



We acknowledge that we are on the traditional, ancestral and unceded territory of the hən̓q̓əmi̓n̓əm speaking Musqueam people.

iSchool Mission: Through innovative research, education and design, our mission is to enhance humanity's capacity to engage information in effective, creative and diverse ways.

INFO 303 (3) Search Engines and Society

Program:	Minor in Informatics
Year:	2021-2022
Course Schedule:	Tuesdays & Thursdays, 9:30-11:00 am
Location:	IKBLC 155 (Weeks 1 and 2 will be conducted via Zoom)
Instructor:	Dr. Luanne Sinnamon
Office location:	IKBLC 496
Office phone:	604 822 0825
Office hours:	Mondays, 1:00-2:30; Zoom link posted in Canvas
E-mail address:	luanne.sinnamon@ubc.ca
Teaching Assistant	Sowlat Sabahi
Learning Management Site:	http://lthub.ubc.ca/guides/canvas/

Calendar Description: Aspects of technical implementation and societal impact of search engines. Explores how Google and other Internet search engines are powerful, global, and non-neutral tools that drive economies and shape our views of the world.

Course Overview: Everyday, Google handles billions of searches. Technically, how do search engines organize the web to make even obscure information findable? How do search results mirror and shape our everyday decisions, our lives and patterns of social behaviour? This course provides an introductory review of the science of search engines, including how search engines discover webpages, analyze their content, and index and rank webpages in response to a user query. Building on this foundation, the course then examines the many profound and fascinating implications of this technology. We will explore the opportunities and the sociotechnical and ethical concerns that arise from the massive and global scale deployment of search technologies by companies such as Google, Microsoft, Baidu, and Yandex. Specific topics, including algorithmic bias, censorship, misinformation, privacy, and gatekeeping are covered.

Learning Outcomes:

Upon completion of this course you will be able to:

- LO1 Use search engine technologies effectively to collect and analyze digital information and data for a range of purposes in their own lives;
- LO2 Explain how search engines work, including the design of technical components that collect, process, rank and recommend web content; .
- LO3 Research and critique search engine technologies with respect to their ethical and social impact;
- LO4 Analyze complex issues such as algorithmic bias, censorship, misinformation, privacy, and gatekeeping in relation to the historic, economic, and technical context of search engines.



Course Topics:

- History of search engines
- Technical components of search engines
 - Crawling / text acquisition
 - Indexing / text processing
 - Ranking and Recommendation
- Sociotechnical and ethical issues of search engines
 - Ethical theory and critiques of search engines
 - Search engine economic models and issues, including ad economy; antitrust; and copyright
 - Search engine bias and misinformation
 - Gate keeping; Censorship
 - Privacy and surveillance capitalism
- Living with search engines
 - Search behaviour and use of search engines.
 - Search engine regulation
 - Alternative search engines to Google

Prerequisites: None. INFO 200 is recommended

Format of the course: The class will meet twice per week (T/Th). Each week the first class will take the form of an interactive lecture to introduce the core concepts and the topic of the week. The second class each week will include a shorter lecture and conclude with a workshop in which students will work in small groups to investigate a problem related to the week’s theme. These will involve working with online search tools or will take the form of a guided discussion.

****Note** – as per UBC guidelines, the first two weeks will run online: the Tuesday classes will run virtually by Zoom at the scheduled time; the Thursday class will run asynchronously, with materials and exercises posted online.

Required and Recommended Reading: You are not required to buy any texts for the course. All readings will be available for free online. Required and recommended readings are available in electronic format from the UBC Library or the Internet. Weekly assigned readings consist of 2-3 items, which include journal articles, book chapters, news articles, podcasts and videos.

