Master´s Programme in Computational Social Science

120 credits

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F7MCD

Valid from: 2018 Autumn semester

Determined by
Board of the Faculty of Arts and Sciences

Date determined
2017-06-01

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2017-11-24

Introduction

The master's programme in Computational Social Science trains students to apply computational methods to analyse large, complex datasets related to human social behaviour, and to arrive at theoretically and empirically grounded explanations of social outcomes such as ethnic segregation in schools, income inequality, firm growth and survival, political change, cultural diffusion and myriad others. In the process, students are inducted into multidisciplinary domains of research in the social sciences that connect sociology, political science, economics, management science, and related disciplines with technical innovations in mathematics, statistics, and computer science. The programme provides:

1. Grounding in the philosophy of social science research, with special attention paid to the scientific potential, practical limits, and ethical risks of growing troves of digital data describing human behaviours;
2. Theoretically and empirically guided understandings of human decision making and cognitive processes, including cognitive biases, that guide choices and social interactions;
3. A framework for connecting micro-level social actions of individuals, families, firms, and other social actors, and macro-level social outcomes like segregation, inequality, cultural evolution, and industrial change;
4. Formal training in key methodological components of computational social science, including traditional statistical methods, network analysis, computer simulation, agent-based modelling, web-scraping, and machine learning;
5. Practical skills to implement computationally intensive social science research designs using appropriate methods;
6. A broad background in theories and empirical findings in key substantive areas of academic research in the social sciences, with connections to non-academic applications.

The programme qualifies students to engage in research and knowledge production in academia, the private sector, and the public sector.

Aim

Knowledge and understanding

For a Master's degree (120 credits) the student shall

- demonstrate knowledge and understanding in Computational Social Science, including both broad knowledge of the field and a considerable degree of specialised knowledge in certain areas of the field as well as insight into current research and development work, and
- demonstrate specialised methodological knowledge in Computational Social Science, with special reference to critical traditions of the social sciences and the humanities.

Competence and skills

For a Master's degree (120 credits) the student shall

- demonstrate the ability to critically and systematically integrate knowledge and analyse, assess and deal with complex phenomena, issues and situations even with limited information
- demonstrate the ability to identify and formulate issues critically, autonomously and creatively as well as to plan and, using appropriate methods, undertake advanced tasks within predetermined time frames and so contribute to the formation of knowledge as well as the ability to evaluate this work
- demonstrate the ability in speech and writing both nationally and internationally to report clearly and discuss his or her conclusions and the knowledge and arguments on which they are based in dialogue with different audiences, and
- demonstrate the skills required for participation in research and development work or autonomous employment in some other qualified capacity.

Judgement and approach

For a Master's degree (120 credits) the student shall

- demonstrate the ability to make assessments in Computational Social Science informed by relevant disciplinary, social and ethical issues and also to demonstrate awareness of ethical aspects of research and development work
- demonstrate insight into the possibilities and limitations of research, its role in society and the responsibility of the individual for how it is used, and
- demonstrate the ability to identify the personal need for further knowledge and take responsibility for his or her ongoing learning.

Content

Semester 1

Logic of Social Inquiry, 7,5 credits

This course will introduce students to principles of scientific inquiry, while also

examining the unique features that distinguish social sciences from other sciences. Students will learn to produce research questions and design research to answer these questions. Attention will be paid to the conceptual distinction between the micro- and macro-levels of social analysis, and how computational approaches can be used to target these levels of analysis.

Behavioural Mechanisms in the Social Sciences, 7,5 credits

Social scientific disciplines have evolved under implicit and explicit assumptions about human cognitive and decision-making processes. This course will examine these assumptions, including those underpinning classical rational choice theory and its extensions. Emerging empirical results in behavioural economics, cognitive science, psychology, and related disciplines that bear on human decision making processes will be examined. Cognitive frameworks that offer alternatives to rational choice theory will be considered and critiqued.

Statistics & Data Science I, 7,5 credits

This course presents students with the key concepts, postulates, and theorems in probability theory, and provides an overview of probability distributions relevant to computational social science research. Students are introduced to programming for data analysis, with a focus on random number generators and simulation. Computer simulations and conventional mathematical approaches are used to explore key results in probability and mathematical statistics.

Statistics & Data Science II, 7,5 credits

This course introduces students to multivariate modelling using linear regression. Extensions and special applications of linear regression models are considered, including models appropriate for causal inference. The underlying assumptions and limits of linear regression models are explored using conventional mathematics and computer simulation.

Semester 2

Discrete Choice Modelling, 7,5 credits

This course provides an overview of statistical models for binary and categorical outcomes that are integral to social network analysis, machine learning, and the analysis of human decision making. The course provides a practical introduction to maximum likelihood approaches to model estimation. Models for binary outcomes are considered, including a discussion of key assumptions and limitations. The underlying framework is extended to models for polytomous outcomes, including McFadden's multinomial logistic regression model. Computer laboratory sessions explore practical applications and model assumptions.

Agent-Based Modelling, 7,5 credits

This course provides a detailed introduction to agent-based modelling (ABM). The course covers all the steps involved in developing an ABM: theoretical design, implementation, and evaluation. In intensive laboratory sessions, students implement agent-based models using object-oriented programming, carry out computer-based experiments with those models, and consider methods for evaluating the robustness and sensitivity of simulation results.

