Information Management and Systems: PhD

The Doctoral Program

The doctoral program in Information Management and Systems is a research-oriented program in which the student chooses specific fields of specialization, prepares sufficiently in the literature and the research of those fields to pass a qualifying examination, and completes original research culminating in the written dissertation. The degree of Doctor of Philosophy is conferred in recognition of a candidate’s grasp of a broad field of learning and distinguished accomplishment in that field through the contribution of an original piece of research revealing high critical ability and powers of imagination and synthesis.

The I School also offers a master’s in Information Management and Systems (http://guide.berkeley.edu/graduate/degree-programs/information-management-systems) (MIMS), a master’s in Information and Data Science (http://guide.berkeley.edu/graduate/degree-programs/information-data-science) (MIDS), and a master’s in Information and Cybersecurity (http://guide.berkeley.edu/graduate/degree-programs/information-cybersecurity) (MICS).

Admission to the PhD Program

We welcome students from a diverse set of backgrounds; some will be technically educated, some educated in the humanities and social sciences.

The I School accepts only 3-5 PhD students each year from more than 80 applications. Applications are reviewed by a committee of faculty.

Applicants are judged on a number of factors. Good scores and a high GPA are necessary, but not sufficient. The deciding factor is the ability to demonstrate a research record and agenda that fit well with specific I School faculty. In a small, interdisciplinary program, it is important that applicants clearly indicate in their statement of purpose which faculty member(s) they are interested in researching with, and why.

To be eligible to apply to the PhD in Information Management and Systems program, applicants must meet the following requirements:

- A bachelor’s degree or its recognized equivalent from an accredited institution.
- Superior scholastic record, normally well above a 3.0 GPA.
- Clear indication of appropriate research goals, described in the Statement of Purpose.
- Results of the General Test of the Graduate Record Examination (GRE) (http://www.gre.org).
- For applicants whose academic work has been in a language other than English, the Test of English as a Foreign Language (TOEFL) or International English Language Testing System (IELTS).

Minimum Requirements for Admission

The following minimum requirements apply to all graduate programs and will be verified by the Graduate Division:

1. A bachelor’s degree or recognized equivalent from an accredited institution;
2. A grade point average of B or better (3.0);
3. If the applicant comes from a country or political entity (e.g., Quebec) where English is not the official language, adequate proficiency in English to do graduate work, as evidenced by a TOEFL score of at least 90 on the iBT test, 570 on the paper-and-pencil test, or an IELTS Band score of at least 7 on a 9-point scale (note that individual programs may set higher levels for any of these); and
4. Sufficient undergraduate training to do graduate work in the given field.

Applicants Who Already Hold a Graduate Degree

The Graduate Council views academic degrees not as vocational training certificates, but as evidence of broad training in research methods, independent study, and articulation of learning. Therefore, applicants who already have academic graduate degrees should be able to pursue new subject matter at an advanced level without the need to enroll in a related or similar graduate program.

Programs may consider students for an additional academic master’s or professional master’s degree only if the additional degree is in a distinctly different field.

Applicants admitted to a doctoral program that requires a master’s degree to be earned at Berkeley as a prerequisite (even though the applicant already has a master’s degree from another institution in the same or a closely allied field of study) will be permitted to undertake the second master’s degree, despite the overlap in field.

The Graduate Division will admit students for a second doctoral degree only if they meet the following guidelines:

1. Applicants with doctoral degrees may be admitted for an additional doctoral degree only if that degree program is in a general area of knowledge distinctly different from the field in which they earned their original degree. For example, a physics PhD could be admitted to a doctoral degree program in music or history; however, a student with a doctoral degree in mathematics would not be permitted to add a PhD in statistics.
2. Applicants who hold the PhD degree may be admitted to a professional doctorate or professional master’s degree program if there is no duplication of training involved.

Applicants may apply only to one single degree program or one concurrent degree program per admission cycle.

Required Documents for Applications

1. Transcripts: Applicants may upload unofficial transcripts with your application for the departmental initial review. If the applicant is admitted, then official transcripts of all college-level work will be required. Official transcripts must be in sealed envelopes as issued by the school(s) attended. If you have attended Berkeley, upload your unofficial transcript with your application for the departmental initial review. If you are admitted, an official transcript with evidence of degree conferred will not be required.
2. Letters of recommendation: Applicants may request online letters of recommendation through the online application system. Hard
copies of recommendation letters must be sent directly to the program, not the Graduate Division.

3. **Evidence of English language proficiency**: All applicants from countries or political entities in which the official language is not English are required to submit official evidence of English language proficiency. This applies to applicants from Bangladesh, Burma, Nepal, India, Pakistan, Latin America, the Middle East, the People’s Republic of China, Taiwan, Japan, Korea, Southeast Asia, most European countries, and Quebec (Canada). However, applicants who, at the time of application, have already completed at least one year of full-time academic course work with grades of B or better at a US university may submit an official transcript from the US university to fulfill this requirement. The following courses will not fulfill this requirement:

- courses in English as a Second Language,
- courses conducted in a language other than English,
- courses that will be completed after the application is submitted, and
- courses of a non-academic nature.

If applicants have previously been denied admission to Berkeley on the basis of their English language proficiency, they must submit new test scores that meet the current minimum from one of the standardized tests. Official TOEFL score reports must be sent directly from Educational Test Services (ETS). The institution code for Berkeley is 4833. Official IELTS score reports must be mailed directly from the British Council. TOEFL and IELTS score reports are only valid for two years.

**Where to Apply**

Visit the Berkeley Graduate Division application page (http://grad.berkeley.edu/admissions/apply).

**Program Design**

The School of Information is an interdisciplinary school examining the design, organization, and management of information and information systems. The School of Information draws on the expertise not only of its own faculty but of the full Berkeley campus. We encourage students to take full advantage of being at this world-class University and not feel bound by disciplinary boundaries.

