Handwritten Character Recognition (0–9, A–Z)

"Turning handwriting into smart digital insight."

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Problem & Goal

Problem:

- Handwriting varies—hard to recognize
- Manual reading is slow and error-prone

Goal:

- Train a model to recognize digits & letters
- Support real user-drawn images

Project Overview: Dataset & Preprocessing

Dataset:

MNIST + A–Z dataset

Balanced, 28×28 grayscale images

Preprocessing:

Grayscale → Invert → Threshold

Clean, resize, and pad

Technologies Used

Tools & Libraries:

- Python, TensorFlow, Keras
- OpenCV, NumPy, Pandas
- Matplotlib, Google Colab

Project Workflow:

1. **Load Dataset**
   - Import MNIST (0–9) and A–Z data.
   - Normalize and reshape to 28×28 grayscale.
2. **Build & Train CNN Model**
   - Use TensorFlow/Keras to define a Convolutional Neural Network.
   - Train with combined dataset and evaluate accuracy.
3. **Upload Custom Images**
   - Add .jpg handwritten characters.
   - Preprocess: grayscale → invert → threshold → clean → resize → normalize.
4. **Fine-Tune with Custom Data**
   - Label images, merge with training set, retrain model.
5. **Make Predictions**
   - Predict custom characters and plot results.
6. **Word Separation**
   - Detect letters from word image using contours.
   - Predict each letter and form full word.

Training Process:

- Trained on 80%, tested on 20%
- 10 epochs, batch size 64
- Used both datasets and custom images

Results :

- Achieved high accuracy on test dataset (digits + letters).
- Successfully predicted custom handwritten characters.
- Separated letters from word images and predicted full words.
- Improved performance by fine-tuning with real user data.

Conclusion :

We built a CNN model to recognize handwritten digits (0–9) and letters (A–Z). The model was trained on standard and custom data for better accuracy. We added image preprocessing to clean and predict custom characters and words. This project shows how deep learning and image processing can solve handwriting recognition effectively.

Thank You !