



**Directed Research – Data Science with Julia  
CDS490-001**

**Tuesdays August 24 – November 30: 4:30–7:10pm  
Finals Period: Tuesday December 14: 4:30–7:15pm**

**Blueridge Hall 127<sup>1</sup>**

**Syllabus  
v20210822**

**Instructor**

Prof. Dale S. Rothman  
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*Office hours:* Wednesdays and Thursdays 3:00-5:00PM and by appointment  
in office or on Microsoft Teams (see instructions below)

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<sup>1</sup> Zoom links for, and recordings of, sessions will be made available on Blackboard.  
CDS490 Fall 2021 Syllabus - v20210822

## COURSE OVERVIEW

This course is an introduction to the Julia Programming Language and its potential for use in the computational and data sciences. Julia is a new language – a little over a decade old – but it has been gaining a lot of traction (see. e.g., [Julia: The Goldilocks Language](#)).

This will be a practical course on using Julia. We will leave all the details about how Julia works and why it has certain advantages to computer science folks. We will begin with the basics, e.g., general Julia syntax, data types, operations, etc.; working with data (including reading in external files); and simple visualization. We will then move onto more detailed applications, e.g., statistical analysis, machine learning, and computer simulation. Given that this course is for advanced undergraduates, exactly what applications we will explore, and how we will explore them (individually, in groups, or as the whole class), will be decided upon, in large part, by the participants in the class.

To be upfront, I am still relatively new to the use of Julia myself. Therefore, I expect there to be a lot of mutual learning going on in this course. I very much look forward to working with you on exploring to possibilities for this new language.

## COURSE MANAGEMENT

### Course Website

The class website on Blackboard is the hub for this course. It contains, *inter alia*, a copy of this syllabus, Zoom links to the synchronous sessions and office hours, weekly outlines, links to readings (other than from the required text) and other preparatory material, links to the software to be used in the course, course assignments, and your grades.

Material for each week is provided in the weekly overview sections. Please note that course handouts (i.e. lecture slides) will be made available after classes.

Any important changes to the website during the semester will be announced.

### Office Hours

*Professor Rothman:* My official office hours will be on Wednesdays and Thursdays from 3:00-5:00PM. Generally, I will be working from home on Wednesdays and in the office on Thursdays (Research Hall, Room 374). I will be using the Bookings feature on Microsoft Teams to manage pre-scheduled appointments during these times. The link for pre-scheduling a 15 minute appointment is <https://outlook.office365.com/owa/calendar/GMUDale@gmuedu.onmicrosoft.com/bookings/>. This will automatically set up a Teams meeting, but we can also meet in my office if we are both on campus. You should also feel free to stop by my office or try to contact me on Microsoft Teams during these times. If I am not assisting another student, I will be happy to meet with you until the next scheduled appointment or until the end of the day. For appointments outside of these hours, please contact me to schedule a time that works for both of us.

## ASSIGNMENTS AND GRADING

You can earn up to 101 points in this course, as indicated by the assignments below. Note that there are no in-class exams, including midterm or final, in this course

- *FERPA Release Form (1)*: You will need to sign and submit a FERPA release form for this course (see section on Software below). No additional assignments will be graded until this form is submitted and will be treated as late submissions. If you submit the form by the start of class on Tuesday August 31, you will receive this bonus point.

In all cases, assignments are to be submitted on Blackboard.

Based on the final total score, your final grade will be determined as follows: A+ [97-101], A [93-96.99], A- [90-92.99], B+ [87-89.99], B [83-86.99], B- [80-82.99], C+ [77-79.99], C [73-76.99], C- [70-72.99], D [65-69.99], F [<65].

## COURSE MATERIALS

### Readings and other Preparatory Material

All readings and preparatory material are listed in the weekly sections on the class website. These will consist of, *inter alia*, required readings, optional readings, links to websites, and videos. The optional readings may or may not be discussed in class, depending on the time available, but is nonetheless included in the interest of depth and completeness.

### Software

To keep things simple, I would very much like all members of the class to use the same software setup for running Julia. This will be to use the Julia Extension in Microsoft VSCode (see <https://www.julia-vscode.org/>). In addition to providing a nice IDE, it is now possible to create and run Jupyter notebooks using Julia code inside VSCode.

