

SYRACUSE UNIVERSITY, FALL 2025 SYLLABUS

MAT 495/695, Fundamentals of Data Science

General Information

Course Meetings:

MAT 495/695-M001 (ID: 20587/20603), TuTh 9:30AM - 10:50AM, Carnegie 100

Instructor: Thomas John, Ph.D. email: thjohn@syr.edu, Office Hours (virtual): TBA.

Course Catalogue Description:

Fundamental methods for data science, such as regression, linear discriminant analysis, k-nearest neighbors, support vector machine, k-means, principal component analysis, and nonlinear dimension reduction. Performance evaluation and model selection.

Additional work required of graduate students. (See page 2 for details).

PREREQ: (MAT 331 AND MAT 521) OR (MAT 503 AND MAT 523)

Shared Competencies:

MAT 495/695 supports two of Syracuse University's Shared Competencies:

- Scientific Inquiry and Research Skills
- Information Literacy and Technological Agility

Text:

Texts below cover the topics with differing details. They will be used in parallel. Online access (full text) to the textbooks below are available via EZproxy (<https://library.syr.edu/help/work-off-campus.php>).

- Fundamentals of Data Science : Theory and Practice.
 - Kalita, J. K., Bhattacharyya, D. K., & Roy, S. (2024). Academic Press.
 - https://search.syr.edu/permalink/01SYU_INST/1jt847n/alma9972369121108496
- Mathematical Foundations for Data Analysis Authors Jeff M. Phillips
 - <https://doi-org.libezproxy2.syr.edu/10.1007/978-3-030-62341-8>

Following are a few additional resources:

- Advanced Data Science (at Johns Hopkins Bloomberg School of Public Health)
 - <https://jhu-advdatasci.github.io/2018/index.html>
 - <https://jhu-advdatasci.github.io/2018/resources.html>
- Applied Linear Algebra (2nd ed. 2018.). Olver, P. J., & Shakiban, C.
 - https://search.syr.edu/permalink/01SYU_INST/16ashv9/alma9972320975308496
- Matrix Algebra: Theory, Computations and Applications in Statistics, James E. Gentle
 - <https://doi-org.libezproxy2.syr.edu/10.1007/978-3-319-64867-5>

Supplemental material containing theoretical and programming expositions will be provided as needed.

Grading:

Final grade will be based on two exams (25% each), mini-projects (20%), end of semester project (15%), and HW/class participation (15%). Final letter grades will be given according to the following scale:

A (93-100); A- (90-92); B+ (87-89); B (83-86); B- (80-82);
C+ (77-79); C (73-76); C- (70-72); D (60-70); F (0-59)

Exam Dates (tentative):

- Exam 1: Thursday, October 9th
- Exam 2: Tuesday, November 18th

(No) Makeup Policy:

There will be absolutely no make-ups for any reason. If you miss a quiz/test for a valid reason (which must be verified by a documentation from a physician or from Student Outreach and Support (see <https://experience.syracuse.edu/student-outreach/student-support/absence-notifications/>), performance from the corresponding part of a test/final will be used as replacement.

Additional Work for Graduate Students:

Exams and projects will have additional components for graduate students to complete. These will be clearly specified in those assignments. These will be deriving/executing/programming a more general scenario and/or more in-depth interpretations in the project reports.

Homework:

Homework will be assigned regularly and some of the problems may be asked to be turned in. You may discuss these problems with other students, but each of you is expected to write up your own solutions independently. The **best** way to learn this material is to do homework problems. Try as much as possible to do the homework on your own.

No Extensions on Submission Deadlines:

No extension will be given in any circumstances. If you have a valid excuse, you may be exempted from that assignment, *as long as your excuse covers the entire assignment period- not just the due date only*. Do not wait until the due date to do your assignment. "Internet problems," "Broken laptops," "homework portal down on due date," etc. are not valid excuses.

This policy is in place also from the perspective of professional responsibilities. A data analyst (or some related title) almost often works under expectations and deadlines (from a team, a client, brand competition, delivery opportunity, regulatory, etc.) and these deadlines are almost always unmovable.

Attendance:

You are expected to attend every class and every exam. If you miss a class, it is your responsibility to obtain a copy of the lecture notes for that class from another student. You are also responsible for any announcements about changes to the course schedule, the exam schedule, or the course requirements that were made during that class.

It is a federal requirement that faculty promptly notify the university of students who do not attend or cease to attend any class. Faculty will use Early-Semester Progress Reports and Mid-Semester Progress Reports in Orange SUccess to alert the Registrar and Financial Aid Office on non-attendance.

Phone, Laptop, Tablet in class policy:

Phones, laptops, tablets, and similar electronics are not allowed to be out during class. *This policy will be strictly enforced in class. Repeated violations of this policy will be recorded.* Students who repeatedly violate this policy will be asked to leave the room and the overall course grade will be affected by such behavior. Particularly, calculators on cell phones cannot be used on quizzes/tests.

