Name: \_\_\_\_\_

Neptun: \_\_\_\_\_

Deep Network Development Exam Handout May 8, 2025

You have 1 hour to complete this exam. There are 5 tasks, each worth 10 points, for a total of 50 points. A pass requires at least 25 points.

This is a **pass/fail exam**. **Be concise and to the point**: long-winded answers will be penalized. Answer only what is asked.

Good luck!

## Exam Tasks

- 1. Draw a simple diagram of an **autoencoder** architecture. Briefly explain the main components of an **autoencoder** and their roles in the learning process.
- 2. Draw a diagram of a simple **artificial neuron**. Label and explain the main components of the artificial neuron and describe the role of each part in the network function.
- 3. Examine the training and validation loss curves. Based on your behavior in the epochs, determine which of the following best describes the model training process:
  - Overfitting
  - Underfitting
  - Early-stopping (well-timed intervention)

Justify your answer with reference to the shape and trend of the loss curves.

- 4. Define the **Mean Squared Error (MSE)** loss function and explain how it measures the performance of a model. Describe a typical use case where MSE is the appropriate choice of loss function.
- Given the following 5 bounding boxes, IoU between all the bounding boxes, and IoU threshold 0.2 select the bounding boxes that remain after applying Non-Max Suppression:

The bounding box scores:

- Box 0 score: 0.7
- Box 1 score: 0.55
- Box 2 score: 0.86
- Box 3 score: 0.93
- Box 4 score: 0.62



