

INFO 5200 - Information Policy: Applied Research and Analysis

This course will address a wide range of information policy issues such as privacy, security, antitrust, intellectual property, algorithmic fairness, net neutrality, risk mitigation strategies, and other legal and policy compliance concerns in a simulated project management environment. Patterned on life cycle project management for products and services in contemporary large-scale technology companies, students will adopt specific topic areas for applied research and analysis working dynamically with other team members. Course outcomes include conducting upper-level research in specific information policy domains, experiential group dynamics, persuasive analytic presentations, fundamentals of project management in the technology sector, and insights into corporate hierarchies, organization, and functionalities.

COMM 6490 - Social Behavior and Technology

This course explores personal connections in the digital age, and how information and communication technologies impact our lives and relationships. It focuses on how people manage interactions and identities, develop and maintain relationships, accomplish social goals, create shared meanings, and engage in collaboration and conflict in social media. Emphasis will be placed on how current thinking in relational communication can explain and anticipate interpersonal dynamics on the Internet, but also on how online behaviors may challenge traditional principles of human communication. A major part of the course is a semester-long research project in which students working in small groups design, run, and present their own empirical study of personal relationships and technology.

CS 5304 - Data Science in the Wild

Massive amounts of data are collected by many companies and organizations and the task of a data scientist is to extract actionable knowledge from the data – for scientific needs, to improve public health, to promote businesses, for social studies and for various other purposes. This course will focus on the practical aspects of the field and will attempt to provide a comprehensive set of tools for extracting knowledge from data.

The course will cover the topics needed to solve data-science problems, which include problem formulation (business understanding), data preparation (collection, sampling, integration, cleaning), data modeling (characterization, model selection, and analysis), implementation (large-scale data processing, feedback loops, QA) and communication (data presentation, visualization). Advanced topics such as causal inference and processing streaming data will be presented.

Throughout the course, the students will perform a data-science mission with all the required steps, from problem formulation to result presentation.

INFO 5368 - Practical Applications in Machine Learning (PAML)

This course provides hands-on experience developing and deploying foundational machine learning algorithms on real-world datasets for practical applications (e.g., healthcare, computer vision). Students will learn about the machine learning pipeline end-to-end including dataset creation, pre- and post-processing, annotation, annotation validation, preparation for machine learning, training and testing a model, and evaluation. Students will focus on real-world challenges at each stage of the ML pipeline while handling bias in models and datasets. Lastly, students will analyze the strengths and weaknesses of regression, classification, clustering, and deep learning algorithms.

INFO 4113 - [Technology and Law Colloquium]

This course explores new developments at the intersection of law and information technology. The class is structured as a series of dialogues with a diverse group of scholars – professors, practitioners, journalists, and others – investigating how law and new technologies interact with and shape one another across many different domains. Students will be exposed to innovative research about technology policy, privacy, platforms, law enforcement, the nature of expertise, and the changing nature of legal and technical practice. The class will include both a public lecture component and a smaller group discussion.

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ILRLE 7400 - Understanding Social and Economic Data

The course is designed to teach students basic and advanced techniques for acquiring and transforming raw information into social and economic data. The current version is particularly aimed at American Ph.D. students who are interested in using confidential U.S. Census Bureau data, and the confidential data of other American statistical agencies that cooperate with the Census Bureau. We cover the legal, statistical, computing, and social science aspects of the data “production” process. Major emphasis is placed on U.S. Census Bureau data that are accessible from the Bureau’s Research Data Center network. Graduate students and faculty

who are planning to use RDC-based data, or are seriously considering it, should pay particular attention to the labs related to the proposal process. The RDC-accessible data products covered in the course include the internal files used to manage the Census Bureau's household and establishment frames; the Longitudinal Employer-Household Dynamics (LEHD) micro data; the Longitudinal Business Database (LBD) and its predecessor the Longitudinal Research Database (LRD); internal versions of the Survey of Income and Program Participation (SIPP), Current Population Survey (CPS), American Community Survey (ACS), American Housing Survey (AHS), and the 1990, 2000, and 2010 Decennial Censuses of Population and Housing; the Employer and Non-employer Business Registers (BR and SSEL); the Censuses and Annual Surveys of Manufactures, Mining, Services, Retail Trade, Wholesale Trade, Construction, Transportation, Communications, and Utilities; Business Expenditures Survey; Characteristics of Business Owners; and others. Students will also be introduced to the NSF-sponsored Virtual Research Data Center and Social Science Gateway to XSEDE. This course is part of the dissemination activities of the National Science Foundation-Census Research Network (Cornell Node).