Social Network Analysis, 7,5 credits

Social network concepts, data structures, and measures are introduced. Statistical models applicable to social network data are explored. In intensive laboratory sessions, students work with real network data, create network visualizations, calculate network statistics, implement statistical models related to

network formation and evolution, and simulate networks using these models.

Digital Strategies for Social Science Research, 7,5 credits

This course combines a presentation of data collection and management tools with a reflection on their production and their potential use for research. Students learn how to extract relevant information from online data sources, deal with the mass of data that is extracted, and apply appropriate tools for making sense of the data. Students will engage in intensive laboratory sessions in which they acquire their own digital data and apply statistical methods, including machine learning algorithms, to extract insights.

Semester 3

Inequality and Segregation: Theory and Measurement, 7,5 credits

This course introduces commonly used measures of inequality and segregation employed in social science research. Ideal properties of inequality and segregation measures are examined, and common measures evaluated with respect to these properties. Students engage in computer laboratories to generate measures based on social data and examine the sensitivity of measures to population compositions and other characteristics.

Culture: Theory and Research, 7,5 credits

This course introduces major theories, empirical research, and related literature in the study of cultural production and cultural consumption, with an emphasis on contemporary research using computational designs.

Organizations: Theory and Research, 7,5 credits

This course introduces major theories, empirical research, and related literatures in the study of organizations including organizational demography, organizational decision making, and internal dynamics. Special emphasis is given to research employing computational designs.

Big Data: Social Processes and Ethical Issues, 7,5 credits

This course examines the social processes surrounding the creation, storage and use of large scale digital data sets and related digital platforms. Students examine what populations and what kinds of information are included or excluded in emerging “big” datasets, and how these datasets come about. Ethical issues and dangers related to the use of these troves of data are considered.

Studies Abroad

Students can choose to carry out their third semester of studies abroad. The Faculty of Arts and Sciences gives students the opportunity for exchange studies. Specific routines are established for this purpose. Students wishing to take advantage of this possibility must consult with the programme director to ensure credits will be transferred.

Semester 4

Master’s Thesis 30 credits

The topic of the master’s dissertation is decided together with the supervisor. The master’s thesis shall be written within the main area of study, Sociology. Examination includes completion, presentation and defence of a master’s thesis as well as opposition of another master’s thesis.

Teaching and working methods

Teaching in the programme requires a high level of student participation and independent study. It is expected that learning will occur both within and outside the classroom. Teaching forms will include readings, lectures, seminars, computer laboratories, and individual/group tutorials, as deemed appropriate by course instructors and described in course syllabi.

Entry requirements

Bachelor's degree equivalent to a Swedish Kandidatexamen within the humanities, social-, cultural-, behavioural-, natural-, computer-, or engineering-sciences.

English corresponding to the level of English in Swedish upper secondary education (English 6/B).

Threshold requirements

In order to be admitted to the second year of the programme – the third semester – the student must have successfully passed at least 45 credits of the first year's courses.

Degree requirements

The student will be awarded the degree of Master Science (120 credits) with a major in Computational Social Science provided all course requirements are completed and that the student fulfils the general and specific eligibility requirements including proof of holding a Bachelor's (kandidat) or a corresponding degree.

Completed courses and other requirements will be listed in the degree certificate. A degree certificate is issued by the Faculty Board on request. A Diploma Supplement will be attached to the degree certificate.

Degree in Swedish

Filosofie masterexamen i Computational Social Science (120 hp).

Degree in English

Master of Science (120 credits) with a major in Computational Social Science.

Specific information

Transfer of Credits

The Board of the Faculty of Arts and Sciences or a person nominated by the board decide whether or not previous education can be transferred into the programme.

Language of Instruction

Language of Instruction is English.

Curriculum

Semester 1 (Autumn 2018)

Course code	Course name	Credits	Level	Weeks	ECV
771A11	Logic of Social Inquiry	7.5	A1X	v201834-201838	C
771A13	Behavioural Mechanisms in the Social Sciences	7.5	A1X	v201839-201843	C
771A15	Statistics and Data Science I	7.5	A1X	v201844-201848	C
771A17	Statistics and Data Science II	7.5	A1X	v201849-201903	C

Semester 2 (Spring 2019)

Course code	Course name	Credits	Level	Weeks	ECV
771A19	Discrete Choice Modelling	7.5	A1X	v201904-201908	C
771A23	Social Network Analysis	7.5	A1X	v201909-201913	C
771A21	Agent-Based Modelling	7.5	A1X	v201914-201918	C
771A25	Digital Strategies for Social Science Research	7.5	A1X	v201919-201923	C

Semester 3 (Autumn 2019)

Course code	Course name	Credits	Level	Weeks	ECV
771A27	Inequality and Segregation: Theory and Measurement	7.5	A1F	v201934-201938	C
771A29	Culture: Theory and Research	7.5	A1F	v201939-201943	C
771A31	Organizations: Theory and Research	7.5	A1F	v201944-201948	C
771A33	Big Data: Social Processes and Ethical Issues	7.5	A1F	v201949-202003	C

Semester 4 (Spring 2020)

Course code	Course name	Credits	Level	Weeks	ECV
771A35	Master's Thesis in Computational Social Science	30	A2E	v202004-202023	C

ECV = Elective / Compulsory /Voluntary
*Kursen läses över flera terminer