Department of Philosophy | University of Guelph

PHIL 6410/4140: Philosophy of Computation

Fall 2023

**Instructors**: Please see Web Advisor for instructor information.

**Offices**: Please see Web Advisor for instructor information.

**Location:** Please consult Courselink for the classroom location.

**Time:** Tuesdays 11:30 AM – 2:20 PM

# Course Description

This course deals with selected issues in the Philosophy of Computation. The course is team-taught, and there are three 4-week modules, each with its own evaluation, completed by/at the end of the module.

The first module of the course (Dr. Hacker-Wright, [jhackerw@uoguelph.ca](mailto:jhackerw@uoguelph.ca)) will cover the currently prominent theories of normative ethics in the context of issues in data science. Specifically, it will cover Utilitarianism, Kantianism, Contractualism, and Virtue Ethics. In each case, the theories will be introduced with examples that show the implications of each normative theory for ethical issues arising from emerging technologies.

The second course module (Dr. Wayne: [awayne@uoguelph.ca](mailto:awayne@uoguelph.ca)) focuses on philosophy of science. We aim to understand and critically evaluate the impacts of big data and artificial intelligence on experiment, scientific method, and the social structure of science.

The third module (Dr. Brennan: [sjbrennan@uoguelph.ca](mailto:sjbrennan@uoguelph.ca)) will focus on Social and Political Philosophy. We will look at issues of power, oppression, and privilege as they relate to data science. Drawing primarily on work in feminist philosophy, we will look at problems with Big Data related to race and gender as well as to the liberatory potential of data science.

# Required Resources

1. Hacker-Wright: all resources will be available on Courselink.
2. Goldenberg: all resources are available on Courselink.
3. Brennan: all resources are available on Courselink

# Learning Outcomes

By the end of this course, you should be able to:

1. Identify and critically evaluate a wide range of philosophical issues related to computation and AI.

2. Write summaries and critical evaluations of philosophical work related to computation and AI.

3. Comprehend ongoing academic and popular discussions about philosophical issues in computation and AI.

# Assessments

Assignment 1 (Instructor: Hacker-Wright) Due Week 4 (33.3%)

This portion of your final grade will be based on a five-page paper, in which you will take up one of the normative frameworks we have discussed in class and apply it to a novel issue in the philosophy of computation, based on research that you will conduct independently. You will be provided with further specifics about this assignment by the second week of class.

Assignment 2 (Instructor: Wayne) Due Week 8 (33.3%)

This portion of your final grade will be based on:

* Two reading responses, approximately 300 words each, pass/fail, due Oct. 19 and Oct. 26 at 10:30 am, worth 5% each,
* An in-class presentation on Nov. 2, worth 5%,
* A critical reflection, approximately 1,200 words, due Nov. 4, worth 18.3%.

Assignment 3 (Instructor: Brennan): 4 papers due weekly (33.3%)

Your grade for this section of the course will be determined by 4 short papers, one due each week on the day of class.

The form of the short papers is called QFCs: “Questions For Consideration.” Students will write a one QFC per class on a reading assigned for that class. You choose which reading.

A QFC is a brief (2-4 page, double spaced) document that does three things:

1. Reproduces a very brief excerpt, with page reference, from one of the readings. You should reproduce an excerpt that exemplifies, or gets to the heart of, the question you will pose (See step 2).

2. Poses an open, searching question about the reading. What do I mean by “open, searching question”? I mean that it must be a question for which you do not know the answer, and one that you wish to investigate with your fellow students and me. The question will not, that is, be a criticism in disguise. It will be something you genuinely wish to work with the group, and with the text, to figure out.

3. Ventures a tentative answer to the question.

Each class, we will work through all of the QFCs students have prepared for that class. That is, your QFCs and the work they encourage us to do \*are\* the class.

Acknowledgement: I originally got the idea for QFC’s from Prof. Kate Norlock at Trent University. She got it from someone else; she doesn’t remember who. I borrowed this version from Prof. Shannon Dea at the University of Regina.

