

The University of Oklahoma
School of Computer Science
C S 4723/5723: Neural Data Science
Fall 2025

Class Format: In Person	Website
Meeting Times: T/R 09:00 AM - 10:15 AM	Location: Carson Engineering Center 438
Instructor: Sina Khanmohammadi	sinakhan@ou.edu
Office Hours: M/W/F 9:00 AM - 10:00 AM	Location: DEH 245
* All times are in Central Time (CT)	

Prerequisites:

- Computer Programming (C S 1213, C S 1313, C S 1321, C S 1323, C S 1324)
- Statistics (ECE 2523, ISE 3293, MATH 4743, MATH 4753)
- or Permission of Instructor.

Course Description: This course will introduce the fundamental concepts of neural data analysis and its implementation using computer programming. Topics include statistical modeling, connectivity analysis, time-frequency analysis, and pattern recognition.

Learning Outcome:

- CS 4723
 - Describe the basic principles and physiological foundations of neural data.
 - Identify a suitable type of data to study different properties of the brain.
 - Develop and utilize computational techniques to analyze neural data.
- CS 5723 (in addition to the CS 4723 outcomes)
 - Gain insights into current research topics in neural data analysis.
 - Improve written and oral communication skills with course project.

Course Materials:

Required Textbook:

- Hans Op de Beeck and Chie Nakatani, *Introduction to Human Neuroimaging*, Cambridge University Press, 2019. [Website](#)

Other References:

- Katarzyna J. Blinowska and Jaroslaw Zygierecz, *Practical Biomedical Signal Analysis using MATLAB*, CRC Press, 2021. [Website](#)
- Kayvan Najarian and Robert Splinter, *Biomedical Signal and Image Processing*, CRC Press, 2012. [Website](#)
- Fabian J. Theis and Anke Meyer-Base, *Biomedical Signal Analysis: Contemporary Methods and Applications*, MIT Press, 2010. [Website](#)

Grading:

CS 4723:

- Class Activity (10%)
- Homework x5 (50%)
- Midterm Exam (20%)
- Final Exam (20%)

CS 5723:

- Class Activity (10%)
- Homework x5 (35%)
- Midterm Exam (20%)
- Final Exam (20%)
- Project (15%)

Project Breakdown:

- Proposal (5%)
- Presentation (5%)
- Report (5%)

Grade Scale:

- A (90-100)
- B (80-89)
- C (70-79)
- D (60-69)
- F (≤ 59)

Tentative Schedule (Subject to change):

Week1	8/26-8/28	.....	Introduction and Overview
Week2	9/02-9/04	.....	Introduction and Overview
Week3	9/09-9/11	.....	Programming in Python
Week4	9/16-9/18	.....	Basics of Signal Processing
Week5	9/23-9/25	.....	Exploring EEG Data
Week6	9/30-10/02	.....	Preprocessing EEG Data
Week7	10/07-10/09	.....	Time-Frequency Analysis of EEG Data
Week8	10/14-10/16	.....	Basics of Machine Learning
Week9	10/21-10/23	.....	Decoding Analysis using EEG Data
Week10	10/28-10/30	.....	Basics of Statistics
Week11	11/04-11/06	.....	Exploring fMRI Data
Week12	11/11-11/13	.....	Preprocessing fMRI Data
Week13	11/18-11/20	.....	GLM Modeling of fMRI Data
Week14	11/25-11/27*	.....	Basics of Graph Theory
Week15	12/02-12/04	.....	Connectivity Analysis using fMRI Data
Week16	12/09-12/11	.....	Project Presentations

* Thanksgiving. No Classes between Nov. 26 - Nov. 30.

