Intelligence:
Artificial and Human

SMC199H1F	CSC199H1F
Tuesday 10am-12pm	Tuesday 2-4pm
LA248	CR406

Instructors:
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Course Description:

This course engages the history, assumptions, and aspirations of computer science, and AI in particular. It invites both humanities and computer science students to inquire into such questions as: What is human intelligence, and how close are we to replicating it? How productive (or reductive) is the brain-computer analogy? What are the ethical challenges posed by AI systems (on workers, on society, on the environment) and should we — can we? — put a hold on "progress"? Is Silicon Valley the seat of a new techno-religion, and if so, what implications does this have for research incentive and funding? What are the historical roots of computer science, robotics, and AI, and what can they teach us about today's research priorities? What insight (or inspiration) can we get from works of science fiction about the future of human-AI interaction? Assignments will ensure that in addition to wrestling with these questions, students acquire the fundamental reading, writing, and research skills they will need to succeed throughout their undergraduate studies and beyond.

Course Objectives:

In an age increasingly shaped by the exigencies of AI and deep learning research, a humanistic perspective on intelligent technologies will help the next generation of students remain in control of their field, and take it in new and exciting directions. Reciprocally, computer literacy, along with a deeper appreciation for the ways computer scientists identify and solve problems, should be part of any humanistic education, along with traditional reading, writing, and oral expression skills. Writing algorithms has started to become an essential skill outside of the computing sciences, although not as an end unto itself; even among computer science undergraduates, knowledge of computer programming will not guarantee employment — let alone a fulfilling career — in a competitive market-place where humans must compete with AI technologies. To be deployed to its fullest potential, computational thinking must be both subjected to critical inquiry and informed by culture. We believe that the best way to accomplish this is to integrate

an introduction to computational thinking with a rigorous survey of the philosophy and history behind it. This course proposes just that: a collaborative experiment between fledging computer scientists and humanists.

Rules and Expectations:

- **Attendance**: This course interlaces lectures with discussions based on assigned readings. Attendance ***and*** participation are ***mandatory***. Students will need to provide adequate justification for missing class. Failure to do so will result in penalties on the participation grade.
- **Work ethics:** By default, classes will take place **in person**. A Zoom link will be provided in the event we need to meet online (as is the case until Jan. 31, for instance). When attending class remotely, students are expected to be properly attired, awake, and ready to turn their video cameras and microphones on for discussion. We also strongly recommend that you **print out your readings** so as to be able to quickly flip through material as the seminar unfolds.
- **Late submission policy:** Late submission of assignments will be penalized by a half-grade per day (i.e., 2-3%). For instance, a B+ paper submitted 2 days late would thus receive a B-. Please submit on time using the Quercus page.
- **Plagiarism policy:** The University of Toronto treats cases of academic misconduct very seriously. Beware in particular of plagiarism, which includes copy-pasting, paraphrasing, and appropriating someone else's words or ideas without properly acknowledging them (or, for that matter, doing so with your own work). Consult the University of Toronto's *Code of Behaviour on Academic Matters* for more information: http://www.governingcouncil.utoronto.ca/Assets/Governing+Council+Digital+Assets/Policies/PDF/ppjun011995.pdf. For a thorough guide on what constitutes plagiarism (pay special attention to inadequate paraphrases): https://usingsources.fas.harvard.edu/what-constitutes-plagiarism

Evaluation:

Reading Summaries: 10% (5 x 2% each)
Problem Set: 10%
Bibliography: 10%
Book review proposal: 5%
Book review draft: 15%
Final book review: 30%
Attendance and participation: 20%

**To ensure your paper matches university standards, we require that you use the "Essay Checklist: Click Your Way to an A" tool offered by the Kelly Library when formatting, revising, and submitting your first and final drafts. You can access it here: http://kl-smc.site/cl/index.html **

Required Text:

Birkenstein Cathy and Gerald Graff. *They Say / I Say: The Moves That Matter in Persuasive Writing*. New York: W.W. Norton & Co., 2007.

For bibliographical references and essay writing tool, consult:

McKibbin, Joan and Margot Northey. *Making Sense: A Student's Guide to Research and Writing*. 8th ed. Oxford: Oxford University Press, 2015.

Turabian, Kate L. *A Manual for Writers of Research Papers, Theses, and Dissertations*, 8th edition. Chicago: Chicago University Press, 2013.

You can also consult the Chicago Manual of Style online, via the library website.

