Exercise Questions:

Question 1: Load the MNIST dataset, and split it into a training set, a validation set, and a test set (e.g., use 50,000 instances for training, 10,000 for validation, and 10,000 for testing). Then train various classifiers, such as a random forest classifier, an extra-trees classifier, and an SVM classifier. Next, try to combine them into an ensemble that outperforms each individual classifier on the validation set, using soft or hard voting. Once you have found one, try it on the test set. How much better does it perform compared to the individual classifiers?

Question 2: Using the MNIST dataset and the ensemble classifier identified in Question 1, explore the stacking ensemble technique with a single layer. Train a stacking ensemble classifier comprising base classifiers (random forest, extra-trees, SVM, and MLP) on the training set. Evaluate its performance on the validation set and compare it with the previous ensemble classifier. Determine if the single-layer stacking approach improves classification accuracy. Finally, test the best-performing stacking ensemble on the test set to assess its generalization performance.