

Cognitive Robotics (Fall 2024)

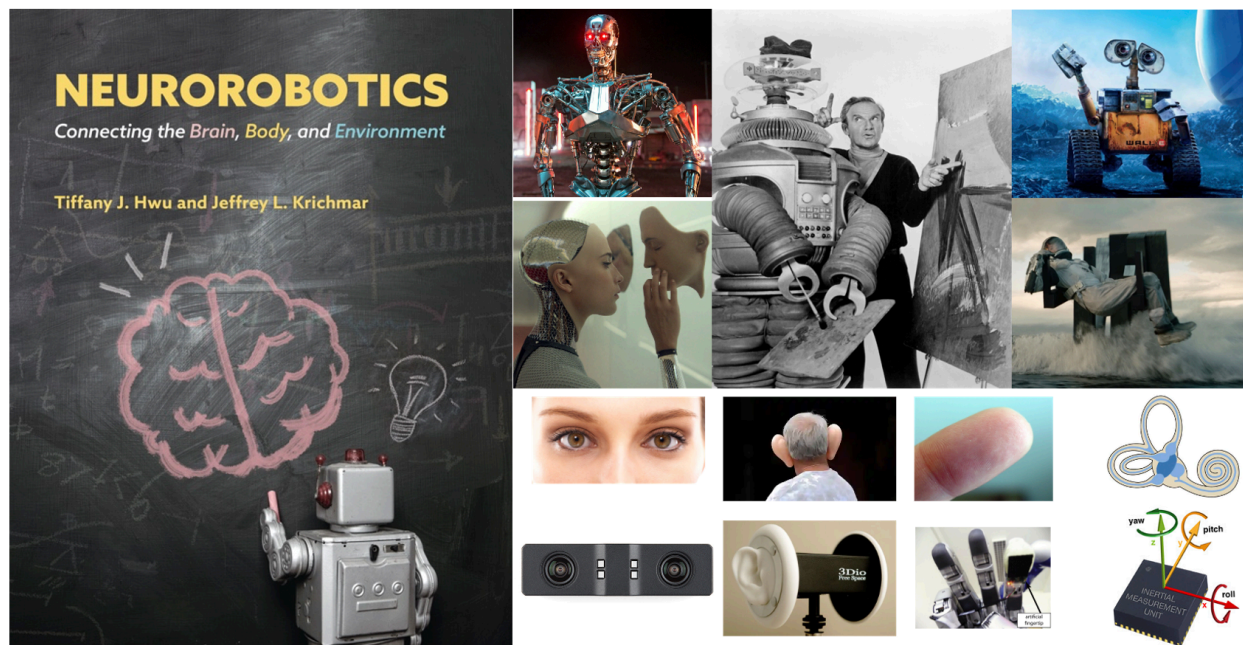
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COGS 112R/LR – Cognitive Robotics

PSYCH 112R/LR – Cognitive Robotics

Fall 2024



Course website: <https://canvas.eee.uci.edu/courses/66812>

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Lecture and Instruction: Tuesdays and Thursdays from 2PM until 3:20PM

Room: ALP 3600/3610

Lab Section 1: Tuesdays from 3:30PM until 6:20PM

Room: ALP 3600

Lab Section 2: Thursdays from 3:30PM until 6:20PM

Room: ALP 3600

Instructor: Jeff Krichmar - jkrichma@uci.edu (<mailto:jkrichma@uci.edu>)

Office: SBSG 2328

Office Hours – Tuesdays 12PM–1:30PM or by Appointment

Teaching Assistants:

- Heliodoro (Helio) Tejada Lemus – htejeda@uci.edu (<mailto:htejeda@uci.edu>)
 - Office: SBSG 2277
 - Office Hours: TBD
- Ya-Ning Wu – yaninw1@uci.edu (<mailto:yaninw1@uci.edu>)
 - Office: SBSG ????
 - Office Hours: TBD

Course Description:

Neurobots are robots whose control has been modeled after some aspect of the brain. Since the brain is so closely coupled to the body and situated in the environment, neurobots can be a powerful tool for studying neural function in a holistic fashion. It may also be a means to develop autonomous systems that have some level of biological intelligence. The motivation to study neurorobotics comes from both a desire to understand cognition as well as to improve autonomous applications. In this course, we will explore the field of neurorobotics. Each week we will cover topics related to neurorobotics, look at a neurobot case study, and learn concepts using a virtual robot simulator.