INFO 4300 - Language and Information

How to make sense of the vast amounts of information available online, and how to relate it and to the social context in which it appears? This course introduces basic tools for retrieving and analyzing unstructured textual information from the web and social media. Applications include information retrieval (with human feedback), sentiment analysis, and social analysis of text. The coursework will include programming projects that play on the interaction between knowledge and social factors.

CS 6740 - Advanced Language Technologies

Graduate-level introduction to technologies for the computational treatment of information in human-language form, covering modern natural-language processing (NLP) and/or information retrieval (IR). Possible topics include language modeling, word embeddings, text categorization and clustering, information extraction, computational syntactic and semantic formalisms, grammar induction, machine translation, latent semantic analysis (LSI), and clickthrough data for web search.

INFO 4220 - Networks II: Market Design

Networks II builds on its prerequisite course and continues to examine how each of the computing, economic, sociological and natural worlds are connected and how the structure of these connections affects these worlds. In this course, we will construct mathematical models for and analyze networked settings, allowing us to both make predictions about behavior in such systems, as well as reason about how to design such systems to exhibit some desirable behavior. Throughout, we will draw on real-world examples such as social networks, peer-to-peer filesharing, Internet markets, and crowdsourcing, that illustrate these phenomena.

CS 5436 - Privacy in the Digital Age

This course introduces students to privacy technologies and surveys the current state of digital privacy from multiple perspectives, including technology, law, policy, ethics, economics, and surveillance.

INFO 6260 - Networks, Crowds, and Markets: Foundations for Formal Analysis and Design

Information science studies systems at the juncture of people and technologies—their behavior, analysis and design. This doctoral level mixed lecture-seminar course is an introduction to the formal analysis of social systems: we will introduce concepts from mathematics, computer science and economics that are fundamental to analyzing many settings—networks, crowds, markets—studied by information science, and see how formal reasoning using abstract mathematical models can help analyze and predict outcomes. Throughout, we will draw on real-world examples such as social networks, Internet markets, and crowdsourcing to illustrate how formal analysis can inform the understanding and design of social systems.

CS 6742 - Natural Language Processing and Social Interaction

More and more of life is now manifested online, and many of the digital traces that are left by human activity are increasingly recorded in natural-language format. This research-oriented course examines the opportunities for natural language processing to contribute to the analysis and facilitation of socially embedded processes. Possible topics include sentiment analysis, learning social-network structure, analysis of text in political or legal domains, review aggregation systems, analysis of online conversations, and text categorization with respect to psychological categories.

INFO 4555 - Business Intelligence Systems

This course covers the fundamental technical and organizational concepts and challenges related to the development of Business Intelligence Systems, a key component crucial to the competitiveness of a wide range of organizations. Topics covered include: data profiling, dimensional data modeling, data transformation, metadata systems, data governance, data delivery options, and an overview of emerging technologies in this space. Course is comprised of interactive lectures, work/lab sessions, and a substantial team project.

INFO 3312 - Data Communication

Data scientists often present information to disseminate their findings. This course introduces theories and applications of communicating with data, with an emphasis on visualizations. To support this approach, we will focus on the what, why, and how of data visualization. “What” focuses on specific types of visualizations for a particular purpose, as well as tools for constructing these plots. In “how” we will focus on the process of generating a data visualization

from pre-processing the raw data, mapping attributes of the data to plot aesthetics, strategically determining how to define the visual encoding of the data for maximal accessibility, and finalizing the visualization to consider the importance of visual appeal. In “why” we discuss the theory tying together the “how” and the “what”, and consider empirical evidence of best-practices in data communication.

AEM 4620 - Advanced Financial Modeling and Analysis

Focuses on issues involving technology and financial markets. It is designed to equip future finance professionals with the knowledge of key finance systems (Bloomberg) skills and technologies. The lectures and labs teach students to apply their theoretical finance knowledge in real-world situations for the purpose of optimizing their future job performance and increase their marketability. Lectures explore topics on the effects of technology on financial markets. The lab component requires students to complete the 30-hour, self-paced Bloomberg certification process.

ORIE 5256 - Special Topics in Financial Engineering V

This course is taught by a seasoned finance professional. Machine learning (ML) is changing virtually every aspect of our lives. As it relates to finance, this is the most exciting time to adopt a disruptive technology that will transform how everyone invests for generations. Students will learn scientifically sound ML tools used in the financial industry.

NBA 6300 - Introduction to Digital Technology/Transitions

This course is designed for MBA students interested in working in the technology industry, technology-focused consulting, or managerial roles in companies which provide digital products and services. It is also useful for students looking to familiarize and understand the latest technologies from a business perspective. This course focuses on technology considerations in business management decisions concentrating on technology strategy, industry digital transformation, and a high-level understanding of technology concepts needed by business leaders to make effective decisions regarding them. Students will be exposed to a variety of current technologies and trends enabling them to achieve success in technology-driven enterprises and new ventures. It is a mandatory course for students enrolled in the Digital Technology Immersion and recommended as an elective for students interested in working in the technology industry or roles involving digital products and services, but enrolled in SSO, SPMI, or other immersions.

