CS:4980:0003
Network Security and Privacy

The University of Iowa
The College of Liberal Arts and Sciences
Department of Computer Science

Semester: Fall 2016
Location: 118 MLH
Time: 3:30 pm - 4:45 pm TTh

Instructor: Zubair Shafiq
Office Hours: 4:45 pm - 5:45 pm TTh (or by appointment) @ 201J MLH
Website: http://cs.uiowa.edu/~mshafiq
Email: zubair-shafiq@uiowa.edu
Facebook Group: https://www.facebook.com/groups/uics4980

Description

This course will focus on latest research in the areas of network security and privacy. Instead of covering the full breadth, we will focus on three specific topic areas: (1) web security and privacy, (2) spam and reputation fraud, (3) network security and anonymity. The preliminary list of topics includes online tracking, ad-blockers, malvertising, URL shorteners, fake views, fake likes and followers, crowdturfing, anonymization, Internet censorship, credit card fraud, and denial of service.

In addition to the lectures delivered by the instructor, the course will require students to read and discuss relevant research papers. The course is taught with an emphasis on latest research papers on a given topic rather than seminal research papers. The course will require students to thoroughly read, review, and discuss 2-3 research papers every week. The students will also work on hands-on projects to understand network security and privacy challenges.

Note: This course will cover select topics in the area of network security and privacy. Note that this course will not provide a thorough grounding in network security and privacy. If that is your intention, you should instead enroll in CS:4640 Computer Security which is offered in Spring.

Prerequisites

This is an advanced-level course aimed at graduate students. The course assumes prior knowledge of basic computer networking and security concepts. The course also assumes proficient programming skills in Python, C++, or Java. You should also be comfortable with Unix command line.

Format

This course will be project-centric. The students will complete projects in groups of 2. Thus, to succeed in this course, you must be able to work in a group. As you are free to choose your project partner, I will not be sympathetic to complaints at the end of the semester about how your project partner did not do any work.

Projects: There will be 2 programming projects during the course. These projects will require you to program in Python/C++/Java.

Research Paper Presentation and Discussion: After the introduction and review of basic concepts, we will read and discuss important research papers. Each student will present and lead discussions for 2-3 papers during the course. All students are required to read the papers in advance of the class. Our goal will be to critically analyze these research papers, identify their weaknesses, and opportunities for future work.
Textbook

None. The instructor will provide links to lecture slides/notes and research papers.

Grading

The course uses the +/- grading system. Overall grade distribution is as follows.

- Research paper presentations: 20%
- Research paper reviews: 25%
- In-class discussion: 10%
- Project # 1: 15%
- Project # 2 presentation: 10%
- Project # 2 report: 20%

Course Policies

- Attendance: Attendance is mandatory. An attendance sheet will be circulated at the beginning of each class. You can miss up to 3 classes without any impact on your final grade. For each additional missed class, your final course grade will be lowered by 2%. If you miss more than 20% of the classes for this course, you cannot receive a grade higher than C. If you experience life-altering circumstances and cannot attend classes, seek advice from the Academic Advising Center about withdrawing from the course.
- Late Submission Policy: There are no late project submissions unless you demonstrate in advance (and I agree) that a significant life-event prevents you from an on-time submission or if you have a documented emergency.

Projects

Project # 1: Announced on week # 5, due on week # 8
Project # 2: Announced on week # 9, due on week # 12

(Tentative) Schedule

After the background and preliminaries in the first two weeks, the course is broadly divided into three topic areas: (1) web security and privacy, (2) spam and reputation fraud, (3) network security and anonymity.