(see attached list of Required and Recommended Readings)

Course Assignments and Assessment Summary (See Canvas for full details)

Assignment Name	Due Date	Weight	Learning Outcomes
1. Search Diary and Reflection	February 8	15%	LO1, LO2
2. Group Internet Labs (5 in total)	Throughout	25%	LO1, LO2, LO3, LO4
3. Midterm in-class test	February 17	25%	LO2
4a. Term Paper Proposal	March 8	--	---
4b. Term Paper	April 15	25%	LO3, LO4
5. Participation	Throughout	10%	LO2, LO3, LO4

1. Search Diary and Reflection

Through a week-long digital diary, you will reflect on the role of search engines in your everyday life (LO1). Diary entries will focus on the motivation and context of search engine use. You will record and reflect upon 4 instances of search engine use framed by a series of standard questions and including a contextual photo. The diary will be up to 5 pages in length. The assignment is intended to prime your



thinking about topics covered in the course by reflecting on your own experiences with search (LO1), and on how search engines function (LO2).

2. Group Lab Reports (5 in total)

You will work on set problems in assigned lab groups of 3-4 students and submit a structured lab-style report of 1-2 pages in length. The lab work is designed for students to strengthen their own skills in using search-based tools (LO1) and their understanding of how search engines work (LO2); to develop critical skills based on direct interaction with search technologies (LO3); and to delve deeper into weekly topics (LO4). Each lab will be carried out during class time as part of the workshop time allocated on Thursday each week, and will be due on Friday. Reports are due for the following weeks: 3, 4, 7, 9, 10.

3. Midterm Test (in class)

An in-class test will take place in Week 6 to assess students' understanding of the general structure and key technical components of search engines (LO2). The test will include multiple choice, definitional and short answer questions drawn from class material and readings from weeks 1-5. An in-class review session will be held prior to the mid-term.

4. Term Paper

Students will work independently to write a paper of approximately 2500 words that addresses a topic relevant to the themes covered in the second half of the course (e.g., algorithmic bias, censorship, economic models, privacy, and gatekeeping). The paper is intended as an opportunity for students to analyze and critique the social and ethical impacts of search engines (LO3) in the content of one or more related issue (LO4). Papers should draw upon a combination of peer reviewed research papers and contemporary media reports to identify the technical, ethical and social dimensions of their topic and to map out alternate approaches or solutions to the issue. A list of suggested topics will be provided, but students will have the opportunity to propose their own topics of interest.

A 250 word ungraded proposal will be due in Week 8. The proposal should outline the chosen topic, research question or thesis and identify at least 3 sources for the paper.

5. Participation

Students' participation will be assessed based on the quality of their contributions to the class discussions, attendance, and submission of homework, as assigned. Students are expected to be prepared to discuss readings, share their ideas with other students and ask questions in a manner that demonstrates mutual respect and willingness to listen to and learn from a range of perspectives. Course readings will be essential to gain an understanding of how search engines work (LO2); develop a critical perspective on the role of these technologies in society (LO3); and to develop knowledge of the complex social, ethical and legal issues covered in the course (LO4).

Course Schedule (See Canvas Modules for full details and links to readings)

Week	Date	Topic	Required Readings
WK 1	Tues Jan 11.	Course Introduction History of Search Engines Meeting by Zoom	Granka (2010) The politics of search.



	Thur Jan13	Virtual Lab Instructions on Canvas - no class meeting	Croft, Metzler & Strohman (2015) Search engines: Information retrieval in practice, Chapter 1 Google (2020) <i>Trillions of Questions, no Easy Answers: A (home) movie about how Google search works</i> (1 hour Video)
WK 2	Tues Jan 18	How does search work, Part 1: Overview, Content Types and Crawling	Croft, Metzler & Strohman (2015) Search engines: Information retrieval in practice, Chapter 2 Code.org (2017) The Internet: How Search Works (short video)
	Thur Jan20	Virtual Lab – no Class Meeting Instructions on Canvas	
WK 3	Tues Jan 25	How does search work, Part 2: Text Processing and Indexing	Smucker (2013) Information Representation Computerphile (2015) How search engines treat data (short video).
	Thur Jan27	In Person Lab (Group Report)	
WK 4	Tue Feb 1	How does search work, Part 3: Ranking & Recommendation	Teevan & Dumais (2013) Web retrieval, ranking and personalization. Segal (2011) The dirty little secrets of search. Terry Winograd explains PageRank (short video)
	Thur Feb 3	In Person Lab (Group Report)	Schultheiß & Lewandowski (2021), “Outside the industry, nobody knows what we do” SEO as seen by search engine optimizers and content providers
WK 5	Tues Feb 8	How do people search? Search skills and behaviours	Haider & Sundin (2019) Invisible Search and Online Search Engines, Chapter 4. Russell (2019) The Joy of Search, Chapter 1.
	Thur Feb 10	In person Discussion Groups	



