CNN-Based Road Sign Classification for Deep learning

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DADS JUNE BATCH
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Introduction

Accurate, real-time road sign recognition aids autonomous driving.

Building a CNN model aims to improve classification effectiveness.

According to NHTSA, recognition tech could prevent 2.2 million accidents yearly.

Convolutional Neural Networks (CNNs) Overview

What Are CNNs?

Deep learning models specialized in image recognition.

Key Components

- Convolutional layers extract features
- Pooling layers reduce dimensionality
- Activation functions add non-linearity

How CNNs Work

They learn hierarchical features for classification tasks.

LeNet-5 from 1989 was an early CNN architecture example.

Dataset: The ROAD signs Traffic Recognition

Classes and Size

32 traffic sign categories with 1029 training images.

Challenges

- Variable lighting and shadows
- Different image scales
- Partial occlusions of signs

Performance

Advanced CNNs surpass 97% accuracy

Model Architecture: A Simple CNN

Input Layer

32x32 pixel RGB images

Convolutional Layers

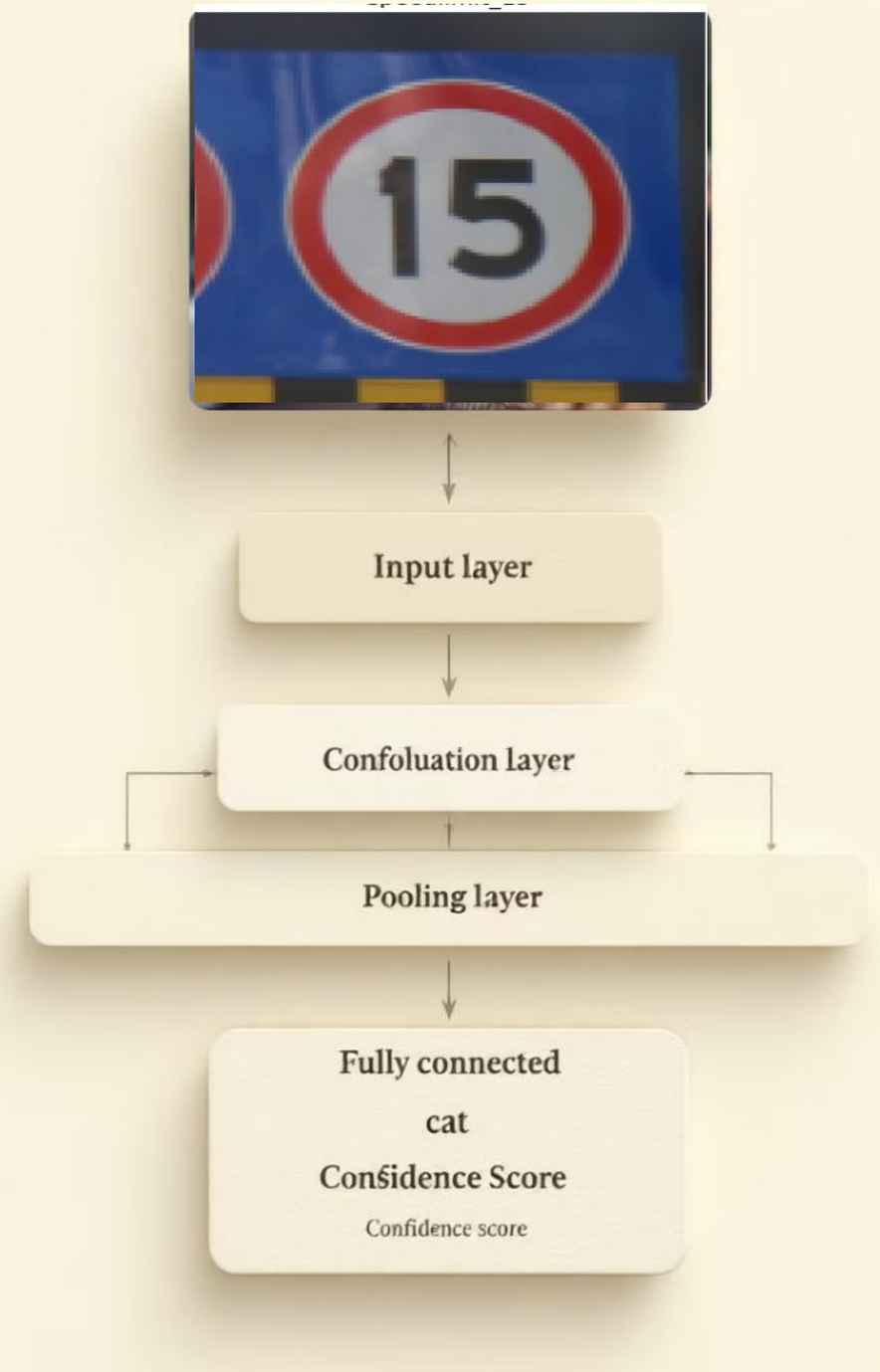
32 and 64 filters with 3x3 kernels and ReLU activation