Class Schedule

INTRODUCTIONS
(and a touch of literary criticism)

WEEK 1: What is (Artificial) Intelligence? (Jan. 11) >> ONLINE, Synchronous <<

- ▹ Various perspectives, audiences, and genres
- ▹ What is the object of the computing sciences?

▸▸ ***Assignment for this week:*** Watch *Ex Machina* (2014) and *Wargames* (1983), both of which are available through U of T's Media Common streaming services. Come ready to discuss their respective treatment of AI in class.

INTRODUCTIONS
(and a touch of philosophy)

WEEK 2: What is (Human) Intelligence? (Jan. 18) >> ONLINE, Synchronous <<

- ▹ Intelligence, the mind, the soul, and consciousness
- ▹ Thinking, reasoning, learning

▸▸ ***Readings for this week:***

Richard Grant, "Do Trees Talk to Each Other?," *Smithsonian.com*, March 2018 https://www.smithsonianmag.com/science-nature/the-whispering-trees-180968084/

Cathy Birkenstein and Gerald Graff, *They Say / I Say: The Moves That Matter in Persuasive Writing* (New York: W.W. Norton & Co., 2007), 1-15 ("Introduction"), 163-66 ("I take your point: Entering Class Discussions").

▸▸ ***Assignment for this week:*** Make sure to write your instructors a ***formal email***. In this email, you should introduce yourself and request an online appointment. The goal of this appointment will be to get to know one another better and make sure you are adapting well to university.

****Reading Summaries due before class (Grant)****

THE HISTORICAL LENS

WEEK 3: The Long History of Computation (Jan. 25) >> ONLINE, Synchronous <<

- ▹ Leibniz and the deep roots of Computer Science
- ▹ The computer before the computer

▸▸ ***Readings for this week:***

Jonathan Gray, " 'Let us Calculate!': Leibniz, Llull, and the Computational Imagination," *The Public Domain Review,* https://publicdomainreview.org/2016/11/10/let-us-calculate-leibniz-llull-and-computational-imagination/

G. W. Leibniz, *Dissertation on the Art of Combinations* 1666 (Selection), https://www.math.ucla.edu/~pak/hidden/papers/Quotes/Leibniz-Arte-Combinatoria.pdf

Birkenstein and Graff, 18-29 ("Starting with What Others Are Saying") and 30-41 ("The Art of Summarizing").

THE HISTORICAL LENS

WEEK 4: Who Invented the Computer (and Why)? (Feb. 1)

- ▹ Ada Lovelace and the Babbage Engine
- ▹ Mathematical theories of computing

▸▸ ***Readings for this week:***

George Boole, "An Investigation of the Laws of Thought on Which are Founded the Mathematical Theories of Logic and Probabilities (1854)," in H. R. Lewis, *Ideas That Created the Future: Classic Papers of Computer Science* (Cambridge, MA: MIT Press, 2021), 27-44.

Eugene Eric Kim and Betty Alexandra Toole, "Ada and the First Computer," *Scientific American* 280, no. 5 (May 1999): 76-81.

Optional: Luigia Carlucci Aiello, "The Multifaceted Impact of Ada Lovelace in the Digital Age," *Artificial Intelligence* no. 235 (2016): 58-62. [An essay review of Robin Hammerman, Andrew L. Russell (Eds.), *Ada's Legacy: Cultures of Computing from the Victorian to the Digital Age* (New York, NY: Association for Computing Machinery and Morgan & Claypool, 2015.]

****Reading Summary due before class (pick Gray or Kim & Toole) ****
****Bibliography due Friday Feb. 4]****

THE HISTORICAL LENS

WEEK 5: Crucibles of AI Research (Feb. 8)

- ▹ Alan Turing, his Test, and his Predictions
- ▹ The Dartmouth Conference: Laying out the Research Program

▸▸ Readings for this week:

A. M. Turing, "Computing Machinery and Intelligence," *Mind* 49, no. 236 (Oct. 1950): 433-460.

J. McCarthy et al., *A Proposal for the Dartmouth Summer Research Project on Artificial Intelligence.* August 31, 1955. Available online: http://jmc.stanford.edu/articles/dartmouth/dartmouth.pdf

Birkenstein and Graff, 173-83 ("Reading for the Conversation").

THE HISTORICAL LENS

WEEK 6: Norbert Wiener's Cybernetics (Feb. 15)

- ▹ Humans and Machines in the Age of Information
- ▹ AI, games, and geopolitics

▸▸ Readings for this week:

Norbert Wiener, *The Human Use of Human Beings* [originally published in 1950] (London: Free Association Book, 1989), 7-27 [Preface and Ch. 1]

Norbert Wiener, "Cybernetics and Psychopathology," in *Cybernetics, or Control and Communication in the Animal and the Machine*, 2nd ed. (Cambridge, MA: MIT Press, 1961), ch. 7.

