

BEP-480/670 Neuroimaging

Spring 2026, College of Education, The University of Alabama

Instructor: Dr. Firat Soylu (fsoylu@ua.edu)

Room: Autherine Lucy Hall 327

Meeting Time: Tuesdays, 9:00 AM– 11:50 AM

Office hours: Weds 12:00 pm - 2:00 pm. Reserve a time-slot

Office: Capital Hall 1812

Course Description

This course provides students with an overview of the methods, experimental design principles, and analytical skills used in functional magnetic resonance imaging (fMRI) research. We will focus on designing experiments, creating data analysis pipelines in a Matlab environment, best practices in MRI research, and open science principles.

Student Learning Outcomes

Students will:

- learn the basics of functional Magnetic Resonance Imaging (fMRI) in tutorial sessions, including understanding the hemodynamic response function, BOLD signal, preprocessing of fMRI data, experimental design, and basic statistical analysis of fMRI data.
- learn about MRI safety, stimuli presentation, data collection, and data organization by attending lab sessions.
- gain hands-on experience with fMRI as some lab sessions will take place at the on-campus MRI facility.
- learn about the applications and uses of fMRI by presenting scientific papers in which fMRI was used to answer research questions about cognition and by listening to their classmates' presentations.
- monitor their own learning by completing weekly quizzes and summarizing lab sessions.
- explore practical and ethical issues related to MRI research.

Prerequisites

BEP 220 - Brain, Learning, and Cognition (for BEP 480)

Textbook

Huettel, S. A., Song, A. W., & McCarthy, G. (2014). Functional Magnetic Resonance Imaging (3rd ed.). Sinauer Associates. ISBN: 978-1605354170

You can opt in to use the access granted ebook version or acquire the hardcopy of the book.

Software

The software listed below need to be installed on your personal computer to complete the class activities. You can also use university computers, which already have MATLAB, and just install the SPM25 toolbox. You will learn how to setup these software in class.

- **MATLAB:** You will need to have MATLAB on your laptop to be able to do the in-class activities and assignments. UA has a MATLAB site license, meaning that all students and faculty have free access to MATLAB and all its toolboxes.
- **EEGLAB:** SPM25 is an open-source and free neuroimaging data analysis toolbox that works on MATLAB. Download SPM25

Contacting the Instructor

You can contact the instructor, Dr. Firat Soyly, through email (fsoyly@ua.edu). Please ensure that you have “BEP 480/670” in your subject line.

Summary of Course Activities

This course comprises 13 modules. We will cover one module each week. In the first half of every class session, we will start with a 30-40 min lecture providing an overview of the contents for the week, followed by a quiz based on the same contents. In the second half, we will discuss a paper and then will conduct practical fMRI data analysis activities. Students will also complete a final project at the end of the semester.

- **Quizzes:** There will be a quiz for each module. Each quiz will have 10 multiple-choice questions. The quizzes will be given every Tuesday and can only be taken in class.
- **Group-led paper discussion:** Each week a group of students will lead a discussion on an fMRI paper. More information will be provided on how these activities will be structured on the course website.
- **Final project prospectus (due March 13th):** By the eighth week of the class you will submit a two page prospectus for your project that lays out the focus of your project, the research questions and your preliminary ideas for the research design. We can have a one-on-one meeting to discuss your project ideas. The proposal will also have a tentative bibliography showing the body of literature you will use in your project.
- **Final project submission (due April 29th):** You will submit a project report, together with the batch scripts for your data analysis.

Use of Generative AI

AI use is generally not allowed. All submitted work must be produced by the students themselves, whether individually or collaboratively. Use of a generative AI tools such as ChatGPT to complete an assignment constitutes academic misconduct. However, generative AI can be used for searching about literature on a specific topic, provided that you read the original work, or searching for answers to technical questions.

Schedule & Weekly Themes

- Introduction to the class, the syllabus and the software environment.
 - Jan 13
- Module 1: An Introduction to fMRI
 - Chapter 1, Jan 20
- Module 2: MRI Scanners
 - Chapter 2, Jan 27
- Module 3: Basic Principles of MRI Signal Generation
 - Chapter 3, Feb 3
- Module 4: Basic Principles of MRI Image Formation
 - Chapter 4, Feb 10
- Module 5: MRI Contrast Mechanisms and Acquisition Techniques
 - Chapter 5, Feb 17
- Module 6: From Neuronal to Hemodynamic Activity
 - Chapter 6, Feb 24

- Module 7: BOLD fMRI: Origins and Properties
 - Chapter 7, March 3
- Module 8: Signal, Noise, and Preprocessing of fMRI Data
 - Chapter 8, March 10

******* Spring Break *******

- Module 9: Experimental Design
 - Chapter 9, March 24
 - Final project prospectus is due
- Module 10: Statistical Analysis I: Basic Analyses
 - Chapter 10, March 31
- Module 11: Statistical Analysis II: Advanced Approaches
 - Chapter 11, April 7
- Module 12: Advanced fMRI Methods
 - Chapter 12, April 14
- Module 13: The Future of fMRI: Practical and Ethical Issues
 - Chapter 14, April 21