Norlock writes about QFCs here: Norlock, K. “Grading

(Anxious and Silent) Participation: Assessing Student Attendance and Engagement with Short Papers on a ‘Question For Consideration’.” Teaching Philosophy 39.4 (December 2016) 483-50

# Schedule

## Week 1: September 14

Topic

What is a normative ethical theory? Utilitarianism will be introduced as an example of a normative ethical theory, and we will discuss how utilitarianism can be deployed as a powerful theory of rational choice under conditions of uncertainty. We will discuss this in relation theory in relation to designing algorithms for autonomous vehicles and consider generally what we expect, ethically, of autonomous systems and their designers.

### Readings

“Normative Theories of Rational Choice: Expected Utility,” Rachel Briggs

“Why Ethics Matters for Autonomous Cars” Patrick Lin

“Does Humanity Want Computers Making Moral Decisions?” Colin Allen and Wendell Wallach

## Week 2: September 21

### Topic

Kant and Kantian ethics will be introduced, with a focus on the central notions of autonomy and respect for persons. We will discuss how these ideas inform our notions of rights and set limits on the pursuit of utility. We will examine the ties between the ethical notions of autonomy and rational agency and technology by thinking about the possibility of artificial agents.

### Readings

Selection from *Creating the Kingdom of Ends*, Christine Korsgaard

“Artificial life, artificial agents, virtual realities: technologies of autonomous agency” Colin Allen

“Prospects for a Kantian machine” T.M. Powers

## Week 3: September 28

### Topic

This week will introduce contractualism, exploring the idea that morality can be thought of as a social contract, and the implications of this view for idea of rights. In this unit, we will examine the connection between contractualism and privacy rights, with a view to implications for information technology.

### Readings

Selection from *A Theory of Justice,* John Rawls

“Contractualism and Utilitarianism,” T.M. Scanlon

“Design Contractualism for Pervasive/Affective Computing,” Jeremy Pitt

## Week 4: October 5

### Topics

This week will introduce the topic of virtue ethics. This approach focuses on traits of character that are necessary for human beings to flourish. This approach opens up an interesting range of questions about how technologies affect our character and whether that interaction contributes to our inhibits our flourishing.

### Readings

Selection from Shannon Vallor, *Technology and the Virtues.*

## Week 5, October 12: Introduction to scientific method

### Topics

The readings for this week present two classic approaches to scientific method, confirmation theory (Hempel) and falsificationism (Popper). We then look at revolutionary technological developments over the last few decades and identify key questions about their impact on science. These new techniques enable scientists to create, store, and analyze vast amounts of data. We focus on two significant milestones: in 2021, the AI program AlphaFold made a breakthrough prediction of protein folding structures; in 2022, an AI program at Columbia University was fed raw physics data and developed a novel set of physical laws and concepts.

Assignment: None

### Readings

1. Carl Hempel, “Scientific Inquiry: Invention and Test,” in *Philosophy of Natural Science,* Ch. 2 (Prentice-Hall, 1966).
2. Karl Popper, “Science: Conjectures and Refutations,” in *Conjectures and Refutations: The Growth of Scientific Knowledge*, Ch. 1 (Basic Books, 1962).

## Week 6, October 19: Data journeys

### Topics

Our focus this week is on big data. Data need to be selected and cleaned up to be used for computational analysis. Data production and processing methods are incredibly complex. To what extent are these data accurate representations of the natural world? To what extent do big data reflect the interests and motivations of researchers?

Assignment

Reading response due Oct. 19 at 10:30 am, submitted in Courselink (approx. 300 words, pass/fail).

### Readings

1. Sabina Leonelli, “Learning from Data Journeys,” sections 1-3 (pp. 1-12), in *Data Journeys in the Sciences*, S. Leonelli and N. Tempini, eds., (Springer, 2020).
2. Wendy Parker, “Evaluating Data Journeys: Climategate, Synthetic Data and the Benchmarking of Methods for Climate Data Processing,” in *Data Journeys in the Sciences*, pp. 191-204.

