

# CS:4980:0006 Online Advertising and Tracking

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

Semester: Fall 2019  
Location: 113 MLH  
Time: 9:30 am - 10:45 am TTh

Instructor: Zubair Shafiq  
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## Description

You may have seen a targeted advertisement leading you to believe that advertisers are listening to your private conversations. Is it true? Is it a conspiracy? Is it just coincidence? Or is there another explanation?

A layperson may think that most online services such as search, email, and social media are “free”. Unfortunately, many do not realize that these services are provided without charge to simply keep us hooked while our personal data is harvested by a whole host of “ad-tech” organizations. The “free” web is supported by online behavioral advertising, which relies on a complex and opaque online tracking ecosystem that surveils users across the web to precisely target them with ads. Online behavioral advertising is not only creepy but also presents a grave privacy threat to our society. This research-oriented course will provide a deep-dive into online behavioral advertising and the associated tracking ecosystem.

Outline of major topics:

- **Tracking:** Online tracking, Cookies, Fingerprinting
- **Advertising:** Real-time Bidding (RTB), Header Bidding (HB), ads.txt
- **Blocking:** Ad-blocking, Tracker-blocking (filter lists, heuristics, machine learning)
- **Obfuscation:** Arms race (anti-adblocking, circumvention, adversarial attacks)
- **Fairness and Regulation:** Discrimination, AdChoices, GDPR (General Data Protection Regulation), CCPA (California Consumer Privacy Act)

## Prerequisites

This is an advanced-level course aimed mainly 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++, Java, or JavaScript. 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 the research paper. For example, you can write suggestions to overcome technical weaknesses in the paper. Reviews are expected to be at least 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.

**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. [3 sentences]

**Results:** Discuss the key findings of the paper. Discuss the conclusions that can be derived from them. [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. [5 sentences]

**Weaknesses:** What are the technical flaws or limitations of the paper? What are the things you particularly disliked about the paper? You can point out the technical flaws in the approach or weaknesses in the analysis of the results. [5 sentences]

**(Important) Ideas:** Discuss about your ideas for potential future work after reading the paper. You can propose ideas to improve the existing work or suggest completely new ideas related to the paper. [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 ICON 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/JavaScript 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 pairs. Each group will pick a topic based on the papers they read in the class. You are welcome to pursue your own ideas. The 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 will be 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 we will not be sympathetic to complaints at the end of the semester about how your project partner did not do any work. So pick your project partner carefully!

## **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: 10%
- Research paper reviews: 20%
- Mini-project: 10%
- Course project: 40%
- Participation: 20%

## **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 regularly attend, seek advice from the Academic Advising Center.
- **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.

## **Absences and Attendance**

Students are responsible for attending class and for contributing to the learning environment of a course. Students are also responsible for knowing the absence policies for their courses, which will vary by instructor. All absence policies, however, must uphold the UI policy related to student illness, mandatory religious obligations, unavoidable circumstances, or University authorized activities (<https://clas.uiowa.edu/students/handbook/attendance-absences>). Students may use this absence form to communicate with instructors:

<https://clas.uiowa.edu/sites/default/files/ABSENCE%20EXPLANATION%20FORM2019.pdf>

## **Academic Integrity**

All undergraduates enrolled in courses offered by CLAS have, in essence, agreed to the College's Code of Academic Honesty. Misconduct is reported to the College, resulting in suspension or other sanctions, with sanctions communicated with the student through the UI email address (<https://clas.uiowa.edu/students/handbook/academicfraud-honor-code>).

## **Accommodations for Disabilities**

UI is committed to an educational experience that is accessible to all students. A student may request academic accommodations for a disability (such as mental health, attention, learning, vision, and physical or health-related condition) by registering with Student Disability Services (SDS). The student is then responsible for discussing specific accommodations with the instructor. More information is at <https://sds.studentlife.uiowa.edu/>.

## **Administrative Home of the Course**

The College of Liberal Arts and Sciences (CLAS) is the administrative home of this course and governs its add/drop deadlines, the second-grade-only option, and related policies. Other colleges may have different policies. CLAS policies may be found here:

<https://clas.uiowa.edu/students/handbook>.

## **Communication and the Required Use of UI Email**

Students are responsible for official correspondences sent to the UI email address (uiowa.edu) and must use this address for all communication within UI (Operations Manual, III.15.2).

## **Complaints**

Students with a complaint about a course should first visit with the instructor or course supervisor and then with the Chair of the department or program offering the course; students may next bring the issue to CLAS in 120 Schaeffer Hall. For more information, see

<https://clas.uiowa.edu/students/handbook/student-rights-responsibilities>.

## **Final Examination Policies**

The final exam schedule is announced around the fifth week of classes; students are responsible for knowing the date, time, and place of a final exam. Students should not make travel plans until knowing this information. No exams of any kind are allowed the week before finals. Visit

<https://registrar.uiowa.edu/final-examination-scheduling-policies>.

## **Nondiscrimination in the Classroom**

UI is committed to making the classroom a respectful and inclusive space for all people irrespective of their gender, sexual, racial, religious or other identities. Toward this goal, students are invited to optionally share their preferred names and pronouns with their instructors and classmates. The University of Iowa prohibits discrimination and harassment against individuals on the basis of race, class, gender, sexual orientation, national origin, and other identity categories set forth in the University's Human Rights policy. For more information, contact the Office of Equal Opportunity and Diversity (diversity.uiowa.edu).

## **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 must uphold the UI mission and contribute to a safe environment that enhances learning. Incidents of sexual harassment must be reported immediately. For assistance, please see <https://osmrc.uiowa.edu/>.