**

**AL2002-Artificial Intelligence - Lab**

**Project Proposal**

Project Name:

*Handwritten Digit Recognition Model*

Members:

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**1. Introduction:**

The objective of this project is to develop a deep learning model for image classification using the MNIST dataset. The MNIST dataset consists of a large collection of grayscale images of handwritten digits (0-9) and their corresponding labels. By training a deep neural network on this dataset, we aim to accurately classify and predict the handwritten digits in new unseen images.

**2. Project Goals:**

The main goals of this project are as follows:

* Implement a deep neural network model for image classification.
* Train the model on the MNIST dataset to learn the patterns and features of handwritten digits.
* Evaluate the model's performance by measuring accuracy on a separate development dataset.
* Use the trained model to make predictions on new test images and assess its performance.

**3. Methodology:**

The project will involve the following steps:

* Data Preparation: Load the MNIST dataset and preprocess the images by normalizing the pixel values to the range [0, 1].
* Model Architecture: Define a deep neural network model with two hidden layers, ReLU activation, and softmax output.
* Forward Propagation: Implement the forward propagation algorithm to compute the output probabilities for each class.
* Backward Propagation: Develop the backward propagation algorithm to calculate the gradients for updating the model parameters.
* Training: Perform gradient descent optimization to train the model on the training set, adjusting the parameters to minimize the loss.
* Prediction: Utilize the trained model to make predictions on the development dataset and evaluate its accuracy.
* Testing: Select a few test images from the training dataset, visualize the predictions, and assess the model's performance.
* Evaluation: Measure the accuracy of the model on the development dataset and report the results.

**4. Expected Deliverables:**

The deliverables for this project include:

* Python code implementing the deep learning model for image classification.
* A trained model capable of predicting handwritten digits.
* Accuracy results on the development dataset.
* Visualizations of test predictions and performance analysis.

**5. Timeline:**

The estimated timeline for completing this project is as follows:

* Week 1: Data preparation and preprocessing.
* Week 2: Model architecture design and implementation.
* Week 3: Forward and backward propagation algorithms.
* Week 4: Training and evaluation on the development dataset.
* Week 5: Testing and performance analysis.
* Week 6: Finalize the project, prepare documentation, and submit the deliverables.

**6. Resources:**

The following resources will be required for the successful completion of the project:

* MNIST dataset: It will serve as the primary dataset for training, development, and testing.
* Python programming language: It will be used to implement the deep learning model and perform necessary computations.
* Numpy, Pandas, and Matplotlib libraries: These libraries will be utilized for data manipulation, visualization, and array operations.
* Development environment: An appropriate Python development environment such as Jupyter Notebook or PyCharm will be used.

**7. Conclusion:**

This project aims to develop an accurate image classification model for recognizing handwritten digits using deep learning techniques. By leveraging the power of deep neural networks, we will strive to achieve high accuracy in digit classification and contribute to the field of computer vision. The completion of this project will provide valuable insights into deep learning and its applications in image classification tasks.