HandWritten Digit Recognizer

This is a simple yet powerful web app built using **Streamlit** and **TensorFlow**. It allows users to draw a digit (0–9) on a canvas and uses a **Convolutional Neural Network (CNN)** model trained on the **MNIST dataset** to recognize the digit.

Features

- **%** Draw digits on a canvas (white on black)
- **Q** Real-time digit prediction using a CNN model
- In Visualization of the preprocessed input
- ♥□ Built using TensorFlow, OpenCV, and Streamlit

Tech Stack

Component	Technology	Used
Component	1 commoney	USCU

Backend Python, TensorFlow

Frontend Streamlit, Canvas plugin

Image Processing OpenCV

Model Input Grayscale 28x28 images

How It Works

- 1. **User draws** a digit on the canvas.
- 2. The canvas image is **converted to grayscale**, resized to **28x28**, and **inverted** to match the MNIST format.
- 3. The processed image is passed to a **CNN model trained on MNIST**.
- 4. The **predicted digit** is displayed with confidence.

Setup Instructions

Clone the repository:

git clone https://github.com/jhanani14/Handwritten_Digit_Recognition-MNIST-.git

cd mnist-digit-recognizer

Create and activate a virtual environment (optional but recommended):

python -m venv venv
venv\Scripts\activate # On Windows

Install dependencies:

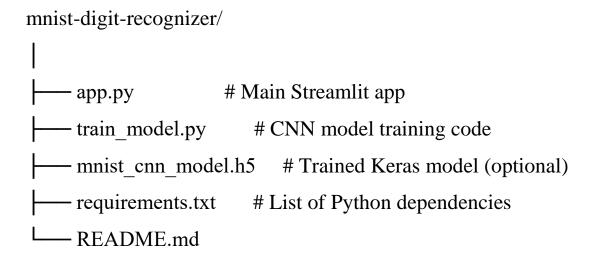
pip install -r requirements.txt

Train the model (if mnist_cnn_model.h5 is not already included): python train_model.py

Run the Streamlit app:

streamlit run app.py

Project Structure



Model Overview

• **Input:** 28x28 grayscale image

- Architecture: 2 Conv layers → Flatten → Dense → Output(10 classes)
- Dataset: MNIST handwritten digits

• **Accuracy:** ~99%

Requirements

streamlit
tensorflow
opency-python
streamlit-drawable-canvas
numpy

Future Improvements

- Add voice output of prediction
- Add bar chart showing prediction confidence
- Deploy on Streamlit Cloud
- Allow drawing multiple digits and segmenting