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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<th>CRN</th>
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<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
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<tbody>
<tr>
<td>67943</td>
<td>Online</td>
<td>CC1</td>
<td>ARRANGED -</td>
<td>-</td>
<td>-</td>
<td>Farivar, R</td>
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Credit Hours: 4 hours
Cloud Computing Capstone
Restricted to MCS:Computer Sci Online -UIUC or NDEG:Computer Science Onl-UIUC.
This course is only for students that are in the Computer Science MCS-DS Program. Additional Coursera ID verification and ProctorU fees may apply. Prerequisites: CS 498 Cloud Computing Applications and one other Cloud Computing breadth course must have been completed.

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<tbody>
<tr>
<td>43812</td>
<td>Lecture-Discussion</td>
<td>DHP</td>
<td>09:30 AM - 10:45 AM</td>
<td>WF</td>
<td>1103 - Siebel Center for Comp Sci</td>
<td>Padua, D</td>
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Credit Hours: 4 hours
Compiler Tech for Parallelism
Restricted to Graduate - Urbana-Champaign.
Topic: Compiler Techniques for Parallelism The focus of this course is compiler transformations to map computations onto parallel computing devices and systems including microprocessor SIMD vector extensions, multicores, and distributed memory computers. Specific topics include: dependence analysis, loop restructuring techniques for parallelism and locality, transformation of recursive computations, analysis and optimization of explicitly parallel constructs, optimization heuristics, and autotuning strategies for compiler optimization.

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Credit Hours: 4 hours
Data Mining Capstone
Restricted to MCS:Computer Sci Online -UIUC or NDEG:Computer Science Onl-UIUC.
This course is only for students that are in the Computer Science MCS-DS Program. Additional Coursera ID verification and ProctorU fees may apply. Pre-requisites: CS 410 and CS 412

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Credit Hours: 4 hours
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<td>68277</td>
<td>Lecture-Discussion</td>
<td>ETC</td>
<td>04:00 PM - 05:20 PM</td>
<td>MW</td>
<td>106B3 - Engineering Hall</td>
<td>Bashir, M</td>
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Credit Hours: 4 hours
Ethical Thinking-Cyber Space
Restricted to Graduate - Urbana-Champaign.
“It isn’t enough for cyber-professionals to be technologically knowledgeable; they must also be ethically minded and capable of meeting the heavy burden of responsibility that comes with having technological skills and access to sensitive data. This course will address this need through a case-study-based ethics curriculum for cybersecurity. The curriculum will immerse students in
real-life ethical dilemmas inherent to cybersecurity and engage them in open dialogue and debate within a community of ethical practice. The curriculum will be designed to develop critical reasoning skills in addition to other “soft skills” vital for cybersecurity professionals. Specific curricular objectives include: Increased awareness of the complex web of consequences that cybersecurity professionals are prone to encounter, Development of critical reasoning skills that will allow students to become more sophisticated in their ethical reasoning abilities and responses, Development of collaborative problem solving and communication skills, and Fostering and establishing a culture of dialogue around complex ethical dimensions of cybersecurity.”

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<th>Instructor</th>
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Credit Hours: 4 hours

Health Data Analysis
Restricted to Graduate - Urbana-Champaign.
Prerequisite: One or more courses demonstrating a working knowledge of machine learning and data mining. Topic: There are about 10,000 known human diseases, yet human doctors are only able to recall a fraction of them at any given moment. Operational waste and inefficiencies in healthcare system is vastly overlooked. But maybe, with the help of data analytics, we can overcome all these issues. Today, in healthcare, large amounts of multi-modal health data is becoming more accessible. Electronic health records, genetic, imaging, and smartwatch data could be an enabling resource for deriving insights for improving care delivery and reducing waste. The enormity and complexity of these datasets present great challenges in analyses and subsequent applications to a practical clinical environment. The course will consist of paper readings, presentations, and student projects. Students write critiques, make presentations, and create an academic paper suitable for a workshop or conference. We will review the recent advances in the area of health data analysis. Reading selections broadly cover clinical, genetic, and image analysis. Students are expected to have a working knowledge of machine learning, data mining, and programming skills to carry an implementation of a final project (preferably in Python, but all languages are welcome). The project is extremely hands-on. You will experience firsthand all of the journey a data scientist goes through: data ambiguity, missing data, anomalies, skewness, predictive models, descriptive models, etc. Undergrad may register for this course with instructor approval.