WK 6	Tues Feb 15	Review of Search Engine Technology	Recommended podcast: Dumais (2019) HCI, IR and the search for better search (Audio or transcript).
	Thurs Feb 17	In-class Midterm Test	
READING WEEK			
WK 7	Tues Mar 1	Economics and Ethics of Search Engines	Fuchs (2019). A Contribution to the Critique of the Political Economy of Google Taylor (2012) Behind the White Curtain: Search Engine Economics (short video)
	Thur Mar 3	In-person Lab	
WK 8	Tues Mar 8	Bias and Misinformation in Search	Friedman & Nissenbaum (1996). Bias in computer systems. Farhad (2018) Here's the Conversation We Really Need to Have About Bias at Google. O'Neil (2017) The Era of Blind Faith in Big Data Must End (short video)
	Thur Mar 10	Lab	
WK 9	Tues Mar 15	Gate Keeping and Knowledge Mediation	Bozdag (2013) Bias in Algorithmic filtering and personalization. LaFrance (2016) Searching for lost knowledge in the Age of Intelligent Machines. Labbe (2020) Good Code – on Google Scholar (30 min. podcast)
	Thur Mar 17	In-person Lab	
WK 10	Tues Mar 22	Surveillance and Privacy	Halavais (2018) Search Engine Society, Chapter 7- Privacy Carr (2019) Thieves of Experience: How Google and Facebook Corrupted Capitalism Satariano, A. (2019) Google is fined \$57 Million under Europe's data privacy law. NYT
	Thurs Mar 24	In-person Lab	



WK11	Tues Mar 29	Search Engine Regulation	Morrison & Ghaffary (2022) The Case against Big Tech: Google Somers (2017). Torching the Modern-Day Library of Alexandria Ziewitz, M. (2016). Governing Algorithms: Myth, Mess, and Methods
	Thur Mar 31	In-person Lab	
WK 12	Tues Apr 5	Alternatives to Google	Brunton & Nissenbaum (2019) The Fantasy of Opting Out Schofield (2019) Can DuckDuckGo Replace Google Search While Offering Better Privacy?
	Thur Apr 7	Course Summary and Wrap Up	

Attendance: Attendance is required in all class meetings. If you know you are going to be absent you must inform me beforehand if at all possible. Any penalties imposed for excessive absences are at the discretion of the instructor.

Evaluation: all assignments will be marked according to [UBC grading policy](#). Late assignments will be penalized by grade reductions of 4% per day.

Required Materials: There is no cost for course materials. All readings are available through links in the weekly modules in the Canvas course site.

Academic Concession: If you miss marked coursework (assignment, exam, presentation, participation in class) and are an Arts student, review the Faculty of Arts' [academic concession page](#) and then complete Arts Academic Advising's [online academic concession form](#), so that an advisor can evaluate your concession case. If you are a student in a different Faculty, please consult [your Faculty's webpage on academic concession](#), and then contact me where appropriate.

Policies and Resources to Support Student Success: UBC provides resources to support student learning and to maintain healthy lifestyles but recognizes that sometimes crises arise and so there are additional resources to access including those for survivors of sexual violence. UBC values respect for the person and ideas of all members of the academic community. Harassment and discrimination are not tolerated nor is suppression of academic freedom. UBC provides appropriate accommodation for students with disabilities and for religious and cultural observances. UBC values academic honesty and students are expected to acknowledge the ideas generated by others and to uphold the highest academic standards in all of their actions. Details of the policies and how to access support are available here (<https://senate.ubc.ca/policies-resources-support-student-success>)

