Deep Learning for Beginners

Student Worksheet · Neural Networks and Handwritten Digits

Topic 57 · Verified example: scikit-learn digits (8×8), Keras 3 with PyTorch backend, 346/360 correct on the test set.

Instructions: Answer each question before consulting the answer guide. Use the actual dataset and evaluation results. Optional coding challenges require Python, Keras 3, PyTorch and scikit-learn.

1. Explain deep learning in one sentence. How does it relate to machine learning?

2. What is an artificial neuron? Identify inputs, weights, bias, activation, and output.

3. Calculate z for inputs [2,3], weights [0.5,0.2] and bias 0.1. What is ReLU(z)?

4. Why use a nonlinear hidden-layer activation such as ReLU?

5. Explain the difference between loss and accuracy for classification.

6. What is backpropagation, and how is it different from Adam?

7. Identify dataset size, image size, and train/validation/test counts in this project.

8. Compute test accuracy given 346 correct predictions from 360 test cases.

9. Change Dense(64) to Dense(32). Describe a fair comparison.

10. Write a two-sentence project conclusion including a limitation.