The PhD degree program at the School of Information is a research program. Each student is expected to work with his or her adviser to ensure that the program of study includes:

- A thorough understanding of research methods and research design.
- The ability to review current research critically.
- The ability to understand emerging trends from an interdisciplinary perspective.

**Expected PhD Timeline:**

- **Semester 1**: Identify a faculty adviser
- **Semesters 1–4**: Complete breadth courses; complete major and minor requirements
- **Semester 4**: Complete the preliminary research paper
- **Semester 5**: Complete preliminary exam
- **Semester 6–8**: Complete qualifying exam; advance to candidacy
- **Four semesters after qualifying exam**: Complete dissertation and give presentation

Please refer to the School of Information website (http://www.ischool.berkeley.edu/programs/phd/degreerequirements) for more information.

**INFO 201 Research Design and Applications for Data and Analysis 3 Units**

Terms offered: Spring 2020
Introduces the data sciences landscape, with a particular focus on learning data science techniques to uncover and answer the questions students will encounter in industry. Lectures, readings, discussions, and assignments will teach how to apply disciplined, creative methods to ask better questions, gather data, interpret results, and convey findings to various audiences. The emphasis throughout is on making practical contributions to real decisions that organizations will and should make. Course must be taken for a letter grade to fulfill degree requirements. Research Design and Applications for Data and Analysis: Read More [+]

**Hours & Format**

Fall and/or spring: 15 weeks - 1.5 hours of lecture and 1.5 hours of web-based lecture per week

**Additional Details**

Subject/Course Level: Information/Graduate
Grading: Letter grade.
Research Design and Applications for Data and Analysis: Read Less [-]

**INFO 202 Information Organization and Retrieval 2 Units**

Terms offered: Fall 2019, Fall 2018, Fall 2017
This course introduces the intellectual foundations of information organization and retrieval: conceptual modeling, semantic representation, vocabulary and metadata design, classification, and standardization, as well as information retrieval practices, technology, and applications, including computational processes for analyzing information in both textual and non-textual formats.

Information Organization and Retrieval: Read More [+]

**Rules & Requirements**

Prerequisites: Students should have a working knowledge of the Python programming language

Hours & Format

Fall and/or spring: 8 weeks - 3 hours of lecture per week

**Additional Details**

Subject/Course Level: Information/Graduate
Grading: Letter grade.
Instructor: Bamman
Information Organization and Retrieval: Read Less [-]
INFO 203 Social Issues of Information 2 Units
Terms offered: Spring 2020, Spring 2019, Spring 2018
This course is designed to be an introduction to the topics and issues associated with information and information technology and its role in society. Throughout the semester we will consider both the consequence and impact of technologies on social groups and on social interaction and how society defines and shapes the technologies that are produced. Students will be exposed to a broad range of applied and practical problems, theoretical issues, as well as methods used in social scientific analysis. The four sections of the course are: 1) theories of technology in society, 2) information technology in workplaces 3) automation vs. humans, and 4) networked sociability.
Social Issues of Information: Read More [-]

Hours & Format
Fall and/or spring: 8 weeks - 3 hours of lecture per week

Additional Details
Subject/Course Level: Information/Graduate

Grading: Letter grade.

Instructor: Burrell

Social Issues of Information: Read Less [-]

INFO 205 Information Law and Policy 2 Units
Terms offered: Spring 2020, Spring 2019, Spring 2018
This course uses examples from various commercial domains—retail, health, credit, entertainment, social media, and biosensing/quantified self—to explore legal and ethical issues including freedom of expression, privacy, research ethics, consumer protection, information and cybersecurity, and copyright. The class emphasizes how existing legal and policy frameworks constrain, inform, and enable the architecture, interfaces, data practices, and consumer facing policies and documentation of such offerings; and, fosters reflection on the ethical impact of information and communication technologies and the role of information professionals in legal and ethical work.
Information Law and Policy: Read More [-]

Rules & Requirements
Prerequisites: Consent of instructor required for nonmajors

Hours & Format
Fall and/or spring: 7 weeks - 4 hours of lecture per week

Additional Details
Subject/Course Level: Information/Graduate

Grading: Letter grade.

Instructor: Mulligan

Information Law and Policy: Read Less [-]

INFO 206A Introduction to Programming and Computation 2 Units
Terms offered: Fall 2019
This course introduces the basics of computer programming that are essential for those interested in computer science, data science, and information management. Students will write their own interactive programs (in Python) to analyze data, process text, draw graphics, manipulate images, and simulate physical systems. Problem decomposition, program efficiency, and good programming style are emphasized throughout the course.
Introduction to Programming and Computation: Read More [+]

Hours & Format
Fall and/or spring: 7.5 weeks - 4 hours of lecture per week

Additional Details
Subject/Course Level: Information/Graduate

Grading: Letter grade.

Instructor: Farid

Introduction to Programming and Computation: Read Less [-]

INFO 206B Introduction to Data Structures and Analytics 2 Units
Terms offered: Fall 2019
The ability to represent, manipulate, and analyze structured data sets is foundational to the modern practice of data science. This course introduces students to the fundamentals of data structures and data analysis (in Python). Best practices for writing code are emphasized throughout the course. This course forms the second half of a sequence that begins with INFO 106. It may also be taken as a stand-alone course by any student that has sufficient Python experience.
Introduction to Data Structures and Analytics: Read More [+]

Rules & Requirements
Prerequisites: INFO 206A or equivalent, or permission of instructor

Credit Restrictions: Course must be completed for a letter grade to fulfill degree requirements.

Hours & Format
Fall and/or spring: 7.5 weeks - 4 hours of lecture per week

Additional Details
Subject/Course Level: Information/Graduate

Grading: Letter grade.

