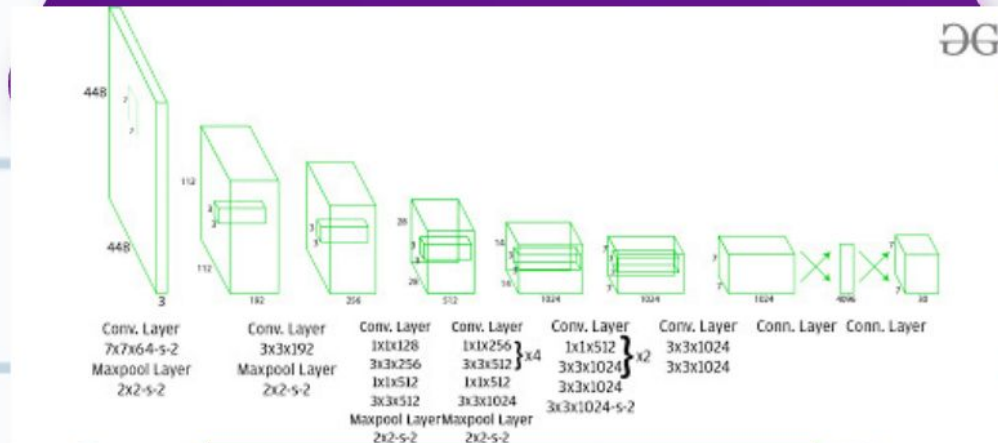
YOLO, which stands for "You Only Look Once," is a popular object detection algorithm used in computer vision and image processing. YOLO revolutionized the field of object detection by providing real-time and accurate detection of multiple objects within a single pass of the neural network..

Once trained, YOLO can quickly identify and locate license plates within an image or video stream, making it a valuable tool for applications like automated toll collection, parking management, and law enforcement.

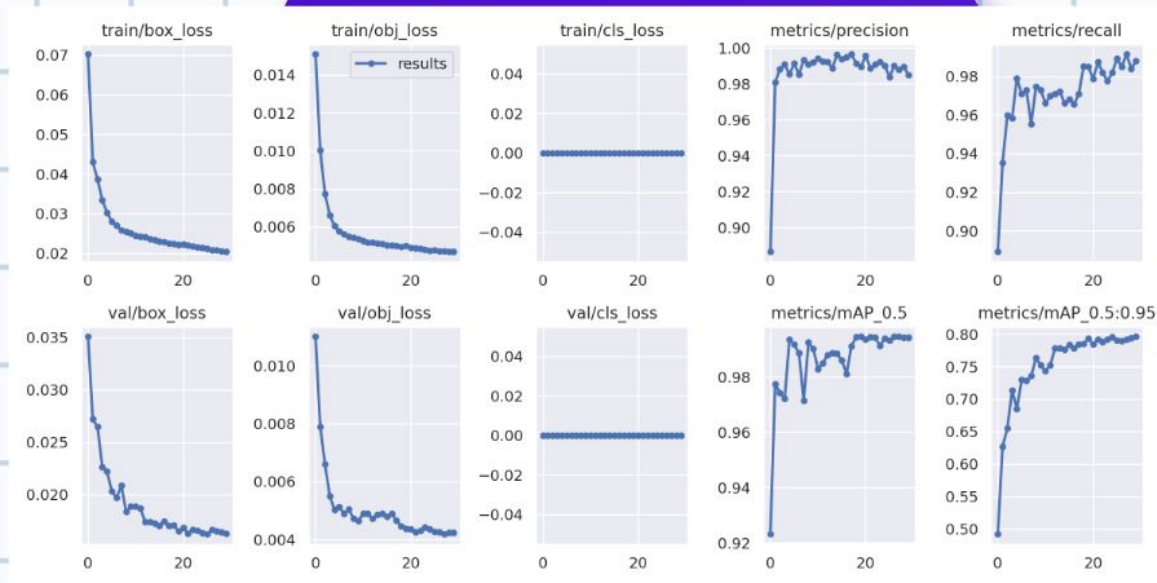
**Yolo Architecture**

# Yolo Architecture

YOLO consists of multiple convolutional layers and produces a fixed number of bounding boxes with associated confidence scores and class predictions, making it both accurate and efficient for object detection tasks.



## Findings & Results



Detection

Recognition  
and  
Character  
segmentation

Metrics (Yolov8s)



## Bounding box alongwith confidence

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## Conclusions

- 1 Successfully implemented the yolo model which works well over single object detection (plate)
2. Processing over the image like plotting bounding boxes, contours ,segments makes the detection task very reliable and efficient
3. yolov8s and yolov8n is a fast and easy to work with algorithm which makes it ideal for similar problem statements
- 4 The trained YOLO model can be used for object detection in various applications, such as surveillance, robotics, and more. Fine-tuning, evaluation, and deployment are areas for future exploration.

## References

# Thankyou!!

- Yolo Ultralytics: <https://docs.ultralytics.com/>
- OCR : <https://github.com/JaidedAI/EasyOCR>
- <https://medium.com/@theophilebuyssens/license-plate-recognition-using-opencv-yolo-and-keras-f5bfe03afc65>
- Tflite export: [https://docs.ultralytics.com/yolov5/tutorials/model\\_export/#formats](https://docs.ultralytics.com/yolov5/tutorials/model_export/#formats)