******* Final project submission (April 29, 11:59 PM) *******

Grading

Class attendance (2 pt/class. Total of 13 classes, with a max of 24 pts counting towards the final grade)	24 pts
Weekly quizzes (3 pt/quiz. Total of 13 quizzes, with a max of 36)	36 pts
Group-led paper discussion	10 pts
Final project prospectus	5 pts
Final project paper & scripts	25 pts
Total	100 pts

Grading scale: A+: 97–100, A: 93–96, A–: 90–92, B+: 87–89, B: 83–86, B–: 80–82, C+: 77–79, C: 73–76, C–: 70–72, D+: 67–69, D: 63–66, D–: 60–62, F: 0–59 (BEP 480)

Grading scale: A: 90–100, B: 80–89, C: 70–79, D: 60–69, F: 0–59 (BEP 670)

Policy Statements

Policy on Missed Exams and Coursework

It is important that students turn in all assignments on time and attend classes. Each week, students are required to complete an in-class quiz. You cannot take the quiz if you don't show up for class. Except in the case of documented severe illness, funeral of a family member, or a personal, catastrophic or religious event (as defined by the University policies), assignments submitted late are not accepted. There will not be any exceptions to the policy stated here.

Attendance Policy

Class attendance is necessary and required. It is expected that you undertake appropriate prior preparation for each class period and actively participate during class. Attendance will be taken. In the case of an excused absence (documented severe illness, funeral of a family member, or a personal, catastrophic or religious event, as defined by the University policies), please contact me by email in advance of the absence.

Notification of Changes

The instructor will make every effort to follow the guidelines of this syllabus as listed; however, the instructor reserves the right to amend this document as the need arises. In such instances, the instructor will notify students in class and/or via email and will endeavor to provide reasonable time for students to adjust to any changes.

Mission of the College of Education

Our mission in the College of Education is to be a leader in Alabama and across the nation in teaching, scholarship, advocacy, and service by developing professionals with pedagogic and disciplinary expertise who advance the intellectual and social conditions of all learners in a globalized society.

Conceptual Framework Summary

The vision of the College of Education (COE) at The University of Alabama is to develop effective, ethical, and reflective professionals who advance the theme of the COE: Unite, Act, and Lead (UA Leads). By engaging in theoretically informed and intellectually advanced effective practice our graduates will

UNITE with the larger community to collaboratively nurture cultural competence, empathy, and a vision of equity and justice for all learners;

ACT to develop the full potential of all learners to be excellent professionals in their fields; and

LEAD through continuous research-based critical inquiry of policy and reflective practice to enable transformative change in our diverse local and global communities.

Dispositions

We strive to create programs that emphasize Fairness and Equity, Reflective Stance for Professional Practice, a Commitment to Diversity, and a Culture of Collaboration.

Statement on Academic Misconduct

Students are expected to be familiar with and adhere to the official Code of Academic Conduct provided in the Online Catalog (<https://catalog.ua.edu>).

Statement on Disability Accommodations

- Contact the Office of Disability Services (ODS) as detailed in the Online Catalog.
- The Office of Disability Services (ODS) is the central contact point for UA students with disabilities. The goal of ODS is to ensure that University programs and services are accessible to qualified students with disabilities. For student who may require their services more information is available at <http://ods.ua.edu>. ODS is located at 1000 Houser Hall and their phone number is 348-4285 (voice) or 348-3081 (TTY).

Severe Weather Protocol

Please see the latest Severe Weather Guidelines in the Online Catalog. The link for the Severe Weather Guidelines is <https://ready.ua.edu/severe-weather-guidelines/>

Statement on Pregnant and Parenting Students

Title IX is a federal law that prohibits discrimination on the basis of sex in an education program. Among the types of gender discrimination covered by this statute, Title IX protects against discrimination related to pregnancy or parental status. Protection extends to students who are pregnant or who have either had a false pregnancy, termination of pregnancy, have gone through childbirth, or are recovering from any of those conditions. Title IX regulations also prohibit a school from applying any rule related to a student's parental,

family or marital status that treats students differently based on their sex. For more information, please visit http://provost.ua.edu/uploads/3/9/7/6/39760652/student_pregnancy_faq_final_8_11_17.pdf

Statement on Religious Observances

The University of Alabama respects the religious diversity of our academic community and recognizes the importance of religious holy days and observances in the lives of our community members. For more information, please go to <http://provost.ua.edu/religious-observances.html>

Statement on Academic Work Duplication

Any submission of academic work designed to meet the requirements of a particular credit-bearing course is assumed to be work completed for that course and only that course; the same material submission, or material that is substantially similar, may not be used to meet the requirements of another course. Any violation of this rule may result in a referral to the Associate Dean for Student Services and Certification for disciplinary action.

UAct Statement

The UAct website provides an overview of The University's expectations regarding respect and civility. The website link is <https://www.ua.edu/campuslife/uact/>