Syllabus for CSCI 4830
History and Future of Computing
Spring 2015

Lectures: Tuesday and Thursday from 2:00–3:15pm in ECCR 1B06

Lecturer: Aaron Clauset

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Course Web Page:	`http://santafe.edu/~aaronc/courses/4830/`
Office Hours:	Tuesday and Thursday, 11:00am–12:00pm, or by appointment

Description: In this course, we will survey and ponder the history and future of computing. This course will focus on the technical context and trajectory of fundamental innovations in the history of computing (e.g., Babbage's Difference Engine, the telegraph and Morse code, early "networks," information theory, numerical computation, the early Internet, etc.), and on computing's likely future (Internet of Things, wearables and privacy, P vs. NP, ubiquitous artificial intelligence, self-driving cars, etc.). Students are expected to think critically about both the technical and the social aspects of computing in these contexts, and should be prepared to discuss the grand arc of computational progress, the specific technologies that have fueled it, and the problems, opportunities, and challenges computing poses for society.

Prerequisites: Algorithms (CSCI 3104), and students must be upper-division CSCI majors

Required Text: *The Information: A History, A Theory, A Flood*, by James Gleick

Overview:

- Meetings 2 times a week (T/Th)
- Intensive class discussions; student participation is mandatory
- Weekly reading assignments (roughly 50 pages per week)
- Weekly writing assignments (mini-essays)
- Some assignments may include simple programming or mathematical problems
- One mid-term exam and one final exam
- This will be a challenging course. Plan accordingly

Topic Schedule

Week 1	The grand arc of computation
Week 2	Origins of computation
Week 3	Telegraph systems
Week 4	Information theory
Week 5	Deeper into information
Week 6	Information is physical
Week 7	Biology is computation
Week 8	Some things are uncomputable
Week 9	Sexism and computing
Week 10	Social computing and privacy
Week 11	Spring break
Week 12	Augmented reality
Week 13	Internet of things
Week 14	General artificial intelligence
Week 15	General artificial intelligence
Week 16	Is the singularity real?
Week 17	Final exam

Examinations

Midterm exam	March 12 (Thursday)	in class
Final exam	May 6 (Wednesday)	1:30–4:00pm

Grading

Grades will be assigned as the weighted sum of scores in four areas: class participation (0.25), written assignments (0.40), midterm exam (0.15) and final exam (0.20).

Letter grades will not be assigned until after all work for the semester has been submitted and graded. In the meantime, only numerical grades will be tracked.

Weekly Reading Assignments
There will be weekly reading assignments. The purpose of these assignments is to help you prepare for the intensive class discussions and lectures on the weekly topic.

All reading material for a given week should be completed prior to the Tuesday class of that week. Reading assignments will be drawn from popular books and essays and multimedia sources on the history and future of computing (see below for the complete list). *The success of the class depends on each student coming to class prepared to discuss the assigned material.*

Weekly Writing Assignments
There will be weekly writing assignments, starting in Week 2, except for the week of the midterm. The purpose of these assignments is to have you express and critically explore *your own ideas* about a given topic.

Each week you will compose and submit an original 2-page long "mini-essay." Essays must be typeset electronically (12 point font, 1-inch margins) and submitted as a PDF document via email to the instructor no later than 11:59pm on Thursday night, each week. If you cite references (and I encourage you to), they must follow the the Chicago Manual of Style.

Files must be named like `Lastname-Firstname-MMDD-WeekX.pdf` where `X` is the number of the corresponding week of class and `MMDD` is the 2-digit month and 2-digit day of your birthday. For instance, `Clauset-Aaron-0701-Week2.pdf`. *Misnamed files will not be graded.*

These essays must be written independently. However, I strongly encourage you to discuss ideas with each other outside of class. Talk. Have debates. Argue. Discard bad ideas. Refine the good ones. *But do not copy or plagiarize from any source. Do not insult my or your own intelligence by submitting someone else's writing as your own, in whole or in part.*

Late or non-PDF submissions, and submissions longer than 2 or shorter than 1.5 pages will receive no credit. There is no flexibility on these policies. To compensate for their unforgiving nature, the lowest 3 essay grades will be automatically dropped at the end of the semester.

Points will be deducted for sloppy writing, sloppy thinking, spelling mistakes, and poor grammar. I will not be unreasonable in my grading, but don't make me read garbage. If I cannot understand what you are saying, you did not succeed in the assignment. The best way to get full credit is to write clearly and say interesting, thoughtful things. You will be graded on what you write, not what you meant to write. See the *Advice for the writing assignments* on page 6 for specific advice about how to get full credit on the essays.

