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Automated Vehicle Number Plate Detection and Recognition using YOLOv8.

Paper ID: 1092

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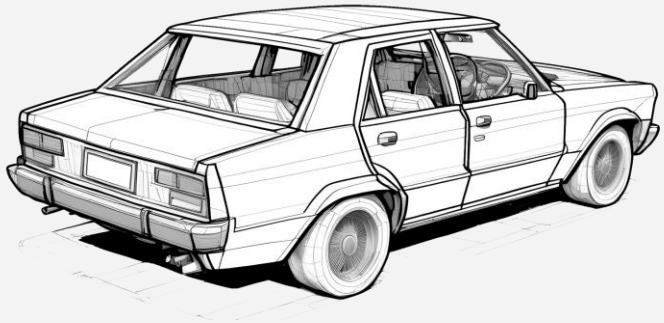
01 Introduction



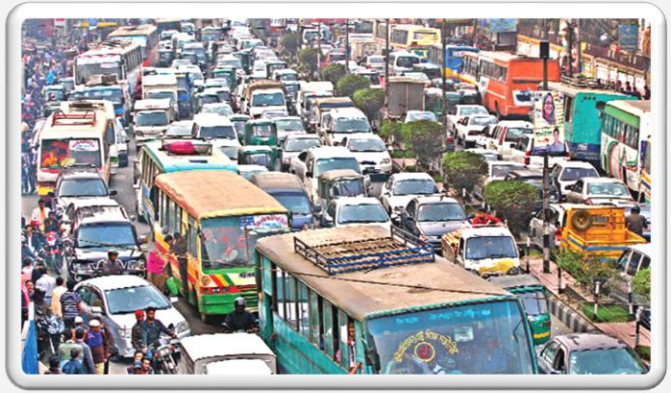
Introduction

01 Problem Statement

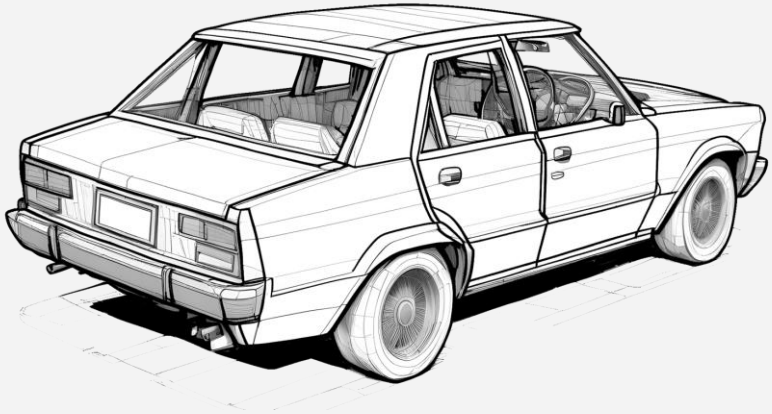
- ✓ Fast urbanization of Bangladesh really causes heavy traffic congestion as well as poor law enforcement.
- ✓ Automated license plate recognition is important for toll collection, parking management, and traffic surveillance.

02 Challenges

- ✓ Multilingual Bangla–English plates.
- ✓ Skewed angles, varying lighting, and noisy inputs.



02 Objective



Objectives

01 Primary Goal

- ✓ Create a system for real-time detection and recognition of Bangla vehicle license plates.

02 Key Objectives

- ✓ Develop a custom dataset for Bangla license plates.
- ✓ Integrate YOLOv8 for detection and Easy-OCR for recognition.
- ✓ Achieve high accuracy in detection and recognition under challenging conditions.

03 Literature Review

Literature Review

Key Findings from Existing Works

- ❑ Most systems focus on Latin-based plates, not Bangla.
- ❑ The challenges include poor lighting, skewed plate, and impending noise pollution.

Gaps in Research

- ❑ Limited datasets for Bangla license plates.
- ❑ Lack of robust systems for multilingual scripts.

Our Contribution

- ❑ Custom dataset for Bangla plates.
- ❑ Integration of YOLOv8 and Easy-OCR for superior performance.