Instructor: Farid

Formerly known as: Information 206

Introduction to Data Structures and Analytics: Read Less [-]
INFO 213 User Interface Design and Development 4 Units
Terms offered: Fall 2019, Fall 2018, Fall 2017

INFO 214 User Experience Research 3 Units
Terms offered: Spring 2020, Spring 2019, Spring 2018
This course addresses concepts and methods of user experience research, from understanding and identifying needs, to evaluating concepts and designs, to assessing the usability of products and solutions. We emphasize methods of collecting and interpreting qualitative data about user activities, working both individually and in teams, and translating them into design decisions. Students gain hands-on practice with observation, interview, survey, focus groups, and expert review. Team activities and group work are required during class and for most assignments. Additional topics include research in enterprise, consulting, and startup organizations, lean/agile techniques, mobile research approaches, and strategies for communicating findings.

INFO 216 Computer-Mediated Communication 3 Units
Terms offered: Fall 2016, Spring 2016, Spring 2015
This course covers the practical and theoretical issues associated with computer-mediated communication (CMC) systems (e.g., email, newsgroups, wikis, online games, etc.). We will focus on the analysis of CMC practices, the relationship between technology and behavior, and the design and implementation issues associated with constructing CMC systems. This course primarily takes a social scientific approach (including research from social psychology, economics, sociology, and communication).

INFO 218 Concepts of Information 3 Units
Terms offered: Spring 2020, Spring 2018, Spring 2016
As it's generally used, "information" is a collection of notions, rather than a single coherent concept. In this course, we'll examine conceptions of information based in information theory, philosophy, social science, economics, and history. Issues include: How compatible are these conceptions; can we talk about "information" in the abstract? What work do these various notions play in discussions of literacy, intellectual property, advertising, and the political process? And where does this leave "information studies" and "the information society"?

Rules & Requirements

Prerequisites: Graduate standing

Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Information/Graduate

Grading: Letter grade.

Instructors: Duguid, Nunberg

Concepts of Information: Read Less [-]
INFO 219 Privacy, Security, and Cryptography 3 Units
Terms offered: Spring 2020, Fall 2017, Fall 2013
Policy and technical issues related to insuring the accuracy and privacy of information. Encoding and decoding techniques including public and private key encryption. Survey of security problems in networked information environment including viruses, worms, trojan horses, Internet address spoofing. Privacy, Security, and Cryptography: Read More [+]

Rules & Requirements
Prerequisites: Graduate standing in the School of Information or consent of instructor

Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details
Subject/Course Level: Information/Graduate
Grading: Letter grade.
Instructor: Tygar
Privacy, Security, and Cryptography: Read Less [-]

INFO 225 Managing in Information-Intensive Companies 3 Units
Terms offered: Fall 2018, Fall 2017, Fall 2016
This course focuses on managing people in information-intensive firms and industries, such as information technology industries. Topics include managing knowledge workers; managing teams (including virtual ones); collaborating across disparate units, giving and receiving feedback; managing the innovation process (including in eco-systems); managing through networks; and managing when using communication tools (e.g., tele-presence). The course relies heavily on cases as a pedagogical form.
Managing in Information-Intensive Companies: Read More [+]

Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details
Subject/Course Level: Information/Graduate
Grading: Letter grade.
Instructor: Hansen
Managing in Information-Intensive Companies: Read Less [-]

INFO 232 Applied Behavioral Economics for Information Systems 3 Units
Terms offered: Fall 2019, Fall 2018, Fall 2017
"Behavioral Economics" is one important perspective on how information impacts human behavior. The goal of this class is to deploy a few important theories about the relationship between information and behavior, into practical settings — emphasizing the design of experiments that can now be incorporated into many 'applications' in day-to-day life. Truly 'smart systems' will have built into them precise, testable propositions about how human behavior can be modified by what the systems tell us and do for us. So let's design these experiments into our systems from the ground up! This class develops a theoretically informed, practical point of view on how to do that more effectively and with greater impact.
Applied Behavioral Economics for Information Systems: Read More [+]

Rules & Requirements
Credit Restrictions: Students will receive no credit for Information 232 after completing Information 290 sect 6 (Fall 13).

Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details
Subject/Course Level: Information/Graduate
Grading: Letter grade.
Instructor: Weber
Applied Behavioral Economics for Information Systems: Read Less [-]

INFO 233 Social Psychology and Information Technology 3 Units
Terms offered: Spring 2020, Spring 2019
Discusses application of social psychological theory and research to information technologies and systems; we focus on sociological social psychology, which largely focuses on group processes, networks, and interpersonal relationships. Information technologies considered include software systems used on the internet such as social networks, email, and social games, as well as specific hardware technologies such as mobile devices, computers, wearables, and virtual/augmented reality devices. We examine human communication practices, through the lens of different social psychology theories, including: symbolic interaction, identity theories, social exchange theory, status construction theory, and social networks and social structure theory.
Social Psychology and Information Technology: Read More [+]

Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details
Subject/Course Level: Information/Graduate
Grading: Letter grade.
Instructor: Cheshire
Social Psychology and Information Technology: Read Less [-]
INFO 234 Information Technology Economics, Strategy, and Policy 3 Units
Terms offered: Spring 2019, Spring 2018, Spring 2017
Application of economic tools and principles, including game theory, industrial organization, information economics, and behavioral economics, to analyze business strategies and public policy issues surrounding information technologies and IT industries. Topics include: economics of information; economics of information goods, services, and platforms; strategic pricing; strategic complements and substitutes; competition models; network industry structure and telecommunications regulation; search and the "long tail"; network cascades and social epidemics; network formation and network structure; peer production and crowdsourcing; interdependent security and privacy. 
Information Technology Economics, Strategy, and Policy: Read More [+]
Objectives & Outcomes
Course Objectives:
INFO234 is a graduate level course in the school’s topical area of Information Economics and Policy, and can be taken by the masters and doctoral students to satisfy their respective degree requirements.