****Reading Summary due before class (Pick Turing or Wiener) ****

****Problem Set due Friday Feb. 18****

WEEK 7: Reading Week (Feb. 22)

No class.

THE PHILOSOPHICAL LENS

WEEK 8: Philosophy, Science, and Computation (Mar. 1)

- ▹ System analysis and the architecture of complexity

▹ Intelligence and decision making

Herbert A. Simon, "The Architecture of Complexity," *Proceedings of the American Philosophical Society* 106, no 6 (December 1962): 467-482.

Birkenstein and Graff, 167-72 ("Is Digital Communication Good or Bad -- or Both?")

THE PHILOSOPHICAL LENS

WEEK 9: What Is It Like to Work For Google? (Mar. 8)

▹ Labour and the environment

▹ The academic and the corporate world

▸▸ ***Readings for this week:***

Kate Crawford and Vladan Joler, "Anatomy of an AI System," 2018. Available online: https://anatomyof.ai

Compare Crawford and Joler's approach to those of the following industry insiders:

H. E. Firdman, "Components of AI System,"*AI Expert* 1, no. 1 (December 1986). Available online: https://dl.acm.org/doi/10.5555/7558.18667

Ice Cream Labs, "The Core Components of Artificial Intelligence," *Medium* (August 9, 2018). Available online: https://icecreamlabs.com/2018/08/09/core-components-ai/

Robert Thomas, "The Essential Components of AI," *Forbes* (October 10, 2019). Available online: https://www.forbes.com/sites/forbesinsights/2019/10/10/the-essential-components-of-ai/#19c209a01f9d]

Birkenstein and Graff, 55-67 ("Three ways to Respond").

****Reading Summary due before class (Pick Simon or Crawford & Joler) ****

****Book Report Proposal due March 11****

THE PHILOSOPHICAL LENS

Week 10: Should We Pursue AI? If So, How? (Mar. 15)

▹ Ethical perspectives

▹ Legal perspectives

▸▸ ***Readings for this week:***

Vincent C. Müller, "Ethics of Artificial Intelligence and Robotics," *The Stanford Encyclopedia of Philosophy* (Summer 2021 Edition), Edward N. Zalta, ed., Available online: https://plato.stanford.edu/archives/sum2021/entries/ethics-ai

David J. Gunkel, The Machine Question: Critical Perspectives on AI, Robots, and Ethics (Cambridge, MA: MIT Press, 2012), 1-14.

Birkenstein and Graff, 42-51 ("The Art of Quoting").

****Reading Summary due before class [Gunkel]****

THE LITERARY LENS

WEEK 11: Is the Brain a Computer? (Mar. 22)

- ▹ Metaphors and computer science
- ▹ Scientific theories as metaphors

▸▸ ***Readings for this week:***

Robert Epstein, "The Empty Brain," *Aeon*, 18 May 2016, https://aeon.co/essays/your-brain-does-not-process-information-and-it-is-not-a-computer

Blake Richards, "Yes, the Brain is a Computer… No, it's not a metaphor," *Medium: The Spike,* 1 Oct. 2018, https://medium.com/the-spike/yes-the-brain-is-a-computer-11f630cad736

Kevin Lande, "Do You Compute?," *Aeon*, 11 April 2019, https://aeon.co/essays/your-brain-probably-is-a-computer-whatever-that-means

Birkenstein and Graff, 68-77 ("Distinguishing What You Say from What They Say").

****Book Report Draft due March 25****

THE LITERARY LENS

WEEK 12: Armageddon: Viruses and the Singularity (Mar. 29)

- ▹ More metaphors
- ▹ Theologians and Futurists

▸▸ ***Readings for this week:***

I. J. Good, "Speculations concerning the first ultraintelligent machine," in F. Alt & M. Ruminoff (eds.), *Advances in Computers, volume 6.* (Academic Press 1965), 31-88.

Raymond Gozzi Jr., "The Computer 'Virus' as Metaphor." *ETC.: A Review of General Semantics* 47, no. 2 (Summer 1990), 177-180.

Birkenstein and Graff, 92-101 ("Saying Why It Matters").

▸▸ ***Assignment for this week:*** Watch (or rewatch) a science fiction movie that features AI as a virulent agent or superintelligent threat. Come ready to discuss.

