MATLAB for Brain, Biological, and Cognitive Scientists

Spring 2018

BIOL 691 — Current Topics Biology

NEUR 592 — Current Topics Neuroscience

Time: Fridays: 10:30 am – 1:10 pm

Classroom: Innovation Hall 205

Instructor: Frank Krueger, Ph.D.

Interdisciplinary Program in Neuroscience [website]

School of Systems Biology [website]

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Office hour: By appointment

Course Description: The objective of this hybrid course (face-to-face & synchronous online) is to provide students an introductory programming course in MATLAB, which is a special-purpose language that makes it possible to write a powerful moderate-size program to solve computational problems. With a focus within the fields of biology, neuroscience, and cognitive sciences, the course includes two major parts that include programming assignments and a data project: first, students will learn about MATLAB fundamentals through illustration of important computational concepts and second, they will learn about data analysis and modeling through implementation of their own data project.

Learning Outcomes: On successful completion of the course, students will (i) become familiar with general concepts in computer science, (ii) gain an understanding of the general concepts of programming, and (iii) obtain a solid foundation in the use of MATLAB.

PRELIMINARY SCHEDULE OF TOPICS

Class	Date	Topics
Week 1[+]	**01/26/18**	**Organization: MATLAB Environment**
Week 2[+]	02/02/18	Fundamentals: Matrices and Operators*
Week 3[#]	02/09/18	Fundamentals: Functions & Visualization*
Week 4[#]	02/16/17	Fundamentals: Selection & Loops*
Week 5[#]	02/23/18	Fundamentals: Programmer's Toolbox*
Week 6[#]	03/02/18	Fundamentals: Data Types & File Input/ Output*
Week 7[#]	**03/09/18**	**Fundamentals: Mid-Term Exam**
Week 8	**03/16/18**	**SPRING BREAK**
Week 9[#]	03/23/18	Data Project: Organizing & Preprocessing Data*
Week 10[#]	03/30/18	Data Project: Clustering Data*
Week 11[#]	04/06/18	Data Project: Creating Classification & Regression Models*
Week 12[#]	04/13/18	Data Project: Interpreting & Evaluating Models*
Week 13[#]	04/20/18	Data Project: Simplifying Data Sets*
Week 14[#]	04/27/18	Data Project: Improving Model Performances*
Week 15[#]	05/04/18	**Data Project: Presentation**

[*] Programming assignments are due **before Wednesday, 11:59 pm**

[+] Face-to-Face Class

[#] Synchronous Online Class

Required Textbook

Wallisch P, Lusignan ME, Benayoun MD, Baker TI, Dickey AS, Hatsopoulos NG. (2014). *MATLAB for Neuroscientists: An Introduction to Scientific Computing in MATLAB*, 2nd ed. Academic Press.

Additional readings will be assigned.

Exams and Grading Policy

Grades will be determined on the basis of (i) programming assignments and (ii) data project presentation. Your final grade will be calculated as 2/3 "programming assignment" grade + 1/3 "data project presentation" grade.

Student Responsibilities

MasonLive/Email: Students are responsible for the content of university communications sent to their George Mason University email account and are required to activate their account and check it regularly. For accessibility and privacy, the university, school, and program will send communications to students solely through their Mason email account—students should respond accordingly [Masonlive Login information].

Students with Disabilities: Students with disabilities who seek accommodations in a course must be registered with the George Mason University Office of Disability Services (ODS) and inform their instructor, in writing, at the beginning of the semester [Office of Disability Services].

Academic Integrity: Students must be responsible for their own work, and students and faculty must take on the responsibility of dealing explicitly with violations. The tenet must be a foundation of our university culture [Academic Integrity].

Honor Code and Virtual Classroom Conduct: Students must adhere to the guidelines of the George Mason University Honor Code. We value critical thinking and therefore, it is imperative that students read the assigned books and articles prior to the class with a critical eye. Active thought, quality of inputs, and a conflict resolution attitude should be your guiding principles. The principle of academic integrity is taken very seriously and violations are treated gravely. What does academic integrity mean in this course? Essentially this: when you are responsible for a task, you will perform that task. When you rely on someone else's work in an aspect of the performance of that task, you will give full credit in the proper, accepted form. Another aspect of academic integrity is the free play of ideas. Vigorous discussion and debate are encouraged in this course, with the firm expectation that all aspects of the class will be conducted with civility and respect for differing ideas, perspectives, and traditions. When in doubt (of any kind) please ask for guidance and clarification. Plagiarism is the equivalent of intellectual robbery and cannot be tolerated in the academic setting. If you have any doubts about what constitutes plagiarism, please see me [Honor Code].

University Policies: Students must follow the university policies [University Policy].

Responsible Use of Computing: Students must follow the university policy for Responsible Use of Computing [Responsible Use of Computing].

University Calendar: Details regarding the current Academic Calendar [University Calendar].

University Catalog: The current university catalog [University Catalog].

Student Services

Writing Center: The George Mason University Writing Center staff provides a variety of resources and services (e.g., tutoring, workshops, writing guides, handbooks) intended to support students as they work to construct and share knowledge through writing [Writing Center].

ESL Writing Support: The ESL (English as a Second Language) program was designed specifically for students whose first language is not English who feel they might benefit from additional, targeted support over the course of an entire semester [ESL Writing Support].

University Libraries: University Libraries provides resources for distance students [University Library].

Counseling and Psychological Services: The George Mason University Counseling and Psychological Services (CAPS) staff consists of professional counseling and clinical psychologists, social workers, and counselors who offer a wide range of services (e.g., individual and group counseling, workshops and outreach programs) to enhance students' personal experience and academic performance [Counseling and Psychological Services].

Family Educational Rights and Privacy Act (FERPA): The Family Educational Rights and Privacy Act of 1974 (FERPA), also known as the "Buckley Amendment," is a federal law that gives protection to student educational records and provides students with certain rights [FERPA].