

## Homework 10

Nov. 20, 2025

- Review on the major knowledge points of the week with the help of AI. Nothing to hand in, but the reviews should be summarized at the end of the course.

- **Problem 16. Experiment of CNN on MNIST dataset**

**Activity:** With the help of AI, write your own code of CNN for digit recognition with a proper design. Adjust some of the factors in your design (such as the settings of convolutional layers, pooling, fully connected layers, activation functions etc.) and observe their effects on the training procedures and test performances. Your goal is to use this experiment to build hands-on experiences on CNN. You can discuss with AI on what factors you should consider to better reach your goal, and you decide on the specific design of your experiment, including how you evaluate the results.

**Report:** Write the experiment report by yourself with the help of AI. **It should include a rational reasoning on what factors you have played with in the experiments, and clearly indicate whether it is your reasoning or AI's reasoning or both.** Again, you decide the length by yourself (but no more than 3 pages). **You should still use colored fonts to distinguish your writings, writings/revisions by AI and your revisions of AI writings as before.** Please submit the full log file of all your interactions with AI as a supplementary file of the report. **And please indicate the time you spent on this problem when submitting the homework on the web.**

- **Problem 17. Learn more about gradient vanishing and explosion**

**Activity:** Learn more about the phenomena of gradient vanishing and explosion in BP learning in neural networks with deep structures. You can learn this topic from AI or from literature, but you should identify a few representative references that have played important roles in people's understanding on these questions in the early days.

**Report:** Write a one-page summary of what you learned, including a few key references. Again, you can use AI to help but you should not let AI writing it for you. **You should still use colored fonts to distinguish your writings, writings/revisions by AI and your revisions of AI writings as before.**

**Due date: Nov. 26 (Wed.) 23:59 Beijing time**