Academic Integrity: The academic enterprise is founded on honesty, civility, and integrity. As members of this enterprise, all students are expected to know, understand, and follow the codes of conduct regarding academic integrity. At the most basic level, this means submitting only original work done by you and acknowledging all sources of information or ideas and attributing them to others as



required. This also means you should not cheat, copy, or mislead others about what is your work. Violations of academic integrity (i.e., misconduct) lead to the breakdown of the academic enterprise, and therefore serious consequences arise and harsh sanctions are imposed. For example, incidences of plagiarism or cheating may result in a mark of zero on the assignment or exam and more serious consequences may apply when the matter is referred to the Office of the Dean. Careful records are kept in order to monitor and prevent recurrences. A more detailed description of academic integrity, including the University's policies and procedures, may be found in the [UBC Calendar: Student Conduct and Discipline](#). Academic misconduct includes cheating, plagiarism, and self-plagiarism <http://www.calendar.ubc.ca/vancouver/index.cfm?tree=3,54,111,959> (§7)

Academic Accommodation for Students with Disabilities: Academic accommodations help students with a disability or ongoing medical condition overcome challenges that may affect their academic success. Students requiring academic accommodations must register with the [Centre for Accessibility](#) (previously known as Access & Diversity). The Centre will determine that student's eligibility for accommodations in accordance with [Policy LR7: Accommodation for Students with Disabilities \(Joint Senate and Board Policy\)](#). Academic accommodations are not determined by your instructors, and instructors should not ask you about the nature of your disability or ongoing medical condition, or request copies of your disability documentation. However, your instructor may consult with the Centre for Accessibility should the accommodations affect the essential learning outcomes of a course.

Required Articles and Media:

- Brunton, F. and Nissenbaum, H. (n.d.) The Fantasy of Opting Out. The MIT Press Reader. <https://thereader.mitpress.mit.edu/the-fantasy-of-opting-out/>
- Carr, N. (January, 2019). Thieves of experience: How Google and Facebook Corrupted Capitalism. Los Angeles Review of Books. <https://lareviewofbooks.org/article/thieves-of-experience-how-google-and-facebook-corrupted-capitalism>
- Croft, B., Metzler, D., & Strohmman, T. (2015). Architecture of a search engine. In Search engines: Information retrieval in practice (Chap. 2, pp. 13–30 and Chap 3, pp.31-63). Boston, MA: Addison-Wesley. <https://ciir.cs.umass.edu/downloads/SEIRiP.pdf>
- Duhigg, C. (February, 2018). The Case Against Google. The New York Times Magazine. <https://www.nytimes.com/2018/02/20/magazine/the-case-against-google.html>
- Friedman, B., & Nissenbaum, H. (1996). Bias in computer systems. ACM Transactions on Information Systems, 14(3), 330–347. <https://doi.org/10.1145/230538.230561>
- Fuchs, C. (2019). A Contribution to the Critique of the Political Economy of Google. Fast Capitalism, 8(1), Article 1. <https://doi.org/10.32855/fcapital.201101.006>
- Google (2020) Trillions of Questions, no Easy Answers: A (home) movie about how Google search works https://www.youtube.com/watch?v=tFq6Q_muwG0
- Granka, L. A. (2010). The Politics of Search: A Decade Retrospective. The Information Society, 26(5), 364–374. <https://doi.org/10.1080/01972243.2010.511560>
- Haider, J. and Sundin, O. (2019) Invisible Search and Online Search Engines: the Ubiquity of Search in Everyday Life. (Chap. 4, Search in Everyday Life, p 76-99). Routledge. (Available as an e-book in UBC Library)
- Halavais, A. (2018) Search Engine Society, 2nd ed. Digital Media and Society Series. Polity Press. Chap. 7. Privacy, p. 198-226.



