Class Schedule - Spring 2015

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.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>62819</td>
<td>Lecture-Discussion</td>
<td>AB</td>
<td>12:30 PM - 01:45 PM</td>
<td>MW</td>
<td>1304 - Siebel Center for Comp Sci</td>
<td>Blum, A</td>
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<tr>
<td>62182</td>
<td>Lecture-Discussion</td>
<td>AGB</td>
<td>11:00 AM - 12:20 PM</td>
<td>TR</td>
<td>1109 - Siebel Center for Comp Sci</td>
<td>Warnow, T</td>
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<tr>
<td>43773</td>
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<td>AK</td>
<td>02:00 PM - 03:15 PM</td>
<td>TR</td>
<td>1304 - Siebel Center for Comp Sci</td>
<td>Kirlik, A</td>
</tr>
<tr>
<td>48247</td>
<td>Lecture-Discussion</td>
<td>KGK</td>
<td>02:00 PM - 03:15 PM</td>
<td>WF</td>
<td>1109 - Siebel Center for Comp Sci</td>
<td>Karahalios, K</td>
</tr>
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Credit Hours: 4 hours

Topic in Algorithms
This course will cover a collection of topics in theory and algorithms for analysis of data and networks. Topics will include: - The geometry of high-dimensional space including tail inequalities and random projection, - Singular value decomposition and principal component analysis, - Properties and analysis of random graphs including phase transitions and the second-moment method, also small-world and preferential-attachment models, - Random walks and Markov chains. Conductance and rapid mixing, - Machine learning: algorithms and analysis. Uniform convergence, the Perceptron and Winnow algorithms, Stochastic gradient descent, and Kernel methods. - Algorithms for streaming and sketching. - Plus other topics depending on time and interest. Evaluation will be based on homework assignments and class participation.

Credit Hours: 4 hours

Algorithmic Genomic Biology
Course description: This course covers four fascinating and related problems: constructing evolutionary trees, computing multiple sequence alignments, genome assembly, and analyzing microbiomes. Students will learn the mathematical and computational foundations in these areas, read the current literature, and do a team research project. The techniques involved include discrete algorithms, graph theory, simulations, and probabilistic analysis of algorithms. The course is appropriate for graduate students in computer science, computer engineering, bioengineering, mathematics, and statistics; graduate students in the biological sciences are also welcome, and will have different homework and exams. Pre-requisites: No biology background is required, but students should have some mathematical maturity, and at least one undergraduate course in algorithm design, data structures, or probability theory. Students without this background (e.g., biology graduate students, or undergraduates in engineering who have not completed an algorithms course) may be admitted, but should contact the instructor to discuss the course. Meets with BIOE 598

Credit Hours: 4 hours

Cognitive Engineering
Topic: Cognitive Engineering This course is oriented to engineering and computer science students who would like their research on interactive systems and technologies to be informed by relevant research in the social, behavioral and cognitive sciences, and to students in these sciences who would like their research to be relevant to technology or engineering design. The format will combine group projects and seminar discussions based on readings to be provided from the "Oxford Handbook of Cognitive Engineering" (J.D. Lee & A. Kirlik, 2013), whose table of contents (list of topics to be covered) can be found on OUP and related websites. Open to graduate students and to senior undergraduates by permission of instructor.

Credit Hours: 4 hours
Social Spaces: Signals+Media
Restricted to Graduate - Urbana-Champaign.
The Internet is home to a panoply of varieties of human interaction. Social media, interactive games, telepresence, online environments, and simple text e-mails now mediate our normal experiences of education, medicine, politics, business, sociality, collective action, and more. As the Internet has become an infrastructure for social life and society itself, our ability to measure and represent that society is also transforming. In this seminar, we explore online social cues through the lens of social signaling theory. The goal is to create theory and data driven designs and applications that align the goals of the online system creators, the online system users, and that encourage productive engagement.

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<tr>
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<th>Type of Class</th>
<th>Location</th>
<th>Time</th>
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<th>Notes</th>
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<tbody>
<tr>
<td>46428</td>
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<td>56938</td>
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<td>03:00 PM - 04:50 PM</td>
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<td>12:30 PM - 01:45 PM</td>
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<td>1304 - Siebel Center for Comp Sci</td>
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<tr>
<td>61852</td>
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<td>11:00 AM - 12:15 PM</td>
<td>WF</td>
<td>1304 - Siebel Center for Comp Sci</td>
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Credit Hours: 4 hours
Improving Your Research Skills
This class aims at improving graduate students’ research skills including: 1) how to identify and formulate high impact research problems; 2) how to create a research agenda and carry it out; and 3) how to give presentations and write papers. For an overview, see Elements of successful research (https://uofi.box.com/s/pnevwpb04ga2msjgb6). Guest lectures on research methods were contributed by Professors Jia-Wei Han, Klara Nahrstedt, P. R. Kumar, Tarek Abdelzaher, Indy Gupta, Kevin Chang, and Y. Y. Zhou and from former students who took this class before. Class projects can be based on your current research.

Credit Hours: 4 hours
Cloud Comp & Software Network
This is a research topics course for graduate students to specialize and experiment with Software Defined Architecture, Cloud Computing, Software Defined Networking, Big Data, and Security. It assumes basic knowledge of material covered in Cloud Computing, Advanced Operating Systems, Advanced Networking, and NoSQL/SQL Data Bases, Data Mining, and Machine Learning. Topics include: Containers, Scheduling, I/O and Storage, GPUs, Bare Metal to Software Service Provisioning, Resource Allocation, Quality of Service, Virtual Machines, Software Engineering for Services, and Data Intensive computing. Students will have access to several Cloud Computers and the Matrix Software Defined Networking Lab. The course will be project-based, meet once a week for 1.5 hours, read papers, write a semester paper. Grading will be based on attendance, participation, reading, and the project and paper. Prerequisite: Special permission granted by the instructor. This course will meet in 3124 Siebel Center.

Credit Hours: 4 hours
Spectral Graph Theory
Restricted to Graduate - Urbana-Champaign.
This course is about spectra of graphs and their multiple uses in mathematics and computer science. Course topics will include: Eigenvalues and eigenvectors of common graphs; random walks on graphs; eigenvalues and the diameter of a graph; eigenvalues, cuts and small set expansion via Cheeger’s and generalized Cheeger’s inequality; approximations of graphs and sparsification; expander graphs with applications in coding theory and derandomization; graph lifts and eigenvalues; eigenvalues of random graphs; finding cliques in and partitioning semi-random graphs; testing isomorphism of graphs of bounded eigenvalue multiplicity. This course will assume familiarity with graphs and linear algebra. While this background knowledge is elementary, the course will move at a fast pace. This course may be suitable for advanced undergraduates. Undergraduate students who are interested in taking the course are advised to consult with the instructor before registering.

Credit Hours: 4 hours
Restricted to Graduate - Urbana-Champaign.
Title: Designing and Building Applications for Extreme Scale Systems Learn how to design and implement applications for extreme scale systems, including analyzing and understanding the performance of applications, the primary causes of poor performance and
scalability, and how both the choice of algorithm and programming system impact achievable performance. The course covers multi-
and many-core processors, interconnects in HPC systems, parallel I/O, and the impact of faults on program and algorithm design.