Syllabus

Villanova University

Course: CSC 8000 - Foundations of Algorithms and Data Structures
Term: Fall 2025
Instructor: Dr. Maurício Gruppi
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Office: Mendel Hall, 292A
Last updated: July 28, 2025

🔗 Quick links

- Course Schedule
- Textbook Github Repository

🕐 Meeting times and locations

- **Section 001**: Wed 6:15 PM - 09:00 PM, Mendel Hall 213

🕐 Office hours

- **Dr. Gruppi**:
  - Tuesdays 3 PM - 4 PM in Mendel 292A
  - Wednesdays 5 PM - 6 PM in Mendel 292A
  - *Note: You do not have to book a time to come to office hours, but I do appreciate if you let me know in advance that you will be coming.*
  - *Possibly available at other times or via Zoom upon request.*
- **TA** Sankalpa Rijal:
  - Tuesday 2 PM - 4 PM, Via Zoom
  - Wednesday 2 PM - 4 PM, Via Zoom

**All office hours subject to change. Updates will be posted.*

Contents

📖 Main references

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- Textbook: "Python Data Science Handbook (2nd Edition)" by Jake VanderPlas. O'Reilly Media Inc., 2023.
- Lecture notes and assignments will be available on the course LMS page.

📋 Course content

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The following topics are covered in this course:

1. Python basics: control structures, debugging, Jupyter notebooks.
2. Efficient array storage and manipulation with NumPy: Universal functions, aggregation, broadcasting, filtering.
3. Data manipulation and analysis with Pandas: Loading data frames, merging data frames, aggregating and grouping values.
4. Data visualization using Matplotlib and Seaborn: Plotting data distributions and patterns.
5. Introduction to machine learning with Scikit-learn: Training/validation/test sets, model selection, feature engineering.

📋 Course structure

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- Classes will take place in person at the designated time and location. The schedule will be available on Learning Management System (LMS) describing the contents of each class, including homework due dates, quizzes and exams.
- Evaluation will be based on in-class exercises, a midterm exam, a final project followed by a report. Details in section **Assessment**.
- Office hours will be held to provide addition guidance to students. See section **Office hours** for details.

🎯 Course goals

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The goal of this course is to teach students the key components of Python used in machine learning applications. This includes a general overview of the Python language and the introduction of various libraries used in data science and machine learning.
Upon successful completion of the course, the student will be able to:

- Understand the basic concepts of Python: control structures, syntax, work with Jupyter Notebooks.
- Manipulate numerical data with NumPy.
- Manipulate and produce statistical analysis of complex datasets using Pandas.
- Produce data visualization with Matplotlib and Seaborn.
- Understand the basic concepts of Machine Learning: learning paradigms, training/validation/test data, feature engineering, and use Scikit-Learn to implement ML models.

📈 Assessment

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Assessment of the learning goals in the class consists of in-class exercises (labs), a midterm exam, a final project, and a final exam.
Grades will be distributed with the following activities:

Assignment	**Points**
In-class labs	15%
Midterm exam	25%
Project	35%
Final exam	25%
Total	100%

A description of each assessment module as well as their related goals is shown in Table 1. The final grade cutoff points are displayed in Table 2.

Assessment	Description	Goals assessed
In-class labs	Hands-on exercises administered at the end of a lecture. All labs will be scheduled and students must show substantial progress before the end of class to get credit for the activity.	Application, interpretation, problem solving.
Midterm exam	Written exam that will take place on the scheduled date.	Fundamental understanding, problem interpretation, problem solving.
Project	A project spanning several weeks where students must implement a complete data analysis pipeline on a dataset of choice.	Application, problems solving.
Final exam	A comprehensive written exam.	Fundamental understanding, problem interpretation, problem solving.

Table 1: Assessment modules

Grade	Cutoff	Grade	Cutoff
A	95	C	73
A-	90	C-	70
B+	87	D+	67
B	83	D	63
B-	80	D-	60
C+	77	F	< 60

Table 2: Letter grade cutoff points

✅ Attendance

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Attendance is expected for a successful completion of this course. The instructor will register the attendance at the beginning of every class.

As per university guidelines, if the number of unexcused absences for first year students exceeds twice the number of weekly classes (four absences for a course that meets twice a week), then such student will receive a failing grade "Y".

Personal Days

In addition to the attendance policy stated above, students are entitled to one excused absence for any reason that may contribute to their personal wellness. Students must advise the instructor by email before class of their intent to utilize a Personal Day as the reason for their absence. A Personal Day will not be approved retroactively. Students may, but are not required, to provide additional information regarding their absence. Additionally, a Personal Day may not:

a. be used immediately preceding or following a University holiday or break period;

b. be used on days when exams, presentations or other major assignments are scheduled.

A Personal Day does not grant an automatic extension for items due. Students remain responsible for all assignments, exams, presentations, etc. due on that date. It is in the instructor's discretion to determine whether any extension is appropriate given individual circumstances.

🤖 Technology

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- Students are allowed to make use of technology to assist them in the process of learning. Laptops, tablets and similar devices are permitted for uses related to the class and **should not cause distractions to anyone present**.
- All homework assignments **must be typeset**, unless otherwise stated. Students should make use of a computer and a text editor to write reports and homework solutions and export them in PDF format.
- Use of **Artificial Intelligence**: all submissions made by a student should be a result of their own work or, in the case of group work, their peers. The use of AI or Large Language Models such as ChatGPT, Microsoft Co-pilot, Llama 2 and Google Bard should be made with caution to ensure it will be beneficial to the student's learning outcomes. Answers generated by such models will **not be accepted** and will configure an **academic integrity violation**.

🕐 Late work

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Late work will not be accepted unless there is an excused absence. Make sure to notify the instructor as soon as possible to discuss the submission.

✍️ Student conduct

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As it is every member's responsibility to contribute to the creation of a healthy and safe community, students are required to comply with University health and safety directives, guidelines, rules, regulations and protocols in times of emergency and/or public health concern. Violations may be referred for action under the Code of Student Conduct.

Office of Disabilities and Learning Support Services

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It is the policy of Villanova to make reasonable academic accommodations for qualified individuals with disabilities. All students who need accommodations should go to Clockwork for Students via myNOVA to complete the Online Intake or to send accommodation letters to professors. Go to the LSS website or the ODS website for registration guidelines and instructions. If you have any questions please contact LSS at 610-519-5176 or learning.support.services@villanova.edu, or ODS at 610-519-3209 or ods@villanova.edu.

Academic Integrity

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All students are expected to uphold Villanova's Academic Integrity Policy and Code. Any incident of academic dishonesty will be reported to the Dean of the College of Liberal Arts and Sciences for disciplinary action. You may view the University's Academic Integrity Policy and Code for a detailed description.

Absence for Religious Holidays

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Villanova University makes every reasonable effort to allow members of the community to observe their religious holidays, consistent with the University's obligations, responsibilities, and policies. Students who expect to miss a class or assignment due to the observance of a religious holiday should discuss the matter with their professors as soon as possible, normally at least two weeks in advance. Absence from classes or examinations for religious reasons does not relieve students from responsibility for any part of the course work required during the absence. For more information, see Religious Holidays.

Lecture recording

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This course, including your participation, will be recorded on video and may be made available to students in the course for viewing remotely. Course videos and materials belong to your instructor, the University, and/or other sources depending on the specific facts of each situation, and are protected by copyright. Do not download, copy, or share any course or student materials or videos without the explicit permission of the instructor. For questions about recording and use of videos in which you appear please contact your instructor.

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