Student Learning Outcomes:
Students will learn to identify, describe, and analyze business strategies and public policy issues of particular relevance to the information industry. Students will learn and apply economic tools and principles to analyze phenomena such as platform competition, social epidemics, and peer production, and current policy issues such as network neutrality and information privacy. Through integrated assignments and project work, the students will apply the theoretical concepts and analytic tools learned in lectures and readings to develop and evaluate a business model, product, or service of their choosing, e.g., a start-up idea they are pursuing.

Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details
Subject/Course Level: Information/Graduate
Grading: Letter grade.
Instructor: Chuang

INFO 236 Privacy Law for Technologists 3 Units
Terms offered: Spring 2019
Information privacy law profoundly shapes how internet-enabled services work. This course translates regulatory demands flowing from the growing field of privacy and security law to those who are creating interesting and transformative internet-enabled services. We focus both on formal requirements of the law and on how technology might accommodate regulatory demands and goals. Topics include: Computer Fraud and Abuse Act, unfair/deceptive trade practices, Electronic Communications Privacy Act, children’s privacy, big data and discrimination, Digital Millennium Copyright Act, intermediary liability issues, ediscovery and data retention, anti-marketing laws, and technical requirements of the European Union-United States Privacy Shield.
Privacy Law for Technologists: Read More [+]
Objectives & Outcomes

Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details
Subject/Course Level: Information/Graduate
Grading: Letter grade.
Instructor: Hoofnagle

INFO 239 Technology and Delegation 3 Units
Terms offered: Fall 2019, Fall 2018, Fall 2017
The introduction of technology increasingly delegates responsibility to technical actors, often reducing traditional forms of transparency and challenging traditional methods for accountability. This course explores the interaction between technical design and values including: privacy, accessibility, fairness, and freedom of expression. We will draw on literature from design, science and technology studies, computer science, law, and ethics, as well as primary sources in policy, standards and source code. We will investigate approaches to identifying the value implications of technical designs and use methods and tools for intentionally building in values at the outset.
Technology and Delegation: Read More [+]
Objectives & Outcomes

Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details
Subject/Course Level: Information/Graduate
Grading: Letter grade.
Instructor: Mulligan
INFO 247 Information Visualization and Presentation 4 Units
Terms offered: Spring 2020, Spring 2019, Spring 2018
The design and presentation of digital information. Use of graphics, animation, sound, visualization software, and hypermedia in presenting information to the user. Methods of presenting complex information to enhance comprehension and analysis. Incorporation of visualization techniques into human-computer interfaces. Course must be completed for a letter grade to fulfill degree requirements.

Rules & Requirements

Prerequisites: Information 206, Computer Science 160, or knowledge of programming and data structures with consent of instructor

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of laboratory per week

Additional Details

Subject/Course Level: Information/Graduate

Grading: Letter grade.

Instructor: Hearst

INFO 251 Applied Machine Learning 4 Units
Terms offered: Spring 2020, Fall 2018, Fall 2017
Provides a theoretical and practical introduction to modern techniques in applied machine learning. Covers key concepts in supervised and unsupervised machine learning, including the design of machine learning experiments, algorithms for prediction and inference, optimization, and evaluation. Students will learn functional, procedural, and statistical programming techniques for working with real-world data.

Objectives & Outcomes

Student Learning Outcomes:
• Effectively design, execute, and critique experimental and non-experimental methods from statistics, machine learning, and econometrics.
• Implement basic algorithms on structured and unstructured data, and evaluate the performance of these algorithms on a variety of real-world datasets.
• Understand the difference between causal and non-causal relationships, and which situations and methods are appropriate for both forms of analysis.
• Understand the principles, advantages, and disadvantages of different algorithms for supervised and unsupervised machine learning.

Rules & Requirements

Prerequisites: Info 206, or equivalent course in Python programming; Info 271B, or equivalent graduate-level course in statistics or econometrics; or permission of instructor

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Information/Graduate

Grading: Letter grade.

Instructor: Blumenstock
INFO 253A Front-End Web Architecture 3 Units
Terms offered: Not yet offered
This course is a survey of technologies that power the user interfaces of web applications on a variety of devices today, including desktop, mobile, and tablet devices. This course will delve into some of the core Front-End languages and frameworks (HTML/CSS/JS/React/Redux), as well as the underlying technologies enable web applications (HTTP, URI, JSON). The goal of this course is to provide an overview of the technical issues surrounding user interfaces powered by the web today, and to provide a solid and comprehensive perspective of the Web's constantly evolving landscape.

Rules & Requirements
Prerequisites: Introductory programming

Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details
Subject/Course Level: Information/Graduate
Grading: Letter grade.
Formerly known as: Information 253

INFO 253B Back-End Web Architecture 3 Units
Terms offered: Spring 2020
This course is a survey of web technologies that are used to build back-end systems that enable rich web applications. Utilizing technologies such as Python, Flask, Docker, RDBMS/NoSQL databases, and Spark, this class aims to cover the foundational concepts that drive the web today. This class focuses on building APIs using micro-services that power everything from content management systems to data engineering pipelines that provide insights by processing large amounts of data. The goal of this course is to provide an overview of the technical issues surrounding back-end systems today, and to provide a solid and comprehensive perspective of the web's constantly evolving landscape.

Rules & Requirements
Prerequisites: Introductory programming

Hours & Format
Fall and/or spring: 15 weeks - 1.5 hours of lecture and 1.5 hours of laboratory per week

Additional Details
Subject/Course Level: Information/Graduate
Grading: Letter grade.
Instructor: Pardos

INFO 254 Data Mining and Analytics 3 Units
Terms offered: Fall 2019, Spring 2019, Spring 2018
This course introduces students to practical fundamentals of data mining and machine learning with just enough theory to aid intuition building. The course is project-oriented, with a project beginning in class every week and to be completed outside of class by the following week, or two weeks for longer assignments. The in-class portion of the project is meant to be collaborative, with the instructor working closely with groups to understand the learning objectives and help them work through any logistics that may be slowing them down. Weekly lectures introduce the concepts and algorithms which will be used in the upcoming project. Students leave the class with hands-on data mining and data engineering skills they can confidently apply.

