Syllabus

Course Info

- **Instructor**: Roni Rosenfeld and Bryan Wilder
- **TAs**: Khurram Yamin
- **Meetings**: Tuesdays and Thursdays, 2:00-3:20pm
- **Course website:** https://github.com/bwilder0/10748-f2025

1. Course Description

Forecasting epidemics is hard: disease outbreaks are driven by an enormous set of factors ranging from the microscopic details of the immune system to the social dynamics of people's behavior. Are epidemics predictable? And how can data and machine learning methods help us predict them better? This course will present a computational and machine learning approach to epidemiology and epidemic forecasting. We will cover the fundamentals of infectious disease modeling, statistical and machine learning methods to track and forecast epidemics, and the design and optimization of public health interventions. We will also explore recent attempts to leverage modern machine learning tools (deep learning, generative AI) in forecasting. Throughout, students will gain hands-on experience building models, exploring novel data sources, and evaluating forecasters.

For more details about topics covered, see the Course Schedule on the website.

2. Prerequisites

Students entering the class are expected to have basic computer science/programming skills, and familiarity with the basics of statistics and machine learning (e.g. comparable to an introductory course in each). No background required or assumed in epidemiology.

3. Course Components

In-person attendance

This is an in-person, interactive course. Physical attendance is required for all lectures. If you are unable to attend a class session, please email the instructors as soon as you become aware of the problem. Examples of acceptable reasons to miss a class are

attending a conference, having an infectious disease, or family or medical emergencies (discussed further below under “Extensions”).

Grading

The requirements of this course consist of three components: attending classes and participating in in-class discussions, completing homework assignments, and two in-class quizzes. Each component will contribute towards the final grade as follows:

- Participation (20%): students are expected to attend class and participate in discussions of the material.
- Homework (50%): the course will have 5-6 homework assignments asking students to implement and analyze the kinds of methods that we discuss in class.
- Quizzes (30%): One midsemester quiz and one end of semester quiz, worth 15% each.

4. Technologies

We use a variety of technologies:

Piazza

We will use Piazza as the question-answer forum for the course. If you have questions about any of the assignments or course material, please post on Piazza so that other students can benefit from the answer to your question as well.

Gradescope

We use gradescope for submission and grading of all assignments.

Regrade Requests: If you believe an error was made during grading, please open a regrade request in Gradescope . For each assignment, regrade requests will be open for only 1 week after the grades have been published. This is to encourage you to check the feedback you’ve received early!

5. General Policies

Late submissions

Each student receives a total of 4 grace days that can be distributed among any of the homeworks. We will automatically apply these late days when an assignment is not received. Once all grace days have been used, further late submissions will receive a zero.

Extensions

In general, we do not grant extensions on assignments. There are several exceptions:

- **Medical Emergencies:** If you are sick and unable to complete an assignment or attend class, please go to University Health Services. For minor illnesses, we expect grace days or our late penalties to provide sufficient accommodation. For medical emergencies (e.g. prolonged hospitalization), students may request an extension afterwards and should include a note from University Health Services.
- **Family/Personal Emergencies:** If you have a family emergency (e.g. death in the family) or a personal emergency (e.g. mental health crisis), please contact your academic adviser or Counseling and Psychological Services (CaPS). In addition to offering support, they will reach out to the instructors for all your courses on your behalf to request an extension.
- **University-Approved Absences:** If you are attending an out-of-town university approved event (e.g. multi-day athletic/academic trip organized by the university), you may request an extension for the duration of the trip. You must provide confirmation of your attendance, usually from a faculty or staff organizer of the event.

For any of the above situations, you may request an extension **by emailing your instructor**. The email should be sent as soon as you are aware of the conflict and at least **5 days prior to the deadline**. In the case of an emergency, no notice is needed.

Accommodations for Students with Disabilities:

If you have a disability and have an accommodations letter from the Disability Resources office, we encourage you to discuss your accommodations and needs with the instructors as early in the semester as possible. We will work with you to ensure that accommodations are provided as appropriate. If you suspect that you may have a disability and would benefit from accommodations but are not yet registered with the Office of Disability Resources, we encourage you to contact them at access@andrew.cmu.edu.

6. Academic Integrity Policies

Read this carefully!

Collaboration among Students

Students should complete the homework assignments on their own. General discussion about the course material is encouraged, but no written materials related to the assignment (e.g. code, schematics, equations, drafts of assignments, etc) should be exchanged. Please ask the instructors if you have questions about this policy.

Policy regarding “found code”

You are encouraged to read books and other instructional materials, both online and offline, to help you understand the concepts and algorithms taught in class. These materials may contain example code or pseudo code, which may help you better understand an algorithm or an implementation detail. However, when you implement your own solution to an assignment, you must put all materials aside, and write your code on your own, starting "from scratch". Specifically, you may not use any code you found or came across. If you find or come across code that implements any part of your assignment, you must disclose this fact in your collaboration statement.

AI assistance

To best support your own learning, you should complete all graded assignments in this course yourself, without any use of generative artificial intelligence (AI). The only exception is assistance from integrated coding tools within the IDE (e.g., Copilot within Visual Studio is allowed, but not Claude Code or similar "agentic" tools). You are also explicitly prohibited from using AI to generate any text for the assignments, e.g., to answer conceptual questions or analyze your results. Passing off any AI generated content as your own (e.g., cutting and pasting content into written assignments, or paraphrasing AI content) constitutes a violation of CMU's academic integrity policy. If you have any questions about using generative AI in this course please email or talk to the instructors.

Duty to Protect One's Work

Students are responsible for pro-actively protecting their work from copying and misuse by other students. If a student's work is copied by another student, the original author is also considered to be at fault and in gross violation of the course policies. It does not matter whether the author allowed the work to be copied or was merely negligent in preventing it from being copied. When overlapping work is submitted by different students, both students will be punished.

To protect future students, do not post your work publicly, neither during the course nor afterwards.

Penalties for Violations of Course Policies

All violations (even first one) of course policies will always be reported to the university authorities (your Department Head, Associate Dean, Dean of Student Affairs, etc.) as an official Academic Integrity Violation and will carry severe penalties.

1. The penalty for the first violation is a one-and-a-half letter grade reduction. For example, if your final letter grade for the course was to be an A-, it would become a C+.

2. The penalty for the second violation is failure in the course, and can even lead to dismissal from the university.

7. Support

Take care of yourself. Do your best to maintain a healthy lifestyle this semester by eating well, exercising, avoiding drugs and alcohol, getting enough sleep and taking some time to relax. This will help you achieve your goals and cope with stress.

All of us benefit from support during times of struggle. You are not alone. There are many helpful resources available on campus and an important part of the college experience is learning how to ask for help. Asking for support sooner rather than later is often helpful.

If you or anyone you know experiences any academic stress, difficult life events, or feelings like anxiety or depression, we strongly encourage you to seek support. Counseling and Psychological Services (CaPS) is here to help: call 412-268-2922 and visit their website at http://www.cmu.edu/counseling/. Consider reaching out to a friend, faculty or family member you trust for help getting connected to the support that can help.

If you or someone you know is feeling suicidal or in danger of self-harm, call someone immediately, day or night:

- CaPS: 412-268-2922
- Re:solve Crisis Network: 888-796-8226
- If the situation is life threatening, call the police:
    - On campus: CMU Police: 412-268-2323
    - Off campus: 911.

If you have questions about this or your coursework, please let the instructors know.

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8. Note to people outside CMU

Please feel free to reuse any of these course materials that you find of use in your own courses. We ask that you retain any copyright notices, and include written notice indicating the source of any materials you use.