## Class Schedule - Fall 2014

### Computer Science

**CS 598  Special Topics**  credit: 2 TO 4 hours.

Subject offerings of new and developing areas of knowledge in computer science intended to augment the existing curriculum. See Class Schedule or departmental course information for topics and prerequisites. May be repeated in the same or separate terms if topics vary.

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<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
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<tbody>
<tr>
<td>63912</td>
<td>Lecture-Discussion</td>
<td>AGP</td>
<td>12:30 PM - 01:45 PM</td>
<td>TR</td>
<td>1109 - Siebel Center for Comp Sci</td>
<td>Parameswaran, A</td>
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</tbody>
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Credit Hours: 4 hours  
Human-in-the-loop Data Mgmt  
Restricted to students with Junior or Senior class standing.

The course explores two complementary roles for humans as applied to interactive data analytics: one, where humans are the analysts performing or supervising the analysis; here, the emphasis is on building usable tools for these analysts, and second, where humans are the crowdsourced workers assisting with the computation and analysis; here, the emphasis is on having humans process as little data as possible while gaining maximum benefit. Students will read a number of papers -- both important landmark papers as well as cutting-edge papers, act as a discussant for a paper at least once, and complete a semester-long implementation project. Familiarity with basic databases, machine learning, and algorithms expected.

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<tr>
<td>62836</td>
<td>Lecture-Discussion</td>
<td>CPS</td>
<td>09:30 AM - 10:45 AM</td>
<td>WF</td>
<td>1109 - Siebel Center for Comp Sci</td>
<td>Caccamo, M</td>
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Credit Hours: 4 hours  
Cyber-Physical Systems  
Restricted to Graduate - Urbana-Champaign.

In this course, we will delve into topics that deal with the design and theoretical analysis of cyber-physical and embedded systems. The goal of this course is to provide a deep understanding about resource management, analysis, security and safety of modern embedded systems that interact with the physical world, especially those that have different degrees of criticality and stringent timing requirements. Examples of such systems include modern automobiles, avionics and flight systems, space vehicles and satellites, mobile phones, medical equipment, power distribution grid, robotics and biomedical devices among others. This course is structured to improve students' research skills and their ability for critical thinking. In-class discussion will focus on state-of-art research papers published in top conferences and journals focusing on cyber-physical and real-time embedded systems. Course requirements will also include a project to be completed by the students. This class admits both senior undergrads and graduate students. The prerequisite for this class is CS424 (Real-Time Systems) or CS431 (Embedded System Architecture) or consent of the instructor.

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<tr>
<td>63589</td>
<td>Lecture-Discussion</td>
<td>CSC</td>
<td>02:00 PM - 03:15 PM</td>
<td>TR</td>
<td>1109 - Siebel Center for Comp Sci</td>
<td>Chekuri, C</td>
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Credit Hours: 4 hours  
Algorithms for Big Data  
Restricted to Graduate - Urbana-Champaign.

Title: Algorithms for Big Data This course will describe some algorithmic techniques developed for handling large amounts of data that is often available in limited ways. Topics that will be covered include data stream algorithms, sampling and sketching techniques, and sparsification, with applications to signals, matrices, and graphs. Emphasis will be on the theoretical aspects of the design and analysis of such algorithms. Prerequisites: CS 573, good background in (discrete) probability

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<tr>
<td>35989</td>
<td>Lecture-Discussion</td>
<td>CXZ</td>
<td>02:00 PM - 03:15 PM</td>
<td>TR</td>
<td>1310 - Digital Computer Laboratory</td>
<td>Zhai, C</td>
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Advanced Information Retrieval
Restricted to Graduate - Urbana-Champaign.
Topic: Advanced Topics in Information Retrieval. Advanced concepts, models, and algorithms in information retrieval and text mining, including both historical milestones and major recent developments in the field. Topics include information retrieval models, statistical language models, information retrieval evaluation, applications of machine learning in information retrieval and text mining, and other emerging new topics.

63587 Lecture-Discussion HS 02:00 PM - 03:15 PM TR 1302 - Siebel Center for Comp Sci Sundaram, H

Credit Hours: 4 hours
Social and Economic Networks
Restricted to Graduate - Urbana-Champaign.
Description: Networks including Twitter and Facebook are fascinating: they have reduced the communication cost of connecting and communicating with people to near zero. The zero-cost networks make it easy for information to diffuse, and for informational cascades to occur. A network is a powerful representation of interaction amongst agents as well as objects. In this class, we shall examine the science of interconnectedness, and the associated social and economic consequences. In this course, you will have the opportunity to learn about the following: basic network theory (homophily, strong and weak ties, structural balance), game theory including models of network traffic, and auctions, network models of markets, information networks including link analysis and search, network dynamics including population and structural effects (cascades, power laws, diffusion, small world phenomena, epidemics and collective action).