Important Dates (Tentative):

Homework 1	.....	9/19 @ 11:50 PM
Homework 2	.....	10/17 @ 11:50 PM
Midterm Exam	.....	10/23 @ 9:00 AM
Homework 3	.....	10/31 @ 11:50 PM
Project Proposal	.....	11/1 @ 11:50 PM
Homework 4	.....	11/26 @ 11:50 PM
Homework 5	.....	12/10 @ 11:50 PM
Project Package (Report, Slides, Code)	.....	12/12 @ 11:50 PM
Final Exam	.....	12/15 @ 8:00 AM

* All the times are in Central Time (CT)

Learning Activities, Assignments, and Assessments :**Class Activity:**

- The class activities are part of the final grade and include attendance, surveys, quizzes, and discussions.

Homework Assignments:

- There will be five homework assignments, each worth 100 points.
- Your answers should be accompanied by complete, clear, and accurate supporting work. For example, if the answers include coding, you need to provide comments describing each line of your code.
- An answer with no work or large gaps in the work will receive minimal credit.
- You are free to collaborate with others to complete your homework, but you are not allowed to simply copy answers from other students or resources (check “Academic Integrity” in course policies for more details).
- You need to showcase your knowledge and effort by writing the answers in your own way.

Exams:

- There will be two exams (midterm and final) each worth 100 points.
- The exam will be closed-book and closed-notes exams (you are not allowed to bring any notes or resources).
- Cheating in any form will not be tolerated (check “Academic Integrity” in course policies for more details).

Project:

- Students who are taking this course at a graduate level will have a project as part of their assignments.
- The exact format and structure of the project will be provided during the semester and involve a topic in neural data analysis.
- The project proposal is due in the middle of the semester and the project report and presentation will be due at the end of the semester.
- The project presentation slides and write-ups must be written exclusively by you (check “Academic Integrity” in course policies for more details).

Course Policies: The instructor reserves the right to add, remove, or change any element of class policy at any time and for any reason, within the limits of University policy.

Academic Integrity and Plagiarism:

- The work you turn in needs to be your own. This includes putting written work into your own words and citing your sources, as appropriate to avoid plagiarism. If you work in a group, seek assistance from a tutor, use a resource on campus (including writing center and math center), and/or use online resources (including AI software), the work you turn in must be your own, demonstrating your own understanding of the material that you have gained through the learning process.
- Penalties for serious offenses include a zero on the assignment and egregious offenses can even result in expulsion from the university, so it is important to understand expectations.
- Plagiarism as defined by the [OU Integrity Office](#) includes:
 - Copying words and presenting them as your own writing.
 - Copying words, even if you give the source, unless you also indicate that the copied words are a direct quotation “”.
 - Copying words and then changing them a little, even if you give the source.
 - Even if you express it in your own words, it is plagiarism to use someone else’s idea as your own.
 - Copying any downloaded code or solutions (whether documented or undocumented) is considered academic misconduct and will be treated as such. Exceptions to this policy (such as a course project that builds on an existing open-source project) may be requested in advance to be granted by the instructor.
- For more information, check out the student’s guide to [academic integrity](#) to become more familiar with what constitutes as academic misconduct.

Attendance:

- Regular attendance is expected and will be monitored.
- Signing in for someone else is not permitted and is considered a violation of the academic integrity policy for this course.
- The sign in will be taken at a random time of the class, so please arrive on time and stay in the class for the entire duration.
- Excused absence will be considered for legitimate and serious reasons such as a medical emergency (including mental or physical, with a doctor’s, counselor’s, or ADRC note), family emergencies (such as illness or death in a close relation), university sponsored activities (including provost approved or director of athletics approved activities), and legally required activities (such as emergency military service and jury duty).
- Excused absence must be requested at least 24 hours before the class time.

Classroom Conduct:

- All electronic devices, including cell phones and laptops, should be muted and put in silent mode before the beginning of class.
- Using electronic devices, including cell phones and laptops, for anything other than course work (attending class remote sections, taking notes, checking references, and submitting quizzes) is not allowed.
- Disruptions of the class by exhibiting erratic or irrational behavior is not permitted.
- Making physical or verbal threats to a faculty member, teaching assistant, or class members will not be tolerated.
- Failure to comply with the classroom conduct policy may cause the student being asked to leave the classroom and/or reported for possible violation of the [student rights and responsibilities code](#).