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<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Topics and Assigned Papers</th>
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<tbody>
<tr>
<td>1</td>
<td>Background &amp; preliminaries</td>
<td>Course introduction, overview, background</td>
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<tr>
<td>2</td>
<td>Background &amp; preliminaries</td>
<td>Course introduction, overview, background</td>
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<tr>
<td>3</td>
<td>Online Tracking</td>
<td>Tracking the Trackers</td>
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<td>Online tracking: A 1-million-site measurement and analysis</td>
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<td>4</td>
<td>Ad-Blockers</td>
<td>Annoyed Users: Ads and Ad-Block Usage in the Wild</td>
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<td>Measuring the Impact and Perception of Acceptable Advertisements</td>
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<td>Adblocking and Counter-Blocking: A Slice of the Arms Race</td>
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<tr>
<td>5</td>
<td>Malvertising</td>
<td>Knowing Your Enemy: Understanding and Detecting Malicious Web Advertising</td>
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<td></td>
<td>The Dark Alleys of Madison Avenue: Understanding Malicious</td>
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| 6   | URL Shorteners                  | Two Years of Short URLs Internet Measurement: Security Threats and Countermeasures  
|     |                                | Stranger Danger: Exploring the Ecosystem of Ad-based URL Shortening Services  
| 7   | Fake Views                     | Analysis and Detection of Fake Views in Online Video Services  
|     |                                | Understanding the Detection of View Fraud in Video Content Portals  
| 8   | Fake Likes and Followers       | The Socialbot Network: When Bots Socialize for Fame and Money, Paying for Likes?: Understanding Facebook Like Fraud Using Honeypots  
|     |                                | Follow the Green: Growth and Dynamics in Twitter Follower Markets  
| 9   | Crowdturfing                   | Serf and Turf: Crowdturfing for Fun and Profit  
|     |                                | Man vs. Machine: Practical Adversarial Detection of Malicious Crowdsourcing Workers  
| 10  | Anonymization                  | Do You See What I See? Differential Treatment of Anonymous Users  
|     |                                | Examining How the Great Firewall Discovers Hidden Circumvention Servers  
| 11  | Internet Censorship            | Censorship in the Wild: Analyzing Internet Filtering in Syria, IMC’14  
|     |                                | Analyzing the Great Firewall of China Over Space and Time, PETS’15  
| 12  | Credit Card Fraud              | The Underground Ecosystem Of Credit Card Frauds  
|     |                                | All Your Cards Are Belong To Us: Understanding Online Carding Forums  
| 13  | Denial of Service              | Delving into Internet DDoS Attacks by Botnets: Characterization and Analysis  
|     |                                | China's Great Cannon  
| 14  | Project Presentations          | TBD  
| 15  | Project Presentations          | TBD  

**Administrative Home**

The College of Liberal Arts and Sciences is the administrative home of this course and governs matters such as the add/drop deadlines, the second-grade-only option, and other related issues. Different colleges may have different policies. Questions may be addressed to 120 Schaeffer Hall, or see the CLAS Academic Policies Handbook at https://clas.uiowa.edu/students/handbook.

**Electronic Communication**

University policy specifies that students are responsible for all official correspondences sent to their University of Iowa e-mail address (@uiowa.edu). Faculty and students should use this account for correspondences (Operations Manual, III.15.2, k.11).

**Accommodations for Disabilities**

A student seeking academic accommodations should first register with Student Disability Services and then meet with the course instructor privately in the instructor's office to make particular arrangements. See https://sds.studentlife.uiowa.edu for more information.

**Academic Honesty**

All CLAS students or students taking classes offered by CLAS have, in essence, agreed to the College's Code of Academic Honesty: "I pledge to do my own academic work and to excel to the best of my abilities, upholding the IOWA
Challenge. I promise not to lie about my academic work, to cheat, or to steal the words or ideas of others; nor will I help fellow students to violate the Code of Academic Honesty." Any student committing academic misconduct is reported to the College and placed on disciplinary probation or may be suspended or expelled (CLAS Academic Policies Handbook).

CLAS Final Examination Policies

The final examination schedule for each class is announced by the Registrar generally by the fifth week of classes. Final exams are offered only during the official final examination period. No exams of any kind are allowed during the last week of classes. All students should plan on being at the UI through the final examination period. Once the Registrar has announced the date, time, and location of each final exam, the complete schedule will be published on the Registrar's website and will be shared with instructors and students. It is the student's responsibility to know the date, time, and place of a final exam.

Making a Suggestion or a Complaint

Students with a suggestion or complaint should first visit with the instructor (and the course supervisor), and then with the departmental DEO. Complaints must be made within six months of the incident (CLAS Academic Policies Handbook).

Understanding Sexual Harassment

Sexual harassment subverts the mission of the University and threatens the well-being of students, faculty, and staff. All members of the UI community have a responsibility to uphold this mission and to contribute to a safe environment that enhances learning. Incidents of sexual harassment should be reported immediately. See the UI Comprehensive Guide on Sexual Harassment for assistance, definitions, and the full University policy.

Reacting Safely to Severe Weather

In severe weather, class members should seek appropriate shelter immediately, leaving the classroom if necessary. The class will continue if possible when the event is over. For more information on Hawk Alert and the siren warning system, visit the Department of Public Safety website.