DSCI 318: Advanced Methods in Data Science

Salisbury University · Fall 2026 · Section 001

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Course information

Instructor

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Office

Henson Science Hall 116

Office hours

2:00–3:30 p.m. Monday, Tuesday, Wednesday, Friday; and by appointment.

Class meetings

10:00–10:50 a.m. Monday, Tuesday, Wednesday, Friday

Room

Devilbiss Hall 127, every session. DH 127 is a dedicated computing lab; Python, Jupyter, and every package used this semester are, or will be, installed on all workstations.

Credits

4 credit hours. Meets 4 hours per week.

Prerequisites

C or better in MATH 216 and DSCI 218

Course description and purpose

An advanced course in data science concepts, focused on synthesizing diverse, possibly unstructured data to better understand and characterize the world. The course covers:

- the data science life cycle;
- advanced data representation;
- data characterization and selection;
- time series analysis;
- numerical optimization and loss functions;
- model comparison;
- visual analytics.

> **What this course is for:**
>
> **DSCI 318 introduces the data science life cycle and builds the mathematical and computational foundation the rest of the major depends on: representing data correctly, choosing and fitting models with an honest understanding of their tradeoffs, and communicating results to audiences who are not already experts. Every weekly challenge and every exam draws directly on that life cycle, asking a real question, exploring real**

> **data, building a model that is actually justified, and explaining what it does and does not show.**
>
> This course is also the direct prerequisite for DSCI 470, the department's capstone. The habits built here, choosing a defensible question, handling data honestly, and defending a method under scrutiny, are the same habits DSCI 470 assumes on day one.

Recommended resources

There is no required textbook. Every lecture is delivered as instructor-provided Jupyter notebooks, distributed through Canvas, which are the primary course material.

- James, G., Witten, D., Hastie, T., Tibshirani, R., & Taylor, J. (2023). *An Introduction to Statistical Learning with Applications in Python*. Springer.
  Free PDF available from the authors at statlearning.com. Referenced throughout the semester as ISLP; you will use this same reference again in DSCI 470.

Computing environment

Class meets every session in Devilbiss Hall 127, a dedicated computing lab. Python, Jupyter, and every package used this semester is, or will be, installed on each workstation. All in-class work and all assessments, including Weekly Challenges and exams, are completed on the DH 127 workstations; a personal laptop is never required to fully participate in or complete this course.

> **Installing Python on your own laptop is optional.**
>
> You are encouraged, but not required, to set up the same environment on a personal laptop for your own practice between class sessions. This benefits your own studying and gets you comfortable with an installation process you will rely on in later courses, but it plays no role in how any Weekly Challenge or exam in this course is completed or graded.

Setting up Python on your own laptop, if you choose to

Recommended: Install Miniforge, a free, fully open-source distribution of the conda package manager maintained by the conda-forge community. The installer is a graphical program on Windows and a shell script on macOS and Linux. Full instructions, including troubleshooting, are at the conda-forge/miniforge GitHub repository. These are the identical instructions used in DSCI 470, so setting this up now carries forward directly.

Once installed, use `conda` to install JupyterLab and the packages used throughout the semester, with others added as needed:

- NumPy, pandas
- scikit-learn
- Matplotlib, seaborn, Plotly

If your own installation ever behaves differently than the DH 127 workstations, the workstations are the reference environment for this course; bring the discrepancy to office hours rather than debugging it alone.

Grading

Grade weighting

Component	Weight
Weekly Challenges	40%
Exams	40%
Final project	20%
Total	**100%**

Letter grades. A: 90–100. B: 80–89.9. C: 70–79.9. D: 60–69.9. F: Below 60.

Weekly Challenges, exams, and the final project are described in their own sections below.

Weekly Challenges

Most weeks close with a Challenge Lab, a Jupyter notebook applying that week's methods to a new question or dataset. Each is completed individually during the Friday class session in DH 127, using only that week's material and any prior weeks it explicitly builds on.

A typical Weekly Challenge asks you to:

- reproduce a core result from that week's lectures on new data, confirming your own understanding before extending it;
- extend that result to answer a genuinely new question, not just repeat the lecture's own example;
- write a short reflection connecting what you found back to the week's concepts, in your own words.

Each Weekly Challenge includes its own grading rubric, distributed with the assignment, so you know exactly what is being assessed before you begin.

Exams

Three exams are given this semester, each called an Exam Challenge, completed individually on the DH 127 workstations during the regular class period:

1. **Exam Challenge 1** (Week 5), cumulative over Weeks 1 through 5.
2. **Exam Challenge 2** (Week 10), cumulative over Weeks 6 through 10.
3. **Comprehensive Final Challenge**, cumulative over the entire semester, given during the University's final assessment period.

Each Exam Challenge follows the same format as a Weekly Challenge, a Jupyter notebook applying course methods to data, completed individually, but drawing on a wider span of material and weighted accordingly.

Final project

You will use the knowledge developed throughout the semester to investigate a dataset and tell its story. This is your first experience with an open-ended data science project in this program, and it is deliberately structured to prepare you for DSCI 470's own, larger capstone project next year.

The project proceeds in three stages:

1. **Proposal** (around mid-semester). A short written proposal naming your dataset, your research question, and your planned approach, submitted for approval before substantial work begins.
2. **Development** (Weeks 14–15, in and outside of class). Analysis, modeling, and visualization work, carried out primarily during the dedicated final project sessions.
3. **Written report and in-class presentation** (final assessment period). A written report telling your dataset's story, defended in a short in-class presentation.

Full instructions and the grading rubric are distributed at proposal time.

Late work

Weekly Challenges and exams. Work submitted late without a reasonable excuse receives a 10% reduction in grade for each class day it is late.

