UCLA Brain Mapping Center

Neuro 222
Brain Imaging and Brain Stimulation

Course Introduction
28 September 2023

Course Objectives

- Provide an introduction to the use of brain imaging and brain stimulation in isolation or in combination to understand neural circuitry, systems, and networks in health and disease.
- Explore the opportunities and limitations of the two fields, and how to overcome them by combining the two approaches for the investigation of brain systems and functions.

Course Format

- We have several instructors who are experts in the specific topics of this course who will be lecturing.
- We have asked the instructors to submit their slides prior to the lectures. Slides will be made available through the course website (password-protected).
- Discussions on the topics are encouraged
- All of us are passionate about these topics and happy to discuss them

Module 1: Brain Imaging

Week	Date	Topic	Instructor
0	9/28/2023	Course Introduction Neuroanatomy	Iacoboni / Joshi / Shattuck Allan MacKenzie-Graham, PhD
1	10/3/2023	Course Overview/Project Discussion	Iacoboni / Joshi / Shattuck
1	10/5/2023	Neuroanatomy	Allan MacKenzie-Graham, PhD
2	10/10/2023	MR Physics	Robert Welsh, PhD
2	10/12/2023	MR Physics	Robert Welsh, PhD
3	10/17/2023	Structural MRI	David Shattuck, PhD
3	10/19/2023	Diffusion MRI	David Shattuck, PhD
4	10/24/2023	Functional MRI (fMRI)	Martin Monti, PhD
4	10/26/2023	Positron Emission tomography (PET)	Roger Woods, MD
5	10/31/2023	Shape Modeling/Statistical Analysis	Shantanu Joshi, PhD
5	11/2/2023	Review Brain Imaging	Iacoboni / Joshi / Shattuck

Module Part 2: Brain Stimulation

Week	Date	Topic	Instructor
6	11/7/2023	Transcranial Magnetic Stimulation (TMS) Physiology	Marco Iacoboni, MD PhD
6	11/9/2023	TMS Mapping	Marco Iacoboni, MD PhD
7	11/14/2023	TMS Clinical	Marco Iacoboni, MD PhD
7	11/16/2023	Transcranial Direct Current Stimulation (tDCS) & Head modeling/Simulation	Mayank Jog, PhD
8	11/21/2023	Transcranial Ultrasound (tUS)	Martin Monti, PhD
8	11/23/2023	Thanksgiving Break (no lecture)	
9	11/28/2023	Deep Brain Stimulation	Martin Seeber, PhD
9	11/30/2023	Project Presentations - Part 1	
10	12/5/2023	Project Presentations - Part 2	
10	12/7/2023	Exam Review	

Evaluation

35% - Exam on Brain Imaging (take-home)

35% - Exam on Brain Stimulation (take-home)

20% - Project on a Brain Imaging or Brain Stimulation topic. In-class presentation during Weeks 9 & 10

10% - Class Participation - comments, questions, and discussions during lectures, reviews, and project presentations; preparing for class by reading the assigned papers.

Reading

- We will select 2-4 papers per week for you to review prior to the lecture.
- Papers will be listed on the syllabus at https://neuro222.bmap.ucla.edu/.
- Assigned papers will be finalized at least a week before each lecture. A preliminary list is online now.
- All assigned papers will have URLs that should be accessible through the UCLA network. We can provide pdfs if you are unable to download the papers.
- Additional reading will be recommended during the lectures if you want to learn more about a particular topic.

Exams

- Exams will be take home, open notes.
- You will have one week to complete the exam.
- We will provide you with a set of questions (~6-7), from which you may select a subset to answer (~4).
- Answers will be limited to 1-2 pages per question.
- You may include references in your answers.
- More detailed instructions will be provided when the exams approach.

Projects

- We will discuss the projects next Tuesday (10/3/23).
- The goal of the projects are to provide you with hands-on experience using computational tools for studying brain imaging and brain stimulation data.
- We encourage team projects that make use of the broad range of experience within the class.
- We will provide examples next week of the types of projects we think would be suitable for the course (e.g., analysis of structural or functional MRI data, simulating induced electric fields in a head model).
- We encourage you to explore your own ideas and study things that are of most interest to you.
- Please give this some thought before class next week so we can have a productive discussion.