Improving Digital Footprint Management through Education: Proposal for a New University of Virginia Course

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On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

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ABSTRACT

As students graduate from the University of Virginia (UVA) and enter the increasingly digitized world, they need to know how to effectively manage their digital footprints to protect themselves and their professional image. To that end, I propose establishing a new Computer Science (CS) class to teach students how to better manage their digital footprints. The class could be built on a synthesis of some course material from two existing classes – Privacy in the Internet Age and Introduction to Cybersecurity – with new material. The new course, possibly called Managing Personal Digital Security, could be offered as an elective. To determine its effectiveness, students should be evaluated on their pre- and post- course knowledge of digital footprint management practices. I expect that the course would be successful, and evaluations would show an improvement in knowledge over the semester. The course would require revision every few years to stay current with advancements in technology.

1. INTRODUCTION

Today's world is run largely by the digital sphere. Personal data is gathered on users interacting with any aspect of the digital landscape. Every act in this digital realm can be quantified, categorized, and stored indefinitely. These actions can be compiled and attributed to one specific individual, forming that individual's digital footprint, which is the collection of the digital traces left by an individual interacting with something online or digitally (New South Wales Department of Education, n.d.).

Large, unmanaged digital footprints can be used to harm the individual they are attributed to. It can make it easier to obtain user passwords, commit identity theft, and lock users out of their accounts (New South Wales Department of Education, n.d.). Digital footprints have even been used to track and punish suspected political dissenters and activists (Chandler, 2019).

Education can reduce the risk of harm posed by an individual's footprint. Simple actions like deleting old emails and social media accounts, using ad blockers and VPNs, or deleting location metadata from pictures posted online can offer significant protection (Information Security Office, 2021).

UVA offers two courses – Introduction to Cybersecurity and Privacy in the Internet Age – which teach students how to better navigate the digital world. I propose a new course to teach students to better maintain their data privacy, digital footprint, and information security. Partially based on a synthesis of the best practices taught in each of the existent courses, with new elements added. This course would increase students' ability to minimize their footprint and protect their data.

2. RELATED WORKS

CS 3710/Introduction to Cybersecurity

covers aspects of digital hygiene and online security. Students learn basic technical and non-technical principles of cybersecurity, like risk assessment, vulnerabilities, common exploits, and encryption. CS 3710 is focused on cybersecurity in general, including at the industry and governmental levels; whereas the course I propose focuses on individual-level security and digital management (Orebaugh, 2021 a).

However, there are some similarities. In CS 3710, students learn about the negative consequences of data storage being compromised, whether a company server with thousands of people's credit card information, or a singular individual's email account. They also learn the shocking prevalence with which users tend to keep default passwords on their devices and networks; or use common, short, frequently reused passwords (Orebaugh, 2021 b). These concepts could easily be studied through the lens of individual security and digital footprints.

In CS 4501 Special Topics in CS: Privacy in the Internet Age students learn about privacy issues online, like censorship, traffic analysis, and anonymous communication. Focused on obscuring or privileging digital information, this course differs significantly from the proposed course, which would focus on digital security, and curating or defending digital information (Sun, 2022).

Similarities between the existing and proposed courses include learning about how data is transmitted between devices and over networks, and the differently privileged levels of access granted along these travel paths. Students also learn about how mechanisms like cross-site tracking, privacy-averse default settings, and data aggregation compound to enlarge a user's digital footprint. These are all concepts that could easily be studied through the lens of security and defense as opposed to privacy and evasion, making them applicable to the proposed course (Sun, 2022).

3. PROPOSED DESIGN

The following explains the structure and logistics of the proposed course.

3.1 Scheduling Logistics
The course will be offered as a 3-credit, 3000-4000 level CS elective. As with most upper-level CS courses at UVA, class sessions will be 75 minutes each, twice a week and would include 28 class sessions during the fall or spring academic semester. For coherence, these 28 classes would be grouped into 5 topics: Networks, Devices and the Internet of Things, Online Tracking, Social Media, and Famous Breaches and Strategies. Class periods would consist of interactive lectures, where the professor teaches but students ask questions and participate in class-wide discussions.

3.2 Hybrid Structure
The course would be offered synchronously in-person and streamed online via Zoom, and asynchronously via the Zoom recordings, to maximize accessibility. Recordings will be available under the "Cloud Recordings" tab.

Office hours will be held via Zoom using the Waiting Room feature, which enables the host to admit students one at a time (*Using Waiting Room*, 2022). This allows students to share their screens with the TA/professor and review their work in privacy.

3.3 Course Website
This course would be hosted on Canvas with UVA's other courses (Pawlica, 2023). The website menu options would be: Home, Announcements, Modules, Assignments, Grades, Online Meetings, Gradescope, and Piazza.

3.3.1 *Home*
The Home page would provide an overview of the course, as well as the syllabus, course schedule, and office hours.

3.3.2 *Announcements*
Communications from the professor to the whole class will be sent via Announcements. This allows students to set up their canvas

account preferences for receiving emails, phone notifications, and such.

3.3.3 Modules
Each module would correspond to one week, and will list assignments, readings, activities, lecture topics, and other pertinent information for that week's classes.

3.3.4 Assignments
All non-quiz deliverables expected to be turned in over the course of the semester will be listed on Assignments. Each assignment displays the due date and a link to the assignment's page, which has additional information related to the assignment, such as a rubric or example submissions.

