CP 6543/CP4813/ISyE 8803/ISyE 4803 Syllabus

Public Health Analytics (3 credits)

Spring 2027

Instructor Information

Instructor: Arthi Rao, *PhD, MS-GIST*
Email: arthir@gatech.edu
Office hours: Monday, 11:00 – 1:00 or by appointment
Office location: Geroge Tower, #724

Class Hours: Friday, 11:00-1:45 p.m.
Class location: Architecture (West) 359

General Course Information

Description

The socioecological model of public health clearly establishes the importance of physical and socioeconomic environments in building healthy communities and influencing population health. This research paradigm is firmly embedded in the idea that the health status of an individual is simultaneously produced by individual biology and their surrounding physical, social, cultural and political context. Collectively termed the "social determinants of health," these are known to influence individual health as well as the differential distribution of health outcomes among populations.

The course focuses on measuring the three key functional domains of healthy communities— 1) the physical environment, 2) socioeconomic environment, and 3) access to healthcare. It synthesizes these domains into an interdisciplinary, holistic methodological approach for **enhancing facility location, resource allocation, healthcare operations** and other typical applications for engineers and city planners. The course uses a variety of analytical techniques including applied statistical and spatial methods to measure and model relationships between determinants and impacts/outcomes. In general, all students can learn how to execute the entire life cycle of a data analytics project including problem formulation, data collection/preparation, exploratory analysis, modeling, and visualization. **While the course uses health-related concepts and datasets, the analytical techniques have wide applicability for data science related problems in various industries. Each class includes an instructor-led lecture component and an in-class lab component for hands-on experience in applying analytical techniques.**

Course Learning Outcomes

- Apply diverse theoretical and methodological frameworks used in healthy places research and practice

- Utilize various datasets commonly used in healthy places research and practice
- Discern the advantages and disadvantages of datasets and metrics and their appropriate use
- Formulate, investigate and communicate a research question using applied statistical and spatial methods
- Apply frequently used analytics techniques such as indicator selection, data reduction and modeling
- Learn to use a variety of software including Arc GIS, JMP and GeoDA

Required Course Materials

The course has one required textbook (available on Amazon and online through the Ga Tech library):

Klimberg, R. and McCullough,B.D. (2017). *Fundamentals of Predictive Analytics with JMP, Second Edition*. SAS Institute, Cary, NC.

Additional readings and class materials will be posted online at the course site on Canvas under the "Modules" tab (https://canvas.gatech.edu).

Grading Policy:

Final course grades will be based upon a weighted sum of three lab assignments, class participation and a course project that will consist of a project report and a presentation. Class participation will be measured by attendance and contributions to class discussions of assigned readings (https://catalog.gatech.edu/rules/4/). Each graduate student will also participate in conducting one student-led seminar that will include a summary and discussion of theoretical content covered in the readings. Details on the course project are provided below. All assignments will be uploaded to the Canvas portal. The assignment weights are as follows:

- Lab Assignment 1: 15%
- Lab Assignment 2: 20%
- Lab Assignment 3: 20%
- Final project presentation: 10%
- Final project slide deck: 25%
- Attendance & Participation: 10% (Graduate students will present a seminar on the assigned readings)

Overall course grades will follow the standard thresholds of **A (100-90), B (89.9-80), C (79.9-70), D (69.9-60) and F (below 60)**.

Description of Final Project

The final project is intended to create a comprehensive analytics exercise using the various tools and techniques you have been exposed to during the semester through the lab assignments. Your project can be focused on a public health problem, but I am open to other areas of interest, such as transportation, environment, land use, economic development, real estate, or any other substantive area. I am even open to discussing how the final project can help advance the analysis for your option paper or thesis/dissertation.

The main purpose of this course component is to work through the main steps of an analytics project, namely— problem formulation, data assembly, data exploration, data discovery and dissemination. You may use real data, hypothetical data, or a combination of the two. If you use any hypothetical data, the data should be realistic so that the demonstration is convincing. Most class projects can be adequately completed with small to moderate datasets. Large datasets might require programming experience in Python or R, so use only if necessary.

The general theme of the project should be along the lines of "Analyzing the association between X and Y….". The idea is to use the analytical techniques in this course to demonstrate the relationship of a dependent variable and its correlates. On the due date listed in the syllabus, you will turn in a short project prospectus. It should include:

- The main question your project is intended to answer. State this in one sentence as a question.
- A ½ page, description of your project. Explain why the topic is important and what you hope to explain, learn, and/or accomplish?
- A listing of the required datasets and their sources (Census Bureau, HRSA, etc.)

