GC Digital Initiatives

Courses in Computation and Digital Cultures Across the Curriculum at The Graduate Center

Fall 2017

In Fall 2017, 21 courses focused on computational practices and digital cultures will be offered across The Graduate Centers doctoral, master's, and certificate programs. Topics covered in these courses range from theorizing digital humanities to computer programming to statistical analysis, and provide hands-on opportunities for GC students to develop their digital research skills.

These courses are listed below in alphabetical order by program along with a brief description taken from their respective program websites. Interested students should contact individual programs if they have questions regarding course content/prerequisites or if permission is required. For more information about the GC Digital Initiatives Program, please visit http://cuny.is/gcdi and http://cuny.is/gcdigitalfellows.

CSC 70010 - Analysis of Algorithms (crn:36278)
Prof. Devorah Kletenik
Focus is on theory rather than practice. Instructor permission required.

DESCRIPTION: Analysis of algorithms involves characterizing the amount of resources consumed by an algorithm, measured as a function of input length, and typically bounded in the worst case. The most common resources considered are running time and space used, but others may be considered as well, such as number of random bits used or number of blocks read from secondary storage. In algorithm design, we seek algorithms that have good worst-case resource requirements and other attractive qualities, such as optimality or approximation guarantees, good performance "in practice," parallelizability, and simplicity.

This course covers the design and analysis of algorithms for a number of fundamental problems, such as sorting, order statistics, minimum spanning trees, shortest paths, matching, maximum flow, minimum cut, satisfiability, knapsack, set covering, and linear programming. Common algorithm design techniques will be emphasized, including greedy, divide-and-conquer, and dynamic programming, as well as formulating problems as linear programs and the use of randomness. Some efficient data structures will also be examined, primarily hash tables, but also heaps and binary search trees. Finally, we will briefly discuss the halting problem, NP-completeness, and reductions. Implementation projects might be assigned, applying algorithms to real-world applications.

CSC 80030 - Algorithms for Big Data (crn:36283)
Prof. Delaram Kahrobaei
Focus is on theory rather than practice. Instructor permission required.

DESCRIPTION: Contact program office for more information.

CSC 84020 - Neural Networks & Deep Learning (crn:36280)
Prof. Natacha Gueorguieva
Instructor permission required.

DESCRIPTION: Contact program office for more information.

CSC 86005 - Social Network Analysis (crn:36282)
Prof. Matthew Johnson
Focus is on theory rather than practice. Instructor permission required.

DESCRIPTION: Contact program office for more information.

CSC 86020 - Data Visualization (crn:36288)
Prof. Michael Grossberg

DESCRIPTION: Contact program office for more information.

CSC 87100 - Social/Cultural Computing (crn:36279)
Prof. Lev Manovich

DESCRIPTION: Contact program office for more information.

CSC 74040 - Natural Language Processing (crn:36292)
Prof. Alla Rozovskaya
Instructor permission required.

DESCRIPTION: Natural Language Processing (NLP) is one of the most important areas within Artificial Intelligence. It is deeply connected with Algorithms, Machine Learning, Programming Languages and Compiler Theory, and Automata and Formal Language Theory.

Computers process massive quantities of information every day in the form of human language, yet machine understanding of human language remains one of the great challenges of computer science. How can advances in computing technology enable more intelligent processing of all this language data? Will computers ever be able to use this data to learn

language like humans do? This course provides a systematic introduction to statistical models of human language, with particular attention to the structures of human language that inform them and the structured learning and inference algorithms that drive them. This is a lecture course, not a seminar course, but aims to cover both fundamental and cutting-edge research issues.

CSC 74011 - Artificial Intelligence (crn:36287)
Prof. Changhe Yuan
Instructor permission required.

DESCRIPTION: Artificial intelligence (AI) develops programmed agents (systems) that match or outperform people's abilities to make decisions, to learn, and to plan. To do so, AI develops algorithms and methodologies that sense a system's environment, decide what to do given that data, and effect its chosen actions in its environment.

This is an introductory, graduate-level course on artificial intelligence. It emphasizes fast and clever search heuristics, thoughtful ways to represent knowledge, and incisive techniques that support rational decision making. Application areas will include game playing, natural language processing, and robotics.

DCP 80100 - Adv Meth Demographic Analysis (crn:36013)
(Crosslisted with SOC 81900.)
Prof. Shiro Horiuchi
Introductory statistics including multiple linear regression; DCP 70200 or permission of the instructor. No background in calculus or matrix algebra is required.