Rules & Requirements
Prerequisites: Knowledge of basic Python programming

Objectives & Outcomes
Course Objectives: Conduct manual feature engineering (from domain knowledge) vs. machine induced featurization (representation learning). Develop intuition in various machine learning classification algorithms (e.g. decision trees, neural networks, recurrent neural networks, support vector machines), and clustering techniques (e.g. k-means, spectral, skip-gram). Foster critical thinking about real world actionability from analytics. Provide an overview of issues in research and practice that will shape the complexion of data science across a variety of domains.

Instructor: Pardos

INFO 254 Data Mining and Analytics 3 Units
Terms offered: Fall 2019, Spring 2019, Spring 2018
This course introduces students to practical fundamentals of data mining and machine learning with just enough theory to aid intuition building. The course is project-oriented, with a project beginning in class every week and to be completed outside of class by the following week, or two weeks for longer assignments. The in-class portion of the project is meant to be collaborative, with the instructor working closely with groups to understand the learning objectives and help them work through any logistics that may be slowing them down. Weekly lectures introduce the concepts and algorithms which will be used in the upcoming project. Students leave the class with hands-on data mining and data engineering skills they can confidently apply.

Rules & Requirements
Prerequisites: Knowledge of basic Python programming

Objectives & Outcomes
Course Objectives: Conduct manual feature engineering (from domain knowledge) vs. machine induced featurization (representation learning). Develop intuition in various machine learning classification algorithms (e.g. decision trees, neural networks, recurrent neural networks, support vector machines), and clustering techniques (e.g. k-means, spectral, skip-gram). Foster critical thinking about real world actionability from analytics. Provide an overview of issues in research and practice that will shape the complexion of data science across a variety of domains.

Instructor: Pardos
INFO 256 Applied Natural Language Processing 3 Units
Terms offered: Spring 2019, Fall 2016, Fall 2015
This course examines the state-of-the-art in applied Natural Language Processing (also known as content analysis and language engineering), with an emphasis on how well existing algorithms perform and how they can be used (or not) in applications. Topics include part-of-speech tagging, shallow parsing, text classification, information extraction, incorporation of lexicons and ontologies into text analysis, and question answering. Students will apply and extend existing software tools to text-processing problems.

Rules & Requirements

Prerequisites: Proficient programming in python (programs of at least 200 lines of code), proficient with basic statistics and probabilities

Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Information/Graduate
Grading: Letter grade.
Instructor: Hearst

INFO 257 Database Management 3 Units
Terms offered: Spring 2020, Spring 2019, Spring 2018
Introduction to relational, hierarchical, network, and object-oriented database management systems. Database design concepts, query languages for database applications (such as SQL), concurrency control, recovery techniques, database security. Issues in the management of databases. Use of report writers, application generators, high-level interface generators.

Rules & Requirements

Prerequisites: Proficient programming in python (programs of at least 200 lines of code), proficient with basic statistics and probabilities

Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Information/Graduate
Grading: Letter grade.
Instructor: Hearst

INFO 259 Natural Language Processing 4 Units
Terms offered: Spring 2020, Fall 2018, Fall 2017
This course introduces students to natural language processing and exposes them to the variety of methods available for reasoning about text in computational systems. NLP is deeply interdisciplinary, drawing on both linguistics and computer science, and helps drive much contemporary work in text analysis (as used in computational social science, the digital humanities, and computational journalism). We will focus on major algorithms used in NLP for various applications (part-of-speech tagging, parsing, coreference resolution, machine translation) and on the linguistic phenomena those algorithms attempt to model. Students will implement algorithms and create linguistically annotated data on which those algorithms depend.

Rules & Requirements

Prerequisites: Familiarity with data structures, algorithms, linear algebra, and probability

Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Information/Graduate
Grading: Letter grade.
Instructor: Bamman

INFO 258 Data Mining 3 Units
Terms offered: Spring 2018, Fall 2017
Introduction to data mining, the science of extracting useful knowledge from large sets of data. Applications of data mining in various domains. Techniques include association rule learning, classification, regression, clustering, and anomaly detection. Evaluating the quality of data mining results. Issues in the management of databases. Use of report writers, application generators, high-level interface generators.

Rules & Requirements

Prerequisites: Proficient programming in python (programs of at least 200 lines of code), proficient with basic statistics and probabilities

Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Information/Graduate
Grading: Letter grade.
Instructor: Bamman

INFO 259 Data Analysis 4 Units
Terms offered: Spring 2019, Fall 2018, Fall 2017
This course introduces students to data analysis, the process of extracting useful knowledge from large sets of data. Applications of data analysis in various domains. Techniques include data preprocessing, data mining, and data visualization. Evaluating the quality of data analysis results. Issues in the management of databases. Use of report writers, application generators, high-level interface generators.

Rules & Requirements

Prerequisites: Familiarity with data structures, algorithms, linear algebra, and probability

Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Information/Graduate
Grading: Letter grade.
Instructor: Bamman
INFO C260F Machine Learning in Education 3 Units
Terms offered: Spring 2020, Fall 2018, Fall 2017
This course covers computational approaches to the task of modeling learning and improving outcomes in Intelligent Tutoring Systems (ITS) and Massive Open Online Courses (MOOCs). We will cover theories and methodologies underpinning current approaches to knowledge discovery and data mining in education and survey the latest developments in the broad field of human learning research. The course is project based; teams will be introduced to online learning platforms and their datasets with the objective of pairing data analysis with theory or implementation. Literature review will add context and grounding to projects.