3.3.5 Grades
The Grades page would allow students to see the feedback they have gotten over the course of the semester, as well as their projected final scores in the course.

3.3.6 Online Meetings
As is the default on Canvas, the Online Meetings page would include tabs for Upcoming Meetings, a list of Zoom links to join future meetings; Previous Meetings, a list of previously-held meetings, including their time and date; and Cloud Recordings, a list of links to the recordings of past meetings, along with each meeting's chat logs.

3.3.7 Gradescope
Quizzes would be hosted and displayed via Gradescope.

3.3.8 Piazza
The Piazza tab will provide an embed for the course's Piazza page. Piazza enables students to post questions and notes to the whole class, anonymously if desired. Students, professors, and TAs can view, answer, and comment on the posts. This provides a repository of common questions and advice, and a way to get help without having to go to office hours.

3.4 Grading

Graded elements would include quizzes, class discussions, homework assignments, and a final paper.

3.4.1 Quizzes
Quizzes would be individual assessments at the end of each unit, testing students' understanding of the objective facts presented in the unit.

3.4.2 Class Discussions
Students can earn credit for class discussions by participating in the live discussions during class time or by posting discussions online.

3.4.3 Homework Assignments
Homework assignments can be done individually or in groups of up to 4 people. However, the work expected from the assignment will scale with the size of the group, so that working in a larger group does not provide an advantage or disadvantage. Assignments might consist of case studies or deep-dives into a real-life example of the concepts discussed in class, to evaluate students' abilities to apply the concepts learned in class to real-world scenarios.

3.4.4 Final Paper
The final paper would consist of a final case study similar to a homework assignment, but with students applying the concepts learned over the course of the whole semester (Cofield, 2023).

4. ANTICIPATED RESULTS
The effectiveness of the course will be tested in two ways: a phishing experiment and the Personal Evaluation assignment.

4.1 Phishing Tests
A fake phishing email will be sent to the students at the start of the semester and at the end of the semester. The number of students who report the email as phishing, click the link in the email, and/or enter their login information at the link in the email will be recorded for both attempts. Comparisons

between these statistics at the start and end of the course will give an idea of how effective the course was at teaching students to deal with phishing scam attempts, one of the many principles taught in the course.

4.2   Personal Evaluation

The personal evaluation would give a more holistic overview of the effects the course, including what students got out of the course and what, if any, effect the course had on students' thoughts and behaviors in relation to digital footprint management.

5. CONCLUSION

The high-level objectives of the course are designed to help students understand the importance of digital safety and maintaining a clean digital footprint, and learn strategies for achieving this. Upon completion of this course, students should be able to have more control over their digital footprint and feel more confident in their ability to make informed decisions about the data they generate online. They will graduate with a better understanding of best practices for maintaining good digital hygiene, enabling them to lead safer online lives. Having such students graduate from UVA will enhance the university's reputation. Additionally, having these students enter the workforce will give the industry as whole a more digital-savvy workforce.

6. FUTURE WORK

To complete this project, it would likely be beneficial to review the proposed curriculum with Professors Angela Orebaugh and Yixin Sun—who teach Introduction to Cybersecurity and Privacy in the Internet Age, respectively—to ensure that the course would differ significantly enough from their courses to warrant listing it as a separate elective. Next, the CS Department would have to review the course to ensure it met their standards, and find a professor who is able to teach the course. Then, the course could be offered to students.

REFERENCES

Chandler, S. (2019, October 11). *Social Media is fostering a big rise in real-world stalking*. Forbes. https://www.forbes.com/sites/simonchandler/2019/10/11/social-media-proves-itself-to-be-the-perfect-tool-for-stalkers/

Cofield, C. (2023, April 7). *Managing Personal Digital Security—Syllabus*. Google Docs. https://docs.google.com/document/d/e/2PACX-1vRqM4uI01or9IJMk82Xlu243UQe5pE6zlPt46o2FYXzucpZvuKlLuoO4RtHdUeFB27ePEbIRNg0X-0g/pub

Information Security Office. (2021, January 25). *Reduce your digital footprint*. CMU; Carnegie Mellon University. http://www.cmu.edu/iso/aware/protect-your-privacy/digital-footprint.html

New South Wales Department of Education. (n.d.). *Leaving a digital footprint*. Digital Citizenship; New South Wales Government. Retrieved October 27, 2022, from https://www.digitalcitizenship.nsw.edu.au/articles/leaving-a-digit al-footprint

Orebaugh, A. (2021 a). Introduction to Cybersecurity *Syllabus* [Class handout]. University of Virginia, CS 3710.

Orebaugh, A. (2021 b). [Lecture on password security]. Department of Computer Science, University of Virginia.

Pawlica, A. (2023, March 16). *Rest in peace collab, long live canvas*. The Cavalier Daily - University of Virginia's Student Newspaper; The Cavalier Daily. https://www.cavalierdaily.com/article/2023/03/rest-in-peace-collab-long-live-canvas

Sun, Y. (2022). Privacy in the Internet Age *Syllabus* [Class handout]. University of Virginia, CS 4501.

Using Waiting Room. (2022, December 20). Zoom Support; Zoom Video Communications, Inc. https://support.zoom.us/hc/en-us/articles/115000332726-Using-Waiting-Room