CS:4980:0003 Internet Measurement

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

Semester: Fall 2018
Location: 118 MLH
Time: 3:30 pm - 4:45 pm TTh
Facebook Group: https://www.facebook.com/groups/uics4980.2018

Instructor: Zubair Shafiq
Instructor Office Hours: 4:45 pm - 5:45 pm TTh (or by appointment) @ 201J MLH
Instructor Email: zubair-shafiq@uiowa.edu

TA: Shehroze Farooqi
TA Office Hours: Tuesday 11:00 am – 12:00 pm @ 101N MLH (subject to change, additional scheduled as needed)
TA Email: shehroze-farooqi@uiowa.edu

Description

This research-oriented course covers methods and applications for emerging Internet phenomena. The Internet now plays a central role in many aspects of our lives. Despite the myriad ways we have come to depend on it, many aspects of it can be opaque to users, government agencies, and even network operators. Internet measurement as a field seeks to understand the Internet by assessing its operation. Outline of major topics:

- **Privacy:** Online tracking, Cookies, Fingerprinting, Ad-blocking, Tracker-blocking
- **Security:** Cybercrime, Spam, Malware, OAuth
- **Networking:** Network protocols (TCP, UDP, ICMP, BGP, DNS, HTTP)

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

The course will involve reading research papers and working towards a research-oriented project.

- Students will be tasked to read and write review of two research papers every week. Each student will present and lead discussion for at least one paper during the course. Our goal is to critically analyze these research papers, identify their weaknesses, and opportunities for future work.
- Students will be tasked to do two research projects. The first “mini” project will be completed individually in the beginning of the semester. The second research project will be completed in pairs (max group size of 2) involving a project presentation and a 6-page research paper submission.

Research Paper Review: The purpose of writing a review is to ensure that you understand the key technical concepts of the paper allowing you to actively participate in online and in-class discussions. The review of the paper must provide a brief summary along with your comments. The summary must clearly outline the problems solved by the authors, the methods used to solve them, and the key findings of the paper. The summary must also clearly outline the novel contributions of the paper. The comments must discuss the technical strengths and weaknesses of the paper. You should also write about your ideas to improve or extend of the research paper. For example, you can write suggestions to overcome technical weaknesses in the paper. While there is no word limit but a typical review is expected to be around 500 words. Do not directly quote abstract, paragraph or sentences from the paper. You are allowed to summarize paragraphs and sentences from the paper. Restating in your own words demonstrates that you understand the paper well.

Here is a template for writing a review. We strongly recommend to you to use these headings in writing your reviews. Suggested length is also provided.

Summary: Summarize the paper [3-5 sentences]
Goal: Identify the problem the paper is trying to solve or any hypotheses it is testing. [3 sentences]
Methods: Discuss the methods used to solve the problem. [5 sentences]
Results: Discuss the key findings of the paper. Discuss the conclusions that can be derived from them. [5 sentences]
Novelty: Identify the novelty of the methods or findings of the paper [3 sentences]
Strengths: What are the technical strengths of the paper? What are the things you particularly liked about the paper? You can talk about the technical novelties of the paper, benefits of the approach and methods. [3 sentences]
Weaknesses: What are the technical flaws of the paper? What are the things you particularly disliked about the paper? You can point out the technical flaws in the approach or analysis of the results. [3 sentences]
Ideas: Talk about your ideas for future work after reading the paper. You can propose ideas to improve the existing work or suggest completely new ideas related to the paper. [3-5 sentences]

Research Paper Presentation: Each student will present and lead discussions for at least one paper during the course. The presenter is required to thoroughly understand the paper, including any background material needed to understand the concepts discussed in the paper. Each presentation will be 30 minutes long followed by Q&A. The presenter is also required to initiate a discussion thread about the paper on the Facebook group at least 24 hours before the presentation.

Mini-Project: This project will require you to collect and analyze data from the Web using an open-source tool. You will analyze the collected data (using tables and plots) to answer a few questions. You will also write a short report about your analysis. You can use Python/C++/Java/R/MATLAB for programming. The objective of this mini-project is to give you a flavor of Internet measurement research and assess your capabilities of doing the research project.

Research Project: The students will complete the project in groups of two. Each group will pick a topic based on the papers they read in the class. You are welcome to come up with new ideas. Instructor will also provide a list of projects that students can pick from. The students will define the scope of the project after a discussion with the instructor. The research project will be announced on week 6. You are asked to form group and discuss your ideas with the instructor by the end of week 7. The students will pitch the project ideas in front of the class on week 8. The project presentations will start from week 15 and a 6-page research paper (2 column ACM format, excluding references) will be due by the end of week 16. Note that you are free to choose project partner. However, note that I will not be sympathetic to complaints at the end of the semester about how your project partner did not do any work.

Textbook

None. The instructor will provide links to research papers.

Grading

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

- Research paper presentations: 15%
- Research paper reviews: 20%
- Mini-project: 10%
- Course project: 50%
- Participation: 5%

Course Policies

- Attendance: Attendance is mandatory. We will use peer evaluation to grade research paper and project presentations. A peer evaluation sheet will be circulated at the end of each class. Your peer evaluation will be used to mark your attendance. 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.

(Tentative) Schedule

After the preliminaries in the first week, the course is broadly divided into three topic areas: (1) privacy, (2) security, and (3) networking.

Week	Topic
1	Introduction and overview of topics
2-4	Privacy
5-7	Security
8-10	Networking
11-13	Potpourri
14	Thanksgiving break
15-16	Project Presentations

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 web site 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.