Rules & Requirements
Prerequisites: Suggested background includes one programming course and familiarity with one statistical/computational software package

Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details
Subject/Course Level: Information/Graduate
Grading: Letter grade.
Instructor: Pardos
Also listed as: EDUC C260F

Machine Learning in Education: Read More [+]

INFO C262 Theory and Practice of Tangible User Interfaces 4 Units
Terms offered: Fall 2019, Fall 2018, Fall 2017
This course explores the theory and practice of Tangible User Interfaces, a new approach to Human Computer Interaction that focuses on the physical interaction with computational media. The topics covered in the course include theoretical framework, design examples, enabling technologies, and evaluation of Tangible User Interfaces. Students will design and develop experimental Tangible User Interfaces using physical computing prototyping tools and write a final project report.

Theory and Practice of Tangible User Interfaces: Read More [+]

Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of laboratory per week

Additional Details
Subject/Course Level: Information/Graduate
Grading: Letter grade.
Instructor: Ryokai
Also listed as: NWMEDIA C262

INFO C263 Technologies for Creativity and Learning 3 Units
Terms offered: Spring 2015, Spring 2014
How does the design of new educational technology change the way people learn and think? How do we design systems that reflect our understanding of how we learn? This course explores issues on designing and evaluating technologies that support creativity and learning. The class will cover theories of creativity and learning, implications for design, as well as a survey of new educational technologies such as works in computer supported collaborative learning, digital manipulatives, and immersive learning environments.

Technologies for Creativity and Learning: Read More [+]

Hours & Format
Fall and/or spring: 15 weeks - 3 hours of seminar per week

Additional Details
Subject/Course Level: Information/Graduate
Grading: Letter grade.
Instructor: Ryokai
Also listed as: NWMEDIA C263

INFO C265 Interface Aesthetics 3 Units
Terms offered: Spring 2020, Spring 2019, Spring 2018
This course will cover new interface metaphors beyond desktops (e.g., for mobile devices, computationally enhanced environments, tangible user interfaces) but will also cover visual design basics (e.g., color, layout, typography, iconography) so that we have systematic and critical understanding of aesthetically engaging interfaces. Students will get a hands-on learning experience on these topics through course projects, design critiques, and discussions, in addition to lectures and readings.

Interface Aesthetics: Read More [+]

Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details
Subject/Course Level: Information/Graduate
Grading: Letter grade.
Instructor: Ryokai
Also listed as: NWMEDIA C265

Interface Aesthetics: Read Less [-]
INFO 271B Quantitative Research Methods for Information Systems and Management 3 Units
Terms offered: Fall 2019, Fall 2018, Fall 2017
Introduction to many different types of quantitative research methods, with an emphasis on linking quantitative statistical techniques to real-world research methods. Introductory and intermediate topics include: defining research problems, theory testing, casual inference, probability, and univariate statistics. Research design and methodology topics include: primary/secondary survey data analysis, experimental designs, and coding qualitative data for quantitative analysis.
Quantitative Research Methods for Information Systems and Management: Read More [+]

Rules & Requirements
Prerequisites: Introductory statistics recommended

Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details
Subject/Course Level: Information/Graduate
Grading: Letter grade.
Instructor: Cheshire

INFO 272 Qualitative Research Methods for Information Systems and Management 3 Units
Terms offered: Fall 2019, Fall 2018, Fall 2016
Qualitative Research Methods for Information Systems and Management: Read More [+]

Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details
Subject/Course Level: Information/Graduate
Grading: Letter grade.
Instructor: Burrell

INFO 281 Designing Against Hate: An Exploration of Speech and Affordances on Social Media 2 Units
Terms offered: Spring 2020
Civil society and governments across the world continue to push social media platforms for increased responsiveness to concerns about the abuse of technology. Recent nationally representative surveys reveal a widening trust deficit between the public and private technology companies. This has led to a growing job market for technology policy professionals that can help companies navigate complex issues related to online hate and harassment, and for engineers who understand user-needs for vulnerable communities. This course will provide an opportunity for UC Berkeley graduate students to engage in lectures and guided design exercises aimed at improving the affordances of social media platforms with regard to civil and respectful discourse.
Designing Against Hate: An Exploration of Speech and Affordances on Social Media: Read More [+]

Objectives & Outcomes
Student Learning Outcomes: Explore relevant laws, policies, and community guidelines that govern speech and conduct on the internet. Gain a theoretical and practical understanding of the need for employing design principles to prevent social media platforms from being abused by users. Test relevant design principles on existing case studies and potentially on their own software UX and UI designs. Understand the different ways that social media platforms can and have been abused by bad actors, with a focus on the various forms of hate and harassment.

Hours & Format
Fall and/or spring: 15 weeks - 2 hours of lecture per week

Additional Details
Subject/Course Level: Information/Graduate
Grading: Letter grade.
Instructor: Burrell

Qualitative Research Methods for Information Systems and Management: Read Less [-]
INFO 283 Information and Communications Technology for Development 3 Units
Terms offered: Spring 2019, Spring 2017
This seminar reviews current literature and debates regarding Information and Communication Technologies and Development (ICTD). This is an interdisciplinary and practice-oriented field that draws on insights from economics, sociology, engineering, computer science, management, public health, etc.
Information and Communications Technology for Development: Read More [+]

Hours & Format
Fall and/or spring: 15 weeks - 3 hours of seminar per week

Additional Details
Subject/Course Level: Information/Graduate
Grading: Letter grade.
Instructor: Saxenian
Formerly known as: Information C283

INFO 288 Big Data and Development 3 Units
Terms offered: Spring 2019
As new sources of digital data proliferate in developing economies, there is the exciting possibility that such data could be used to benefit the world’s poor. Through a careful reading of recent research and through hands-on analysis of large-scale datasets, this course introduces students to the opportunities and challenges for data-intensive approaches to international development. Students should be prepared to dissect, discuss, and replicate academic publications from several fields including development economics, machine learning, information science, and computational social science. Students will also conduct original statistical and computational analysis of real-world data.
Big Data and Development: Read More [+]

