New York University
Tandon School of Engineering
Computer Science and Engineering
CS-GY 9223 / CS-UY 3943 - Neuroinformatics
Spring 2026

Professor Erdem Varol
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Time: 2:00 PM - 4:30 PM Tuesdays;
Classroom: 2 MetroTech Room 817
Office hours: Fridays 10:00-11:00 AM(via Zoom)
TA's: TBD

Course Website: https://www.neuroinformaticslab.com/neuroinformatics-cs-gy-9223

Course Pre-requisites:

- Data Structures or equivalent
- Proficiency in programming (particularly Python)
- Basic knowledge of statistics and an introductory understanding of neuroscience

Course Description:

Neuroinformatics is an interdisciplinary course merging neuroscience and computational methods to analyze and interpret complex neural data. Students will learn to handle large-scale neuroimaging and electrophysiological datasets, apply signal processing and machine learning techniques to neural signals, and build computational models to understand brain function. The course emphasizes both theoretical foundations and hands-on programming projects, preparing students for research and industry roles in neurotechnology and computational neuroscience.

Course Load and Evaluation:

- Class Participation: 20%
  - This involves presenting relevant literature papers in a "journal club" fashion at the end of each class.
- **Midterm project:** Group project with an in-class presentation – 30%
  - This will be broken into several milestones that will assigned every two weeks.
- **Final Project:** Group project with an in-class presentation – 50%
  - This will also be broken into several milestones that will assigned every two weeks.

Detailed rubrics and deadlines will be provided on Brightspace and Slack.

Course Topics:

Part I: Foundations and Data Processing

- **Introduction to Neuroinformatics:** Scope, challenges, and opportunities in the field
- **Neuroimaging Techniques:** Overview of fMRI, EEG, MEG, and other modalities
- **Data Acquisition & Preprocessing:** Signal filtering, normalization, and artifact removal
- **Neural Signal Processing:** Time series analysis, spectral analysis, and connectivity metrics
- **Brain Network Analysis:** Graph theoretical approaches and network metrics

Part II: Advanced Computational Methods

- **Machine Learning in Neuroinformatics:** Classification, clustering, and pattern recognition of neural data
- **Computational Modeling of Neural Systems:** Simulation of neural dynamics and network behavior
- **Brain–Computer Interfaces (BCI):** Concepts, design principles, and application areas
- **Data Visualization & Interpretation:** Techniques for visualizing complex neural datasets
- **Capstone Final Project:** Integrative project applying course concepts to a real-world neuroinformatics dataset

Readings and Resources:

Primary Text:

- Dayan, P., & Abbott, L. F. (2005). *Theoretical neuroscience: computational and mathematical modeling of neural systems.* MIT press.
- Gerstner, W., Kistler, W. M., Naud, R., & Paninski, L. (2014). *Neuronal dynamics: From single neurons to networks and models of cognition.* Cambridge University Press. Online link.
- Bassett, D. S., & Sporns, O. (2017). Network neuroscience. *Nature neuroscience*, 20(3), 353-364.

Supplementary Readings:

- Selected research papers and online resources available on the course website

All lecture slides, handouts, and assignment guidelines will be distributed via Brightspace and Slack.

Projects:

Each programming project consists of two phases:

1. **Guided Implementation:** Follow instructions to implement specific methods and analyze a dataset.
2. **Exploratory Phase:** Extend the method or explore creative solutions beyond the baseline implementation.

A detailed, formatted report is required for both phases, including code documentation, graphs, and data visualizations to illustrate your methodology and results.

Inclusion, Diversity, Belonging, Equity and Accessibility (IDBE)

NYU is committed to creating an inclusive and equitable environment for all students. In this class, I aim to cultivate a strong sense of community, emphasizing that it is a space where individuals of diverse backgrounds—spanning beliefs, ethnicities, national origins, gender identities, sexual orientations, religious and political affiliations, and abilities—are treated with respect. All members of the class are expected to contribute to an inclusive atmosphere for each other. While disagreement and differing ideas are welcome, the expectation is that we respect perspectives beyond our own, even when they diverge from our personal beliefs or experiences. If you encounter disrespect or discrimination in the class or feel that the outlined standards are not being upheld, please report your experiences to me.

Moses Center Statement of Disability

If you are student with a disability who is requesting accommodations, please contact New York University's Moses Center for Students with Disabilities (CSD) at 212-998-4980 or mosescsd@nyu.edu. You must be registered with CSD to receive accommodations. Information about the Moses Center can be found at www.nyu.edu/csd. The Moses Center is located at 726 Broadway on the 3rd floor.

NYU School of Engineering Policies and Procedures on Academic Misconduct – complete Student Code of Conduct **here**

Introduction: The School of Engineering encourages academic excellence in an environment that promotes honesty, integrity, and fairness, and students at the School of Engineering are expected to exhibit those qualities in their academic work. It is through the process of submitting their own work and receiving honest feedback on that work that students may progress academically. Any act of academic dishonesty is seen as an attack upon the School and will not be tolerated. Furthermore, those who breach the School's rules on academic integrity will be sanctioned under this Policy. Students are responsible for familiarizing themselves with the School's Policy on Academic Misconduct.

Definition: Academic dishonesty may include misrepresentation, deception, dishonesty, or any act of falsification committed by a student to influence a grade or other academic evaluation. Academic dishonesty also includes intentionally damaging the academic work of others or assisting other students in acts of dishonesty. Common examples of academically dishonest behavior include, but are not limited to, the following:

Cheating: intentionally using or attempting to use unauthorized notes, books, electronic media, or electronic communications in an exam; talking with fellow students or looking at another person's work during an exam; submitting work prepared in advance for an in-class examination; having someone take an exam for you or taking an exam for someone else; violating other rules governing the administration of examinations.

Fabrication: including but not limited to, falsifying experimental data and/or citations.

Plagiarism: intentionally or knowingly representing the words or ideas of another as one's own in any academic exercise; failure to attribute direct quotations, paraphrases, or borrowed facts or information.
Unauthorized collaboration: working together on work meant to be done individually.

Duplicating work: presenting for grading the same work for more than one project or in more than one class, unless express and prior permission has been received from the course instructor(s) or research adviser involved.

Forgery: altering any academic document, including, but not limited to, academic records, admissions materials, or medical excuses.

NYU School of Engineering Policies and Procedures on Excused Absences – complete policy here

Introduction: An absence can be excused if you have missed no more than **10 days of school**. If an illness or special circumstance has caused you to miss more than two weeks of school, please refer to the section labeled Medical Leave of Absence.

Students may request special accommodations for an absence to be excused in the following cases: Medical reasons, Death in immediate family, Personal qualified emergencies (documentation must be provided), Religious Expression or Practice

Deanna Rayment, deanna.rayment@nyu.edu, is the Coordinator of Student Advocacy, Compliance and Student Affairs and handles excused absences. She is located in 5 MTC, LC240C and can assist you should it become necessary.

NYU School of Engineering Academic Calendar – complete list here.

Please pay attention to notable dates such as Add/Drop, Withdrawal, etc. For confirmation of dates or further information, please contact Susana Garcia: sgarcia@nyu.edu