

Course: **Intelligent systems** 2025/26

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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 a 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 oral exam is obligatory, in case of any doubts about the score of the assignments, quizzes or written exam. The final grade is the sum of assignment scores and written exam, each contributing 50%. The grades are valid in the current and next academic 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. Automate machine learning
11. Natural language processing: text representation, transformer architecture, large language models, information extraction, text classification, semantic similarity
12. Transformers for tabular data and time series
13. 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/>
- Chollet, F. and Watson, M., 2025 *Deep Learning with Python*, 3rd edition. Manning. Available at <https://deeplearningwithpython.io/>

Additional readings:

- D. Jurafsky, J. H. Martin. *Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition, with Language Models*, 3rd edition draft, 2025, Freely available at <http://web.stanford.edu/~jurafsky/slp3/>
- Richard S. Sutton and Andrew G. Barto: *Reinforcement Learning, An Introduction*, 2nd edition, MIT press, 2018, [free copy](#)
- Kevin P. Murphy: *Probabilistic Machine Learning: An Introduction*. MIT Press, 2022, freely available from <https://probml.github.io/pml-book/book1>
- Kevin P. Murphy: *Probabilistic Machine Learning: Advanced Topics*. MIT Press, 2023, freely available at <http://probml.github.io/book2>
- Friedman, J., Hastie, T., & Tibshirani, R. (2009). *The elements of statistical learning*, 2nd edition. Springer, Berlin, freely available from <https://web.stanford.edu/~hastie/ElemStatLearn/>
- I. Kononenko in M. Robnik Šikonja: *Intelligentni sistemi*. Založba FE in FRI, Ljubljana, 2010 (in Slovene, mostly outdated)