Phase-1 Submission

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Institution: Dhanalakshmi college of Engineering

Department: Computer science and Engineering

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1. Problem Statement

- Many everyday tasks still involve reading and understanding handwritten numbers, like filling out forms, reading postal codes, or processing bank cheques. Computers often struggle to read handwriting because people write numbers in different ways, sizes, and styles.
- This project, "Recognizing Handwritten Digits with Deep Learning for Smarter AI Applications", aims to teach computers how to read handwritten digits using deep learning.
- This will save time, reduce errors, and help in many areas like banking, education, and government services.

2. Objectives of the Project

- To build a deep learning model that can accurately recognize handwritten digits.
- To train the model using a dataset of handwritten numbers.
- To test how well the model can predict digits written in different styles.
- To create a system that can be used in real-life applications like digital forms or postal code readers.

- To understand how deep learning can help solve handwriting recognition problems.

3.Scope of the Project

- The project will focus on recognizing handwritten digits from 0 to 9.
- A deep learning model, especially a Convolutional Neural Network (CNN), will be used. The model will be trained and tested using the MNIST dataset.
- The system will take image input and output the predicted digit.
- The project will include model training, evaluation, and testing.
- It will be a prototype and not connected to real-time applications or devices.

Limitations:

- The project will use only the MNIST dataset for training and testing.
- Performance depends on dataset quality and available computing power.
- It will not support handwriting in letters or special symbols—only digits.
- It will run on a local machine and not be deployed to the web or mobile apps.

4.Data Source

For this project, we will use the MNIST dataset, which is a well-known dataset of handwritten digits from 0 to 9.

- Source: The dataset is publicly available on platforms like Kaggle, Yann LeCun's website, and other machine learning repositories.
- Type: Public dataset
- Format: Images (28x28 pixels, grayscale) with labels for each digit
- Size: 60,000 images for training and 10,000 for testing

- Access: Static — the dataset is downloaded once and does not change over time.

Dataset Name: MNIST Handwritten Digits Dataset

1.Direct Download Link (Kaggle CSV version):

https://www.kaggle.com/datasets/oddrationale/mnist-in-csv

2.Google's TensorFlow Datasets (TFDS):

https://www.tensorflow.org/datasets/catalog/mnist

5.High-Level Methodology

Data Collection

Download the MNIST dataset using TensorFlow/Keras libraries (static dataset).

Data Cleaning

Normalize pixel values (0–255 scaled to 0–1). No missing values expected.

Exploratory Data Analysis (EDA)

Plot sample images, check class distribution, visualize pixel intensity.

Feature Engineering

Normalize data; no new features created as CNNs work well with raw pixel inputs.

Model Building

Build a Convolutional Neural Network (CNN). CNNs are best for image recognition tasks.

Model Evaluation

Use accuracy score and confusion matrix. Split data into training and testing sets.

Visualization & Interpretation

Plot training/testing accuracy graphs, sample predictions, and confusion matrix.

Deployment

Optional — Create a simple web app using Stream lit to predict digits from images.

6.Tools and Technologies

Programming Language: Python

Notebook/IDE: Google Colab or Jupyter Notebook

Libraries: pandas, NumPy, matplotlib, seaborn, scikit-learn, TensorFlow/Kera's

Optional Tools for Deployment: Stream lit or Gradio

7.Team Members and Roles

Team Members	Roles	Responsibility
Sandhiya S	Team Leader	Data collection and data cleaning
Nithiya sree K	Team Member 1	Exploratory data analysis and feature Engineering
Pachaiyammal P	Team Member 2	Model building and model evaluation
Nivetha D	Team Member 3	Visualization,Interpretation and deployment