Rules & Requirements
Prerequisites: Students are expected to have prior graduate training in machine learning, econometrics, or a related field

Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details
Subject/Course Level: Information/Graduate
Grading: Letter grade.
Instructor: Blumenstock

INFO 289 Public Interest Cybersecurity: The Citizen Clinic Practicum 4 Units
Terms offered: Spring 2020, Fall 2019
This course provides students with real-world experience assisting politically vulnerable organizations and persons around the world to develop and implement sound cybersecurity practices. In the classroom, students study basic theories and practices of digital security, intricacies of protecting largely under-resourced organizations, and tools needed to manage risk in complex political, sociological, legal, and ethical contexts. In the clinic, students work in teams supervised by Clinic staff to provide direct cybersecurity assistance to civil society organizations. We emphasize pragmatic, workable solutions that take into account the unique needs of each partner organization.
Public Interest Cybersecurity: The Citizen Clinic Practicum: Read More [+]

Rules & Requirements
Repeat rules: Course may be repeated for credit with instructor consent.

Hours & Format
Fall and/or spring: 15 weeks - 6 hours of clinic and 4 hours of lecture per week

Additional Details
Subject/Course Level: Information/Graduate
Grading: Letter grade.
Instructor: Weber

INFO 290 Special Topics in Information 1 - 4 Units
Terms offered: Spring 2020, Fall 2019, Spring 2019
Specific topics, hours, and credit may vary from section to section, year to year.
Special Topics in Information: Read More [+]

Rules & Requirements
Repeat rules: Course may be repeated for credit when topic changes. Students may enroll in multiple sections of this course within the same semester.

Hours & Format
Fall and/or spring:
7.5 weeks - 2-6 hours of lecture per week
15 weeks - 1-4 hours of lecture per week

Additional Details
Subject/Course Level: Information/Graduate
Grading: Letter grade.
Special Topics in Information: Read Less [-]
INFO 290A Special Topics in Information 1 or 2 Units
Terms offered: Fall 2016, Fall 2015, Fall 2014

Special Topics in Information: Read More [+]

Rules & Requirements

Prerequisites: Consent of instructor

Repeat rules: Course may be repeated for credit without restriction.

Hours & Format

Fall and/or spring:
5 weeks - 3 hours of lecture per week
6 weeks - 2 hours of lecture per week
8 weeks - 1.5-2 hours of lecture per week

Additional Details

Subject/Course Level: Information/Graduate

Grading: Letter grade.

Formerly known as: Information Systems and Management 290A

Special Topics in Information: Read Less [-]

INFO 290M Special Topics in Management 1 - 4 Units
Terms offered: Fall 2019, Fall 2018, Fall 2017

Specific topics, hours, and credit may vary from section to section and year to year.

Special Topics in Management: Read More [+]

Rules & Requirements

Prerequisites: Consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring:
8 weeks - 2-6 hours of lecture per week
15 weeks - 1-4 hours of lecture per week

Additional Details

Subject/Course Level: Information/Graduate

Grading: Letter grade.

Special Topics in Information: Read Less [-]

INFO 290T Special Topics in Technology 1 - 4 Units
Terms offered: Spring 2020, Spring 2019, Spring 2018

Specific topics, hours, and credit may vary from section to section and year to year.

Special Topics in Technology: Read More [+]

Rules & Requirements

Prerequisites: Consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring:
8 weeks - 2-7.5 hours of lecture per week
15 weeks - 1-4 hours of lecture per week

Additional Details

Subject/Course Level: Information/Graduate

Grading: Letter grade.

Special Topics in Technology: Read Less [-]

INFO 290TA Information Organization Laboratory 3 Units
Terms offered: Fall 2016, Spring 2016, Fall 2015

Students will build tools to explore and apply theories of information organization and retrieval. Students will implement various concepts covered in the concurrent 202 course through small projects on topics like controlled vocabularies, the semantic web, and corpus analysis. We will also experiment with topics suggested by students during the course. Students will develop skills in rapid prototyping of web-based projects using Python, XML, and jQuery.

Information Organization Laboratory: Read More [+]

Rules & Requirements

Prerequisites: It is recommended that students take 202 concurrently, or have taken it in the past

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Information/Graduate

Grading: Letter grade.

Information Organization Laboratory: Read Less [-]
INFO 291 Special Topics in Information 1 - 4 Units
Terms offered: Prior to 2007
Specific topics, hours, and credit may vary from section to section, year to year.
Rules & Requirements
Repeat rules: Course may be repeated for credit when topic changes.
Hours & Format
Fall and/or spring: 15 weeks - 1-4 hours of lecture per week
Additional Details
Subject/Course Level: Information/Graduate
Grading: Offered for satisfactory/unsatisfactory grade only.
Instructor: Hoofnagle
Special Topics in Information: Read Less [-]

INFO 293 Information Management Practicum 1 Unit
Terms offered: Fall 2016, Summer 2016 10 Week Session, Spring 2016
This course provides academic scaffolding for graduate students in the information sciences who are engaged in internships, practicums, or independent research while progressing toward a master's or doctoral degree. We focus on applying academic principles for generating, managing, storing, communicating, and using information to professional contexts, which may include corporations, government entities, or non-governmental organizations.
Rules & Requirements
Prerequisites: Consent of a Head Graduate Adviser for the School of Information
Repeat rules: Course may be repeated for credit without restriction.
Hours & Format
Fall and/or spring: 15 weeks - 1 hour of internship per week
Summer: 10 weeks - 1.5 hours of internship per week
Additional Details
Subject/Course Level: Information/Graduate
Grading: Offered for satisfactory/unsatisfactory grade only.
Information Management Practicum: Read Less [-]
INFO 294 Doctoral Research and Theory Workshop 2 Units
Terms offered: Spring 2020, Spring 2019, Fall 2017
An intensive weekly discussion of current and ongoing research by Ph.D. students with a research interest in issues of information (social, legal, technical, theoretical, etc.). Our goal is to focus on critiquing research problems, theories, and methodologies from multiple perspectives so that we can produce high-quality, publishable work in the interdisciplinary area of information research. Circulated material may include dissertation chapters, qualifying papers, article drafts, and/or new project ideas. We want to have critical and productive discussion, but above all else we want to make our work better: more interesting, more accessible, more rigorous, more theoretically grounded, and more like the stuff we enjoy reading.
Doctoral Research and Theory Workshop: Read More [+]

Rules & Requirements
Prerequisites: PhD students only
Repeat rules: Course may be repeated for credit without restriction.