Reading Schedule

when	deadline	what to read / watch
Week 1	on your own time	*The Information*, Chapters 1–3
Week 2	by Tuesday, Jan. 20	*The Information*, Chapter 4
Week 3	by Tuesday, Jan. 27	*The Information*, Chapter 5
Week 4	by Tuesday, Feb. 3	*The Information*, Chapters 6–7
Week 5	by Tuesday, Feb. 10	*The Information*, Chapter 8
Week 6	by Tuesday, Feb. 17	*The Information*, Chapter 9
Week 7	by Tuesday, Feb. 24	*The Information*, Chapters 10–11
		George Dyson's Edge (2005) essay `http://bit.ly/1DKkz6k`
Week 8	by Tuesday, Mar. 3	*The Information*, Chapters 12, 15 & Epilogue
Week 9	by Tuesday, Mar. 10	When Women Stopped Coding, podcast `http://n.pr/1tIJxC1`
		How stereotypes impair women's careers `http://bit.ly/PO7OUz`
		Hiring women in Silicon Valley, video `http://bit.ly/1up3HdS`
		The Dads of Tech `http://bit.ly/1txWlrF`
		Disrupting the culture of Silicon Valley `http://bit.ly/1sHMBNZ`
		Online and Offline Violence Towards Women `http://bit.ly/1HAe2y3`
Week 10	by Tuesday, Mar. 17	EPIC 2014 (from 2004) `http://bit.ly/1zqA3Ob`
		"Unique in the Crowd." `http://bit.ly/194eDYY`
		Private traits from digital traces `http://bit.ly/1mv8jzb`
Week 11	(spring break)	thinking at your leisure
Week 12	by Tuesday, Mar. 31	digital short, *Sight* `http://vimeo.com/46304267`
		"I, Glasshole" `http://wrd.cm/1FMH1hh`
		Diminished Reality `http://bit.ly/1wceagc`
		Augmented Reality: the Good `http://bit.ly/1y0C0gv`
		Augmented Reality: the Bad `http://bit.ly/1vArQ86`
Week 13	by Tuesday, Apr. 7	Wikipedia article "The Internet of Things" `http://bit.ly/1cEqs9f`
		B. Sterling's "The Epic Struggle of the Internet of Things" (iBooks / Kindle)
		EFF "You Dont Really Own Your Car" `http://bit.ly/1NH8mTc`
Week 14	by Tuesday, Apr. 14	*The Lifecycle of Software Objects* by Ted Chiang `http://bit.ly/ZQMUJg`
		The philosophy of AI `http://bit.ly/1yFPuPG`
Week 15	by Tuesday, Apr. 21	Spike Jonze's *Her*
		What is Strong AI `http://bit.ly/1vAscLK`
Week 16	by Tuesday, Apr. 28	Ray Kurzwel's TED (2005) talk `http://bit.ly/1g3E3ZH`
		Bruce Sterling's Long Now seminar `http://bit.ly/1ywuABs`
		Cosma Shalizi's blog post (and links) `http://bit.ly/1F6lKRy`

Additional reading

If you want more cool things to read about the future of computing, here are two lists.

Science fiction:

- *Summa Technologiae*, by Stanislaw Lem
- *REAMDE*, *Snow Crash*, *Cryptonomicon*, *The Diamond Age*, by Neil Stephenson
- *Holy Fire*, *Distraction*, or *The Caryatids*, by Bruce Sterling
- *A Good Old-Fashioned Future*, by Bruce Sterling
- *The Metamorphosis of Prime Intellect*, by Roger Williams
- *Super Sad True Love Story*, by Gary Shteyngart
- *Eastern Standard Tribe*, by Cory Doctorow
- *Human readable*, by Doctorow
- *Mr. Penumbra's 24-Hour Bookstore*, by Robin Sloan
- *Virtual Light*, *Neuromancer*, by William Gibson
- *Accelerando*, by Stross
- *Rainbows End*, by Verner Vinge
- *Existence*, by David Brin
- *The Dueling Machine*, by Ben Bova
- *A Logic Named Joe*, by Murray Leinster
- *The Shockwave Rider*, by John Brunner
- *The Golden Age* trilogy, by John C. Wright

Non-fiction:

- *Computer Liberation*, by Nelson
- *Augmenting Human Intellect*, by Engelbart
- *Database Nation*, by Garfinkle
- *Being Digital*, by Negroponte
- *Superintelligence*, Nick Bostrom
- *Tomorrow Now*, and *Shaping Things*, by Bruce Sterling
- *Tools for Conviviality*, Ivan Illich
- *Quantum Computing since Democritus*, by Aaronson
- *The Second Machine Age*, by Erik Brynjolfsson and Andrew McAfee
- *Red Plenty*, by Francis Spufford
- The Oatmeal on self-driving cars `http://bit.ly/1ARKXt0`

Advice for the writing assignments

- **Write carefully**. You will only be graded on what you write, not what you meant to write. I cannot read your mind. If your thinking is sloppy or your writing unclear, I will assume you do not know what you're talking about.

- **Write clearly**. If I cannot understanding your perspective on my first pass through your essay, I cannot give you credit for it, even if it is thoughtful and interesting. Write your essays clearly. Explain your ideas. Use examples. Refer to the texts. Refer to the ideas. Expand upon the ideas. Speculate about consequences. Tease out second-order effects. Include references.

