Course title:	Statistical graphical models
Course title in Polish:	Statystyczne modele graficzne
Course for discipline:	Technical Informatics and Telecommunications, Economics and Finance

Semester:	7	**Status of course:**	faculty	**Language:**	english
Academic year:		**Catalog number:**			

Coordinator of course:	dr hab. Konrad Furmańczyk, prof. SGGW
Lecturer od course:	dr hab. Konrad Furmańczyk, prof. SGGW
Executing unit:	Institute of Information Technology
Ordering unit:	Doctoral School SGGW
Assumptions, goals and description of the course:	The course will provide an introduction to statistical graphical models, which constitute an important part of machine learning methods. These methods are useful for explaining dependencies and causality in many complex phenomena and systems, including gene regulatory networks, digital communication, and the analysis of interconnections in financial markets. During the course, Bayesian networks (structure learning and parameter estimation), Gaussian graphical models, and nonparanormal graphical models will be discussed, along with variable selection methods in such models based on the GLASSO approach. Graphical visualization of these models and their applications will also be presented.
Didactic form, number of hours:	10 hours
Teaching methods:	Case-based learning and problem solving
Limit of people in the group:	

Learning outcomes

KNOWLEDGE - the graduate knows and understands:	**SKILLS - the graduate is able to:**	**COMPETENCES - the graduate is ready to:**
To the extent enabling to revise the existing pradigms in the field/discipline - the world achievments, gathering theoretical background as well as general and selected detailed issues	Carry out critical assessment of the scientific research findings and expert activities and their contribution to the knowledge development in the field/discipline	Critically evaluate the achievments in the field/discipline represented
Major general development trends in the field/discipline		Recognise knowledge in solving cognitive and practical problems characteristic for the area of research (field/discipline) and in an interdisciplinary aspect
		Support the ethos of scientific circles and conduct independent research

The method of verification of learning outcomes:	Project
Form of documentation of achieved learning outcomes:	Submitted assignment
Elements and weights of the final grade:	Final grade: project report – 80%, class discussion and participation – 20%.
Place of the course:	Computer laboratory

Basic and supplementary literature

Basic:
Barber, David (2012). Bayesian Reasoning and Machine Learning. Cambridge University Press.
Cowell, Robert G.; Dawid, A. Philip; Lauritzen,Spiegelhalter, David J. Steffen L.; (1999). Probabilistic networks and expert systems. Berlin: Springer
.Jensen, Finn (1996). An introduction to Bayesian networks. Berlin: Springer.

Supplementary:
Jordan, M. I. (2004). "Graphical Models". Statistical Science. 19: 140–155.
Pradeep Ravikumar, Martin Wainwright, Garvesh Raskutti, and Bin Yu. Model selection in Gaussian graphical models: High-dimensional consistency of ℓ1-regularized MLE. In Advances in Neural Information Processing Systems 22, Cambridge, MA, 2009b. MIT Press.
Ming Yuan and Yi Lin. Model selection and estimation in the Gaussian graphical model. Biometrika, 94(1):19–35, 2007.

Comments:	

Estimated number of hours of work of the doctoral student necessary to achieve the assumed learning outcomes:	20

Leraning outcomes reference to the second degree characteristics of the National Qualification Framework (level 8) covering doctoral competences:

Symbol:	**Learning outcomes:**	**8 level NQF**
SD1_KW01	To the extent enabling to revise the existing pradigms in the field/discipline - the world achievments, gathering theoretical background as well as general and selected detailed issues	P8S_WG
SD1_KW02	Major general development trends in the field/discipline	P8S_WG
SD1_KU05	Carry out critical assessment of the scientific research findings and expert activities and their contribution to the knowledge development in the field/discipline	P8S_UW
SD1_KK01	Critically evaluate the achievments in the field/discipline represented	P8S_KK
SD1_KK03	Recognise knowledge in solving cognitive and practical problems characteristic for the area of research (field/discipline) and in an interdisciplinary aspect	P8S_KK
SD1_KK08	Support the ethos of scientific circles and conduct independent research	P8S_KR