04 Methodology

Overview

- YOLOv8 for license plate detection.
- Easy-OCR for character recognition.


```
[ ]  dataset_path = "/content/drive/MyDrive/Colab Notebooks/CarPhoto"
```

```
import os
print(os.listdir("/content/drive/MyDrive/Colab Notebooks/CarPhoto"))
```

```
['data.yaml', 'README.dataset.txt', 'README.roboflow.txt', 'train', 'test', 'valid']
```

```
[ ]  !pip install ultralytics
     from ultralytics import YOLO

     model = YOLO('yolov8n.pt')
```

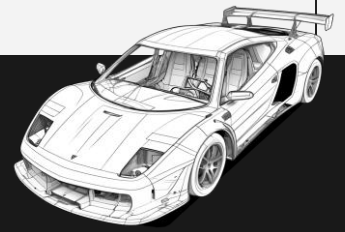
Workflow

Detection (YOLOv8)

Preprocessing

Image acquisition

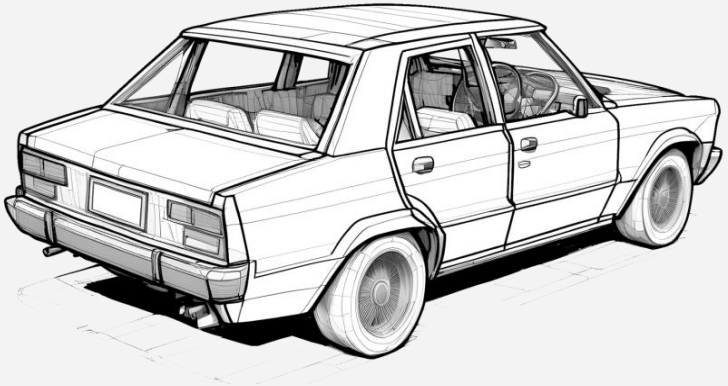
Recognition (Easy-OCR).



Key Features

- Real-time processing.
- Robustness to skewed plates, occlusions, and varying lighting.

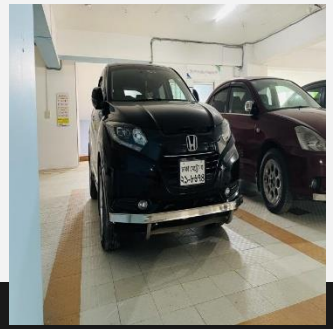
05 Dataset and Preprocessing



Dataset and Preprocessing

Dataset

- 393 images (276 training, 79 validation, 38 testing).
- Collected from Dhaka city, focusing on diverse vehicle types and plate designs.



Preprocessing

- Resizing, cropping, noise removal.
- Annotation using Roboflow.
- Data augmentation: flipping, rotation, contrast adjustments.

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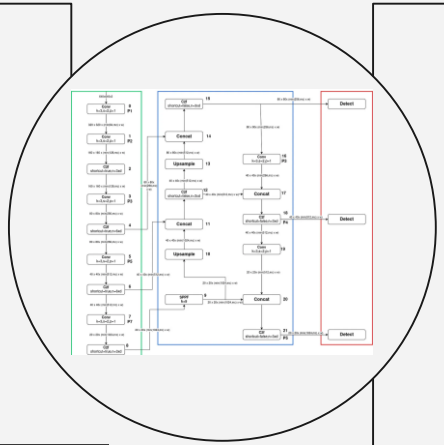
06 YOLOv8 - Model

YOLOv8 Model

Architecture

CSPNet backbone, FPN/PAN neck, anchor-free detection head.



Training Details

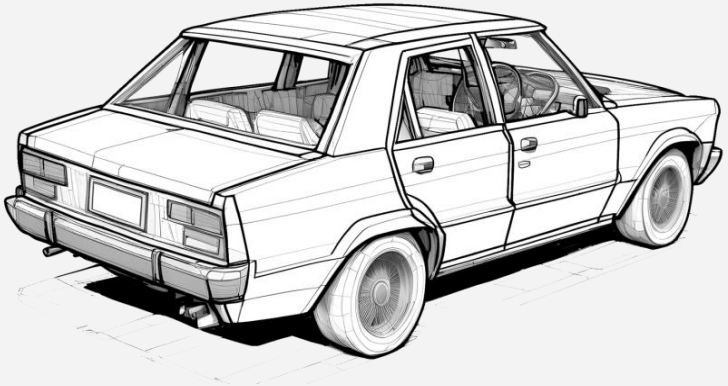
200 epochs, batch size 16, learning rate 0.01.