Calculators:

You will need a calculator to do the computations that will arise throughout the course. Calculators are not to be shared during exams and quizzes. Also, calculators on cell phones cannot be used on exams.

Statistical Software:

Students are expected to learn to use statistical software appropriately. There are several options available. The ITS Public Computer Labs have IBM SPSS Statistics, Minitab, R for Windows, and SAS. To see the software available at the clusters, see <https://answers.syr.edu/display/ITHELP/ITS+Computer+Labs>. Since R is a free and very reputable software, I will be using it for illustration. Students are expected to learn to use it on their own using the rich resources available on the internet.

Learning Objectives:

After taking this course, students will be able to:

- understand the key methods of data science and the contexts for which they apply
- carry out the software implementations, outputs, and interpretations
- understand the mathematical and statistical background behind the methods
- recognize the limitations and nuances of the methods based on the theory
- familiarize some of the latest developments related to the methods

Important Syllabus Reminders from the Office of Academic Affairs

Following are the language the University asks the faculty to provide in their syllabi: [from academicaffairs.syracuse.edu/important-syllabus-reminders/]

Academic Drop Deadline: As part of our efforts to track satisfactory academic progress, the Academic Drop Deadline and the Financial Drop deadline will both occur on September 15, 2025, for the fall semester. Students may still withdraw from courses after these deadlines; this would place a 'WD' grade on their transcripts. Students enrolled in "flex" classes (Flexibly formatted classes) have different deadlines and will need to check MySlice for the Academic and Financial Drop deadlines that pertains to their class.

Academic Integrity And Artificial Intelligence: As a pre-eminent and inclusive student-focused research institution, Syracuse University considers academic integrity at the forefront of learning, serving as a core value and guiding pillar of education. Syracuse University's Academic Integrity Policy provides students with the necessary guidelines to complete academic work with integrity throughout their studies. Students are required to uphold both course-specific and university-wide academic integrity expectations such as crediting your sources, doing your own work, communicating honestly, and supporting academic integrity. The full Syracuse University Academic Integrity Policy can be viewed by visiting the Syracuse University Policies website.

Upholding Academic Integrity includes the protection of faculty's intellectual property. *Students should not upload, distribute, or share instructors' course materials, including presentations, assignments, exams, or other evaluative materials without permission. Using websites that charge fees or require uploading of course material (e.g., Chegg, Course Hero) to obtain exam solutions or assignments completed by others, which are then presented as your own violates academic integrity expectations in this course and may be classified as a Level 3 violation.* All academic integrity expectations that apply to in-person assignments, quizzes, and exams also apply online.

Specifically for this course, the academic integrity aspects relate to exams. A student is not allowed to use ANY electronic device except for their calculator during the exam until the exam is handed in. Accessing material beyond standard calculator functionalities and any statistical table provided during the exam will be a violation of academic integrity.

Students found in violation of the policy are subject to grade sanctions determined by the course instructor and non-grade sanctions determined by the School or College where the course is offered. Students may not drop or withdraw from courses in which they face a suspected violation. Any established violation in this course may result in course failure regardless of violation level.

Artificial Intelligence: Syracuse's academic integrity expectations extend to the fast-growing realm of artificial intelligence (AI) and represent the importance of understanding, exploring, and evaluating emerging technologies.

Based on the specific learning outcomes and assignments in this course, artificial intelligence is permitted on the following: any work done outside of the lecture and the recitation but with explicit indication (disclosure and citation) and step-by-step explanations of the submitted work. See each assignment, quiz, or exam instructions for more information about what artificial intelligence tools are permitted and to what extent, as well as citation requirements. If no instructions are provided for a specific assignment, then no use of any artificial intelligence tool is permitted. Any AI use beyond that which is detailed in course assignments is explicitly prohibited except when documented permission is granted.

[Above is language from Option 2 from academicaffairs.syracuse.edu/important-syllabus-reminders/ || Some Artificial intelligence use]

Academic Integrity Online: All academic integrity expectations that apply to in-person quizzes and exams also apply to online quizzes and exams. In this course, all work submitted for quizzes and exams must be yours alone. Discussing quiz or exam questions with anyone during the quiz or exam period violates academic integrity expectations for this course.

