https://colab.research.google.com/drive/1UNBf_IceInXZcxyzOxaSs4IfQBITUZYU?usp=sharing

The goal of the problem is to accurately classify handwritten digits from 0 to 9 using the k-nearest neighbors (k-NN) algorithm. The MNIST dataset obtained consists of 28x28 grayscale images, with each pixel represented as a gray-level value between 0 and 255. This dataset was first split into training data for validation (%20), and training data for the models (%80). No feature extraction or preprocessing was done on the dataset. Then, different values of k - specifically 1,3,5,7,9,11,13 - were tested on the validation set to determine the best k. The validation accuracies for different values of k were plotted in a table, and the best k value was selected as the one with the highest validation accuracy. In detail, the results were - accuracy of 0.97075 for k = 1, accuracy of 0.9726 for k = 3, accuracy of 0.9706 for k = 5, accuracy of 0.9693 for k = 7, accuracy of 0.96908 for k = 9, accuracy of 0.96683 for k = 11, accuracy of 0.9655 for k = 13 - the selected k value was used to train the k-NN classifier on the combined training and validation sets. The test accuracy of the k-NN classifier was then calculated and reported. The whole process showed that the best validation accuracy was obtained with k = 3, achieving an accuracy of 0.9726. Using this value of k, the k-NN classifier was trained on the combined training and validation sets as mentioned before, achieving a test accuracy of 0.9684. In conclusion, the best results on the validation set were obtained with the k-NN approach using a value of k = 3. This approach provided an effective way to achieve high accuracy in digit recognition tasks in a simple way.