Welcome to Machine Learning 2024/2025!

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Dalle Molle Institute for Artificial Intelligence Studies (IDSIA) USI - SUPSI

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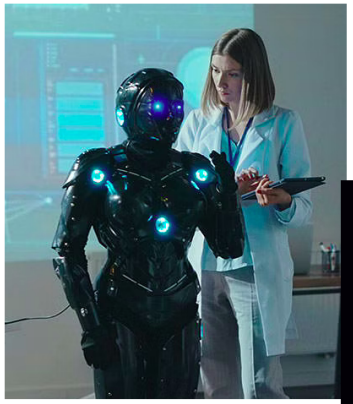
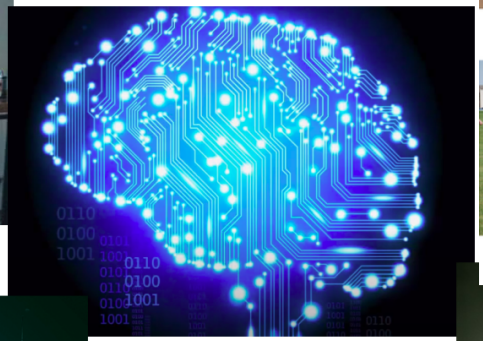
Welcome

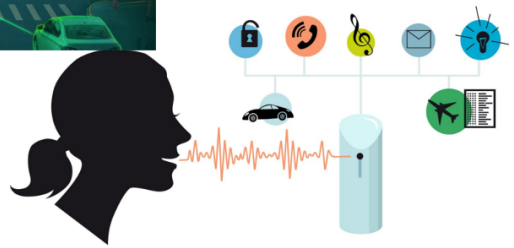
Instructor: Michael Wand

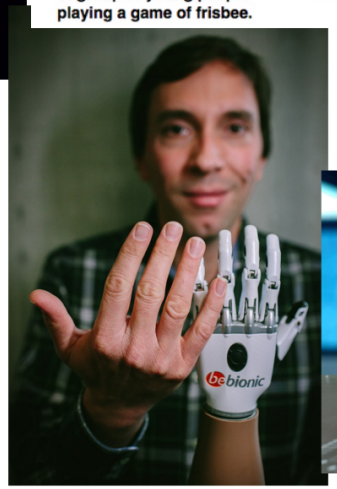
Teaching Assistants: Eric Alcaide, Vincent Herrmann, Mikhail Andronov, Dylan Ashley