In addition, *using websites that charge fees or require uploading of course material (e.g., Chegg, Course Hero) to obtain exam solutions or assignments completed by others and present the work as your own violates academic integrity expectations in this course and may be classified as a Level 3 violation, resulting in suspension or expulsion from Syracuse University.*

Attendance Policy (including Absence Notification): Attendance in classes is expected in all courses at Syracuse University. It is a federal requirement that faculty promptly notify the university of students who do not attend or cease to attend any class. Faculty will use Early-Semester Progress Reports and Mid-Semester Progress Reports in Orange SUccess to alert the Registrar and Financial Aid Office on non-attendance. For more information visit: <http://registrar.syr.edu/students/non-attendance/>

If a student is unable to participate in-person or virtually for an extended period of time (48 hours or more), the student may request an absence notification from their home school/college Dean's Office or through Student Outreach and Support office. Instructors will be notified via the "Absence Notification" flag in Orange SUccess.

Barnes Center at the Arch (Health, Counseling, etc.) staff will not provide medical excuse notes for students. When Barnes Center staff determine it is medically necessary to remove a student from classes, they will coordinate with Student Outreach and Support case management staff to provide appropriate notification to faculty through Orange Success. For absences lasting less than 48 hours, students are encouraged to discuss academic arrangements directly with their faculty.

Additional information may be found at Student Outreach and Support: Absence Notifications >> <https://experience.syracuse.edu/student-outreach/student-support/absence-notifications/>

Blackboard Learning Management System: This class will use the Blackboard Learning Management to house the syllabus, course content, links to external course materials, assignments, quizzes, exams, feedback, and grades. Due dates and times in Blackboard are stored in Coordinated Universal Time (UTC) and displayed for each user based on the time zone setting of their computer and data from their internet browser. The system will always display the time zone being used. If an instructor sets a due date of 11pm Eastern time, a student in the Pacific time zone will see a due date of 8pm."

Information about Blackboard is available on Answers Blackboard; alternatively, you can contact Information Technology Services by sending an email to help@syr.edu, calling 315.443.2677, or in-person at the ITS Service Center, located at 1-227 CST in the Life Sciences Complex. Business hours for the Service Center can be found on the ITS website.

Disability Syllabus Statement: Syracuse University values access and inclusion; we are committed to a climate of mutual respect and full participation. There may be aspects of the instruction or design of this course that result in barriers to your inclusion and full participation in this course. I invite any student to contact me to discuss strategies and/or accommodations (academic adjustments) that may be necessary to ensure equitable access, and to collaborate with the Center for Disability Resources (CDR) in this process.

If you would like to discuss disability-related accommodations or register with CDR, please visit Center for Disability Resources. Please call (315) 443-4498 or email CDRspecialist@syr.edu for more detailed information.

CDR is responsible for coordinating disability-related academic accommodations and will work with the student to develop an access plan. Since academic accommodations are generally not provided retroactively, please contact CDR as soon as possible to initiate this process.

Discrimination Or Harassment: The University does not discriminate and prohibits harassment or discrimination related to any protected category including creed, ethnicity, citizenship, sexual orientation, national origin, sex, gender, pregnancy, reproductive health decisions, disability, marital status, political or social affiliation, age, race, color, veteran status, military status, religion, sexual orientation, domestic violence status, genetic information, gender identity, gender expression or perceived gender.

Any complaint of discrimination or harassment related to any of these protected bases should be reported to Sheila Johnson-Willis, the University's Chief Equal Opportunity & Title IX Officer for Faculty and Staff. She is responsible for coordinating compliance efforts under the various laws including Titles VI, VII, IX and Section 504 of the Rehabilitation Act. She can be contacted at Equal Opportunity, Inclusion, and Resolution Services, 621 Skytop Road, Suite 1001, Syracuse University, Syracuse, NY 13244-1120; or by email: equalopp@syr.edu; or by telephone: 315-443-4018.

TITLE IX: Federal and state law, and University policy prohibit discrimination and harassment based on sex or gender (including sexual harassment, sexual assault, domestic/dating violence, stalking, and sexual exploitation). If a student has been impacted by any prohibited behavior based on sex or gender, they can obtain confidential counseling support, 24-hours a day, 7 days a week, from the Sexual and Relationship Violence Response Team at the Counseling Center (315-443-8000, Barnes Center at The Arch, 150 Sims Drive, Syracuse, New York 13244). Incidents of sexual or relationship violence or harassment can be reported to the University's Title IX Coordinators (Sheila Johnson Willis, Chief Equal Opportunity Officer and Title IX Officer for Faculty and Staff, 315-443-4018, equalopp@syr.edu or Pamela Peter, Director/Coordinator of Student Title IX Case Management, 315-443-0211, titleix@syr.edu). Reports to law enforcement can be made to the University's Department of Public Safety (315-443-2224, 005 Sims Hall), the Syracuse Police Department (511 South State Street, Syracuse, New York, 911 in case of emergency or 315-435-3016 to speak with the Abused Persons Unit), or the State Police (Campus Sexual Assault Victims Unit, 844-845-7269). I will seek to keep information you share with me private to the greatest extent possible, but as a professor I have mandatory reporting responsibilities to share information regarding sexual misconduct, relationship violence, stalking, harassment, and crimes I learn about with the University's Title IX Officer to help make our campus a safer place for all and to ensure you have access to available resources.