Communication:

- Check [Canvas](#) and your [OU email](#) at least every 24 hours for announcements and updates such as changes in deadlines, syllabus, homework assignments, etc.
- It is your responsibility to be aware of information and notices given via Canvas or email. If you face any difficulties accessing these services, contact [OU IT support](#) to get it resolved as soon as possible.
- Please [turn on your Canvas notifications](#), so that you receive announcements automatically via email/text.
- Please make sure to contact the appropriate person that could help with your issue. Failure to do so might result in delayed response and resolution of your issue. Here is a quick guideline for communication:
 - Administrative (enrollment, transcripts, etc): The OU student advisor.
 - Accommodation Requests (accessible seating, extended deadlines, etc): ADRC.
 - Course Material (lectures, assignments, textbook): First the TA, if not resolved the instructor.
 - General Inquires (course content, teaching methods, etc): The instructor.
 - Grading Issues (missing grades, regrade requests, etc): First the Grader, if not resolved the instructor.
 - Technical Problems (accessing Canvas, installing software, etc): OU IT Help Desk.
- You could contact the instructor and TAs using Canvas or email with the following subject line: [CS 2813]-[NAME]-[REASON].
- Please allow at least 48 hours to get a response to your email.
- Office hours are times in which you may ask questions about course content, delve deeper into the topic through conversation with me, share concerns you have about the course, and/or explore career or graduate school opportunities with me in this field.
- If you need to join the office hours remotely, make sure you notify me before the office hours so I could arrange the remote session.

Generative Artificial Intelligence (GAI):

- The use of Generative AI including, but not limited to, ChatGPT, CoPilot, ClaudeAI, Bard, and Grammarly AI for the assignments is considered a violation of the academic integrity policy for this course.
- Using generative AI for other aspects of the course such as explaining concepts in the textbook and lectures is permitted.

Grading:

- The actual distribution of scores could affect the thresholds used to convert to letter grades.
- All the grades will be uploaded to Canvas online grade book. It is your responsibility to verify that the grades on Canvas are correct.
- You may appeal any grades (homework, project, and class activity) within 72 hours of receiving your grade in Canvas.

Late Work:

- Late submission (even for few minutes) is not permitted for any of the assignments.
- Late submission without an excused reason such as medical emergency (including mental or physical, with a doctor's, counselor's, or ADRC note), family emergencies (such as illness or death in a close relation), university sponsored activities (including provost approved or director of athletics approved activities), or legally required activities (such as emergency military service and jury duty) will result in a grade of zero for that assignment.
- Excused late submission must be requested at least 48 hours before the deadline.

Makeups:

- Makeup assignments will be only available when required by University policy (such as having three or more exams scheduled for the same day).

- If you miss an assignment because of a medical emergency (including mental or physical, with a doctor's, counselor's, or ADRC note), family emergencies (such as illness or death in a close relation), university sponsored activities (including provost approved or director of athletics approved activities), or legally required activities (such as emergency military service and jury duty), necessary arrangements will be made for your accommodation.
- Makeup assignments must be requested at least 72 hours before the deadline.

Remote Session: In case of remote sessions, the following policies apply:

- You are encouraged to share your video for the entire duration of the lecture to help maximize engagement.
- If you don't like to show your surroundings in the remote meetings, you may use one of the [virtual backgrounds provided by OU](#).
- All the public remote sessions, including lectures and presentations, are subject to recording.
- You will not get attendance credits for watching recorded videos, you have to attend the live remote session during the actual class time.
- During lectures, you can unmute and ask questions by holding the "space" key on your keyboard.
- If the instructor experiences any technical difficulties and loses connection, you should stay in the remote meeting for at least 15 minutes. If the problem persists, you can log out and the instructor will provide a pre-recorded video for that session.

