Seminar: Philosophy of Science

Fall 2019 topic: Science and Big Data

General Information

Course #	PHIL 641
Term	Fall 2019
Course pre-requisite(s)	None, but undergrads require permission of instructor
Course co-requisite(s)	None
Restrictions	Not open to students who have taken PHIL 541
Course schedule	Fridays 12:35 AM-02:25 PM
Number of credits	3
Course location	LEA 927

Instructor Information

Name	Eran Tal
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Office hours for students	Mondays 1-2pm
Office location	LEA 933

Course Overview

Scientific research increasingly involves the collection and processing of large amounts of data. Genetics, neuroscience, medicine, high-energy physics, and sociology are among the areas where large volumes of data have changed the ways scientists design experiments, form and test hypotheses, and collaborate. This seminar will explore a range of ontological, epistemic and ethical questions related to big data across the sciences, including: what are data? Is data-intensive science fundamentally different than traditional modes of scientific inquiry? How can data mining and machine learning contribute to scientific inquiry, and what are the ethical implications of using such methods? Discussions will be non-technical and no previous scientific background is required.

Course Materials

Weekly mandatory readings are available for download from myCourses. References to additional readings will be provided during the seminar.

Course Schedule

Wk	Date	Description	Assignments and/or Readings Due
1	Sep 6	Intro	No reading
2	Sep 13	What are data?	Lyon, A. (2016). Data. In The Oxford Handbook of Philosophy of Science, OUP.
3	Sep 20	Data and information	Floridi, L. (2014). Big Data and Information Quality. In L. Floridi & P. Illari (Eds.), *The Philosophy of Information Quality* (pp. 303–315).
4	Sep 27	Theory and scientific method	Anderson, C. (2008, June 23). The End of Theory: The Data Deluge Makes the Scientific Method Obsolete. *Wired*. Pietsch, W. (2015). Aspects of theory-ladenness in data-intensive science. *Philosophy of Science*, *82*(5), 905–916.
5	Oct 4	Biology 1	Callebaut, W. (2012). Scientific perspectivism: A philosopher of science's response to the challenge of big data biology. *Studies in History and Philosophy of Science Part C: Studies in History and Philosophy of Biological and Biomedical Sciences*, *43*(1), 69–80.
6	Oct 11	Biology 2	Leonelli, S. (2014). What difference does quantity make? On the epistemology of Big Data in biology. *Big Data & Society*, *1*(1).
7	Oct 18	Machine learning	Alpaydin, E., & Bach, F. (2014). *Introduction to Machine Learning*. MIT Press. Chapter 1: "Introduction" **Essay outline due Friday October 18th 11:59 PM on myCourses**
8	Oct 25	The opacity of algorithms	Sullivan, E. (forthcoming). Understanding from Machine Learning Models. *The British Journal for the Philosophy of Science*.
9	Nov 1	Medicine	Fry, H. (2018). *Hello World: How to be Human in the Age of the Machine*. Random House. "Medicine"
10	Nov 8	Public health	Ginsberg, J., Mohebbi, M. H., Patel, R. S., Brammer, L., Smolinski, M. S., & Brilliant, L. (2009). Detecting influenza epidemics using search engine query data. *Nature*, *457*(7232), 1012–1014. Lazer, D., Kennedy, R., King, G., & Vespignani, A. (2014). The Parable of Google Flu: Traps in Big Data Analysis. *Science*, *343*(6176), 1203–1205. Madrigal, A. C. (2014, March 27). In Defense of Google Flu Trends. *The Atlantic*.
11	Nov 15	Social Sciences 1	Boyd, D. & Crawford, K. (2012). Critical Questions for Big Data. *Information, Communication & Society*, *15*(5), 662–679.
12	Nov 22	Social Sciences 2	Elish, M. C., & Boyd, D. (2018). Situating methods in the magic of Big Data and AI. *Communication Monographs*, *85*(1), 57–80.

13	Nov 29	Topic TBA	Reading TBA
			Final essay due Wednesday December 4th 11:59 PM on myCourses

Evaluation

The final mark will be composed of the following:

Name of Assignment	**Due Date**	**% of final grade**
In-class presentation	Once during term	25%
Outline of final essay	Friday October 18th 11:59 PM	15%
Final essay	Wednesday December 4th 11:59 PM	50%
Participation in class discussion	Ongoing	10%

In-class presentation: This is a 15-minute presentation of the required text(s) for the week. The idea is **not** to summarize the entire text but to briefly state the author's main theses and then focus on one or two aspects of the text that you found particularly interesting and / or problematic. End the presentation with one or two questions for class discussion. Using handouts is encouraged.

Essay outline: composed of (i) 2 pages containing your research question, main thesis, brief background and a summary of your argument and (ii) bibliography. Additional instructions on preparing the outline will be given in class.

Final essay: a research essay of about 5000 words. Instructions for writing the essay will be given in class.

Submitting work: essays and outlines are to be submitted online through MyCourses – **not by email**. Submit file in **PDF or DOCX** format only. In other words: if you are using a word-processor other than Microsoft Word, please use the 'save as' or 'export' function to save your work as a PDF before uploading it.

Policy for Late Work: Extensions to deadlines must be requested at least a week in advance of the deadline (except in cases of medical or other emergencies). Essays and essay outlines will be penalized at the rate of 3 percentage points per day overdue.

McGill Policy Statements

Language of Submission:

> **"In accord with McGill University's Charter of Students' Rights, students in this course have the right to submit in English or in French any written work that is to be graded."**

« Conformément à la Charte des droits de l'étudiant de l'Université McGill, chaque étudiant a le droit de soumettre en français ou en anglais tout travail écrit devant être noté (sauf dans le cas des cours dont l'un des objets est la maîtrise d'une langue). »

Academic Integrity:

"McGill University values academic integrity. Therefore, all students must understand the meaning and consequences of cheating, plagiarism and other academic offences under the Code of Student Conduct and Disciplinary Procedures" (see www.mcgill.ca/students/srr/honest/ for more information).

« L'université McGill attache une haute importance à l'honnêteté académique. Il incombe par conséquent à tous les étudiants de comprendre ce que l'on entend par tricherie, plagiat et autres infractions académiques, ainsi que les conséquences que peuvent avoir de telles actions, selon le Code de conduite de l'étudiant et des procédures disciplinaires (pour de plus amples renseignements, veuillez consulter le site www.mcgill.ca/students/srr/honest/).»