Car License Plate Recognition System

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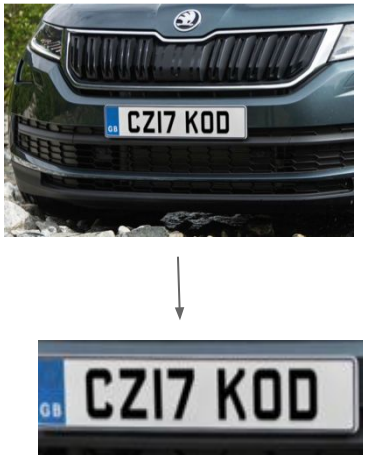
System Overview

- Two important components
  a. License plate detection
  b. Text recognition
- Traditional image-processing techniques in between

Detection Component

- Network Architecture
  - Input size: 416x416 RGB images
  - Convolutional stages (32, 64, 128 channels)
  - Flattened through fully connected layers
  - Output: License plate bounding box



Text Recognition with TrOCR

- TrOCR Model: Pre-trained model by Microsoft for text extraction
- Input: Cropped image of a license plate
- Output: Extracted text

“E4 GLE”

Training Process

- Hardware: NVIDIA RTX 3070 GPU
- Tools: PyTorch Optuna for hyperparameter optimization
- Data: Car Plate Detection dataset (Kaggle)

```
Study statistics:
  Number of finished trials:  150
  Number of pruned trials:  0
  Number of complete trials:  150
Best trial:
  Value:  0.0030831431504338 98
  Params:
    learning_rate: 7.13137172016751e-06
    batch_size: 19
    dropout_rate: 0.020559977606759997
    epochs: 40
```

Data Augmentation and Robustness

Augmentation techniques

- Random horizontal flips
- Brightness/contrast adjustments
- Gaussian noise and rotations

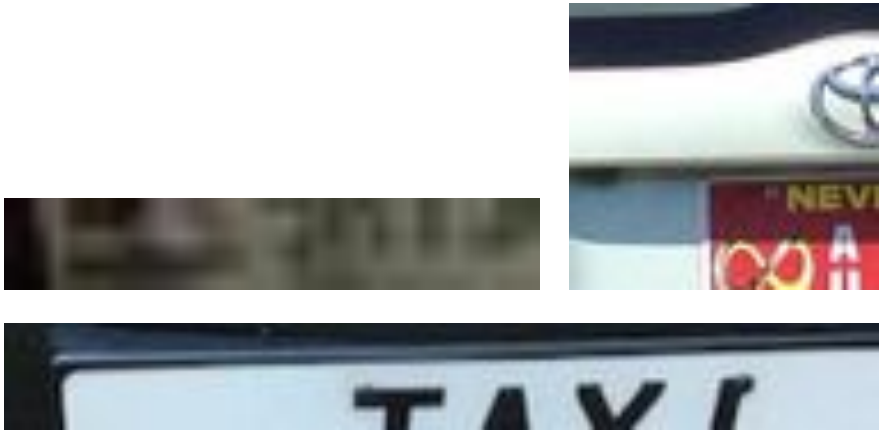
Performance and Limitations

Strengths

- Effective for single-plate detection

Limitations

- Struggles with multiple plates
- Still relatively small dataset?
- Sensitivity to occlusions and lighting conditions



Future Development

- Multi-plate detection
- Fine-tuning OCR for license plates
- Real-time processing

Thank you for your attention