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<td>WF</td>
<td>1131 - Siebel Center for Comp Sci</td>
<td>Sundaram, H</td>
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</table>

Credit Hours: 4 hours

Advanced Social & Information
Restricted to Graduate - Urbana-Champaign.
This is a deep dive into classic and recent, exciting results in network analysis, with particular emphasis on behavioral models. We shall discuss mechanism design, ideas from behavioral economics, and strategic behavior on networks.

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Credit Hours: 4 hours

Logical Systems
Topic: Logical Systems.

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<td>TR</td>
<td>1131 - Siebel Center for Comp Sci</td>
<td>Adve, S</td>
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</table>

Credit Hours: 4 hours

App-Cust Heterogeneous Systems
Application-Customized Heterogeneous Systems Hardware design is evolving towards integrating multiple accelerators (IP components) to obtain application-customized systems. These components will likely be connected with a deep communication hierarchy spanning components on a single chip to within the cloud. Design methods that allow seamless integration of such components will be critical to sustainably achieving cost and performance goals for new applications. This course will cover the hardware and software challenges and application drivers of such heterogeneous system design. Topics will include accelerator architectures, heterogeneous memory and communication systems, scheduling, programming (e.g., domain specific languages and frameworks), the hardware-software interface (e.g., virtual instruction sets), and requirements of several application domains (e.g., virtual reality, machine learning, robotics, graph analytics, and human-centric computing). Students will be required to present and critique research papers and perform a substantial team project. Pre-requisites: CS 433 or equivalent or permission of the instructor.
### Computational Cancer Genomics

**Credit Hours:** 4 hours  
**Restrictions:** Graduate - Urbana-Champaign.  
**Title:** Computational cancer genomics This course focuses on recent algorithmic methods in cancer genomics, including somatic variant calling, phylogeny inference and identification of driver mutations. Students will study the underlying principles of these methods and the application of these methods to cancer genomics data. This course is appropriate for graduate students in computer science, bioengineering, mathematics and statistics. Familiarity with basic statistics, probability and algorithms is expected.

### Parallel Algorithms

**Credit Hours:** 4 hours  
**Restrictions:** Graduate - Urbana-Champaign.  
**Topics:** The course will cover topics in the theory of parallel algorithms and parallel programming models. Topics include:  
- parallel computation complexity -- work and depth,  
- communication complexity  
- parallel reduction and parallel prefix,  
- parallel sorting algorithms,  
- parallel graph algorithms,  
- Networks and routing  
- FFT

### Stat Reinforcement Learning

**Credit Hours:** 4 hours  
**Restrictions:** Graduate - Urbana-Champaign.  
**Description:** Theory of reinforcement learning, with a focus on sample complexity analyses. The course will provide the necessary background and the mathematical tools for understanding the statistical properties of RL algorithms and the challenges. Specific topics include:  
1. MDP basics,  
2. finite sample analyses of batch RL (tabular and func approx),  
3. state abstractions,  
4. importance sampling,  
5. PAC exploration (tabular and func approx),  
6. Intro to POMDPs and PSRs. Prerequisites: probability and statistics, linear algebra, and basic concepts of machine learning. Some familiarity with Markov chains and numerical analysis are also recommended. For more info, refer to the course website for Fall 2018 (on instructor's homepage).

### Reliable Software Systems

**Credit Hours:** 4 hours  
**Restrictions:** Graduate - Urbana-Champaign.  
**Description:** This course teaches the principles and practices of building reliable software systems. We will look into how software systems fail in the real world, study practical, widely-adopted reliability techniques and practices, and discuss the state-of-the-art research of software and system reliability. This is a research-oriented seminar course with a major course project. Prerequisite: CS 241 (System Programming) or CS 423 (Operating Systems Design).