



Course and Examination Fact Sheet: Spring Semester 2020

8,330: Machine Learning

ECTS credits: 4

Overview examination/s

(binding regulations see below)

Decentral - Group examination paper (all given the same grades) (40%)

Decentral - Group examination paper (all given the same grades) (60%)

Attached courses

Timetable -- Language -- Lecturer

[8,330,1.00 Machine Learning](#) -- Englisch -- [Horlemann Anna-Lena](#)

Course information

Course prerequisites

- Basic mathematical knowledge from the assessment level.
- It is advantageous to have preliminary knowledge in programming with R. However, we will have a quick introduction to programming with R during the course, and with some motivation it is possible to acquire these skills in the first week of the semester.

Learning objectives

At the end of the course the students will be able to understand the (mathematical) functionality of basic machine learning techniques. They are able to program their own algorithms, as well as understand and use existing algorithms to analyze data sets. Furthermore, they are able to compare the predictive quality of different methods.

Course content

Machine Learning and Artificial Intelligence are universal techniques for data-based prediction and decisions. The applications are manifold: prediction of macro- and micro-economic variables, business planning, marketing, clinical diagnosis, automatic translation, text and speech recognition, self-driving cars, and many more.

This class deals with the fundamental concepts and algorithmic ideas of machine learning. How can an abstract system "learn"? What exactly does "learning" mean? How can you visualize a step-by-step learning process? How good does a system learn; and when is a learning problem practically unfeasible?

The fundamental knowledge of machine learning algorithms you will acquire during the course will help you to answer questions that might arise in your future work environment, such as:

- Where can your organization potentially use machine learning methods?
- What type of methods are there for a given problem?
- What are the potential risks of using machine learning?

During class and as homework exercises you will program your own machine learning algorithms in R, to get a better understanding of the learning methods. Some of these algorithms will be visualized by graphics. The main topics will be the following:

- Prediction via regression
- (Stochastic) gradient descent
- Classification and decision boundaries
- Simple neural networks



- Decision trees
- Logistic regression
- Loss functions
- Model validation via training and testing

To get a first idea of the above topics, you can have a look at the respective Wikipedia entries.

Course structure

There will be one class of two hours each week. In the lecture we will usually learn theoretical results, that should be applied in programming algorithms in R as homework. Moreover, there will be an (optional) introduction to programming in R.

Course literature

Lecture notes, online resources. Further literature recommendations will be announced on StudyNet (Canvas).

Additional course information

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Examination information

Examination sub part/s

1. Examination sub part (1/2)

Examination time and form

Decentral - Group examination paper (all given the same grades) (40%)

Remark

Homework exercises

Examination-aid rule

Term papers

- Term papers must be written without anyone else's help and in accordance with the known quotation standards, and they must contain a declaration of authorship.
- The documentation of sources (quotations, bibliography) has to be done throughout and consistently in accordance with the APA or MLA standards. The indications of the sources of information taken over verbatim or in paraphrase (quotations) must be integrated into the text in accordance with the precepts of the applicable quotation standard, while informative and bibliographical notes must be added as footnotes (recommendations and standards can be found, for example, in METZGER, C. (2017), Lern- und Arbeitsstrategien (12th ed., Cornelsen Schweiz).
- For any work written at the HSG, the indication of the page numbers both according to the MLA and the APA standard is never optional.
- Where there are no page numbers in sources, precise references must be provided in a different way: titles of chapters or sections, section numbers, acts, scenes, verses, etc.
- For papers in law, the legal standard is recommended (by way of example, cf. FORSTMOSER, P., OGOREK R. et SCHINDLER B. (2018, Juristisches Arbeiten: Eine Anleitung für Studierende (6. Auflage), Zürich: Schulthess, or the recommendations of the Law School).

Supplementary aids

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Examination languages

Question language: English

Answer language: English

2. Examination sub part (2/2)



Examination time and form

Decentral - Group examination paper (all given the same grades) (60%)

Remark

Final project

Examination-aid rule

Term papers

- Term papers must be written without anyone else's help and in accordance with the known quotation standards, and they must contain a declaration of authorship.
- The documentation of sources (quotations, bibliography) has to be done throughout and consistently in accordance with the APA or MLA standards. The indications of the sources of information taken over verbatim or in paraphrase (quotations) must be integrated into the text in accordance with the precepts of the applicable quotation standard, while informative and bibliographical notes must be added as footnotes (recommendations and standards can be found, for example, in METZGER, C. (2017), Lern- und Arbeitsstrategien (12th ed., Cornelsen Schweiz).
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Supplementary aids

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Examination languages

Question language: English

Answer language: English

Examination content

- There will be regular homework exercises that may be solved in groups of up to three participants. The exercises will mainly involve programming the content learned in class.
- For the final term paper, every group of three/four participants will work on an advanced machine learning algorithm and apply it to a data set (chosen yourself).

Examination relevant literature

Lecture notes, online resources

- For the homework exercises no additional literature is needed.



Please note

Please note that this fact sheet alone is binding and has priority over any other information such as StudyNet (Canvas), personal databases or faculty members' websites and information provided in their lectures, etc.

Any possible references and links within the fact sheet to information provided by third parties are merely supplementary and informative in nature and are outside the University of St.Gallen's scope of responsibility and guarantee.

Documents and materials that have been submitted no later than the end of term time (CW21) are relevant to central examinations.

Binding nature of the fact sheet:

- Information about courses and examination time (central/decentral) and examination type starting from the beginning of the bidding on 23 January 2020
- Information about examinations (examination aid regulations, examination content, examination-relevant literature) for decentral examinations after the 4th semester week on 16 March 2020
- Information about examinations (examination aid regulations, examination content, examination-relevant literature) for central examinations as from the starting date for examination registration on 6 April 2020

Please consult the fact sheet again after these deadlines have expired.