

# Report On

## MNIST Image Classification

Submitted in partial fulfillment of the requirements of the Course project in  
Semester VII of fourth year Artificial Intelligence and Data Science

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**CERTIFICATE**

This is to certify that the project entitled “MNIST Image Classification” is a bonafide work of “Shlok Gaikwad(Roll No.4), Priyanshu kamble (Roll No.7), Dhruv mewada (Roll No. 12)” submitted to the University of Mumbai in partial fulfillment of the requirement for the Course project in Semester VII of fourth year Artificial Intelligence and Data Science engineering.

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## **Chapter 1: Abstract**

The “MNIST Image Classification” project provides a practical example of image classification using deep learning with TensorFlow and Keras. We leverage the popular MNIST dataset, which consists of hand-written digits, and train a simple neural network to recognize and classify these digits. The code also demonstrates how to evaluate the model's accuracy and make predictions. The steps in this code include loading and preprocessing the dataset, building a deep neural network model, compiling and training the model, and finally, assessing its performance on test data. We randomly select a few test images to visualize the model's predictions, allowing us to see how well it recognizes the hand-written digits.

## Chapter 2: Introduction

### 2.1 Introduction

The "MNIST Image Classification" project demonstrates the creation of a deep neural network model for recognizing handwritten digits from the MNIST dataset. It loads the MNIST dataset, which consists of grayscale images of handwritten digits (0-9). Preprocesses the data by scaling pixel values to the range  $[0,1]$ . Constructs a simple deep neural network. Compiles the model with the Adam optimizer and sparse categorical cross-entropy loss function. Uses accuracy as the evaluation metric. Trains the model using the preprocessed training images and their corresponding labels. Evaluates the model's accuracy on the test dataset to assess its performance. Generates predictions for test images using the trained model. Displays the selected test images alongside their true labels and predicted labels using the trained model.

### 2.2 Problem Statement

"Develop a deep learning model for handwritten digit classification using the MNIST dataset. The goal is to train a neural network to accurately classify images of handwritten digits (0-9) and evaluate its performance on a test dataset. Additionally, create a visualization that displays a specified number of random test images along with their true labels and predicted labels."

### 2.3 Objectives

- Data Loading and Preprocessing: Load the MNIST dataset, which consists of hand-written digits, and preprocess the data by scaling the pixel values to the range  $[0, 1]$ .
- Model Building: Create a simple feedforward neural network model using the Keras library. The model consists of one input layer, one hidden layer with 128 units and ReLU activation, and one output layer with 10 units (for digit classification) and softmax activation.
- Model Evaluation: Evaluate the trained model's performance on the test data to assess how well it generalizes to unseen examples. The test accuracy is computed, indicating the proportion of correctly classified digits in the test dataset.

## Chapter 3: Proposed System

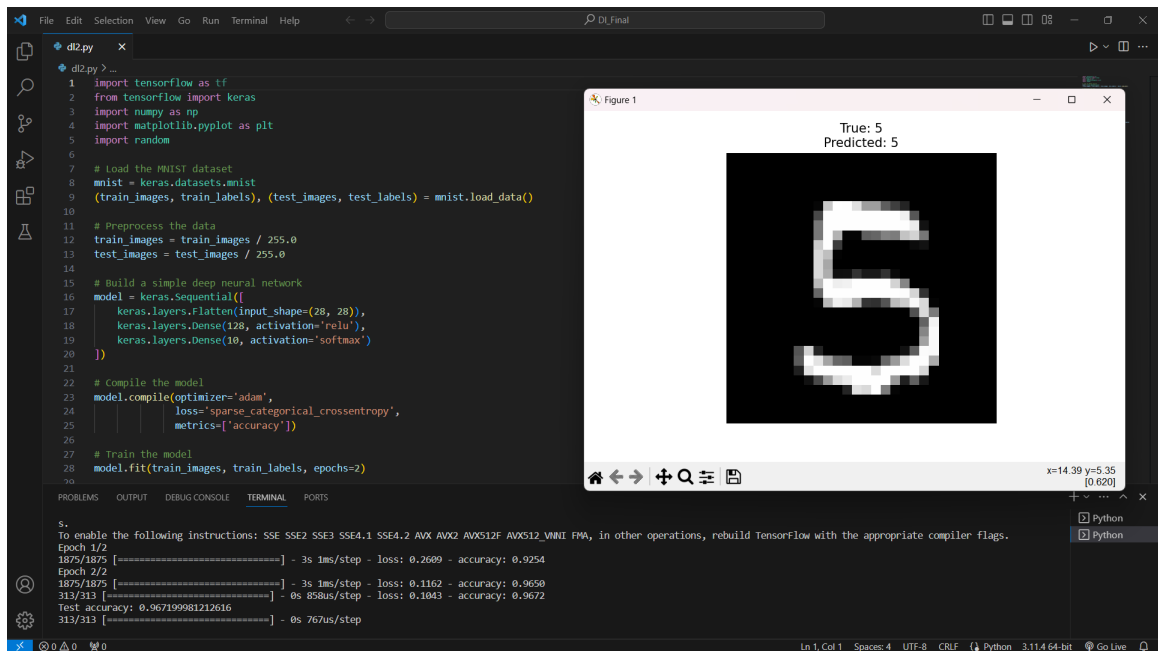
### 3.1 Introduction

In this project, we explore the world of image classification using a simple deep neural network and the MNIST dataset. The MNIST dataset is a collection of handwritten digits, widely used as a benchmark in the field of machine learning and deep learning. Each image in the dataset is a 28x28 grayscale representation of a digit from 0 to 9. It accomplishes several tasks like data preparation, model architecture, model training, model evaluation, prediction, visual display. The project serves as a fundamental example of image classification using a simple neural network and is an excellent starting point for understanding the basics of deep learning and its applications in computer vision. The MNIST dataset is a classic choice for beginners in the field and offers a hands-on experience in training and evaluating deep learning models.

### 3.2 Details of Hardware and Software

- Python
- Visual Studio Code
- Kaggle

### 3.3 Results



### **3.4 Conclusion**

In conclusion, The MNIST Image Classification project utilized TensorFlow and Keras to create a simple deep neural network for recognizing handwritten digits from the MNIST dataset. The model was trained, achieving a respectable level of accuracy on the test data. To provide a visual insight into the model's performance, we randomly selected a few test images, displaying both the true labels and the model's predictions alongside each image. This showcases the model's ability to successfully identify handwritten digits. The simplicity of the project makes it accessible for those new to deep learning, serving as a foundational example for image classification tasks.

### **References**

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