- Hinman, L. M. (2008). Searching Ethics: The Role of Search Engines in the Construction and Distribution of Knowledge. In A. Spink & M. Zimmer (Eds.), *Web Search: Multidisciplinary Perspectives* (pp. 67–76). Springer. https://doi.org/10.1007/978-3-540-75829-7_5
- LaFrance, A. (December, 2016). Searching for Lost Knowledge in the Age of Intelligent Machines. *The Atlantic*. <https://www.theatlantic.com/technology/archive/2016/12/the-search-for-lost-knowledge/506879/>
- Morrison, S & Ghaffary, S. (2022) The Case Against Big Tech: Google. *Vox* <https://www.vox.com/recode/22822916/big-tech-antitrust-monopoly-regulation>
- Noble, S. (2018) *Algorithms of Oppression: How Search Engines Reinforce Racism*. (Chap. 1, 15-63.) NYU Press.
- Russell, Daniel (2019) *The Joy of Search: A Google Insider's Guide to Going Beyond the Basics*. MIT Press. Chapter 1: Introduction.
- Satariano, A. (2019) Google is fined \$57 Million under Europe's data privacy law. *New York Times*. January 21, 2019. <https://www.nytimes.com/2019/01/21/technology/google-europe-gdpr-fine.html>
- Schofield, J. (December, 2019). Can DuckDuckGo Replace Google Search While Offering Better Privacy? *The Guardian*. <https://www.theguardian.com/technology/askjack/2019/dec/12/duckduckgo-google-search-engine-privacy>
- Segal, D. (February, 2011). The Dirty Little Secrets of Search. *The New York Times*. <https://www.nytimes.com/2011/02/13/business/13search.html>
- Smucker, M. D. (2013). Information representation. In I. Ruthven & D. Kelly (Eds.), *Interactive Information Seeking, Behaviour and Retrieval* (1st ed., pp. 77–94). Facet. <https://doi.org/10.29085/9781856049740.007> UBC Library Link: <https://go.exlibris.link/NWFFRPI0>
- Schultheiß, S. and Lewandowski, D. (2021), "Outside the industry, nobody knows what we do" SEO as seen by search engine optimizers and content providers, *Journal of Documentation*, 77(2), 542-557. <https://doi.org/10.1108/JD-07-2020-0127>
- Teevan, J. and Dumais, S. (2013). Web retrieval, ranking and personalization. In I. Ruthven & D. Kelly (Eds.), *Interactive Information Seeking, Behaviour and Retrieval* (1st ed., pp. 189-204). Facet. UBC Library Link: <https://go.exlibris.link/NWFFRPI0>
- Professor Terry Winograd explains the Page Rank Algorithm: <https://www.youtube.com/watch?v=QLDHih81zX0>
- Ziewitz, M. (2016). Governing Algorithms: Myth, Mess, and Methods. *Science, Technology, & Human Values*, 41(1), 3–16. <https://doi.org/10.1177/0162243915608948>

Required Media

- Code.org (2017) The Internet: How Search Works [Video], YouTube https://www.youtube.com/watch?v=LVV_93mBfSU
- Computerphile (Max Wilson). (August, 2015). How Search Engines Treat Data [Video]. YouTube. https://www.youtube.com/watch?v=vrijAlBqxm_w
- Computerphile (Max Wilson). (December, 2015). Search Engine Relevance [Video]. YouTube. <https://www.youtube.com/watch?v=0Z8aGwjLYo>
- Computerphile (Max Wilson). (September, 2015). Page Ranking and Search Engines [Video]. YouTube. <https://www.youtube.com/watch?v=v7n7wZhHj8>
- Labbe, C. (Producer). (2020, February 11). Good Code [Audio podcast – 30 minutes]. <https://www.dli.tech.cornell.edu/goodcode/episode/1ea86721/jake-goldenfein-on-google-scholar>



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O'Neil, O'Neil (September, 2017). The Era of Blind Faith in Big Data Must End. TED Talk [13 minute video]. YouTube. https://www.youtube.com/watch?v=2u_eHHzRto

Taylor, Greg (June, 2012). *Behind the White Curtain: Search Engine Economics*. Oxford Internet Institute, University of Oxford. [Video]. YouTube. https://www.youtube.com/watch?v=boPj_tCqZ_M