We will spend part of the first session making sure everybody gets set up properly. If you wish to get a head start, you can follow the instructions at <https://github.com/julia-vscode/julia-vscode#installing-juliavs-codevs-code-julia-extension>. As of today (22 August 2021), the versions I am using are Julia 1.6.2 and VSCode 1.59.1 (do not use the Insiders version), with the following VSCode Extension:

- Julia 1.3.30 (do not use the Insiders version)
  - once you install this extension, please open the settings and make sure of the following:
    - The setting for Executable Path points to the correct file. In a Mac, this is usually  
/Applications/Julia.app/Contents/Resources/julia/bin/Julia.  
We can figure out what it is on a Windows or Linux machine.
    - The setting for Notebook Controller is checked. This will allow us to use Jupyter notebooks. In a future version of this extension, this will not be necessary.

Finally, because the licenses for these software packages are not provided by Mason, you need to complete and sign a FERPA release form. I have included this as an assignment on the class website, and you will receive 1 extra credit point for submitting the signed form by the start of the second week of classes. If not, you will still need to submit the signed form before I will grade any of your other exams or assignments; they will be treated as late submissions until the form is submitted.

## COURSE SCHEDULE

### Schedule<sup>2,3</sup>

- **Week 1 (August 24): Introduction**
  - **Key Topics/Activities**
    - Course Introduction; setting up and reviewing the programming environment; adding packages and other basics
  - **Assignments**
    - Complete FERPA Waiver
    - Basic Julia Exercises
  - **Required Reading(s)/Preparatory Material**
    - [Julia: The Goldilocks Language](#)
  - **Key Websites**
    - <https://julialang.org/>: homepage for the Julia Programming Language
    - <https://code.visualstudio.com/>: homepage for Visual Studio Code
    - <https://www.julia-vscode.org/>: homepage for the Julia Extension for VSCode
  
- **Week 2 (August 31):**
- **Week 3 (September 7):**
- **Week 4 (September 14):**
- **Week 5 (September 21):**
- **Week 6 (September 28):**
- **Week 7 (October 5):**
- **Week 8 (October 12): No class, related to Fall Break on October 11**
- **Week 9 (October 19):**
- **Week 10 (October 26):**
- **Week 11 (November 2):**
- **Week 12 (November 9):**
- **Week 13 (November 16):**
- **Week 14 (November 23):**
- **Week 15 (November 30):**
- **Finals Period (December 14):**

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<sup>2</sup> Subject to change due to unforeseen circumstances.

<sup>3</sup> Session listed in italics are considered mandatory

## PERSONAL POLICIES

### **Contacting Prof. Rothman outside of Office Hours**

Correspondence can be done using the Email feature on Blackboard or via regular email sent from your GMU email. My ground rules for emails related to the class are as follows:

- Emails from your GMU email should include CDS490 at the start of the Subject field. If not, there is a good chance I will miss it and not respond.
- I check and respond to messages during normal university hours (i.e. weekdays 9am-5pm).
- Just because I view a message does not mean I will respond right away. Please allow up to 24 hours for a response during normal hours and longer on weekends and holidays.
- If your questions are involved enough, I will ask you to schedule an appointment with me.
- Questions asked about an assignment within 5 hours of the deadline may not be answered before the deadline.<sup>4</sup>

### **Class Attendance and Behavior in Class**

Class attendance is expected, but, unless noted, not mandatory. I will be taking attendance, however, in case it is needed for contact tracing for COVID. Not attending a class session is not considered a valid excuse for missing information about class content or assignments. I do plan on recording all sessions on Zoom and making these recordings available, so if you need to miss a session, you are expected to watch the recording of the session.

While in class, I expect a certain pattern of behavior. I plan to start class sessions on time; if you arrive late, please enter in a way that does not disturb others.

### **Assignments in General**

I try to be as clear as possible in the guidance I provide for the assignments, either in the assignment itself or a separate guidance document. I do expect you to read these carefully and to contact me, before you submit the assignment if anything is not clear. Sometimes this includes specifications on how I want you to prepare your submission, e.g., what software to use (e.g. Microsoft Word), formatting, and filenames. Please do not forget to include your name (or those of your group members) on your assignments and, unless otherwise noted, include page numbers. I do reserve the right to deduct points, or send back submissions for re-submission, for not following these guidelines. These may seem unnecessarily prescriptive, but they are intended to: 1) instill good practices in your work and 2) make the grading process, including providing feedback, smoother and faster. Please be aware that I tend to be somewhat forgiving early in the semester, but get increasingly strict as the semester proceeds. I appreciate your cooperation with this.