Key Advantages

High detection accuracy (93–96%).
Real-time processing capabilities.

```python
# Train the model
model.train(
    data=f"/content/drive/MyDrive/Colab Notebooks/CarPhoto/data.yaml",
    epochs=200,
    batch=16,
    imgsz=640,
    name="car_number_plate_detector"
)
```

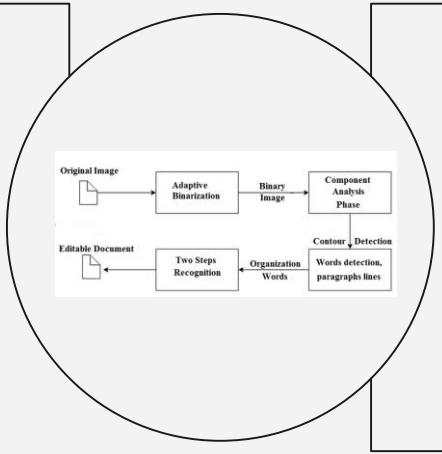
07 Easy-OCR Framework



Easy-OCR Framework

Overview

Multilingual OCR framework for Bangla and English scripts.



Process

Adaptive binarization → Component analysis → Character segmentation → Text recognition.

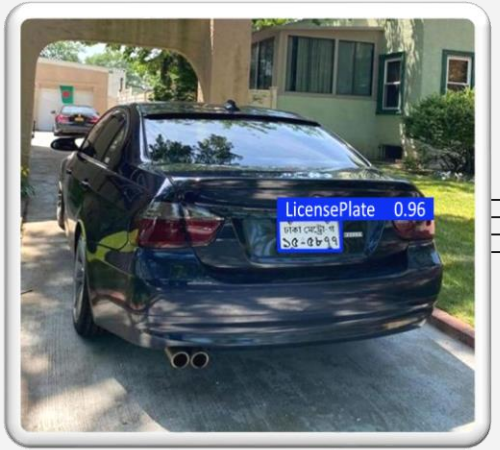
Key Advantages

Handles varying fonts, irregular spacing, and partial occlusions. Achieves low CER (1.52%) and WER (5.53%).

```
# Initialize EasyOCR reader
reader = easyocr.Reader(['bn', 'en'])
```

08 Results & Discussions

Results & Discussions



❑ Detection Accuracy

- 93–96% accuracy in detecting Bangla/English license plates.

❑ Recognition Performance

- CER: 1.52%, WER: 5.53%.

❑ Comparison with Baseline

- Outperforms YOLOv4 + Tesseract (88.5% accuracy, 5.10% CER, 12.50% WER).

❑ Visual Results

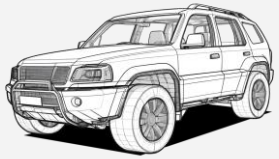
- Showcase detected plates under varying conditions (skewed, occluded, low lighting).

09 Conclusion

Conclusion

Key Contributions

- ✓ Custom dataset for Bangla license plates.
- ✓ High detection and recognition accuracy.
- ✓ Robust performance in real-world conditions.



Applications

Automated toll collection, parking management, traffic monitoring.

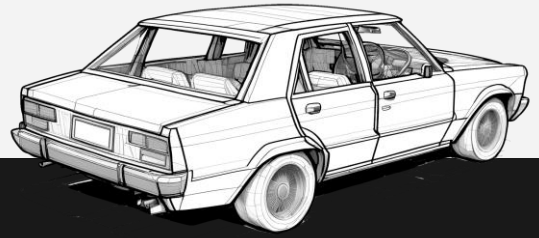
Future Work

- ✓ Improve recognition accuracy under challenging conditions.
- ✓ Enhance generalization for diverse plate formats.
- ✓ Owner Identification and Low enforcement.

Thanks!

Conference Organizers:

The organizers of the **4th International Conference on Electrical, Computer and Communication Engineering (ECCE)** for providing this platform to present our work.



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Any Questions ?