

Algorithms and Protocols in Cyberspace

UCLA DH150/250 Spring 2016

[Dr. Bradley Fidler](#)

This outline will be modified slightly before class begins

Brief Summary

Why was the online world constructed the way it was? Who determined the ways in which information gets to you over the Internet, how you see it -- and why? What does the presence of technologies like the Internet, search engines, the World Wide Web, and encryption mean for our world and for ourselves? This course provides a non-technical introduction in the form of case studies to technologies that make the online world what it is today, such as cryptography (public key and bitcoin/blockchain) and cybersecurity, email, TCP/IP, routing, search engines, databases, artificial intelligence, and the World Wide Web. You will learn how the creators of these technologies -- companies, firms, and the defense and intelligence communities -- understood the world and the problems within it the sought to solve. This way, you will learn about the history and evolution of the online world, and learn to use social and humanistic thinking to better understand technology.

Why Take This Course?

If you are a social science or humanities student, it is important that you understand the protocols and algorithms that are governing increasingly large portions of our world. No corner of politics, society, culture, economics, or geography is left untouched by these technologies. Understanding them will make you a better social scientist or humanistic thinker. If you are an engineering student, after you leave university you will quickly learn that building things and getting them into the world is not just a technical matter, and involves political, cultural, and other social forces. The sooner you learn to navigate and exploit them, the more successful you will be. For everyone, this course will help you think critically and with sophistication about how society and technology work together, impacting everything from politics to your sense of self. You do not require a technical background to take this course.

Times, Places, Contact Information

Class: Tuesdays and Thursdays, 11:00-12:15, 2118 Rolfe Hall

Office Hours: 4731E Boelter Hall, Tuesdays and Thursdays, 12:30-1:30pm or by appointment.

You can ask me questions via [email](#). Putting DH150 in the email subject will ensure that I see your email and respond.

Course Structure

We proceed mostly chronologically, beginning in the 1960s and ending in the 2000s. Each week we study a technology or a group of similar technologies, exploring how they originated, their functions, and their consequences. When possible, we read original documents -- that way, you get a direct line to history and do not need to rely as much on the interpretations of others (i.e. "secondary sources"). We go over their significance in class and you are not expected to wrestle with the overly technical parts. Some readings are straightforward, and others are more complex. Each class we go through them together and work through any challenging parts.

Graduate students enrolled in DH250 will use an expanded reading list and different assignment/grading structure.

Evaluation

30% Blog posts

For weeks 2-9, once per week you will write an approximately 400 word (maximum 600 word) blog post by choosing one of the assigned articles or book chapters and answering the following questions:

1. What is the topic and/or primary question? (This is typically a 1-2 sentence answer.)
2. What is the argument or hypothesis? (This is typically a 1-2 sentence answer.)
3. What is the method or evidence for supporting the the argument or hypothesis?
4. Is the argument and evidence effective?
5. What is a question you have about this reading? Pose a question that demonstrates your understanding of the reading; I will use these questions for class discussion.

These blog posts are not formal essays and can be written as such. You get full points for completing each blog post with reasonable effort, and no points for failing to complete it by Monday at 5:00pm PST of the week the reading is due. Each post is worth 3.75% of your total grade.

We will use internal UCLA blog software that is not indexed online.

20% Participation

Each week you should make a contribution to discussion that shows you have done the readings and given them some thought. The question you pose in your blog post does not count -- however you may bring it up in class in response to a related discussion. You cannot backdate participation points.

Week one is a warmup, and week ten is general discussion, which means there are eight weeks at 2.5% of your total grade per week in which your participation counts

You get one free unexplained absence for this course. Your next two unexplained absences drop your grade 3% each time. Four unexplained absences or above and your grade will suffer

significantly, up to a failing grade. Absences are explained with a note from a health professional such as a doctor or Student Psychological Services that does not describe the situation in any detail.

35% Main Project: Wikipedia Contribution and Essay

For this assignment you will:

1. Take what you are learning about the social aspects of technology (such as their design priorities and implications) and contribute your knowledge to a Wikipedia article by improving (or creating) an article
2. Write an essay
 - a. analyzing the article as it exists before your contributions, or, if it does not exist, the priorities in related articles
 - b. documenting your hypothesis, evidence, and findings regarding your subject (as you would in a typical research paper)
 - c. explaining the thinking and strategy behind your edits

During class (in particular weeks four through eight) we will learn about Wikipedia, how to edit it, and how to choose an article to edit, amongst other things.