****Reading Summary Bonus due before class (Good or Gozzi) ****

THE LITERARY LENS

Week 13: What If…? Imagining the Future of AI (Apr. 5)

- ▹ What is science fiction?
- ▹ What can literature teach us about AI research?

▸▸ ***Readings for this week:***
Isaac Asimov, "The Last Question,*"* *Science Fiction Quarterly* 4, no. 5 (November 1956), 7-15.
Birkenstein and Graff, 184-201 ("Entering Conversation about Literature").

****Final Book Review Due April 8****

Assignment Descriptions:

Reading Summaries:

As undergraduate students, you are responsible for preparing weekly readings. This means you are expected not only to keep up with the readings assigned in the syllabus, but also to annotate them, have them with you during class (preferably in print), and stand ready to discuss them with us and with your peers. To help you prepare, we ask that you submit five short reading summaries in response to the assigned readings (NB: you should still read *all* the readings, not just those you choose to summarize!). Assignments must be submitted every even-numbered week. An optional make up assignment will also be offered.

A reading summary should be written in complete sentences and amount to no more than a double-spaced paragraph fitting on a page. It should include the following information, in the order that best suits your purpose: the title of the reading and its publication genre (scholarly article, book chapter, newspaper article, online essay, encyclopedia entry, documentary film, etc.); its author's (or authors') name(s) and credentials; its date of publication; its main topic and the problem or question it seeks to engage; its thesis, i.e., the proposition its author explicitly, or implicitly, defends (usually, the answer to the problem or question asked); its intended audience (NB: for historical material, this means the readership that was *originally* intended for by the author, not today's readers); its main significance for our course (think not only about thematic connections, but also about the methodological reasons we might have assigned it as part of ours historical, philosophical, or literary discussions).

Make sure to include a heading with the submission date, your name, your main instructor's name, and the course code (use the exact template provided at the head of the summary example). Do not include this heading in the "heading" box of your word processor; save that space for page numbers, which you will have to include for assignments that are longer than a single page. Be mindful of grammar and spelling mistakes. Aim for clarity, concision, and precision. Every response you submit will earn you up to 2%, for a maximum of 10% throughout the term.

Formatting Instructions:

Double-spaced, 1 inch margins, Times New Roman 12, page numbers in upper right corner (if longer than a page). Use the "short heading" template provided with the sample summary. Citations, if you include any, should be formatted in Chicago style (i.e., with a footnote appropriate to the kind of source).

Additional Tips for Chicago Style:

1) Journal, magazine, newspaper, and book titles should be *italicized.* No quotation marks.
2) The titles of articles published within journals, magazines, or newspapers should be in quotation marks (" "); so should the title of book chapters.
3) Punctuation should come before quotation marks, and quotation marks before footnote calls. A footnote call is a superscript digit that refers the reader to the appropriate note at the bottom of the page). It should be placed at the very end of the sentence. E.g.: Turing argues that his reformulation of the question "can machines think?" has "the advantage of drawing a fairly sharp line between the physical and the intellectual capacities of man."
4) If you cite or paraphrase a passage from a source, you need to use footnotes. Pay attention to their formatting. The example at the bottom of this page gives you a template for scholarly articles published in academic journals. The format varies depending on the kind of source you are citing. You should refer back to the following guide: https://www.chicagomanualofstyle.org/tools_citationguide/citation-guide-1.html.

Problem Set

Instructions on how to answer the Problem Set will be given in class, along with the questionnaire. You will have about two weeks to complete it at home. This assignment is worth 10% of your final grade.

Bibliography:

Any research project requires gathering, analyzing, and acknowledging sources. Gathering sources help you frame your inquiry, i.e., figure out what has been written on your topic, and where you think you can make a useful contribution to the conversation. Analyzing them not only provides you with information and insight, but also helps you support your argument, offer argumentative counterpoints, or even serve as the starting point of an entire paper. Academic writing standards require that you keep track of these sources, through proper citations and with the help of a bibliography or work cited list. For this assignment, you are asked to pick a topic of your choice (so long as it relates to AI from a historical, a philosophical, or literary-critical standpoint) and build a working bibliography using Chicago Style instructions. ***Your bibliography should comprise 10 items***, including at least 2 scholarly monographs, 2 scholarly articles, 1 book chapter or article from an anthology, and 1 scholarly encyclopedia or dictionary entry. You can use digital versions of material normally published in print (e.g., ebooks or

scholarly articles found in an online database), but should avoid web pages altogether, unless they are hosted by academic institutions. You will receive marks for adequately formatting your entries, as well as for choosing materials that meet academic standards. This assignment is worth 10% of your final grade.

