MA in Computational Social Science

Faculty Director

• James Evans, Sociology

Executive Committee

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• Marc G. Berman, Psychology
• Kathleen Cagney, Sociology
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• Kathleen D. Morrison, Anthropology
• Howard Nusbaum, Psychology
• John Padgett, Political Science
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• Stephen W. Raudenbush, Sociology
• James T. Sparrow, History

Affiliated Faculty

• Stéphane Bonhomme, Economics
• John Cacioppo, Psychology
• Magne Mogstad, Economics
• Anna Mueller, Comparative Human Development
• John W. Patty, Political Science
• Alessandra Voena, Economics
• Daniel Yurovsky, Psychology

Senior Lecturer

• Rick Evans, Computational Economics

Lecturer
General Information

The Master of Arts in Computational Social Science is a two-year program of graduate study. It has a highly structured curriculum, with a total of 18 required and elective courses tailored to the disciplinary track a student follows. It features a four-course core in computational inference, big data analysis, computational modeling, and computer programming; a regular Computation Workshop for the presentation and critique of work in progress by invited guests; and an optional summer practicum between the first and second year, allowing students to develop their research with a variety of organizations. Students submit an article-length MA thesis in their second year, after completing a three-quarter research commitment working directly with a member of our Executive or Affiliated Faculty.

The program aims to produce leading social scientists in each of our core social science fields – economics, sociology, political science, psychology, history, and anthropology –
producing competitive PhD applicants, well-trained in computational approaches, who have mastered the research and analytical skills necessary to make important contributions.

Students receive close mentorship from the program’s Faculty Director, academic staff, and members of our Executive and Affiliated Faculty.

In addition, they receive full professional support from our Director of Career Services, with biweekly workshops, career planning, and employer recruitment throughout the year.

Program Requirements and Course Work

All MA students complete the equivalent of 18 graduate seminars and write an article-length MA thesis, modeled on a professional journal article, with a member of our Computation Faculty.

The courses are selected with the advice of our academic staff, and follow different disciplinary tracks, tailored to the research commitments of our students.

Admission

All financial aid is merit-based. The program offers partial and full tuition scholarships on a highly competitive basis.

Submission of GRE scores is required. All Computation students should have quantitative GREs in the top 30%.

Applicants must provide evidence of English proficiency by submitting TOEFL or IELTS scores, unless they have completed a degree in an English language University.

How to Apply

The application for admission and financial aid is available at: https://apply-ssd.uchicago.edu/apply/

Any questions should be directed to admissions@ssd.uchicago.edu, (773) 702-8415.

Please also visit our website: https://macss.uchicago.edu
MA Program in Computational Social Science Courses

MACS 30000. Perspectives on Computational Analysis. 100 Units.
Massive digital traces of human behavior and ubiquitous computation have both extended and altered classical social science inquiry. This course surveys successful social science applications of computational approaches to the representation of complex data, information visualization, and model construction and estimation. We will reexamine the scientific method in the social sciences in context of both theory development and testing, exploring how computation and digital data enables new answers to classic investigations, the posing of novel questions, and new ethical challenges and opportunities. Students will review fundamental research designs such as observational studies and experiments, statistical summaries, visualization of data, and how computational opportunities can enhance them. The focus of the course is on exploring the wide range of contemporary approaches to computational social science, with practical programming assignments to train with these approaches.
Instructor(s): Rick Evans and Benjamin Soltoff Terms Offered: Autumn
Note(s): MACSS students have priority. Others admitted with instructor consent.

MACS 30200. Perspectives on Advanced Computational Topics. 100 Units.
This course focuses on scaling up computational approaches to social science analysis and modeling with big data in context of opportunities afforded by high performance and cloud computing. We will begin by exploring various data structures encountered in social science research, how to deal with large or complex data storage and streaming data, and how to factor considerations of computational complexity into their analyses. We will also study social science applications of parallel computing, both on stand-alone machines and in supercomputing environments, to carry out complex computations. Students will learn to carry out parallel I/O and parallel computation on their own machines and on a cluster. We will also address API construction and access, and explore cloud configurations for social science research designs. We will also help students construct web-based outward facing data, analysis and visualization portals. Students will efficiently gather, structure, perform and present analysis on large-scale social science data.
Instructor(s): R. Evans, B. Soltoff Terms Offered: Spring

