University of St.Gallen

Course and Examination Fact Sheet: Autumn Semester 2023

7,044: Introduction to Artificial Intelligence and Machine Learning

ECTS credits: 6

Overview examination/s

(binding regulations see below)
decentral - Analog written examination, Analog, Individual work individual grade (100%, 120 Min.)
Examination time: Term time

Attached courses

Timetable -- Language -- Lecturer
7,044,1.00 Introduction to Artificial Intelligence and Machine Learning -- English -- Mommert Michael

Course information

Course prerequisites

No prerequisites are required. Students will require a laptop computer for tutorials/lab courses. A good background in mathematics and programming experience in Python will be beneficial for this lecture.

This course is assigned to the profile "Technology Solution Architect", but can also be taken without selecting a specialisation.

Learning objectives

Artificial Intelligence (AI):

- Students learn about the history of Artificial Intelligence (AI), the distinction between strong AI and weak AI, and the role of the Turing test
- Students understand the relation between Artificial Intelligence, Machine Learning and Deep Learning and can differentiate between these terms
- Students learn the principles of ethics in relation with AI applications

Machine Learning (ML):

- Students learn about different types of data and how to process data for their use in ML methods
- Students learn feature extraction techniques related to image data
- Students learn best practices in the setup, training, validation and testing of ML methods
- Students learn about different evaluation metrics for classification and regression tasks
- Supervised Learning methods covered in this course: linear models, nearest neighbor methods, decision tree-based methods
- Unsupervised Learning methods covered in this course: k-means clustering, hierarchical clustering, EM clustering, DBSCAN, and principal components analysis (PCA) for dimensionality reduction
- Students learn to implement supervised and unsupervised learning methods as part of the lab courses

Deep Learning (DL):

- Students understand End-to-End learning as compared to traditional ML setups
- Students understand Neural Network setup and training: backpropagation and stochastic gradient descent
- Students learn about different deep Neural Network architectures and their application domains and use cases
- Students learn about semantic segmentation and object detection
- Students learn to implement different Neural Network architectures as part of the lab courses

Course content

Over the last years, Artificial Intelligence (AI) has seen a steep rise to the top with large tech companies such as Google, Facebook and Amazon investing heavily in research and development. From chatbots, face recognition algorithm to self-driving cars, AI is quickly transforming technology, business and society. The driving factors behind this momentum are recent advances in machine learning and in particular deep learning.

This lecture aims to introduce the concepts of Artificial Intelligence (AI) and Machine Learning (ML). The goal is to provide a broad overview in this field, understand the relationship between AI and ML, and to cover major application areas of AI and ML. After the successful completion of this lecture, students should have acquired the terminology in AI and ML and be able to understand its basic concepts.

Topics covered include:

- Definition of Artificial Intelligence
- Supervised learning
- Unsupervised learning
- Traditional Machine Learning methods
- Deep Learning methods

Course structure and indications of the learning and teaching design

This course counts 6 credits. Accordingly, the total workload for students is 180 hours, which includes self-study, theoretical lecture, practical programming, exercises, and all examinations.

In particular, theoretical content will be presented in the lectures based on slides and supported by practical Python programming as part of the lab courses. Programming exercises will utilize Jupyter Notebooks, which can be run on freely available cloud services (the use of Google Colab, which requires a Google account, is recommended, but not required). The lecture will take place weekly with approximately bi-weekly lab exercises to deepen the students' understanding of the lecture topics.

Course literature

- Russel, S., Norvig, P.: Artificial Intelligence - A Modern Approach, Prentice Hall, 1999
- Goodfellow I, Benjo Y., Courville A., Courville A, Deep Learning, MIT Press, 2016

Additional course information

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Examination information

Examination sub part/s

1. Examination sub part (1/1)

Examination modalities

Examination type	Analog written examination
Responsible for organisation	decentral
Examination form	Written exam
Examination mode	Analog
Time of examination	Term time
Examination execution	Synchronous
Examination location	On Campus
Grading type	Individual work individual grade
Weighting	100%
Duration	120 Min.

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Examination languages
Question language: English
Answer language: English

Remark
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Examination-aid rule
Closed Book

The use of aids is prohibited as a matter of principle, with the exception of pocket calculator models of the Texas Instruments TI-30 series and, in case of non-language exams, bilingual dictionaries without any handwritten notes. Any other aids that are admissible must be explicitly listed by faculty members in the paragraph entitled “Supplementary aids” of the course and examination fact sheet; this list is exhaustive.

Procuring any aids, as well as ensuring their working order, is the exclusive responsibility of students.

Supplementary aids

Students are allowed (but not required) to bring a non-programmable pocket calculator to the exam.

Examination content
Topics covered include:

- Definition of Artificial Intelligence
- Supervised learning
- Unsupervised learning
- Traditional Machine Learning methods
- Deep Learning methods

Examination relevant literature

Lecture slides and optional lecture literature:

- Russel, S., Norvig, P.: Artificial Intelligence - A Modern Approach, Prentice Hall, 1999
- Goodfellow I, Benjo Y., Courville A., Courville A, Deep Learning, MIT Press, 2016

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Please note

Please note that only this fact sheet and the examination schedule published at the time of bidding are binding and takes precedence over other information, such as information on StudyNet (Canvas), on lecturers' websites and information in lectures etc.

Any references and links to third-party content within the fact sheet are only of a supplementary, informative nature and lie outside the area of responsibility of the University of St.Gallen.

Documents and materials are only relevant for central examinations if they are available by the end of the lecture period (CW51) at the latest. In the case of centrally organised mid-term examinations, the documents and materials up to CW 42 are relevant for testing.

Binding nature of the fact sheets:

- Course information as well as examination date (organised centrally/decentrally) and form of examination: from bidding start in CW 34 (Thursday, 24 August 2023);
- Examination information (supplementary aids, examination contents, examination literature) for decentralised examinations: in CW 42 (Monday, 16 October 2023);
- Examination information (supplementary aids, examination contents, examination literature) for centrally organised mid-term examinations: in CW 45 (Monday, 06 November 2023);
- Examination information (regulations on aids, examination contents, examination literature) for centrally organised examinations: two weeks before the end of the de-registration period in CW 45 (Monday, 06 November 2023).