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<sup>4</sup> Exceptions to this rule are determined on a case-by-case basis. For example, I will do my best to respond when there are unexpected technical glitches.

## **Writing in Assignments**

While this is not a class on writing, and I recognize that English is not everybody's first language, I do expect your assignments to be well written. Excellent analysis cannot make up for poor communication. This includes, but is not limited to: extensive grammatical errors and/or misspellings; inadequate citation and/or missing/incomplete references; and confusing, illegible, or inadequately described figures and tables. Furthermore, I look for clarity and proper explanation in your writing. When I grade, I will not "read between the lines." By this, I mean that I will not spend a lot of time trying to figure out what you mean or connecting the dots, so it is best to err on the side of more explanation than less.

I do have a couple of pet grammatical peeves. If you have questions about any of these, please let me know:

- make sure you know the difference between effect and affect
- make sure you know the difference between its and it's
- the word data is plural, so you should say, e.g., the data are, not the data is; the singular of data is datum

All this is to say, when doing an assignment, please leave yourself enough time to review and, if necessary, edit what you have written. I try to do the same in the materials I prepare for you, and you should feel free to let me know when I fall short of these standards.

Finally, if you feel you need further assistance with writing, please make use of the GMU Writing Center - <https://writingcenter.gmu.edu/>.

## **Late Assignments**

I expect all assignments to be submitted on time. Unless otherwise noted, late assignments will be penalized 5% initially and another 5% for each additional 24-hour period beyond when they are due. Of course, there can be valid reasons for late submissions, which will receive due consideration. Some factors, beyond official reasons, e.g., military duty, that make it more likely that penalties will not be assessed include:

- you have contacted me well prior to the submission deadline, where well prior means at least a day;
- you have completed prior assignments on time;
- the reason for not meeting the deadline is appropriate - e.g., deaths in the family, yes; waited until the last day to start, no.



## **GENERAL CAMPUS POLICIES**

### **Academic Honesty and Collaboration**

The integrity of the University community is affected by the individual choices made by each of us. GMU has an Honor Code with clear guidelines regarding academic integrity. Three fundamental and rather simple principles to follow at all times are: (1) all work submitted should be your own or that of your assigned group; (2) when using the work or ideas of others, including fellow students, give full credit through accurate citations; and (3) if you are uncertain about the ground rules on a particular assignment, ask for clarification. No grade is important enough to justify academic misconduct.

Plagiarism means using the exact words, opinions, or factual information from another person without giving the person credit. Writers give credit through accepted documentation styles, such as parenthetical citation, footnotes, or endnotes. Paraphrased material must also be cited, using MLA or APA format. A simple listing of books or articles is not sufficient. 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.

As in many classes, a number of projects in this class are designed to be completed in groups. With collaborative work, names of all the participants should appear on the work. Collaborative projects may be divided up so that individual group members complete portions of the whole, provided that group members take sufficient steps to ensure that the pieces conceptually fit together in the end product.

Other projects are designed to be undertaken independently. In the latter case, you may discuss your ideas with others and conference with peers on drafts of the work; however, it is not appropriate to give your paper to someone else to revise. You are responsible for making certain that there is no question that the work you hand in is your own. If only your name appears on an assignment, your professor has the right to expect that you have done the work yourself, fully and independently. Furthermore, it is unacceptable to use a model or a paper developed for another class in this class.

The re-use of computer models is also not acceptable. If one does use code from another model, please ensure the code that is used is accredited to the original model (just as you would do to a reference in a paper).

### **Disability Statement**

If you have a documented learning disability or other condition that may affect academic performance you should: 1) make sure this documentation is on file with Disability Services (SUB I, Rm. 4205; 993-2474; <http://ds.gmu.edu>) to determine the accommodations you need; and 2) talk with me to discuss your accommodation needs.