Email Policy: Syracuse University has established email as a primary vehicle for official communication with students, faculty, and staff. Emergency notifications, educational dialog, research, and general business correspondence are all consistently enhanced in institutions of higher learning where email policies exist and are supported by procedures, practice, and culture.

An official email address is established and assigned by Information Technology Services (ITS) for each registered student, as well as for all active faculty and staff members. All University communications sent via email will be sent to this address. Faculty and staff members must use the officially established University email address to communicate with students registered in their classes. Keep in mind that student records sent to a non-syr.edu email address may create a FERPA violation (See the complete policy at Syracuse University Email Policy).

The Family Educational Rights And Privacy Act: The Family Educational Rights and Privacy Act (FERPA) sets forth requirements regarding the privacy of student records. FERPA governs both the access to and release of those records, known as education records, and the information they contain. Under FERPA, faculty have a legal responsibility to protect the confidentiality of student records. For additional information about FERPA and Syracuse University's FERPA policy, see Compliance with the Family Education Rights and Privacy Act or contact the Office of the Registrar (315.443.2422).

Among the FERPA policies, of interest is section VI (Release Without Consent): "FERPA authorizes the following disclosures of education record information without a student's consent:" [...] part vii: "Disclosures to parents of a dependent student, as defined in Section 152 of the Internal Revenue Code of 1986."

Faith Tradition Observances: Syracuse University's Religious Observances Policy recognizes the diversity of faiths represented in the campus community and protects the rights of students, faculty, and staff to observe religious holy days according to their traditions. Under the policy, students are given an opportunity to make up any examination, study, or work requirements that may be missed due to a religious observance, provided they notify their instructors no later than the academic drop deadline. For observances occurring before the drop

deadline, notification is required at least two academic days in advance. Students may enter their observances in MySlice under Student Services/Enrollment/My Religious Observances/Add a Notification.

Health & Wellness Considerations: Well-being and mental health are significant predictors of academic success. It is critical to take care of yourself physically and emotionally and to effectively navigate stress, anxiety, and depression. Please familiarize yourself with the range of resources the Barnes Center provides (<https://ese.syr.edu/bewell/>) and seek out support for mental health concerns as needed. Counseling services are available 24/7, 365 days, at 315-443-8000.

ORANGE ALERT: ORANGE ALERT, Syracuse University's crisis notification system, uses text messages, phone, and email alerts to provide rapid notification and instructions to members of the University community in the event of a crisis in progress. Crises could include an individual who is considered armed and dangerous, a hazardous materials incident, an explosion, or any other event in which there is an immediate threat of physical harm or death to campus community members.

In the event of an emergency, please use one of the following numbers to reach us:

From any phone: **315.443.2224**; From your cell phone: **#78 (#SU)**; Campus landline: **711**

For more information on ORANGE ALERT, including how to update your contact information, visit the DPS website <https://dps.syr.edu/public-information/orange-alert/>

Policy on Faculty Use of Student Academic Work: Educational use of student work: I intend to use academic work that you complete this semester in subsequent semesters for educational purposes. Before using your work for that purpose, I will render the work anonymous by removing identifying material.

Registration Policy: Students may not attend, submit work, audit, or otherwise participate in courses without being officially enrolled. Instructors may not allow students to attend classes or submit work unless they appear on the official class list or are attending with instructor approval for the purpose of making up an Incomplete (I) grade in a prior term. Instructors will check their class rosters regularly to ensure that everyone attending is registered for the class. Read the full policy in the Academic Rules section of the Undergraduate Course Catalog.

Key Dates: Please see <https://www.syracuse.edu/academics/calendars/academic-year/#fall-2025> for the key dates for the semester. In particular:

First day of classes/Extended Campus Classes	Monday, Aug. 25
Late registration and schedule adjustment	Monday, Aug. 25 - Tuesday, Sept. 2
Labor Day (no residential classes, University offices closed)	Monday, Sept. 1
Add deadline	Tuesday, Sept. 2
Academic/Financial deadline to drop class	Monday, Sept. 15
Grading option deadline (choose pass/fail or audit)	Monday, Sept. 15
Religious observance notification deadline	Monday, Sept. 15
Fall Break, excluding LAW (no residential classes)	Monday, Oct. 13 - Tuesday, Oct. 14
Withdrawal deadline	Friday, Nov. 21
Thanksgiving Break (no residential classes, University offices open Monday through Wednesday)	Sunday, Nov. 23 - Sunday, Nov. 30
Last day of classes	Tuesday, Dec. 9
Final grades due from faculty	Tuesday, Dec. 30