## Week 7, October 26: Computational opacity

### Topics

Our focus this week is on artificial intelligence. Recent cases of deep machine learning by artificial neural networks have produced algorithms, statistical methods and outputs that are opaque to human understanding. Alphafold and Columbia's AI programs, for example, yielded incredibly accurate predictions, but we do not understand how these predictions were obtained. How can we reconcile this "alien reasoning" with human scientific goals and methods? Are there ways to increase the transparency of complex computational systems?

### Assignment

Reading response due Oct. 26 at 10:30 am, submitted in Courselink (approx. 300 words, pass/fail).

### Readings

1. Thomas Nickles, “Whatever Happened to the Logic of Discovery? From Transparent Logic to Alien Reasoning,” in W. J. Gonzalez (ed.), *Current Trends in Philosophy of Science*, Ch. 5, (Synthese Library, 2022)
2. Kathleen Creel, “Transparency in Complex Computational Systems,” *Philosophy of Science*, 87 (October 2020) pp. 568–589.

## Week 8, November 2: Critical reflections

### Topics

This week we present our critical assessments of the impact of big data and artificial intelligence on science.

### Assignment

In-class presentation. Critical reflection due Nov. 4, submitted in Courselink (approx. 1,200 words).

### Readings

None.

## Week 9, November 9: Implicit Bias and Big Data

### Topic

This module will focus on social and political philosophy. We will look at issues of power, oppression, and privilege as they relate to data science. We’ll look at problems with big data related to race and gender as well as at the liberatory potential of data science. This week we begin by thinking about the problem of implicit bias.

### Assignment

### QFC due before class

### Readings

### Implicit Bias, Stanford Encyclopedia of Philosophy, https://plato.stanford.edu/entries/implicit-bias/

Johnson, Gabbrielle M. 2021. “Algorithmic bias: on the implicit biases of social technology.” Synthese 198(10): 9941-9961. https://doi.org/10.1007/s11229-020-02696-y.

Excerpts from:

O’Neil, Cathay. 2016. Weapons of Math Destruction: How Big Data Increases Inequality and Threatens Democracy. New York: Crown Publishers. ISBN 978-0553418811.

Perez, Caroline Criado. 2020. Invisible Women: Exposing Data Bias in a World Designed For Men. London: Vintage Publishing.

Case: Big data, racial bias, and credit

Savchuk, Katia. 2019. “Big Data and Racial Bias: Can That Ghost Be Removed from the Machine?” Stanford Business Review, October 28, 2019. <https://www.gsb.stanford.edu/insights/big-data-racial-bias-can-ghost-be-removed-machine>.

## Week 10, November 16: Objectivity, Data, and Democracy

### Assignment

QFC due before class

### Readings

Nguyen, C. Thi. 2020. “ECHO CHAMBERS AND EPISTEMIC BUBBLES.” Episteme 17(2): 141–61. https://doi:10.1017/epi.2018.32.

Regina Rini, Fake News and Partisan Epistemology, Kennedy Institute of Ethics Journal 27 (S2):43-64 (2017)

Regina Rini, Deepfakes and the Epistemic Backstop, Philosophers' Imprint 20 (24):1-16 (2020)

Excerpt from How Algorithms Create and Prevent Fake News by Noah Giansiracusa

### Extra reading

Taylor, Linnet. 2016. “The ethics of big data as a public good: which public? Whose good?” Philos Trans A Math Phys Eng Sci 374(2083):20160126. doi:10.1098/rsta.2016.0126.

Mavriki, Paola and Maria Karyda. 2020. “Big Data Analytics: From Threatening Privacy to Challenging Democracy.” In E-Democracy – Safeguarding Democracy and Human Rights in the Digital Age, edited by Sokratis K. Katsikas and Vasilios Zorkadis, 3-17. Cham: Springer. <https://doi.org/10.1007/978-3-030-37545-4_1>.

