

# Course: **Intelligent systems** 2024/25

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*The aim:* The goal of the course is the students to become acquainted with the field of intelligent systems, which includes a collection of tools and approaches for solving problems which are difficult or unpractical to tackle with other methods.

## **Student's obligations:**

- five web quizzes
- two assignments
- written exam

## **Grading**

The practical work is graded through two equally weighted assignments, where each has to be finished on time and successfully (at least 50% of points). The exam is in written form. The preconditions for the written exam are successfully passed quizzes and assignments. During the written exam, students are allowed to use one A4 sheet of paper. The precondition for the (optional) oral exam is to pass the written exam. In case of any doubts about the score of the assignments, quizzes or written exam, the oral exam is obligatory. The final grade is the sum of assignment scores and written exam, each contributing 50%. The grades are valid in the current year. Students not passing the exam in the current year have to redo the quizzes and assignments the next year.

## **Syllabus**

1. Introduction to intelligent systems and data science
2. Nature inspired computing (genetic algorithms, genetic programming)
3. Introduction to predictive modelling
4. Bias, variance and overfitting
5. Representation learning and feature selection
6. Ensemble methods
7. Kernel methods
8. Neural networks: architectures, backpropagation, deep neural networks
9. Model inference and explanation
10. Natural language processing: text representation, large language models, information extraction, text classification, semantic similarity
11. Reinforcement learning: basic approaches and algorithms, Q learning, TD learning, deep RL

## Literature:

- James, G., Witten, D., Hastie, T., Tibshirani, R. and Taylor, J., 2023. *An Introduction to Statistical Learning: With Applications in Python*. New York: Springer. Freely available at <https://www.statlearning.com/> (the same book exists for R)

## Additional readings:

- Kevin P. Murphy: *Probabilistic Machine Learning: An Introduction*. MIT Press, 2022, freely available from <https://probml.github.io/pml-book/book1>
- Friedman, J., Hastie, T., & Tibshirani, R. (2009). *The elements of statistical learning, 2<sup>nd</sup> edition*. Springer, Berlin, freely available from <https://web.stanford.edu/~hastie/ElemStatLearn/>
- D. Jurafsky, J. H. Martin. *Speech and language processing: An introduction to natural language processing, computational linguistics, and speech recognition. 3<sup>rd</sup> edition draft*, 2022, Free chapters available at <http://web.stanford.edu/~jurafsky/slp3/>
- Richard S. Sutton and Andrew G. Barto: *Reinforcement Learning, An Introduction, 2<sup>nd</sup> edition*, MIT press, 2018, [free copy](#)
- Kevin P. Murphy: *Probabilistic Machine Learning: Advanced Topics*. MIT Press, 2023, freely available at <http://probml.github.io/book2>
- I. Kononenko in M. Robnik Šikonja: *Inteligentni sistemi*. Založba FE in FRI, Ljubljana, 2010 (in Slovene, partially outdated)