- **Discuss ideas in general, support them with examples**. This class is about general concepts and ideas, and your essays should grapple with them directly. You may use examples (either real or hypothetical) to motivate an idea, or to support a prediction, but keep your focus on the general idea, not on the details of a particular implementation or instantiation.

- **Say interesting things**. Don't rehash someone else's ideas. Tell me what you yourself think. But have something interesting to say. What strikes you as cool or novel or weird or interesting about a topic? What does it *mean*? What is surprising or counter-intuitive? What is not surprising? A central goal of this class is to get you thinking critically about the topics we cover; the essays are the main opportunity you have to explore and argue through those critical thoughts.

- **Be succinct**. Your essays are at most two pages long. Get to the point.

- **Don't bullshit**. If you don't have anything to say, don't waste my time with several pages of bullshit. A document with the text "Nothing to say" (and nothing else) will be worth 25% partial credit. The "Nothing to say" rule applies to every writing assignment and every exam. A blank page is worth zero points.

- **Don't plagiarize**. Do not copy or plagiarize from any source. Do not insult my or your own intelligence by submitting someone else's writing as your own, in whole or in part. I take very seriously the principles of intellectual honesty and academic honor. It is far better, in my view, to submit shoddy work that is your own, than to plagiarize someone else's work as your own. The punishment for plagiarism is far, far worse than a poor grade (see the Honor Code statement below).

Suggestions: Suggestions for improvement are welcome at any time. Any concern about the course should be brought first to my attention. Further recourse is available through the office of the Department Chair or the Graduate Program Advisor, both accessible on the 7th floor of the Engineering Center Office Tower.

Honor Code: As members of the CU academic community, we are all bound by the CU Honor Code. I take the Honor Code very seriously, and I expect that you will, too. Any significant violation will result in a failing grade for the course and will be reported. Here is the University's statement about the matter:

All students of the University of Colorado at Boulder are responsible for knowing and adhering to the academic integrity policy of this institution. Violations of this policy may include: cheating, plagiarism, aid of academic dishonesty, fabrication, lying, bribery, and threatening behavior. All incidents of academic misconduct shall be reported to the Honor Code Council (`honor@colorado.edu`; 303-735-2273). Students who are found to be in violation of the academic integrity policy will be subject to both academic sanctions from the faculty member and non-academic sanctions (including but not limited to university probation, suspension, or expulsion). Other information on the Honor Code can be found at `http://www.colorado.edu/policies/honor.html` and at `http://www.colorado.edu/academics/honorcode/`

Special Accommodations: If you qualify for accommodations because of a disability, please submit to your professor a letter from Disability Services in a timely manner (for exam accommodations provide your letter at least one week prior to the exam) so that your needs can be addressed. Disability Services determines accommodations based on documented disabilities. Contact Disability Services at 303-492-8671 or by e-mail at `dsinfo@colorado.edu`.

If you have a temporary medical condition or injury, see Temporary Injuries under Quick Links at Disability Services website and discuss your needs with your professor.

Campus policy regarding religious observances requires that faculty make every effort to deal reasonably and fairly with all students who, because of religious obligations, have conflicts with scheduled exams, assignments or required attendance. In this class, I will make reasonable efforts to accommodate such needs if you notify me of their specific nature by the end of the 3rd week of class. See full details at `http://www.colorado.edu/policies/fac_relig.html`

Classroom Behavior: Students and faculty each have responsibility for maintaining an appropriate learning environment. Those who fail to adhere to such behavioral standards may be subject to discipline. Professional courtesy and sensitivity are especially important with respect to individuals and topics dealing with differences of race, color, culture, religion, creed, politics, veterans status, sexual orientation, gender, gender identity and gender expression, age, disability, and nationalities.

Class rosters are provided to the instructor with the student's legal name. I will gladly honor your request to address you by an alternate name or gender pronoun. Please advise me of this preference early in the semester so that I may make appropriate changes to my records. See policies at `http://www.colorado.edu/policies/classbehavior.html` and at `http://www.colorado.edu/studentaffairs/judicialaffairs/code.html#student_code`

Discrimination and Harassment: The University of Colorado at Boulder Discrimination and Harassment Policy and Procedures, the University of Colorado Sexual Harassment Policy and Procedures, and the University of Colorado Conflict of Interest in Cases of Amorous Relationships policy apply to all students, staff, and faculty. Any student, staff, or faculty member who believes s/he has been the subject of sexual harassment or discrimination or harassment based upon race, color, national origin, sex, age, disability, creed, religion, sexual orientation, or veteran status should contact the Office of Discrimination and Harassment (ODH) at 303-492-2127 or the Office of Student Conduct (OSC) at 303-492-5550. Information about the ODH, the above referenced policies, and the campus resources available to assist individuals regarding discrimination or harassment can be obtained at `http://www.colorado.edu/odh`