Your final project slide deck is due on the date listed in the course schedule. The slides should be self-explanatory and contain all notes/annotations that explain the slide content, set of well-formatted maps/tables integrated with the project text, and fully documented and commented code (if any), as an appendix. Your slides should document (at a minimum) the following information:

- Problem formulation: Background information and problem description/statement
- Data assembly: Description of data sources used; their advantages and disadvantages; methods used to clean, impute and assemble the final dataset
- Data exploration: Analysis techniques used to understand data structure (spatial clustering, correlations, etc.)
- Data discovery: Modeling techniques used to analyze the relationships of interest; Analysis results with printed maps/tables and other relevant information
- Documented and commented programming code (if used, include as appendix)
- References and in-text citations using the APA (American Psychological Association) style

Course Policies

Attendance and/or Participation

Class sessions are in-person and will consist of a lecture/discussion component and a lab component. Readings listed in the syllabus should be read prior to class to allow appropriate class discussion to take place. I strongly urge students to make every effort to read at least the required reading material. I may assign occasional pop-quizzes if I sense that the background material is not being reviewed adequately. Attendance is strongly recommended at every class since the lectures are critical to successfully executing the lab

assignments. Please do not make any assumptions about criteria for excused absences, check with me in writing beforehand. Lab assignments will be used to reinforce and evaluate your understanding of key concepts throughout the course. Labs will include both theoretical problems and practical applications using various datasets incorporating built environment, socioeconomics, and health.

Timely submissions are expected of all students on due dates listed on the course schedule. Late work will only be accepted under extenuating circumstances and with prior permission from the instructor where possible.

I will use the following communication tools throughout the semester:

Canvas Announcements: I will post regular announcements for class-related topics, schedule changes, reminders, etc. Please ensure that you have enabled the settings correctly in your Canvas accounts to allow announcements to show up in your email inbox. It will also be your responsibility that you check the announcements regularly, so you do not miss anything.

Canvas Inbox: Please communicate with me via the Canvas Inbox. This will be an exclusive channel to email me regarding class-related matters and will ensure the quickest response.

Canvas Discussions: We will use Canvas discussions to post questions, promote interaction between students and enable informed discussions.

Zoom: **This is an in-person class as required by the USG Board of Regents.** As a back-up, I have created a virtual class option on Zoom and have shared the link with you. The Teams meeting is a virtual option only to be used for health-related or other extenuating circumstances. This link will also be used when USG switches to Digital Learning Days. It is not a substitute for attending class in-person. I will mark you absent if you have not received prior permission from me to attend virtually for a justified reason.

Academic Integrity

Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. Review Georgia Tech's Honor Code and the student Code of Conduct.

Any student suspected of cheating or plagiarism on a quiz, exam, or assignment will be reported to the Office of Student Integrity, who will investigate the incident and identify the appropriate penalty for violations.

Accommodations for Students with Disabilities

If you are a student with learning needs that require special accommodation, contact the Office of Disability Services (404-894-2563) as soon as possible to make an appointment to discuss your special needs and to obtain an accommodations letter. Please also e-mail me as soon as possible in order to set up a time to discuss your learning needs.

Student-Faculty Expectations Agreement

At Georgia Tech, we believe that it is important to strive for an atmosphere of mutual respect, acknowledgement, and responsibility between faculty members and the student

body. The Student-Faculty Expectations articulate some basic expectations that you can have of me and that I have of you. In the end, simple respect for knowledge, hard work, and cordial interactions will help build the environment we seek. Therefore, I encourage you to remain committed to the ideals of Georgia Tech while in this class.

Pre- &/or Co-Requisites

An introductory course in basic statistic and GIS is recommended but not required.

Collaboration, Group Work, and Use of Generative AI

Student interaction and healthy discussion is highly encouraged. However, assignments and projects are expected to reflect individual effort, unless specified otherwise. Use of AI for ideation purposes is acceptable. However, please DO NOT use AI generated answers to technical questions on your labs.

Student Use of Mobile Devices in the Classroom

Attending class and paying attention to lectures is critical to understanding the course material. I will allow the use of laptops or tablets for the purposes of taking notes. However, using cellphones will not be allowed unless it is for the sole purpose of supporting your learning in the classroom.

Additional Course Policies

Sharing of class materials and recording class lectures will not be allowed unless it is part of your accommodations.

Campus Resources for Students

Undergraduate Student Academic Success Resources:

A list of resources for undergraduate students' academic success and information about advising can be found at Success at Tech.

- Academic Support: Academic Success and Advising (a unit in the Office of Undergraduate Education & Student Success) provides free support for your courses. Students can attend scheduled supplemental review (PLUS) sessions, stop by Drop-In Tutoring, or schedule a one-on-one appointment through Knack. To explore what options work best for you, please visit us online at success.gatech.edu/tutoring, email us at tutoring@gatech.edu, or come see us at Clough Undergraduate Learning Commons, Suite 283.

Graduate Student Academic and Professional Success Resources:

A list of resources for graduate students is given on the Office of Graduate and Postdoctoral Education website. Specific information for current graduate students includes

- Academic Resources such as the Communications Center, Language Institute, Library, Catalog, Registrar, resources for conducting research, Advocacy and Conflict Resolution resources, and how to manage unexpected situations that may impact your academic performance;
- Student Resources such as Campus Services, Child Care/Family programs, Health & Wellness, Career Services, and the Student Resource Guide; and
- *Professional Development such as the programming from the Career Center and other professional development resources and events"*

Student Well-Being:

At Georgia Tech, we are concerned about your overall physical, social, and mental well-being. A comprehensive list of wellness related resources has been compiled and maintained by the Office of the Vice President for Student Engagement and Well-being (student-resource-guide (gatech.edu)

More resources on supporting student well-being are available through the Learning Well Initiative.