ORIE 4742 - [Info Theory, Probabilistic Modeling, and Deep Learning with Scientific and Financial Apps]

This course is about building and understanding machine learning models for scientific and financial applications. It will cover foundational aspects of information theory and probabilistic inference as they relate to model construction and deep learning. Topics include hamming

codes, repetition codes, entropy, mutual information, Shannon information, channel capacity, likelihood functions, Bayesian inference, graphical models, and deep neural networks. The section on deep neural networks will consider fully connected, convolutional, recurrent, and LSTM networks, generative adversarial training, and variational autoencoders.

ORIE 5215 - Financial Engineering Career Practicum

A professional development course designed specifically for MEng students in ORIE concentrating in Financial Engineering. Through a series of panels and hands-on workshops, students will develop effective job search materials and participate in active exercises covering topics such as networking, interviewing for specific career paths, and other communication skills for today's professional environments.

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ILRLR 4065 - [Technology's Uneven Impact Upon our Workplaces: A Critical View]

This course uses historic examples of mechanization of unionized workplaces (coal mining and west coast docks- what happened then) and current technologizing of industries, union and non-union (transportation, public education- what is happening now) to critically determine why these developments face resistance from certain societal forces. Throughout, the course seeks to build a political/philosophical framework to analyze the tough questions presented, including, the Right and Left thinking that perhaps a Universal Basic Income will solve the dislocation technology causes working families.

ORIE 5640 - [Statistics for Financial Engineering]

Regression, ARIMA, GARCH, stochastic volatility, and factor models. Calibration of financial engineering models, estimation of diffusion models, estimation of risk measures, multivariate models and copulas, bayesian statistics. Students are instructed in the use of R software; prior knowledge of R is helpful but not required. This course is intended for M.Eng. students in financial engineering and assumes some familiarity with finance and financial engineering. Students not in the financial engineering program are welcome if they have a suitable background. Students with no background in finance should consider taking ORIE 4630 instead.

ORIE 4630 - Operations Research Tools for Financial Engineering

Introduction to the applications of OR techniques, e.g., probability, statistics, and optimization, to finance and financial engineering. The course reviews probability and statistics and surveys assets returns, ARIMA time series models, portfolio selection using quadratic programming, regression, CAPM and factor models, option pricing, GARCH models, fixed-income securities, and resampling techniques. Covers the use of R for statistical calculations, simulation, and optimization.

NBAY 5600 - FinTech Intensive Practicum

The goal of the Fintech Intensive is to immerse students in the emerging Financial Technology sector. We will explore the landscape, analyze past moves, discuss current trends, and identify future opportunities, while discussing real problems and solutions at start-ups, traditional financial services firms, and the VC and consulting communities which serve them.

NBA 5600 - Demystifying Big Data and FinTech

The goal of the course is to give a systematic and rigorous introduction to the emerging areas of financial technology, cryptocurrencies and DeFi, digital economy, crowd-based financing and lending, and applications of big data, machine learning, and AI in business settings. This elective consists of seven intensive sessions of lectures, discussions, guest talks by industry leaders, and readings of media and research articles.

BANA 5250 - [Machine Learning for Investment]

This is a 1.5 credit elective course in the MS in Business Analytics degree program. The goal of the course is to give a systematic and rigorous introduction to the emerging areas of financial technology, digital economy, and applications of big data, machine learning, and AI with application in finance.

NBAE 5600 - Introduction to FinTech, Finnovation and Fianalytics

The goal of the course is to give a systematic and rigorous introduction to the emerging areas of financial technology, digital economy, and applications of big data, machine learning, and AI in business economics. This EMBA Elective is comprised of 5 intensive sessions (detailed in course outline) of lectures, discussions, guest lectures, and readings.

AEM 7670 - Topics in International Finance

This course will provide a selective overview of topics at the cutting-edge of academic research and policy debates about the international monetary and financial system. Main areas will include the effects of financial globalization on growth, volatility, and the transmission of business cycles, as well as the determinants of capital flows and exchange rates. The course

will cover topics at the intersection of international finance and macroeconomics, with particular emphasis on the implications for monetary policy and financial regulation. New research related to Fintech, cryptocurrencies, and central bank digital currencies will also be covered. This course is intended for advanced Ph.D. students, especially those in search of thesis topics, and will require extensive student involvement in preparing research proposals and critiques of existing literature. Students will develop their own research ideas during the course and are required to write a substantive research paper.