Your essay and edits will be 2,500 words. By default your edits will not be linked to your name.

My evaluation criteria is 20% analysis of topic/resource, 15% quality of edit(s). You are not judged on the popularity of your edits. If you come to see me before the project is due with questions regarding your drafts or research, your grade will automatically go up a level (e.g. B to B+, or A- to A). Your edit(s) and write-up will be judged much like a research paper, on the quality of your evidence and argument, and the clarity of your expression.

Due Friday 3 June. 5% total grade per day late.

15% Final Exam

During class I will identify key terms and concepts in our readings, and we will define them as a group. For the final exam you will be asked to write a short essay comparing two terms or concepts, drawing on the research you did for your main project. You will be able to choose between five prompts, with the objective of letting you choose a topic where you can really show off.

Important Rules

It is up to you to know what plagiarism is, and to avoid it. We will discuss plagiarism before you begin your writing. I do not use Turnitin, but I automatically report plagiarism up the chain of command.

Be nice to each other as per University of California regulations and your humanity.

WEEK 1: Algorithms, Protocols, Cyberspace

March 29

Course introduction

March 31

Cormen, Thomas H. *Introduction to Algorithms*. MIT Press, 2009. Pages 5-9.

Pouzin, L., and H. Zimmermann. "A Tutorial on Protocols." *Proceedings of the IEEE* 66, no. 11 (November 1978): 1346-1348

Tufekci, Zeynep. "Algorithmic Harms beyond Facebook and Google: Emergent Challenges of Computational Agency." *J. on Telecomm. & High Tech. L.* 13 (2015).

WEEK 2: Routing Algorithms on the First Galactic Network

April 5

Kita, Chigusa Ishikawa. "J.C.R. Licklider's Vision for the IPTO." *Annals of the History of Computing*, IEEE 25, no. 3 (September 2003): 62–77.

Abbate, Janet. *Inventing the Internet*. MIT Press, 2000. Chapter One.

Advanced Research Projects Agency. *Request For Quotations: ARPA Computer Network*. 1968. Pages 22-25.

April 7

Abbate, *Inventing the Internet*. Chapter Two.

Bolt Beranek and Newman. Proposal: Interface Message Processors for the ARPA Computer Network. 1969. Pages I-1, I-2, II-1, II-2, III-3.

Crocker, S.D. "Documentation Conventions." RFC Editor, April 1969.
<https://www.rfc-editor.org/info/rfc0003>. Page one.

WEEK 3: Designing Freedom: Email, the Host-Host Protocol, and Cyberstride

April 12

Abbate, *Inventing the Internet*. Chapter Three.

Partridge, C. “The Technical Development of Internet Email.” *IEEE Annals of the History of Computing* 30, no. 2 (June 2008): 3–29. doi:10.1109/MAHC.2008.32. Pages 1-19.

April 14 (in-class software demo: Adventure)

Medina, Eden. “Designing Freedom, Regulating a Nation: Socialist Cybernetics in Allende’s Chile.” *Journal of Latin American Studies* 38, no. 03 (2006): 581–606.

Beer, Stafford. *Cyberstride: Preparations*. 1972. Pages 5-7.

Rankin, Joy. “Toward a History of Social Computing: Children, Classrooms, Campuses, and Communities.” *IEEE Annals of the History of Computing* 36, no. 2 (2014): 86–88.

WEEK 4: Protocol Wars and the Rise of the Modern Internet: Transmission Control Protocol (TCP), Internet Protocol (IP), and Border Gateway Protocol (BGP)

April 19 (in-class guest lecture)

Russell, Andrew L. *Open Standards and the Digital Age: History, Ideology, and Networks*. New York, NY: Cambridge University Press, 2014. Chapter Seven.

Siles, Ignacio. “Establishing the Internet in Costa Rica: Co-Optation and the Closure of Technological Controversies.” *The Information Society* 28, no. 1 (December 29, 2011): 13–23.

April 21 (Wikipedia assignment work)

Russell, Andrew L. *Open Standards and the Digital Age: History, Ideology, and Networks*. New York, NY: Cambridge University Press, 2014. Chapter Eight, Conclusion.

