Overview

Course:	CS 51: Abstraction and Design in Computation
Course Level:	Lower-level undergraduate
Course Description:	"Fundamental concepts in the design of computer programs, emphasizing the crucial role of abstraction. The goal of the course is to give students insight into the difference between programming and programming well. To emphasize the differing approaches to expressing programming solutions, you will learn to program in a variety of paradigms -- including functional, imperative, and object-oriented. Important ideas from software engineering and models of computation will inform these different views of programming."
Module Topic:	Privacy vs. Perfection
Module Author:	Ellie Lasater-Guttmann
Semesters Taught:	Spring 2022
Tags:	Optimization [CS],perfection [CS], UX design [CS], anonymity [CS/phil], aggregation [CS/phil], privacy [phil], liberty of action [phil], protection from power [phil]
Module Overview:	The module looks at three cases of user tracking to pinpoint how to balance optimizing the UX or backend with privacy concerns. The three cases progress from least powerful for optimization and least privacy-violating to most powerful and most concerning. Students consider whether anonymity and aggregation are useful tools to protect user privacy..
Connection to Course Material:	The course as a whole is devoted to writing beautiful, elegant, and useful code. This module was designed to bring additional components into that discussion of perfect software. Do violations of user privacy make software less perfect?	This module could be improved by connecting it more closely to the course content if possible. Despite not being as closely connected as ideal, the topic was engaging to students. They reported walking away with a clearer understanding of the ways privacy is violated online.

Goals

Module Goals:	- Become familiar with the ways in which user behavior is being tracked online - Understand the ethical values associated with anonymity and privacy - Design a framework that will aid developers in balancing privacy with site optimizations	
Key Philosophical Questions:	1. As a designer of user-facing software, how do you balance perfecting the UX or backend with the privacy and (possible) anonymity of the user? 2. Why is user privacy valuable? - Do different tracking products (heatmaps, screen recordings, analytics) have different impacts on user privacy? 3. Why would a developer use such products?	Students walked away with a better understanding of how their activity is being tracked online, which caused them discomfort. That being said, there was a variety of opinions about the reasonableness of these privacy violations given the benefits of tracking software to the company - a variety which signaled that the students were engaged with the material.

Materials		
Key Philosophical Concepts:	● Privacy promoting the liberty of action ● Privacy as protection from power ● Anonymity ● Aggregation	Certain products violate the first value of privacy but not the second, and vice versa. Similarly, certain products use anonymity and/or aggregation to decrease these privacy violations.
Assigned Readings:	● Google's 4,000-Word Privacy Policy Is a Secret History of the Internet	While I recommend this article, it did not play a central role in our discussion on the day. I would recommend bringing it into the activity more directly.

Implementation		
Class Agenda:	1. 10 minute lecture reminding students about the two concepts of privacy (as control and as restricted access) 2. 40 minutes of activity in small groups 3. 20 minutes to collate the results as a class into a collection of proposed principles about user privacy online	For this module, a classwide regroup after each section of the activity is not necessary, particularly given that students progressed at different paces.

Sample Class Activity:	The activity is a role-playing game where students pretend to be one of three roles: a developer at a startup, a salesperson at a user-tracking company, and a privacy-watchdog representative. The goal is to determine whether there are reasonable applications of three different user-tracking products: Google Analytics (IP tracking), Datadog (tracking on the backend), and Hotjar (front-end real-time tracking).	This module centered on this interactive activity. While the role-playing aspect initially made students feel uncomfortable, they quickly broke through that discomfort and embraced their different characters. This aspect of the activity prompted a more thorough understanding of the privacy concerns at play.
Module Assignment:	The Philosophy for CS 51 is "**Perfection is finally attained** not when there is no longer anything to add, but when there is no longer anything to take away" (Antoine de Saint-Exupéry). From what we learned in lab, what new considerations might bear on whether there's anything to add or take away? For example, what considerations would justify a company removing tracking products from their software implementation? What considerations could justify adding tracking products?	This assignment brought the module material more closely tied to the course material.
Lessons Learned:	1. If possible, I would recommend tying the module material to the course material more directly. I do not have specific recommendations, however. One possibility is to find an example where Datadog would have identified "imperfections" that they had covered in their syllabus already. 2. Students enjoy learning about real-life applications.	