Formatting Instructions:
Double-spaced, 1 inch margins, Times New Roman 12, page numbers in upper right corner. Use the "short heading" template provided with the sample summary. Read the Chicago Style -- Footnote-Bibliography instructions carefully:
https://www.chicagomanualofstyle.org/tools_citationguide/citation-guide-1.html.

Main Assignment: Academic Book Review

Your main assignment this term will be to write an academic book review -- a critical summary of a scholarly monograph (subject to our approval, and fitting with the themes explored in this course). Book reviews are essential to the academic profession, particularly in the humanities and the social sciences. Indeed, few scholars can keep up with the literature of their own fields, let alone with that of adjacent fields, without other experts digesting it for them. Since most of your classes will require that you engage meaningfully with the thoughts of others scholars, learning to summarize and evaluate a complex, book-length argument will serve you well. The assignment is broken down into three steps:

1) Book Review Proposal:

We ask that you submit a ***one page proposal*** in which you state which monograph you intend to review (pick one from the list we will provide you). Treat this assignment as if it were another reading summary assignment (see above), by answering all the questions you can answer at this early stage and by telling us why you picked this book (provide an academic justification, not a touchy-feely narrative of how you came across the source). We recommend you make an appointment or contact us by email if you have any doubts or concerns. This assignment is worth 5% of your final grade.

Formatting Instructions:
Double-spaced, 1 inch margins, Times New Roman 12, page numbers in upper right corner (if longer than a page). Use the "short heading" template provided with the sample summary. Citations, if you include any, should be formatted in Chicago style.

2) Book Review, First Draft:

By now, you should have read your monograph at least once and taken notes on the side. In order to ensure you are on the right track, we ask that you submit an early draft of your final book review with a ***formal cover page*** and a short ***bibliography*** (if appropriate). This draft should be about 1000 words in length, and modeled after the kind of book reviews one encounters in academic journals (examples will be discussed in class). It should begin with an introductory paragraph stating the title of the book and the author's name (i.e., your topic) and restate its thesis and/or purpose (i.e., your thesis statement). A few words about where this book fits in the

literature is also advisable; most likely, the author is explicit about it in his or her introduction. The following paragraphs of your review should summarize the argument (chapter by chapter if it there are only a handful, or else by thematic "clusters"), and then discuss the argument's strengths and weaknesses, with supporting evidence taken from the text or from the scholarly literature (other than other book reviews). When you cite, make sure to follow Chicago Style instructions. Finally, your conclusion should provide, to the extent you can, an overall assessment of the work's merits. Tell us whether the author achieved his or her stated goal, and to what audience you would recommend the book. Try to submit as polished a draft as you can; our feedback will be all the more helpful. This assignment is worth 15% of your final grade.

Formatting Instructions:

Double-spaced, 1 inch margins, Times New Roman 12, page numbers in upper right corner. Use the "formal cover page" template provided in the "Essay Checklist: Click your Way to an A" module linked on the syllabus and offered by the Kelly Library. All citations should be formatted in Chicago style.

3) Book Review, Final Draft:

Writing well and clearly requires practice. Based on the editorial feedback we provided on your first draft, revise your review and resubmit. Note that we expect more than a spelling clean up: you may need to revise the substance or the structure of your paper, do a little more research or analysis to support your claims, or else work on improving your grammar and your style. Pay attention to format too: at this stage, we reserve the right to refuse papers that do not meet our requirements. Before submitting, we strongly recommend you go through the "Essay Checklist: Click your Way to an A" module linked on the syllabus and offered by the Kelly Library. This assignment is worth 30% of your final grade.

Formatting Instructions:

Double-spaced, 1 inch margins, Times New Roman 12, page numbers in upper right corner. Use the "formal cover page" template provided in the "Essay Checklist." All citations should be formatted in Chicago style.

Attendance and participation:

Normally, our seminar takes place in a small room, where faculty and students sit around a table and have an in-depth conversation about a set of readings. To reproduce the pedagogical benefits of this kind of setting in an online classroom environment, it is imperative that every student be equipped with the AV hardware and software needed to participate in class discussion. Expect being asked both open and pointed questions about the readings. 20% of your grade will be determined both by your record of attendance and by the quality of your participation throughout the term. We understand that some of you are shy, and that the digital/hybrid environment can be intimidating; yet learning to overcome public speaking anxiety is an important part of your university education. We also know that some of you are, on the contrary, very keen to speak up;

if this is your case, your challenge will be to give others their share of the spotlight. Either way, rest assured that we will do our utmost to make our classroom conducive to friendly discussion.