Facets of Machine Learning / AI





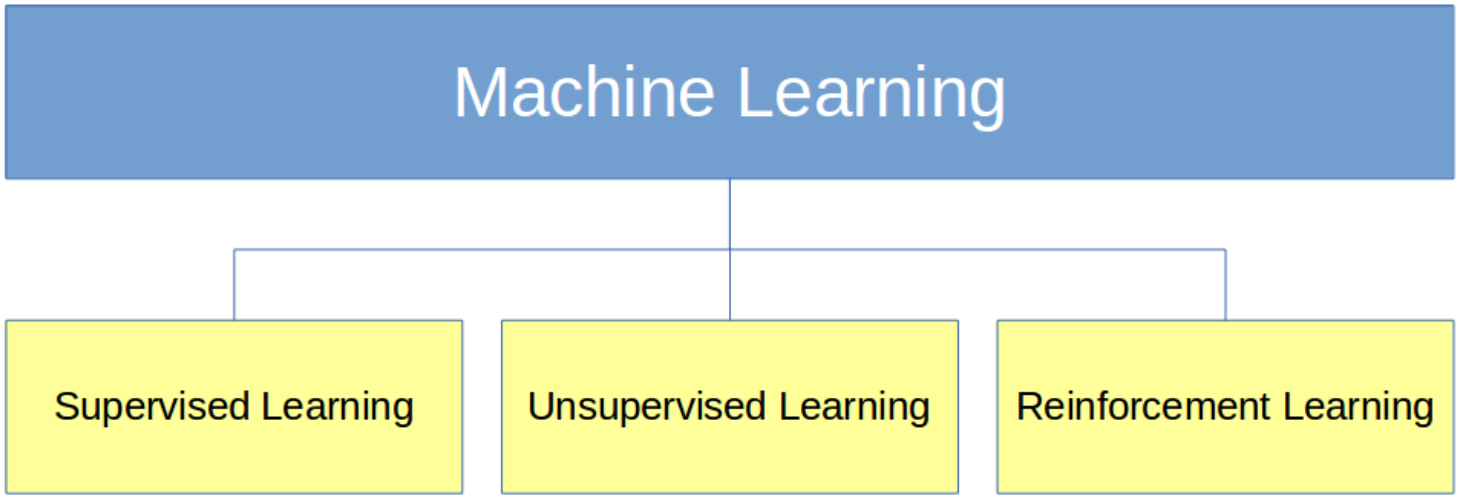




Facets of Machine Learning

- Scenarios: from general problem solving in unknown environments to performing specific tasks
- Application areas: Speech recognition and language processing, image recognition, medical monitoring, rehabilitation/prostheses, security, chemistry and physics, gaming, autonomous driving, intelligent robotics, ...
- Devices: large-scale servers (and the cloud), desktop PCs, portable devices (cellphone), embedded chips
- Many techniques, *Neural Networks* are currently the "workhorse" of Machine Learning and AI
- Many concepts are based on a *probabilistic* framework.

Facets of Machine Learning



- Learn a function from inputs to *targets*
- Classification (categorical targets)
- Regression (real-valued targets)

- Discover and visualize hidden structure
- learn *representations* with specific properties
- generate new data

- Learn *actions*
- There is always an *agent* which moves in some *environment*
- Training signal is a scalar value (the *reward)* which is usually sparse and arbitrarily delayed

Structure of the Lecture

- Introduction, linear, and kernel methods
- Learnable computation: Neural Networks
- **Midterm exam**
- The probabilistic framework: Probability and Bayes' Theorem, probabilistic algorithms
- Reinforcement Learning
- Advanced topics
- **Final exam**

Structure of the Lecture

- Introduction, linear, and kernel methods
  - ➔ theoretical exercise
- Learnable computation: Neural Networks
  - ➔ theoretical and programming exercise
- **Midterm exam**
- The probabilistic framework: Probability and Bayes' Theorem, probabilistic algorithms
  - ➔ theoretical exercise
- Reinforcement Learning
  - ➔ theoretical exercise
- Advanced topics
- **Final exam**

Grading Scheme

- Four theoretical exercises and one programming exercise.
- The theoretical exercises cover each of the four main topics of this lecture, the programming exercise will be about neural networks.
- Grade weighting:
  - ➔ Each theoretical exercise: 5%
  - ➔ Programming exercise: 10%
  - ➔ Midterm exam: 35%
  - ➔ Final exam: 35%.
- In case of sickness: oral substitute exam
- In case anyone fails the course: oral *makeup exam* on pass/fail basis covering the same topics as the final exam (Probabilistic Framework and Reinforcement Learning).

Rules

- Plagiarizing in your assignments is a serious breach of integrity.
- A plagiarized assignment will be graded with zero points.
- In case of repetition, the respective student will be reported to the faculty.
- Also note that *using ChatGPT and similar tools is not allowed* in both theoretical and practical exercises. If we detect the use of such tools, this will be treated the same as plagiarism.

TA Sessions and Further Info

- Please stay tuned to our iCorsi page for current information!
- This includes assignment, tips and tricks, room changes, etc.
- There are weekly TA sessions, each held by one of the TAs.
- Time slots: Monday 9.00, Thursday 13.30 lecture, Friday 15.30 TA session.
- Please consider `https://search.usi.ch/en/educations/54/master-of-science-in-artificial-intelligence/schedules/57/1` for information about the lecture hall!
- Feel free to ask questions! But please ask them on iCorsi, so that everybody can profit.

Prerequisites for this Course

- You do not need to have prior experience with Machine Learning or Artificial Intelligence.
- But you should have a solid knowledge of the basics: linear algebra, analysis, elementary probability theory.
- You will also need to solve programming assignments in Python/Numpy.
- Please have a look at the preliminary quiz which was posted on iCorsi!
- If you need hints on how to brush up your knowledge, please ask ahead of time!

Have Fun!