55918 Lecture-Discussion LVK 12:30 PM - 01:45 PM TR 1131 - Siebel Center for Comp Sci Acun, B Kale, L Robson, M

Credit Hours: 4 hours
Parallel Programming
Topic: Parallel programming with migratable objects. This course will teach and explore a method for parallel programming that can be used to program multicore desktop (with and without accelerators), small clusters, as well as petascale/exascale computers, with the same programming model. The model is based on the idea of over-decomposing the computation into a large number of interacting objects, mostly independent of the number of processors, and to empower an intelligent runtime system decide where and when the objects execute. Pre-requisite: No specific course requirements. Good sequential programming experience in C++ and/or Java.

46032 Lecture-Discussion MAN 11:00 AM - 12:15 PM TR 1302 - Siebel Center for Comp Sci Prabhakaran, M

Credit Hours: 4 hours
Cryptography
Restricted to Graduate - Urbana-Champaign.
Topic: Applied Cryptography. Cryptography is a crucial component in building systems that are "secure." This course will provide a theoretically sound foundation in applied cryptography. We shall see fundamental cryptographic notions and how cryptographic primitives can be used to create a broad range of applications with well-defined security guarantees.

64087 Lecture-Discussion MLT 11:00 AM - 12:15 PM WF 1109 - Siebel Center for Comp Sci Blum, A Chekuri, C

Credit Hours: 4 hours
Machine Learning Theory
Title: Topics in Machine Learning Theory This seminar class will focus on new results and directions in machine learning theory. Machine learning theory concerns questions such as: What kinds of guarantees can we prove about practical machine learning methods, and can we design algorithms achieving desired guarantees? (Why) is Occam's razor a good idea and what does that even mean? What can we say about the inherent ease or difficulty of different types of learning problems? Addressing these questions will bring in connections to probability and statistics, online algorithms, game theory, computational geometry, and empirical machine learning research. The first half of the course will involve the instructor presenting some classic results and background including regret guarantees, combining expert advice, Winnow and Perceptron algorithms, VC-dimension, Rademacher complexity, SVMs, and Kernel functions. The second half will involve student-led discussions of recent papers in areas such as deep
learning, multi-task learning, tensor methods, structured prediction, dictionary learning, and other topics. Prerequisites: CS 573 or equivalent background and maturity.

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<th>Lecture-Discussion</th>
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<th>Time</th>
<th>Professor</th>
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<tr>
<td>46989</td>
<td>Lecture-Discussion</td>
<td>PS</td>
<td>03:30 PM - 04:45 PM</td>
<td>Smaragdis, P</td>
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Credit Hours: 4 hours
Mach Lrng for Signal Processing
Restricted to Graduate - Urbana-Champaign.
Topic: Machine Learning for Signal Processing. Prerequisite: Linear algebra, Probability theory. Today we see an increasing need for machines that can understand complex real-world signals, such as speech, images, movies, music, biological and mechanical readings, etc. In this course we will cover the fundamentals of machine learning and signal processing as they pertain to this goal, as well as exciting recent developments. We will learn how to decompose, analyze, classify, detect and consolidate signals, and examine various commonplace operations such as finding faces from camera feeds, organizing personal music collections, designing speech dialog systems and understanding movie content. The course will consist of lectures and student projects and presentations. Students are expected to have a working knowledge of linear algebra, probability theory, and programming skills to carry an implementation of a final project (preferably in MATLAB, but all languages are welcome).

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<tr>
<td>63395</td>
<td>Lecture-Discussion</td>
<td>RK</td>
<td>11:00 AM - 12:15 PM</td>
<td>Kumar, R</td>
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Credit Hours: 4 hours
Data-Driven Design
Restricted to Graduate - Urbana-Champaign.
Explores the use of data-driven methods to support creative design processes by examining recent work in human computer-interaction, product design, cognitive science, machine learning, graphics, vision, and natural language processing. Students will read and discuss recent papers from these fields, and work in teams on a multi-week project to build data-driven tools to solve real-world design problems. Practical data mining and machine learning knowledge is emphasized: crowdsourcing and web scraping, model and feature selection, parameter tuning. The course has no formal prerequisites, but students should be algorithmically and programmatically mature.