## Week 11, Nov. 23: Data and Identity

Assignment:

QFC due before class

### Readings

Basu, Rima. 2022. “The Internet Never Forgets: How Google Shapes and Cements Our Identities.” Open for Debate. Cardiff University. June 13. https://blogs.cardiff.ac.uk/openfordebate/the-internet-never-forgets-how-google-shapes-and-cements-our-identities/

Rosalind Williams, Flis Henwood, Catherine Will & Kate Weiner, Everyday curation? Attending to data, records and record keeping in the practices of self-monitoring, Big Data and Society 7 (1) (2020)

Soraj Hongladarom, Big Data, Digital Traces and the Metaphysics of the Self, In Thomas Powers (ed.), Philosophy and Computing: Essays in Epistemology, Philosophy of Mind, Logic, and Ethics. Springer (2017)

Excerpt from Data Feminism by Catherine D’Ignazio and Lauren Klein

### Extra reading

Coleman, Beth. 2012. “Everything is Animated: Pervasive Media and the Networked Subject.” Body & Society, 18(1):79-98. <https://doi.org/10.1177/1357034X11433488>

## Week 12, November 30: Data and Racism

### Assignment

QFC due before class

Gillard, Chris. 2018. “Fiction-Free Racism”. Real Life Magazine, October 15, 2018. https://reallifemag.com/friction-free-racism/?fbclid=IwAR3Ds8O0fljSkJGbQN67oUlmic5tGl2tj\_O5jlXQ1Z5-o67IzVsl0k9f5XQ.

Excerpt from Algorithms of Oppression: How Search Engines Reinforce Racism, by Safiya Umoja Noble, New York University Press, 2018

Birhane, Abeba, and Fred Cummins. 2019. “Algorithmic Injustices: Towards a Relational Ethics.” 2019. ArXiv preprint arXiv:1912.07376.

Case Study: Prepolicing

Lam, Barry. 2019. “The Precrime Unit”. January 31. Hi-Phi Nation. Guest voices: Hamid Khan, Jamie Garcia, Sarah Brayne, Flora Salim, and Renee Bolinger. Podcast, 48:28. https://hiphination.org/season-3-episodes/s3-episode-1-the-precrime-unit/.

Brayne, Sarah. 2017. “Big Data Surveillance: The Case of Policing.” American Sociological Review 82(5): 977–1008. https://doi.org/10.1177/0003122417725865.

# University Statements

## Email Communication

As per university regulations, all students are required to check their e-mail account regularly: e-mail is the official route of communication between the University and its students.

## When You Cannot Meet a Course Requirement

When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons please advise the course instructor (or designated person, such as a teaching assistant) in writing, with your name, id#, and e-mail contact. The grounds for Academic Consideration are detailed in the Undergraduate and Graduate Calendars. Undergraduate Calendar - Academic Consideration and Appeals https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml

Graduate Calendar - Grounds for Academic Consideration https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml

Associate Diploma Calendar - Academic Consideration, Appeals and Petitions https://www.uoguelph.ca/registrar/calendars/diploma/current/index.shtml

## Drop Date

Students will have until the last day of classes to drop courses without academic penalty. The deadline to drop two-semester courses will be the last day of classes in the second semester. This applies to all students (undergraduate, graduate and diploma) except for Doctor of Veterinary Medicine and Associate Diploma in Veterinary Technology (conventional and alternative delivery) students. The regulations and procedures for course registration are available in their respective Academic Calendars.

Undergraduate Calendar - Dropping Courses https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-drop.shtml

Graduate Calendar - Registration Changes https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/genreg-reg-regchg.shtml

Associate Diploma Calendar - Dropping Courses https://www.uoguelph.ca/registrar/calendars/diploma/current/c08/c08-drop.shtml

## Copies of Out-of-class Assignments

Keep paper and/or other reliable back-up copies of all out-of-class assignments: you may

be asked to resubmit work at any time.