Student Feedback:

- My goal is to create a positive and productive learning experience in which everyone is welcome, included, and able to learn and succeed. As such, suggestions and comments for improvement of the course are always welcomed.
- If something is said or done in these dialogues that prohibits you from being able to participate in this class, I ask that you reach out to me directly. You may also choose to use other resources on campus, such as reporting through the 24-Hour Reporting Hotline (call [844-428-6531](#)). This hotline can be used to report bias, discrimination, physical or mental harassment, or misconduct by OU community members.
- Apart from the informal feedback, there is also the formal course evaluation process at the end of each semester. The College of Engineering and Faculty members take these evaluations seriously for making promotions, giving awards, and improving teaching effectiveness. Please take a time and respond to these questions as honestly and precisely as possible.

Technology:

- We going to utilize Canvas for this class. Please check the [Getting Started with Canvas](#) to become familiar with Top Hat.
- All the homework assignments must be submitted to Canvas with one question per page (do not include solutions to multiple questions on one page).
- If your answers include handwritten notes, you could use either Canvas mobile app (available in [Android](#) and [iOS](#)) or a desktop scanner to submit your answers.
- If your answers need typesetting, you could use either [L^AT_EX](#) or [Microsoft Word](#), and then convert the files into a PDF file.
- If your answers include code, you could use [Jupyter notebook](#) to run your code and then convert it into a PDF file.
- Please allocate sufficient time before the deadlines to avoid any technical difficulties.

University Policies: In case of any conflicts between course policy and the university policy, the university policy takes precedence.

Mental Health Support Services: Support is available for any student experiencing mental health issues that are impacting their academic success. Students can either be seen at the University Counseling Center (UCC) located on the second floor of Goddard Health Center or receive 24/7/365 crisis support from a licensed mental health provider through [TimelyCare](#). To schedule an appointment or receive more information about mental health resources at OU please call the UCC at [\(405\) 325-2911](#). or visit [University Counseling Center](#). The UCC is located at 620 Elm Ave., Room 201, Norman, OK 73019.

Title IX Resources and Reporting Requirement:

The University of Oklahoma faculty are committed to creating a safe learning environment for all members of our community, free from gender and sex-based discrimination, including sexual harassment, domestic and dating violence, sexual assault, and stalking, in accordance with Title IX. There are resources available to those impacted, including: speaking with someone confidentially about your options, medical attention, counseling, reporting, academic support, and safety plans. If you have (or someone you know has) experienced any form of sex or gender-based discrimination or violence and wish to speak with someone confidentially, please contact [OU Advocates](#) (available 24/7 at [405-615-0013](#)) or [University Counseling Center](#) (M-F 8 a.m. to 5 p.m. at [\(405\) 325-2911](#).)

Because the University of Oklahoma is committed to the safety of you and other students, and because of our Title IX obligations, I, as well as other faculty, Graduate Assistants, and Teaching Assistants, are mandatory reporters. This means that we are obligated to report gender-based violence that has been disclosed to us to the Institutional Equity Office. This means that we are obligated to report gender-based violence that has been disclosed to us to the Institutional Equity Office. This includes disclosures that occur in: class discussion, writing assignments, discussion boards, emails and during Student/Office Hours. You may also choose to report directly to the Institutional Equity Office. After a report is filed, the Title IX Coordinator will reach out to provide resources, support, and information and the reported information will remain private. For more information regarding the University's Title IX Grievance procedures, reporting, or support measures, please visit [Institutional Equity Office](#) at [405-325-3546](#).

Reasonable Accommodation Policy: The University of Oklahoma (OU) is committed to the goal of achieving equal educational opportunity and full educational participation for students with disabilities. If you have already established reasonable accommodations with the Accessibility and Disability Resource Center (ADRC), please log into iAdvise to request your semester accommodations as soon as possible and contact me privately, so that we have adequate time to arrange your approved academic accommodations.