DESCRIPTION: In this course we study advanced methods of demographic analysis. They are widely used in research on mortality, fertility, nuptiality, migration, population composition, and other demographic processes, but many of them can also be applied to a broad range of topics in other areas of the social sciences and biomedical sciences. Those methods include event history analysis (nonparametric, semi-parametric and parametric versions; continuous and discrete time versions; fixed and time-dependent covariate versions), life table techniques (single-decrement, multiple-decrement and multi-state), decomposition analysis, age-period-cohort models, methods for analyzing multiple time trends (e.g., Lee-Carter model), Lexis map analysis, smoothing and non-parametric regression techniques, and mathematical models of population dynamics. Computer exercises are included.

EPSY 70500 - Statistics & Computer Programming I (crn:36082)
Prof. David Rindskopf
Prerequisites: Undergraduate or higher level course in statistics.

DESCRIPTION: Introduction to the basic principles underlying data exploration, description, and analysis, statistical inference and the use of computer packages for data analysis. 70500 and

70600 form an integrated sequence covering descriptive statistics, point and interval estimation, hypothesis testing, t-tests, analysis of variance, correlation, regression (including elementary matrix algebra), repeated measures designs, cross-classified data, and the use of computer packages for these analyses.

EPSY 83300 - The General Linear Model (crn:36078)
Prof. Jay Verkuilen
*** *Prerequisites: EPSY 70600 - Statistics & Computer Programming II or equivalent. Instructor permission required.* ***

DESCRIPTION: This course presents a general statistical procedure (the General Linear Model) for analyzing relations between a set of dependent and independent variables. Problems such as experimental designs with unequal cell frequencies, analysis of covariance, and multivariate analyses with multiple dependent variables are considered within this framework.

EPSY 84200 - Hierarchical Linear Models (crn:36081)
Prof. David Rindskopf
*** *Prerequisites: EPSY 70600 - Statistics & Computer Programming II or equivalent. Instructor permission required.* ***

DESCRIPTION: Data often structured in hierarchies. Examples include students within classrooms, classrooms within schools; employees within departments within organizations within industries. The behavior of individuals is often affected by characteristics of the higher-level units; such effects are also called contextual effects by some researchers. New statistical methods allow the hierarchical structure of data to be included in the modeling process. Multilevel models include related areas such as variance component models, contextual models, empirical Bayes models, aggregation bias, and unit-of-analysis problems. This course will teach the history and current theory of such models, as well as their application using computer packages.

ITCP 70010 - Interactive Media: History, Theory, and Practice (crn:36014)
Prof. Michael Mandiberg & Prof. Stephen Brier
*** *Open to all GC students but meeting with ITP Coordinator required.* ***

DESCRIPTION: This is the first core course in the Interactive Technology and Pedagogy certificate program. We will examine the economic, social, and intellectual history of technological change over time, as well as technology and digital media design and use. Our primary focus is on the mutual shaping of technology and academic teaching, learning and research how people and technologies have shaped academic classroom and research interactions in the past, and how they are reshaping the university in the present. By examining the use and design of technologies inside and outside of the academy, we are, of course, also reflecting on what it means to be human in a world increasingly dominated and controlled by various technologies.

The course also explores the history and theory of digital media, including hypertext and multimedia, highlighting the theoretical and practical possibilities for research, reading, writing, presentation, interaction, and play. We are particularly interested in the ITP program in the possibilities that new, nonlinear, digital tools have opened up for teaching and research, including the emergence of the "Digital Humanities."

LING 78100 - Methods in Computational Linguistics I (crn:36122)
Prof. Michael Mandel
This course has an associated practicum (LING 73600).

DESCRIPTION: Contact program office for more information.

LING 79100 - Statistics for Linguistics Research (crn:36124)
Prof. Martin Chodorow
This course has an associated practicum (LING 73900).

DESCRIPTION: This course provides an introduction to statistical analysis of data from various areas of research in linguistics. Topics cover non-parametric and parametric approaches, including chi-square, ordinal tests, randomization tests, ANOVA, linear regression, logistic regression, and mixed-effects models. In the accompanying practicum, students learn to use R and SPSS for data visualization and statistical analysis.