## Accessibility

The University promotes the full participation of students who experience disabilities in their academic programs. To that end, the provision of academic accommodation is a shared responsibility between the University and the student. When accommodations are needed, the student is required to first register with Student Accessibility Services (SAS). Documentation to substantiate the existence of a disability is required; however, interim accommodations may be possible while that process is underway.

Accommodations are available for both permanent and temporary disabilities. It should be noted that common illnesses such as a cold or the flu do not constitute a disability.

Use of the SAS Exam Centre requires students to book their exams at least 7 days in advance and not later than the 40th Class Day. For Guelph students, information can be found on the SAS website https://www.uoguelph.ca/sas For Ridgetown students, information can be found on the Ridgetown SAS website https://www.ridgetownc.com/services/accessibilityservices.cfm

## Academic Integrity

The University of Guelph is committed to upholding the highest standards of academic integrity, and it is the responsibility of all members of the University community-faculty, staff, and students-to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff, and students have the responsibility of supporting an environment that encourages academic integrity. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor.

Undergraduate Calendar - Academic Misconduct https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml

Graduate Calendar - Academic Misconduct https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml

## Recording of Materials

Presentations that are made in relation to course work - including lectures - cannot be recorded or copied without the permission of the presenter, whether the instructor, a student, or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

## Disclaimer

Please note that the ongoing COVID-19 pandemic may necessitate a revision of the format of course offerings and academic schedules. Any such changes will be announced

via CourseLink and/or class email. All University-wide decisions will be posted on the COVID-19 website (https://news.uoguelph.ca/2019-novel-coronavirus-information/) and circulated by email.

## Illness

The University will not normally require verification of illness (doctor's notes) for fall 2020 or winter 2021 semester courses. However, requests for Academic Consideration may still require medical documentation as appropriate.

## Resources

The Academic Calendars are the source of information about the University of Guelph’s procedures, policies, and regulations that apply to undergraduate, graduate, and diploma programs. Academic Calendars https://www.uoguelph.ca/academics/calendars

## Online Behaviour

Inappropriate online behaviour will not be tolerated. Examples of inappropriate online behaviour include:

· Posting inflammatory messages about your instructor or fellow students

· Using obscene or offensive language online

· Copying or presenting someone else's work as your own

· Adapting information from the Internet without using proper citations or references

· Buying or selling term papers or assignments

· Posting or selling course materials to course notes websites

· Having someone else complete your quiz or completing a quiz for/with another student

· Stating false claims about lost quiz answers or other assignment submissions

· Threatening or harassing a student or instructor online

· Discriminating against fellow students, instructors and/or TAs

· Using the course website to promote profit-driven products or services

· Attempting to compromise the security or functionality of the learning management system

· Sharing your user name and password

· Recording lectures without the permission of the instructor

## Privacy

By enrolling in a course, unless explicitly stated and brought forward to their instructor, it is assumed that students agree to the possibility of being recorded during lecture, seminar or other “live” course activities, whether delivery is in-class or online/remote.

If a student prefers not to be distinguishable during a recording, they may:

1. turn off their camera

2. mute their microphone

3. edit their name (e.g., initials only) upon entry to each session

4. use the chat function to pose questions.

Students who express to their instructor that they, or a reference to their name or person, do not wish to be recorded may discuss possible alternatives or accommodations w

## 7.11 Covid-19 Safety Protocols

For information on current safety protocols, follow these links:

<https://news.uoguelph.ca/return-to-campuses/how-u-of-g-is-preparing-for-yoursafe-return/>

<https://news.uoguelph.ca/return-to-campuses/spaces/#ClassroomSpaces>

Please note, these guidelines may be updated as required in response to evolving University, Public Health or government directives.