If you have not yet established services through ADRC, but have a documented disability and require accommodations, please complete [ADRC's pre-registration form](#) to begin the registration process. ADRC facilitates the interactive process that establishes reasonable accommodations for students at OU. For more information on ADRC registration procedures, please review their [website](#). You may also contact them at [\(405\)325-3852](#) or adrc@ou.edu, or visit www.ou.edu/adrc for more information.

Note: disabilities may include, but are not limited to, mental health, chronic health, physical, vision, hearing, learning and attention disabilities, pregnancy-related. ADRC can also support students experiencing temporary medical conditions.

Religious Observance: It is the policy of the University to excuse the absences of students that result from religious observances and to reschedule examinations and additional required classwork that may fall on religious holidays, without penalty. [[See Faculty Handbook 3.15.2](#)].

Adjustments for Pregnancy/Childbirth Related Issues: Should you need modifications or adjustments to your course requirements because of pregnancy or a pregnancy-related condition, please request modifications via the [Institutional Equity Office](#) website or call the Institutional Equity Office at [405/325-3546](#) as soon as possible. Also, see the Institutional Equity Office [FAQ on Pregnant and Parenting Students' Rights](#) for answers to commonly asked questions.

Final Exam Preparation Periods: Pre-finals week will be defined as the seven calendar days before the first day of finals. Faculty may cover new course material throughout this week. For specific provisions of the policy please refer to OU's [Final Exam Preparation Period policy](#).

Emergency Protocol: During an emergency, there are official university [procedures](#) that will maximize your safety.

Severe Weather: If you receive an OU Alert to seek refuge or hear a tornado siren that signals severe weather:

1. LOOK for severe weather refuge location maps located inside most OU buildings near the entrances.
2. SEEK refuge inside a building. Do not leave one building to seek shelter in another building that you deem safer. If outside, get into the nearest building.
3. GO to the building's severe weather refuge location. If you do not know where that is, go to the lowest level possible and seek refuge in an innermost room. Avoid outside doors and windows.
4. GET IN, GET DOWN, COVER UP.
5. WAIT for official notice to resume normal activities.

Additional [Weather Safety Information](#) is available through the Department of Campus Safety.

The University of Oklahoma Active Threat Guidance: The University of Oklahoma embraces a Run, Hide, Fight strategy for active threats on campus. This strategy is well known, widely accepted, and proven to save lives. To receive emergency campus alerts, be sure to update your contact information and preferences in the account settings section at [one.ou.edu](#).

1. RUN: Running away from the threat is usually the best option. If it is safe to run, run as far away from the threat as possible. Call [911](#) when you are in a safe location and let them know from which OU campus you're calling from and location of active threat.
2. HIDE: If running is not practical, the next best option is to hide. Lock and barricade all doors; turn off all lights; turn down your phone's volume; search for improvised weapons; hide behind solid objects and walls; and hide yourself completely and stay quiet. Remain in place until law enforcement arrives. Be patient and remain hidden.
3. FIGHT: If you are unable to run or hide, the last best option is to fight. Have one or more improvised weapons with you and be prepared to attack. Attack them when they are least expecting it and hit them where it hurts most: the face (specifically eyes, nose, and ears), the throat, the diaphragm (solar plexus), and the groin.

Please save OUPD's contact information in your phone.

- NORMAN campus: For non-emergencies call [\(405\) 325-1717](#). For emergencies call [\(405\) 325-1911](#) or dial [911](#).
- TULSA campus: For non-emergencies call [\(918\) 660-3900](#). For emergencies call [\(918\) 660-3333](#) or dial [911](#).

Fire Alarm/General Emergency: If you receive an OU Alert that there is danger inside or near the building, or the fire alarm inside the building activates:

1. *LEAVE* the building. Do not use the elevators.
2. *KNOW* at least two building exits.
3. *ASSIST* those that may need help.
4. *PROCEED* to the emergency assembly area.
5. *ONCE* safely outside, *NOTIFY* first responders of anyone that may still be inside building due to mobility issues.
6. *WAIT* for official notice before attempting to re-enter the building.

[OU Fire Safety on Campus](#)