

# **MCELLBI 65 Neuroscience, Film, and Philosophy**

3 units

Syllabus, Spring 2023

Instructor: Doris Tsao, [dortsao@berkeley.edu](mailto:dortsao@berkeley.edu)

Enrollment limit: 50 students

Time: Fridays 2-5 PM

## **Course Description**

Advances in neuroscience are forcing us to confront anew questions concerning the nature of identity, reality, morality, and free will. Scientists can now implant artificial memories, augment natural brain capabilities, and read out intentions from the brain before they are acted upon. This class intends to shine a light on the brave new world enabled by modern neuroscience through three lenses: science, film, and philosophy. Topics to be covered include: the architecture of the brain, AI & the mind body problem, the neural construction of reality, action and free will, memory, the neural basis of morality, mechanisms for brain wiring, mental illness, and brain machine interfaces.

## **Prerequisites**

None. However, the class assumes a curious mind and a willingness to read materials where, the first time around, one might not understand every detail (due to the expansiveness of the topics).

## **Lecture Format**

This is a 3-unit course. The course will meet once a week, on Friday, for three hours. It is organized into seven two-week sections, each focused on one central topic. In week A, the instructor will give an hour-long lecture. This will be followed by two presentations, one on neuroscience and one on philosophy, by students (~ half hour each). This will then be followed by an hour-long discussion. In week B, we will watch a movie exploring the same question, and have a free discussion afterwards.

## **Textbook**

Quiroga, Rodrigo Quian. 2020. *NeuroScience Fiction: How Neuroscience Is Transforming Sci-Fi into Reality-While Challenging Our Beliefs About the Mind, Machines, and What Makes Us Human*. BenBella Books.

Luo, Liqun. 2020. *Principles of Neurobiology*. Garland Science.

## Weekly Schedule

<b>Date</b>	<b>Lecture Plan</b>	<b>Topic</b>
20-Jan	Introduction	The overall architecture of the brain, <i>The Land of Silence and Darkness</i>
27-Jan	Lecture 1 & student presentations	AI & the Mind Body Problem
3-Feb	Movie 1 & discussion	<i>Blade Runner</i>
10-Feb	Lecture 2 & student presentations	The neural construction of reality
17-Feb	Movie 2 & discussion	<i>The Matrix</i>
24-Feb	Lecture 3 & student presentations	Free will
3-Mar	Movie 3 & discussion	<i>Minority Report</i>
10-Mar	Lecture 4 & student presentations	Memory
17-Mar	Movie 4 & discussion	<i>Eternal Sunshine of the Spotless Mind</i>
24-Mar	Lecture 5 & student presentations	Innate properties of the brain, Talent, and Morality
31-Mar	Movie 5 & discussion	<i>Florence Foster Jenkins</i>
7-Apr	Lecture 6 & student presentations	Mental Illness
14-Apr	Movie 6 & discussion	<i>Shutter Island</i>
21-Apr	Lecture 7 & student presentations	Brain machine interfaces
28-Apr	Movie 7 & discussion	<i>The Diving Bell and the Butterfly</i>
9-May	FINAL EXAM	

## Readings

	<b>Quiroga Book</b>	<b>Neuroscience readings</b>	<b>Philosophy Readings</b>
<b>Lecture 1</b>	Chapter 1-3	Chapter 1, Luo; LeCun et al.	Descartes; Nagel
<b>Lecture 2</b>	Chapter 4, 5	Chapter 4, Luo; Tsao	Kant
<b>Lecture 3</b>	Chapter 6	Chapter 8, Luo; Libet;	Balagauer
<b>Lecture 4</b>	Chapters 7-9	Chapter 11, Luo; Tonegawa et al.	Locke
<b>Lecture 5</b>		Chapter 5, 7, Luo; Brainard	Kant, Churchland
<b>Lecture 6</b>		Chapter 12, Luo; Keller et al.	Jaynes
<b>Lecture 7</b>		Andersen; Moses et al.	Tamburrini

LeCun, Yann, Yoshua Bengio, and Geoffrey Hinton. 2015. "Deep Learning." *Nature*. <https://doi.org/10.1038/nature14539>.

Descartes, Rene. 1987. "Meditations on First Philosophy, Sixth Meditation." *The Philosophical Writings of Descartes*. New York: Cambridge University Press.

Nagel, Thomas. 1974. "What Is It like to Be a Bat." *Readings in Philosophy of Psychology* 1: 159–68.

Tsao, Doris Y. 2019. "Face Values." *Scientific American* 320 (2): 22–29.

Kant, Critique of Pure Reason, Transcendental Aesthetic

Libet, Benjamin. 2003. "The Bereitschafts Potential (BP) and the Conscious Will/Intention to Act." *The Bereitschaftspotential*. [https://doi.org/10.1007/978-1-4615-0189-3\\_3](https://doi.org/10.1007/978-1-4615-0189-3_3).

Balaguer, Mark. 2014. *Free Will*. MIT Press.

Tonegawa, Susumu, Mark D. Morrissey, and Takashi Kitamura. 2018. "The Role of Engram Cells in the Systems Consolidation of Memory." *Nature Reviews. Neuroscience* 19 (8): 485–98.

Locke, John. 1690. "An Essay Concerning Human Understanding." *The Clarendon Edition of the Works of John Locke: An Essay Concerning Human Understanding*. <https://doi.org/10.1093/oseo/instance.00018020>., Chapter 27

Brainard, Michael S., and Allison J. Doupe. 2013. "Translating Birdsong: Songbirds as a Model for Basic and Applied Medical Research." *Annual Review of Neuroscience* 36 (July): 489–517.

