Course and Examination Fact Sheet: Autumn Semester 2021

7,325: Smart Data Analytics

ECTS credits: 4

Overview examination/s
(binding regulations see below)
Decentral - Group examination paper with presentation (all given the same grades) (80%)
Examination time: term time
Decentral - Active participation (20%)
Examination time: term time

Attached courses
Timetable -- Language -- Lecturer
7,325,1.00 Smart Data Analytics -- Englisch -- Härdle Wolfgang Karl

Course information

Course prerequisites

Learning objectives

• Students learn about tools and concepts for unstructured data.
• Students learn to apply and implement these tools and concepts.
• Students implement ready to use practical tools for smart data analytics.

Course content
The evolution from analogue to digital technologies continues to dominate the attention of decision makers today. Many tools in industrial production processes have been automated or replaced by highly complex mechanisms with pre-programmed decision making. The change to digital modes of operations increasingly determines the lives of individuals and does so in increasingly unexpected ways.

The SDA course presents tools and concepts for unstructured data with a strong focus on applications and implementations. It presents the decision analytics in a way that is understandable for non-mathematicians and practitioners who are confronted with day to day number crunching statistical data analysis. All practical examples may be recalculated and modified: software and Quantlets are in www.quantlet.de. The SDA course endows the practitioner with ready to use practical tools for smart data analytics.

The students get insight into the area of modern internet based Computational Statistics Methods. Practically relevant knowledge on methods, data forms and Gestalt will be trained. The use of GITHUB and network techniques will be taught. Direct computer oriented knowledge and possibilities of empirical research will be shown. We present hands on practical examples from finance, Crypto currencies and network analysis.

Course structure and indications of the learning and teaching design

Data are everywhere and the ubiquitous availability of huge amounts of data makes it necessary to develop smart data analytics. Out of the plethora of tools that are available for many scientific disciplines this course offers for the common data analyst an easy access to all levels of analysis without deep computer programming knowledge. SDA provides a wide variety of exercises. In addition a full set of slides is provided making it easier for the participants to reanalyze the presented material. The R and Python programming language are becoming the lingua franca of computational data analysis. They are the common
smart data analysis software platforms used inside corporations and in academia. Both are OS independent free open-source programs which are popularized and improved by hundreds of volunteers all over the world.

| Unit 1 What do we see? | • Basic concepts  
| | • Data Management  
| | • Structuring Data elements |
| Unit 2 Data Analysis | • LDA Latent Dirichlet Analysis  
| | • DTM Dynamic Topic Modeling |
| Unit 3 Modern Data Analysis | • Cluster Analysis and Classification  
| | • Understanding Crypto Currencies  
| | • CRIX a CRypto currency InDeX  
| | • Options on cryptos |
| Unit 4 Modern Data Analytics | • Python tools for SDA  
| | • Text mining and scoring  
| | • Applications & Empirics |
| Unit 5 Smart Data Analytics | • NetworkCentrality  
| | • LSTM NeuralNetworks  
| | • SVMs and Probability of Defaults |
| Unit 6 Smart Data Analytics | • Financial Risk Meter  
| | • Scagnostics  
| | • Hierarchical and Spectral Clustering |
| Unit 7 Very Smart Data Analytics | • GAN Generative Adversial Networks  
| | • HMM Hidden Markov Models  
| | • UMAP Uniform Manifold Approximation and Projection |
| Unit ( We do Smart Data Analytics | • Machine learning in Economics  
| | • Deep Learning of Forecasts  
| | • Generalized Random Forests |

Course literature


All examples are presented in R or Python. The Quantlets are available here: www.quantlet.de  
The CRIX is here: thecrix.de  
The FRM links: https://firamis.de/frm/ and hu.berlin/FRM

Fact sheet version: 1.0 as of 28/07/2021, valid for Autumn Semester 2021
Additional course information

The course will be taught face-to-face as a block seminar during the semester break.

In the case of the President’s Board having to implement new directives due to the SARS-CoV-2 pandemic in AS2021, the course information listed above will be changed as follows:

- The course is conducted online via the platform Zoom.
- The lecturer informs via StudyNet on the changed implementation modalities of the course;

The examination information listed below would be changed as follows:

- The presentation is conducted online and are being recorded;
- The active participation part remains unchanged.

Examination information

Examination sub part/s

1. Examination sub part (1/2)

Examination time and form
Decentral - Group examination paper with presentation (all given the same grades) (80%)
Examination time: term time

Remark
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Examination-aid rule
Term papers

Written work must be written without outside help according to the known citation standards, and a declaration of authorship must be attached, which is available as a template on the StudentWeb.

Documentation (quotations, bibliography, etc.) must be carried out universally and consistently according to the requirements of the chosen/specified citation standard such as e.g. APA or MLA.

The legal standard is recommended for legal work (cf. by way of example: FORSTMOser, P., OGREK R., SCHINDLER B., Juristisches Arbeiten: Eine Anleitung für Studierende (the latest edition in each case), or according to the recommendations of the Law School).

The reference sources of information (paraphrases, quotations, etc.) that has been taken over literally or in the sense of the original text must be integrated into the text in accordance with the requirements of the citation standard used. Informative and bibliographical notes must be included as footnotes (recommendations and standards e.g. in METZGER, C., Lern- und Arbeitsstrategien (latest edition)).

For all written work at the University of St.Gallen, the indication of page numbers is mandatory, regardless of the standard chosen. Where page numbers are missing in sources, the precise designation must be made differently: chapter or section title, section number, article, etc.

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 - Active participation (20%)
Examination time: term time

**Remark**
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**Examination-aid rule**
Active classroom participation

In the "Active classroom participation" examination form, regular participation in class is assessed.

The assessment criteria can be as follows:

- Requests to speak enrich the discussion (productive) / requests to speak disturb the discussion (counterproductive);
- Requests to speak are correct/requests to speak are incorrect;
- Requests to speak are frequent/average/rare;
- No requests to speak, but students follow the lesson/no requests to speak and students do not noticeably follow the lessons.

**Supplementary aids**
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**Examination languages**
Question language: English
Answer language: English

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**Examination content**
Students work on a project that is constantly presented in class and updated/amended.

Possible projects are in the area of text mining, Crypto Currencies, Credit Scoring, SVM, Random Forests, Scagnostics

**Examination relevant literature**
The examination consists in the project, accordingly there is no mandatory literature, but it is highly recommended to consult the following works:


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, 26 August 2021);
- Examination information (regulations on aids, examination contents, examination literature) for decentralised examinations: in CW 42 (Monday, 18 October 2021);
- Examination information (regulations on aids, examination contents, examination literature) for centrally organised mid-term examinations: in CW 42 (Monday, 18 October 2021);
- Examination information (regulations on aids, examination contents, examination literature) for centrally organised examinations: two weeks before the end of the registration period in CW 45 (Monday, 8 November 2021).