MACS 30500. Computing for the Social Sciences. 100 Units.
This is an applied course for social scientists with little programming experience who wish to use computational analysis in their research. After completion of this course, students will be able to write basic programs that fulfill their own research needs. Major topics to be covered include data wrangling, data exploration, functional programming, statistical modeling, and reproducible research. Students will also learn how to parse text files, scrape data from other sources, create and query relational databases, implement parallel processes, and manage digital projects. Class meetings will be a combination of lecture and laboratory sessions, and students will complete weekly programming assignments as well as a final research project. Assignments will be completed primarily using the open-source R and Python programming languages and the version control software Git.
Instructor(s): Benjamin Soltoff Terms Offered: Autumn
Note(s): MACS students have priority. Others admitted with instructor consent.
Equivalent Course(s): SOCI 40176
MACS 40000. Economic Policy Analysis with Overlapping Generation Models. 100 Units.
This course will study economic policy questions ideally addressed by the overlapping
generations (OG) dynamic general equilibrium framework. OG models represent a rich
class of macroeconomic general equilibrium model that is extremely useful for answering
questions in which inequality, demographics, and individual heterogeneity are important.
OG models are used extensively by the Joint Committee on Taxation, Congressional Budget
Office, and Department of the Treasury. This course will train students how to set up and
solve OG models. The standard nonlinear global solution method for these models—time
path iteration—is a fixed point method that is similar to but significantly different from value
function iteration. This course will take students through progressively richer versions of
the model, which will include endogenous labor supply, nontrivial demographics, bequests,
stochastic income, multiple industries, non-balanced government budget constraint, and
household tax structure.
Instructor(s): Rick Evans Terms Offered: Autumn

MACS 40700. Data Visualization. 100 Units.
Social scientists frequently wish to convey information to a broader audience in a cohesive
and interpretable manner. Visualizations are an excellent method to summarize information
and report analysis and conclusions in a compelling format. This course introduces the
theory and applications of data visualization. Students will learn techniques and methods for
developing rich, informative and interactive, web-facing visualizations based on principles
from graphic design and perceptual psychology. Students will practice these techniques
on many types of social science data, including multivariate, temporal, geospatial, text,
hierarchical, and network data. These techniques will be developed using a variety of
software implementations such as R, ggplot2, D3, and Tableau.
Instructor(s): B. Soltoff Terms Offered: Spring

MACS 50000. Computational Social Science Workshop. 100 Units.
High performance and cloud computing, massive digital traces of human behavior from
ubiquitous sensors, and a growing suite of efficient model estimation, machine learning and
simulation tools are not just extending classical social science inquiry, but transforming it to
pose novel questions at larger and smaller scales. The Computational Social Science (CSS)
Workshop is a weekly event that features this work, highlights associated skills and data,
and explores the use of CSS in the world. The CSS Workshop alternates weekly between
research workshops and professional workshops. The research workshops feature new CSS
work from top faculty and advanced graduate students from UChicago and around the world,
while professional workshops highlight useful skills and data (e.g., machine learning with
Python’s scikit-learn; the Twitter firehose API) and showcase practitioners using CSS in the
government, industry and nonprofit sectors. Each quarter, the CSS Workshop also hosts a
distinguished lecture, debate and dinner, and a student conference.
Instructor(s): James Evans Terms Offered: Autumn,Winter,Spring
Note(s): MACSS students must register for a R. Other faculty and graduate students
welcome.
Equivalent Course(s): SOCI 60016
MACS 54000. **Introduction to Spatial Data Science. 100 Units.**
Spatial data science consists of a collection of concepts and methods drawn from both statistics and computer science that deal with accessing, manipulating, visualizing, exploring and reasoning about geographical data. The course introduces the types of spatial data relevant in social science inquiry and reviews a range of methods to explore these data. Topics covered include formal spatial data structures, geovisualization and visual analytics, rate smoothing, spatial autocorrelation, cluster detection and spatial data mining. An important aspect of the course is to learn and apply open source software tools, including R and GeoDa.
Instructor(s): L. Anselin Terms Offered: Autumn
Prerequisite(s): A multivariate statistics course: familiarity with GIS is helpful, but not necessary
Equivalent Course(s): SOCI 30253, GEOG 20500, SOCI 20253

MACS 55000. **Spatial Regression Analysis. 100 Units.**
This course covers statistical and econometric methods specifically geared to the problems of spatial dependence and spatial heterogeneity in cross-sectional data. The main objective of the course is to gain insight into the scope of spatial regression methods, to be able to apply them in an empirical setting, and to properly interpret the results of spatial regression analysis. While the focus is on spatial aspects, the types of methods covered have general validity in statistical practice. The course covers the specification of spatial regression models in order to incorporate spatial dependence and spatial heterogeneity, as well as different estimation methods and specification tests to detect the presence of spatial autocorrelation and spatial heterogeneity. Special attention is paid to the application to spatial models of generic statistical paradigms, such as Maximum Likelihood, Generalized Methods of Moments and the Bayesian perspective. An important aspect of the course is the application of open source software tools such as R, GeoDa and PySal to solve empirical problems.
Instructor(s): L. Anselin Terms Offered: Spring
Equivalent Course(s): GEOG 40217, SOCI 40217
Font Notice

This document should contain certain fonts with restrictive licenses. For this draft, substitutions were made using less legally restrictive fonts. Specifically:

Times was used instead of Trajan.

Times was used instead of Palatino.

The editor may contact Leepfrog for a draft with the correct fonts in place.