Kant, Immanuel, and Hank-McMahon Professor of Philosophy Karl Ameriks. 1998. *Kant: Groundwork of the Metaphysics of Morals*. Cambridge University Press.

Churchland, Patricia. 2019. *Conscience: The Origins of Moral Intuition*. W. W. Norton & Company.

Keller, Georg B., and Thomas D. Mrsic-Flogel. 2018. "Predictive Processing: A Canonical Cortical Computation." *Neuron* 100 (2): 424–35.

Jaynes, Julian. 2000. *The Origin of Consciousness in the Breakdown of the Bicameral Mind*. Houghton Mifflin Harcourt.

Andersen, Richard. 2019. "The Intention Machine." *Scientific American* 320 (4): 24–41.

Moses, David A., Sean L. Metzger, Jessie R. Liu, Gopala K. Anumanchipalli, Joseph G. Makin, Pengfei F.

Sun, Josh Chartier, et al. 2021. "Neuroprosthesis for Decoding Speech in a Paralyzed Person with Anarthria." *The New England Journal of Medicine* 385 (3): 217–27.

Tamburrini, Guglielmo. 2014. "Philosophical Reflections on Brain–Computer Interfaces." In *Brain-Computer-Interfaces in Their Ethical, Social and Cultural Contexts*, edited by Gerd Gröbler and Elisabeth Hildt, 147–62. Dordrecht: Springer Netherlands.

## **Exams and Grading**

10% class attendance

20% class presentation (each student will choose a group with which to give one presentation, on either a neuroscience or philosophical topic)

10% quizzes (every other week, on assigned readings)

30% final written exam

30% final project

## **Final Project**

-Students will be free to choose a topic of choice, related to the class theme, and to write an essay or story or make a film on the topic;

-Example topics for exploration include: the conscious experience of people born without vision or hearing, the Chinese Room Paradox and its relation to large scale language models in modern AI, speculations on how to augment someone's computational powers with a brain machine interface and how to then probe their consciousness, the science and philosophy of time perception, the science of social cognition and implications for modern social networks. Please note that are just examples! You should follow your own interests.

-Projects will be graded on creativity, clarity, and effort.

## **Berkeley Honor Code Statement**

### **The student community at UC Berkeley has adopted the following Honor Code:**

“As a member of the UC Berkeley community, I act with honesty, integrity, and respect for others.”  
The hope and expectation is that you will adhere to this code.

**Collaboration and Independence:** Reviewing lecture and reading materials and studying for exams can be enjoyable and enriching things to do with fellow students. This is recommended. However, unless otherwise instructed, homework assignments are to be completed independently and materials submitted as homework should be the result of one’s own independent work.

**Cheating:** A good lifetime strategy is always to act in such a way that no one would ever imagine that you would even consider cheating. Anyone caught cheating on a quiz or exam in this course will receive a failing grade in the course and will also be reported to the University Center for Student Conduct. In order to guarantee that you are not suspected of cheating, please keep your eyes on your own materials and do not converse with others during the quizzes and exams.

**Plagiarism:** To copy text or ideas from another source without appropriate reference is plagiarism and will result in a failing grade for your assignment and usually further disciplinary action. For additional information on plagiarism and how to avoid it, see, for example:  
<http://gsi.berkeley.edu/teachingguide/misconduct/prevent-plag.html>

**Academic Integrity and Ethics:** Cheating on exams and plagiarism are two common examples of dishonest, unethical behavior. Honesty and integrity are of great importance in all facets of life. They help to build a sense of self-confidence, and are key to building trust within relationships, whether personal or professional. There is no tolerance for dishonesty in the academic world, for it undermines what we are dedicated to doing – furthering knowledge for the benefit of humanity.

Your experience as a student at UC Berkeley is hopefully fueled by passion for learning and replete with fulfilling activities. And we also appreciate that being a student may be stressful. There may be times when there is temptation to engage in some kind of cheating in order to improve a grade or otherwise advance your career. This could be as blatant as having someone else sit for you in an exam, or submitting a written assignment that has been copied from another source. And it could be as subtle as glancing at a fellow student’s exam when you are unsure of an answer to a question and are looking for some confirmation. One might do any of these things and potentially not get caught. However, if you cheat, no matter how much you may have learned in this class, you have failed to learn perhaps the most important lesson of all.

## **Safe, Supportive and Inclusive Environment**

Whenever a faculty member, staff member, post-doc, or GSI is responsible for the supervision of a student, a personal relationship between them of a romantic or sexual nature, even if consensual, is against university policy. Any such relationship jeopardizes the integrity of the educational process.

Although faculty and staff can act as excellent resources for students, you should be aware that they are required to report any violations of this campus policy. If you wish to have a confidential discussion on

matters related to this policy, you may contact the Confidential Care Advocates on campus for support related to counseling or sensitive issues. Appointments can be made by calling (510) 642-1988.

The classroom, lab, and work place should be safe and inclusive environments for everyone. The Office for the Prevention of Harassment and Discrimination (OPHD) is responsible for ensuring the University provides an environment for faculty, staff and students that is free from discrimination and harassment on the basis of categories including race, color, national origin, age, sex, gender, gender identity, and sexual orientation. Questions or concerns? Call (510) 643-7985, email [ask\\_ophd@berkeley.edu](mailto:ask_ophd@berkeley.edu), or go to <http://survivorsupport.berkeley.edu/>.