### **Sexual Harassment, Sexual Misconduct, and Interpersonal Violence**

As a faculty member and designated “Responsible Employee,” I am required to report all disclosures of sexual assault, interpersonal violence, and stalking to Mason’s Title IX Coordinator per university policy 1412. If you wish to speak with someone confidentially, please contact the Student Support and Advocacy Center (703-380-1434), Counseling and Psychological Services (703-993-2380), Student Health Services, or Mason’s Title IX Coordinator (703-993-8730; [cde@gmu.edu](mailto:cde@gmu.edu)).

### **Course Material and Privacy**

All course materials posted to Blackboard or other course site are private to this class; by federal law, any materials that identify specific students (via their name, voice, or image) must not be shared with anyone not enrolled in this class.

Videorecordings -- whether made by instructors or students -- of class meetings that include audio, visual, or textual information from other students are private and must not be shared outside the class.

Live video conference meetings (e.g. office hour meetings) that include audio, textual, or visual information from other students must be viewed privately and not shared with others in your household or recorded and shared outside the class.

All of our synchronous meetings in this class will be recorded to provide necessary information for students in this class. Recordings will be stored on Blackboard and will only be accessible to instructors and students taking this course during this semester.

Students must use their Mason email account to receive important University information, including communications related to this class.

### **Student Support Resources**

George Mason University has a number of academic support and other resources to facilitate student success (e.g., Counseling and Psychological Services, Learning Services, University Career Services, the Writing Center, etc.). See <http://www.gmu.edu> for more details.

### **Military activation**

In accordance with the “Virginia Tuition Relief, Refund, and Reinstatement Guidelines,” Mason students in the uniformed services under call or order to active duty, after the beginning of a semester or summer session have two options they may consider with the dean's office of their school of enrollment and Office of the University Registrar in determining their enrollment status with the University: 1. Students may withdraw from courses in which they are enrolled as of the effective date of the call or order to report to active duty and 2. Students may take a grade of incomplete in all courses. For more details see <https://catalog.gmu.edu/student-services/military-services/>.

### **Safe Return to Campus Statement (as of 20 August 2021)**

All students taking courses with a face-to-face component are required to follow the

university's public health and safety precautions and procedures outlined on the university Safe Return to Campus webpage (<https://www2.gmu.edu/safe-return-campus>). Some key points:

- If you suspect that you are sick or have been directed to self-isolate, please quarantine or get testing. I will work with you to ensure that you are able to continue with the course as best as possible.
- *COVID Health Check*: All students in face-to-face and hybrid courses must complete the Mason COVID Health Check daily, seven days a week. The COVID Health Check system uses a color code system and you will receive either a Green, Yellow, or Red email response. Only students who receive a "green" notification are permitted to attend courses with a face-to-face component. *Faculty are allowed to ask to see this notification.*
- *Vaccination*: Faculty cannot require students to provide proof of vaccination, or ask other health questions.
- *Face Coverings (i.e., masks)*: Everyone, even if you're vaccinated, must wear a mask when you are inside a Mason building. Individuals should follow [CDC guidance](#) and [University Policy 1415 Public Health and Safety Precautions – Face Coverings](#) for selection and how to properly wear face coverings. Students who have a disability that may prohibit the use of face coverings should contact the Office of Disability Services (ods@gmu.edu or (703) 993-2474) ; this will be treated just like other special accommodations coming through ODS. *You will need to present a form from ODS for this accommodation to the instructor; i.e., I can ask for this form.*
  - *Apparently, some anti-maskers carry a cup with them, and when asked about the mask they will sip on their drink. The rules are that each person on-campus needs to have a mask with them. And the masks can come down for drinking and eating, but should be up for swallowing and chewing. Thus, please do not try this trick.*
- *Physical Distancing*: If you wish to request special accommodations because of the virus, e.g. wish to sit 6 feet away from everyone, please contact the Office of Disability Services (ods@gmu.edu or (703) 993-2474); this will be treated just like other special accommodations coming through ODS. *You will need to present a form from ODS for this accommodation to the instructor; i.e., I can ask for this form.*

If you do not complying with these policies, you may be asked to leave the classroom. Repeated refusal will be treated as unruly behavior, which can lead to additional action.

### **Campus Closure or Emergency Class Cancellation/Adjustment Policy**

If the campus closes, or if a class meeting needs to be canceled or adjusted due to weather or other concern, students should check Blackboard for updates on how to continue learning and for information about any changes to events or assignments.