Lectures have been pre-recorded and will be available on Canvas via YuJa. During the lecture portion of the class, we will go over the lecture materials and answer any questions students may have. We will also teach fundamentals of programming in Python and using the LEGO Spike Prime robot.

Exams based on lecture materials and lab programming assignments. Exams will be held in ALP 3600/3610. Exams will be open book, open note, open computer. No communications (DMs, IMs, text messages or emails allowed during exam). Grades will be curved.


This course fulfills the Psychology Lab Requirement. **NO PROGRAMMING EXPERIENCE IS REQUIRED.**

Textbook:


Neurorobotics: Connecting the Brain, Body and Environment.

Tiffany Hwu & Jeff Krichmar, MIT Press, 2022.

Supplementary materials: <https://faculty.sites.uci.edu/krichmarlab/>
(<https://faculty.sites.uci.edu/krichmarlab/>)

Publisher's website: <https://mitpress.mit.edu/9780262047067/neurorobotics/> 
(<https://mitpress.mit.edu/9780262047067/neurorobotics/>)

Software: Spike Prime App

1. Software available at: <https://education.lego.com/en-us/downloads/spike-app/software> 
(<https://education.lego.com/en-us/downloads/spike-app/software>)
2. Installed in ALP 3600/3610.
3. Can be installed on your computer, tablet, or phone.

Grading and Course Requirements:

Lab Reports	20%	DROP THE LOWEST GRADE FROM THE AVERAGE
Chapter Quizzes	10%	DROP THE LOWEST GRADE FROM THE AVERAGE
Mid-term examination	20%	NO MAKEUP EXAMINATIONS. NO EXCEPTIONS
Final examination	25%	NO MAKEUP EXAMINATIONS. NO EXCEPTIONS
Final project	25%	

REPORTS AND FILES MUST BE TURNED INTO THE CANVAS ASSIGNMENT BEFORE THE DEADLINE. NO EXCEPTIONS.

Course Schedule

Week	Lectures (Tuesday and Thursday)	Lab Assignment
0 – Sep 26	Introduction to Cognitive Robotics Using LEGO Spike Prime with Python	
1 – Oct 1 & 3	Chapter 1 – Neurorobotics: Origins and Background	Spike Prime Getting Started
2 – Oct 8 & 10	Chapter 2 – Neuroscience: <ul style="list-style-type: none"> • Background for Creating Neurorobots 	Vehicles
3 – Oct 15 & 17	Chapter 3 – Learning and Memory	Visual Navigation
4 – Oct 22 & 24	Chapter 4 – Reinforcement Learning and Prediction	Robot Conditioning
5 – Oct 29 & 31	Midterm Exam (Tuesday, October 29 th)	
6 – Nov 5 & 7	Chapter 5 – Neurorobot Design Principles, Part 1 <ul style="list-style-type: none"> • Every Action has a Reaction 	Robot Maze with Model Free RL
7 – Nov 12 & 14	Chapter 6 – Neurorobot Design Principles, Part 2 <ul style="list-style-type: none"> • Adaptive Behavior to Change for the Better 	Basal Ganglia Action Selection
8 – Nov 19 & 21	Chapter 7 – Neurorobot Design Principles 3: <ul style="list-style-type: none"> • Behavioral Tradeoffs, Life is Full of Compromises 	Final Projects
9 – Nov 26	Chapter 10 – Neurorobotics: Past, Present and Future	Final Projects
10 – Dec 3 & 5	Finals Review and Final Projects	Final Projects Due on December 8 th
Finals – Dec 12	Final Exam <ul style="list-style-type: none"> • Thursday, December 12th, 1:30 – 3:30PM 	

Course Summary: