LUND UNIVERSITY
Department of Sociology

A. Reading course: Machine Learning Techniques in Social Science (PhD level), 7,5 hp

A third level (PhD) "reading course" does not involve any teaching and typically only has one or a few participants taking part in the course. A reading course for 7,5 credits should cover an ambitious and demanding reading material, which exact page number can vary depending on the nature of texts (i.e., heavy dominance of research articles). The Department of Sociology offer reading courses to its PhD students on areas that cover either a specific topic of high relevance for the PhD thesis, or a specific area of research expertise in the Department. This course belongs to the latter category.

The aim of this particular course is to learn how to apply a select number of machine learning techniques for social scientific research. General topics that can be included this reading course include natural language processing (e.g. topic modeling), quantitative computational methods (e.g. social network analysis, random forests, support vector machines, neural networks, or machine learning regression methods), and optimization algorithms (e.g. the genetic algorithm). These techniques require the ability to use an appropriate software tool or programming language (e.g. R or Python).

This particular course will involve reading a number of technical methodological texts, writing code that applies the given techniques to a set of data, and analyzing the results of the analysis in a lab report(s).

This course has been reviewed by the Director of graduate studies on **2022-11-10**.

B. Course Details, Assessment, Grades

This course is offered by Christopher Swader upon demand as a reading course on the readings listed under D, below. There is no teaching. The course is examined on the basis of written works totalling (in English) 10-15 pages.

The grades for the course are awarded as Pass or Fail. To receive a Pass, the student must fulfil the learning outcomes specified for the course and demonstrate an independent, reflective, well-informed and critical relationship to the issues presented in the course

C. Learning Outcomes

By the end of the course the student should be able to learn how the selected machine learn techniques work and how they can be best applied for social scientific data analysis. Thus the learning outcomes are:

1) Demonstrate a working knowledge of the chosen method(s).

2) Demonstrate the abilility to apply the method(s) to social scientific analysis tasks.

D. Admission Requirements

Applicants must be admitted to the Ph.D. program at the Department of Sociology, Lund University, or be accepted as a visiting student to that program.

E. Course Literature

Choose a manageable amount of texts (between 500-800 pages of readings. This should take into consideration the level of difficulty and technical nature of the readings. Higher difficulty means fewer such readings are required), picked from the list below or defined in collaboration with the course leader, that cover the agreed-upon Machine Learning methods.

Basov, Nikita, and Darya Kholodova. 2022. "Networks of Context: Three-Layer Socio-Cultural Mapping for a Verstehende Network Analysis." *Social Networks* 69 (May): 84–101. https://doi.org/10.1016/j.socnet.2021.03.003.

Basov, Nikita, Wouter De Nooy, and Aleksandra Nenko. 2021. "Local Meaning Structures: Mixed-Method Sociosemantic Network Analysis." *American Journal of Cultural Sociology* 9 (3): 376–417. https://doi.org/10.1057/s41290-019-00084-9.

Basov, Nikita. 2020. "The Ambivalence of Cultural Homophily: Field Positions, Semantic Similarities, and Social Network Ties in Creative Collectives." *Poetics* 78 (February): 101353. https://doi.org/10.1016/j.poetic.2019.02.004.

Basov, Nikita, and Julia Brennecke. 2017. "Duality Beyond Dyads: Multiplex Patterning of Social Ties and Cultural Meanings." In *Research in the Sociology of Organizations*, edited by Peter Groenewegen, Julie E. Ferguson, Christine Moser, John W. Mohr, and Stephen P. Borgatti, 53:87–112. Emerald Publishing Limited. https://doi.org/10.1108/S0733-558X20170000053005.'

Dai, Qionghai, and Yue Gao. 2023. *Hypergraph Computation*. Singapore: Springer. (244 pages)

Géron, Aurélien. 2023. *Hands-on Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems*. Third edition. Beijing Boston Farnham Sebastopol Tokyo: O'Reilly. (856 pages)

Mohr, John W., Robin Wagner-Pacifici, Ronald L. Breiger, and Petko Bogdanov. 2013. "Graphing the Grammar of Motives in National Security Strategies: Cultural Interpretation, Automated Text Analysis and the Drama of Global Politics." *Poetics*, Topic Models and the Cultural Sciences, 41 (6): 670–700. https://doi.org/10.1016/j.poetic.2013.08.003.

Mohr, John W., and Harrison C. White. 2008. "How to Model an Institution." *Theory and Society* 37 (5): 485–512. https://doi.org/10.1007/s11186-008-9066-0.

Raj P.M., Krishna, Ankith Mohan, and K.G. Srinivasa. 2018. *Practical Social Network Analysis with Python*. Computer Communications and Networks. Cham: Springer International Publishing. https://doi.org/10.1007/978-3-319-96746-2.