

Handwritten Digit Recognition

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Project Overview

The Handwritten Digit Recognition project utilizes deep learning techniques to classify handwritten digits from the MNIST dataset. This AI model is built using TensorFlow and Keras, employing a Convolutional Neural Network (CNN) to achieve high accuracy in recognizing digits from 0 to 9.

Project Workflow

1. Dataset Loading & Preprocessing

- The MNIST dataset, consisting of 60,000 training images and 10,000 test images, is loaded.
- Images are reshaped to fit the CNN model and normalized for improved training efficiency.

2. Model Architecture

- A CNN model is constructed with multiple convolutional layers, max-pooling layers, and dense layers.
- The architecture includes ReLU activation for non-linearity and Softmax activation for multi-class classification.
- The model is compiled using the Adam optimizer and Sparse Categorical Crossentropy loss function.

3. Training & Evaluation

- The model is trained for 10 epochs using the training dataset.
- Accuracy and loss metrics are plotted to visualize the model's performance.

4. Prediction & Testing

- The trained model is tested on individual images to validate its ability to recognize handwritten digits.
- Predictions are displayed alongside the input images.

5. Model Saving & Loading

- The trained model is saved as "tf-cnn-model.h5" for future use.
- The saved model is reloaded and tested on new inputs to confirm its effectiveness.

Technologies Used

- Python
- TensorFlow & Keras
- Matplotlib
- NumPy

This project demonstrates the practical implementation of deep learning in optical character recognition (OCR) and serves as a foundation for more advanced AI-driven handwriting recognition applications.