

KIM 03 Learning Paradigms: Supervised, Reinforcement, and Self-Supervised Learning

In this task, you will explore three fundamental learning paradigms in artificial intelligence: Supervised Learning, Reinforcement Learning, and Self-Supervised Learning. You will first relate each paradigm to human learning experiences and then implement simple models to see how these paradigms work in practice.

Task 1: Human Learning Analogues

Get together in pairs or small groups (2-3 people) and for each learning paradigm, write a short narrative (approx. 200–300 words) describing how a human would

- learn to swim,
- learn Spanish (or any other language),
- learn to play the violin

using each of the learning paradigms alone.

Supervised Learning

- What is suitable (labelled) training data?
- What kind of feedback would a human help to learn?
- What would generalization look like?

Reinforcement Learning

- What are suitable actions and states?
- What is the equivalent of rewards/punishments?
- What would exploration vs. exploitation look like?

Unsupervised or Self-Supervised Learning

- What kind of input data could be used?
- How could the training signal be generated from the data itself?
- What kind of patterns and relations could be learned?

Task 2: Small Implementations / Simulations

Go to [this link](#) to access the project repository. Fork and clone it to your local machine and follow the installation instructions in the README file.

You will find three folders with Jupyter notebooks for each learning paradigm:

- supervised/SL_MNIST.ipynb : Supervised Learning example with MNIST dataset and a simple CNN.
- reinforcement/RL_Gridworld_Qlearning.ipynb : Reinforcement Learning example with a Gridworld environment and Q-learning.
- self-supervised/SSL_MaskedAutoencoder_MNIST.ipynb : Self-Supervised Learning example with a Masked Autoencoder on MNIST dataset.

Run each notebook, understand the code, and experiment with the parameters. You can modify the number of training examples, learning rates, and other hyperparameters to see how they affect the learning process.

Goals of the Activity

By completing these tasks, you will:

- Develop a deeper understanding of different learning paradigms by relating them to human learning experiences.
- Get a first impression of how these learning paradigms can be implemented in practice using simple models and datasets.
- Gain hands-on experience with Python and Jupyter notebooks, which are widely used in the AI community.