Pooling and Flatten

Max pooling layers reduce feature size, followed by flattening

Fully Connected & Output

128-unit fully connected layer and 43-unit softmax output



Training the Model

1

Setup

75/20 train-test split, 75 epochs, batch size 32

2

Data Augmentation

- Rotation
- Scaling
- Brightness adjustments

3

Validation

Monitor performance to avoid overfitting

4

Frameworks

Implemented using TensorFlow or PyTorch

Results and Performance Evaluation

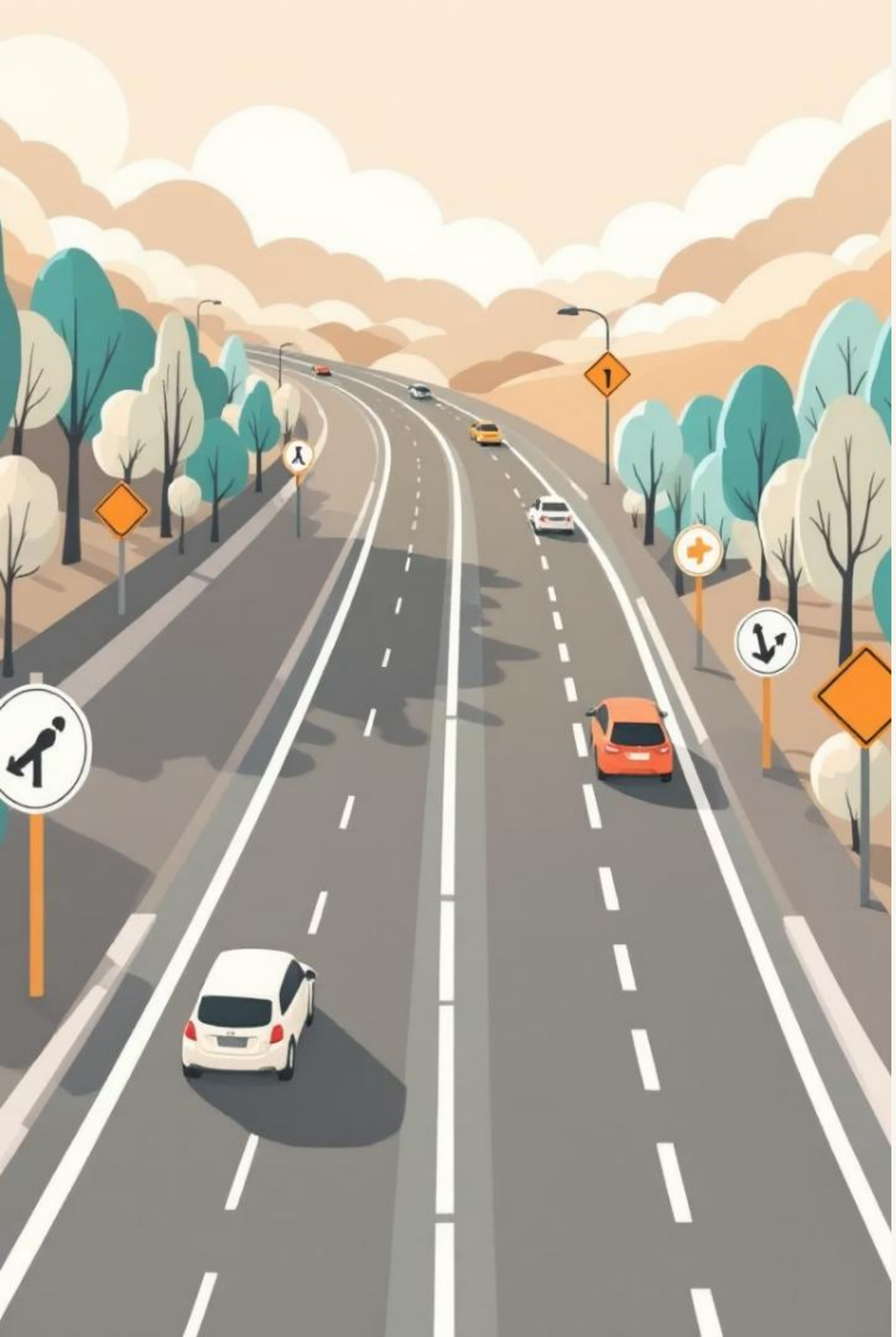
Accuracy

Achieved 95% test set accuracy

Strong performance on varied traffic signs

Confusion Analysis

Identifies common misclassifications to improve model



Conclusion

Effective CNN Model

Our simple CNN achieves high classification accuracy

Transportation Impact

Potential to reduce accidents and enhance safety

Future Goals

Refine model and deploy in real environments