LING 83600 - Language Technology (crn:36128)
(Crosslisted with CSC 84020.)
Prof. Alla Rozovskaya
Prerequisites: LING 78100 & LING 83800.

DESCRIPTION: Applications of speech and language processing are found everywhere today. Automated telephone systems, for example, incorporate voice recognition and synthesis. This seminar will explore how computers deal with natural language in such areas as speech recognition, speech generation, and machine translation. Intended as an introduction to the field, the course will survey a range of methodologies in speech and language processing and will cover the basic components of natural language systems, including the lexicon, syntax and parsing, semantic analysis and representation, discourse processing, and pragmatics.

The course is open to graduate students with a solid background in either linguistics or computing. Knowledge of both is not required. It is recommended that students with minimal computer programming background have first taken Linguistics-73600 to learn programming skills. For students with minimal programming skills, Linguistics-83800 is a recommended co-requisite for this course. Computer science students or students with more programming skills will have the option of doing a programming-based rather than a research-based term project.

This course would be excellent for students who may be interested in research in computational linguistics or natural language processing (NLP). Specific research areas surveyed briefly in this course will include: Natural Language Processing, Natural Language Generation, Statistical Parsing, Speech Technologies, Machine Translation, Information Extraction, Automatic Summarization, and others.

MALS 75400 - Introduction to Digital Humanities (crn:36309)
(Crosslisted with IDS 81680.)
Prof. Matthew Gold
Doctoral students should register with IDS 81680.

DESCRIPTION: The dramatic growth of the Digital Humanities (DH) over the past half dozen years has helped scholars re-imagine the very nature and forms of academic research across a range of scholarly disciplines, encompassing the arts, the interpretive social sciences as well as traditional humanities subject areas. This initial core course will explore the history of the digital humanities, focusing especially on diverse pioneering projects and core texts that ground this innovative methodological and conceptual approach to scholarly inquiry and teaching. It will also emphasize ongoing debates in the digital humanities, such as the problem of defining the digital humanities, controversies over new models of peer review for digital scholarship, issues related to collaborative labor on digital projects, and the problematic questions surrounding research involving "big data." The course will also emphasize the ways in which DH has helped transform the nature of academic teaching and pedagogy in the contemporary university with its emphasis on collaborative, student-centered and digital learning environments and approaches. The course will also take up broad social, legal and ethical questions and concerns surrounding digital media and contemporary culture, including privacy, intellectual property, and open/public access to knowledge and scholarship. Students completing the course will gain broad understanding of the emerging role of the digital humanities across several academic disciplines and will begin to learn some of the fundamental skills used often in digital humanities projects.

NURS 71100 - Applied Statistics I (crn:36164)
Prof. William Gallo
Prerequisites: graduate level statistics course within the last 5 years and NURS 70100.

DESCRIPTION: The focus of this first course in the two-semester statistics sequence will be on developing a conceptual understanding of the uses and interpretation of statistics involving the differences between and among populations (groups) including t tests, one way ANOVA, multifactorial ANOVA, Analysis of Covariance (ANCOVA) and Repeated Measures ANOVA. Drawing on current nursing research, the case study method will be used to enhance the students' conceptual understanding by illustrating actual applications of particular statistical techniques.

PHYS 78100 - Computational Methods in Physics (crn:36522)
Prof. Ariyeh Maller
Instructor permission required.

DESCRIPTION: Contact program office for more information.

SOC 71500 - Sociological Statistics I (crn:36229)
Prof. Leslie McCall
Limited seats available.

DESCRIPTION: Contact program office for more information.

SSW 76000 - Methods of Data Analysis (crn:36185)
Prof. Alexis Kuerbis
This course is offered at the Silberman School of Social Work at Hunter College located at 119th Str. & 3rd Ave.

DESCRIPTION: This course introduces concepts and provides experiences that enable students to gain a solid understanding of statistical procedures. The goal is to enable students to conduct univariate, bivariate, and multivariate statistical analysis of data. Students will understand the following: basic statistical concepts and their relationship to specific research designs; levels of measurement; types of hypotheses; statistics-based research literature in social welfare and other disciplines; and analyze, interpret, and present numerical information from data. The selected methods for statistical data analysis include descriptive and inferential statistics to explore variables, variable relationships, test hypotheses, use the appropriate statistical procedures, and identify and describe relationships. The use of computer assisted (SPSS) data analysis will be used as a means to generate statistical outputs for enhancing the understanding of statistical results.