Hours & Format
Fall and/or spring: 15 weeks - 2 hours of workshop per week

Additional Details
Subject/Course Level: Information/Graduate
Grading: Letter grade.
Instructor: Cheshire
Doctoral Research and Theory Workshop: Read Less [-]

INFO 295 Doctoral Colloquium 1 Unit
Terms offered: Spring 2020, Fall 2019, Spring 2019
Colloquia, discussion and readings designed to introduce students to the range of interests of the school.
Doctoral Colloquium: Read More [+]

Rules & Requirements
Prerequisites: Ph.D. standing in the School of Information

Hours & Format
Fall and/or spring: 15 weeks - 1 hour of colloquium per week

Additional Details
Subject/Course Level: Information/Graduate
Grading: Offered for satisfactory/unsatisfactory grade only.
Doctoral Colloquium: Read Less [-]

INFO 296A Seminar 2 - 4 Units
Terms offered: Spring 2020, Fall 2019, Spring 2019
Topics in information management and systems and related fields. Specific topics vary from year to year.
Seminar: Read More [+]

Rules & Requirements
Prerequisites: Consent of instructor
Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format
Fall and/or spring: 15 weeks - 2-4 hours of seminar per week

Additional Details
Subject/Course Level: Information/Graduate
Grading: Letter grade.
Seminar: Read Less [-]

INFO 298 Directed Group Study 1 - 4 Units
Terms offered: Fall 2019, Spring 2016, Fall 2015
Group projects on special topics in information management and systems.
Directed Group Study: Read More [+]

Rules & Requirements
Prerequisites: Consent of instructor
Credit Restrictions: Students will receive no credit for INFO 298 after completing INFOSYS 298.
Repeat rules: Course may be repeated for credit when topic changes. Students may enroll in multiple sections of this course within the same semester.

Hours & Format
Fall and/or spring: 15 weeks - 1-4 hours of directed group study per week
Summer: 8 weeks - 1.5-7.5 hours of directed group study per week

Additional Details
Subject/Course Level: Information/Graduate
Grading: Letter grade.
Directed Group Study: Read Less [-]
INFO 298A Directed Group Work on Final Project 1 - 4 Units
Terms offered: Spring 2016, Spring 2015, Spring 2014
The final project is designed to integrate the skills and concepts learned during the Information School Master's program and helps prepare students to compete in the job market. It provides experience in formulating and carrying out a sustained, coherent, and significant course of work resulting in a tangible work product; in project management, in presenting work in both written and oral form; and, when appropriate, in working in a multidisciplinary team. Projects may take the form of research papers or professionally-oriented applied work.

Directed Group Work on Final Project: Read More [+]

Rules & Requirements
Prerequisites: Consent of instructor. Course must be taken for a letter grade to fulfill degree requirements

Hours & Format
Fall and/or spring: 15 weeks - 1-4 hours of directed group study per week

Additional Details
Subject/Course Level: Information/Graduate
Grading: Letter grade.

Directed Group Work on Final Project: Read Less [-]

INFO 299 Individual Study 1 - 12 Units
Terms offered: Summer 2016 8 Week Session, Spring 2016, Fall 2015
Individual study of topics in information management and systems under faculty supervision.

Individual Study: Read More [+]

Rules & Requirements
Prerequisites: Consent of instructor

Repeat rules: Course may be repeated for credit when topic changes. Students may enroll in multiple sections of this course within the same semester.

Hours & Format
Fall and/or spring: 15 weeks - 1-12 hours of independent study per week
Summer: 8 weeks - 2-22.5 hours of independent study per week

Additional Details
Subject/Course Level: Information/Graduate
Grading: Letter grade.

Individual Study: Read Less [-]

INFO 375 Teaching Assistance Practicum 2 Units
Terms offered: Fall 2019, Fall 2018, Fall 2017
Discussion, reading, preparation, and practical experience under faculty supervision in the teaching of specific topics within information management and systems. Does not count toward a degree.

Teaching Assistance Practicum: Read More [+]

Hours & Format
Fall and/or spring: 15 weeks - 2 hours of lecture per week

Additional Details
Subject/Course Level: Information/Professional course for teachers or prospective teachers
Grading: Offered for satisfactory/unsatisfactory grade only.
Instructor: Duguid

Teaching Assistance Practicum: Read Less [-]

INFO 602 Individual Study for Doctoral Students 1 - 5 Units
Terms offered: Spring 2016, Fall 2015, Spring 2015
Individual study in consultation with the major field adviser, intended to provide an opportunity for qualified students to prepare themselves for the various examinations required of candidates for the Ph.D. degree.

Individual Study for Doctoral Students: Read More [+]

Rules & Requirements
Prerequisites: Consent of instructor
Repeat rules: Course may be repeated for credit without restriction.

Hours & Format
Fall and/or spring: 15 weeks - 1-5 hours of independent study per week

Additional Details
Subject/Course Level: Information/Graduate examination preparation
Grading: Offered for satisfactory/unsatisfactory grade only.

Individual Study for Doctoral Students: Read Less [-]