Strazisar, Virginia, and Radia Perlman. *Gateway Routing: An Implementation Specification*. IEN 30. 1978. Pages 2-5.

[mod.protocols.tcp-ip.listserv.thread](#). Feb-March 1987. Get a sense of the tone.

WEEK 5: Edge Cryptography and Ordering Machines: The Private Line Interface and the Blockchain

April 26

Blanchette, Jean-François. *Burdens of Proof: Cryptographic Culture and Evidence Law in the Age of Electronic Documents*. The MIT Press, 2012. Chapter Two.

Fidler, B. and Q. Dupont. “Edge Cryptography in the Co-Development of Computer Network and Security Architecture.” In press, 2016.

April 28

DuPont, Quinn. & Maurer, Bill. (2015). Ledgers and Law in the Blockchain. *King's Review*.

Nakamoto, Satoshi. "Bitcoin: A Peer-to-Peer Electronic Cash System." Consulted 1, no. 2012 (2008). Page one.

WEEK 6: Closed World Cyberwar: From SAGE to the Global Information Grid

May 3

Edwards, Paul N. *The Closed World: Computers and the Politics of Discourse in Cold War America*. The MIT Press, 1997. Selections.

May 5

Maybaum, Col. F. Lee and Duffield, Howard C, "Defense Data Network An Overview", *IEEE Military Communication Conference '86* , pp. 15.1.1-15.1.7, October 1986

Barlow, John. *A Declaration of the Independence of Cyberspace*. Davos, Switzerland: 1996.

The Cyber Warfare Lexicon [public release version]. USSTRATCOM. January 2009. Selections.

WEEK 7: Hypertext Transfer Protocol (HTTP), WWW, and the Network Citizen

May 10

Markoff, John. *What the Dormouse Said: How the Sixties Counterculture Shaped the Personal Computer Industry*. Penguin, 2006. Chapter Five.

Chun, Wendy Hui Kyong. *Programmed Visions: Software and Memory*. MIT Press, 2011. Chapter Two.

May 12

Weber, Marc. "The Web at 25," *CORE 25*, pp 37-55

Senft, Theresa M., and Safiya Umoja Noble. "Race and Social Media." *The Routledge handbook of social media* (2013): 107-125.

WEEK 8: (Big) Databases and Search from Operation Igloo White to the PageRank Algorithm

May 17

Haigh, T. "How Data Got Its Base: Information Storage Software in the 1950s and 1960s." *IEEE Annals of the History of Computing* 31, no. 4 (October 2009): 6–25.

Shields, Capt Henry S. *Project CHECO Southeast Asia Report: Igloo White January 1970 - September 1971*. 1971. Directorate of Operations Analysis, CHECO/CORONA Harvest Division. Pages 1-8.

Hayles, N. Katherine. "Narrative and Database: Natural Symbionts." *PMLA* 122, no. 5 (2007): 1603–8.

May 19

Katja Mayer (2009) "On the sociometry of search engines: a historical review of methods," in: Becker, Stalder (Eds.): *Deep Search: The politics of search beyond Google*.

Burrell, Jenna. "How the Machine 'thinks': Understanding Opacity in Machine Learning Algorithms." *Big Data & Society* 3, no. 1 (June 1, 2016).

WEEK 9: Network Societies, Discipline, Buzzfeed

May 24

Castells, Manuel. *The Rise of the Network Society: The Information Age: Economy, Society, and Culture*. Wiley, 2010. Selections.

Wood, Ellen Meiksins. "Modernity, Postmodernity or Capitalism?" *Review of International Political Economy* 4, no. 3 (January 1, 1997): 539–60.

May 26

Foucault, Michel. *Discipline and Punish: The Birth of the Prison*. Knopf Doubleday Publishing Group, 1977. Chapter three Section three, "Panopticism."

Deleuze, Gilles. "Postscript on the Societies of Control." *October* 59 (January 1, 1992): 3–7.

Peretti, Jonah. "Capitalism and Schizophrenia: Contemporary Visual Culture and the Acceleration of Identity Formation/Dissolution." *Negations* 1, no. 1 (1996).

WEEK 10: Lightning Presentations and Discussion