Excused work. If illness, a family emergency, a university-sponsored activity, or a religious observance affects a deadline, contact me as early as you can, ideally before the deadline itself. Documentation with a proper signature may be required for any reschedule.

Attendance and classroom conduct

Plan to attend class every day. Come prepared: you are expected to ask and answer questions at least once during most sessions. When classmates are presenting, pay attention and ask questions if you have them.

Devices. DH 127's own workstations are used for all coursework, so a personal laptop is not needed in class. If you bring one, use it in a way that does not distract your classmates, and keep phones in your bag or pocket during class.

Academic integrity and collaboration

Weekly Challenges and exams. Individual work. Do not collaborate.

Course materials. Course notes and materials are for the use of students enrolled in this section. Ask me before sharing them with anyone outside the course; sharing them without permission also violates copyright law.

The Salisbury University Academic Misconduct Policy is available from the Office of the Provost.

Course schedule

The schedule is tentative and subject to change, particularly the specific topics covered in Weeks 11 through 15, which will be finalized as the semester progresses. Changes are announced in class and in Canvas as early as possible. Calendar dates below, semester start, holidays, and the final assessment, are confirmed against the department's Fall 2026 course schedule.

Class meets every session in Devilbiss Hall 127.

Key dates

- Semester begins: Monday, August 31, 2026
- Labor Day, no class: Monday, September 7, 2026
- Exam Challenge 1: Friday, October 2, 2026
- Fall Break, no class: Monday–Tuesday, October 19–20, 2026
- Exam Challenge 2: Friday, November 6, 2026
- Thanksgiving recess, no class: Wednesday–Friday, November 25–27, 2026
- Last day of classes: Wednesday, December 9, 2026
- DSCI 318 Comprehensive Final Challenge: Tuesday, December 15, 2026, 8:00 a.m.

Daily schedule, Fall 2026

Date	Session	Topic	Due
Week 1: Aug 31–Sep 4			
Mon 8/31	1.1	What Is Data Science? (Life Cycle + real-world pivot)	N/A
Tue 9/1	1.2	Vectors, Matrices, and Norms	N/A

Date	Session	Topic	Due
Wed 9/2	1.3	SQL/SQLite + First Look at Learning Algorithms	N/A
Fri 9/4	1.4	CHALLENGE: Weighted Estimators	Weekly Challenge due
Week 2: Sep 7–11			
Mon 9/7	N/A	**No class: Labor Day.**	N/A
Tue 9/8	2.1	EDA & Data Transformation	N/A
Wed 9/9	2.2	EDA & Data Transformation	N/A
Fri 9/11	2.3	Lab	N/A
Week 3: Sep 14–18			
Mon 9/14	3.1	EDA & Data Transformation	N/A
Tue 9/15	3.2	EDA & Data Transformation	N/A
Wed 9/16	3.3	EDA & Data Transformation	N/A
Fri 9/18	3.4	Lab	N/A
Week 4: Sep 21–25			
Mon 9/21	4.1	EDA & Data Transformation (wrap-up)	N/A
Tue 9/22	4.2	EDA & Data Transformation (wrap-up)	N/A
Wed 9/23	4.3	Time Series Analysis (begins)	N/A
Fri 9/25	4.4	Lab	N/A
Week 5: Sep 28–Oct 2			
Mon 9/28	5.1	Time Series Analysis	N/A
Tue 9/29	5.2	Time Series Analysis	N/A
Wed 9/30	5.3	Time Series Analysis	N/A

Date	Session	Topic	Due
Fri 10/2	5.4	EXAM CHALLENGE 1 (cumulative, Weeks 1–5)	Exam Challenge 1 due
Week 6: Oct 5–9			
Mon 10/5	6.1	Time Series Analysis (wrap-up)	N/A
Tue 10/6	6.2	Time Series Analysis (wrap-up)	N/A
Wed 10/7	6.3	Numerical Optimization & Loss Functions (begins)	N/A
Fri 10/9	6.4	Open Lab Day	N/A
Week 7: Oct 12–16			
Mon 10/12	7.1	Numerical Optimization & Loss Functions	N/A
Tue 10/13	7.2	Numerical Optimization & Loss Functions	N/A
Wed 10/14	7.3	Numerical Optimization & Loss Functions	N/A
Fri 10/16	7.4	Numerical Optimization & Loss Functions	N/A
Week 8: Oct 19–23			
Mon 10/19	N/A	**No class: Fall Break.**	N/A
Tue 10/20	N/A	**No class: Fall Break.**	N/A
Wed 10/21	8.1	Bridge into Ensemble & Aggregation	N/A
Fri 10/23	8.2	Challenge Lab (Numerical Optimization, full arc)	Weekly Challenge due
Week 9: Oct 26–30			
Mon 10/26	9.1	Decision Trees: Part I (the Mathematics)	N/A
Tue 10/27	9.2	Decision Trees: Part II (Implementation & Verification)	N/A

Date	Session	Topic	Due
Wed 10/28	9.3	Ensemble & Aggregation (bagging & random forests)	N/A
Fri 10/30	9.4	Challenge Lab (Ensemble & Aggregation)	Weekly Challenge due
Week 10: Nov 2–6			
Mon 11/2	10.1	Ensemble & Aggregation (wrap-up)	N/A
Tue 11/3	10.2	Ensemble & Aggregation (wrap-up)	N/A
Wed 11/4	10.3	Model Assessment, Selection & Tuning (begins)	N/A
Fri 11/6	10.4	EXAM CHALLENGE 2 (cumulative, Weeks 6–10)	Exam Challenge 2 due
Week 11: Nov 9–13			
Mon 11/9	11.1	Lab	N/A
Tue 11/10	11.2	Model Assessment, Selection & Tuning	N/A
Wed 11/11	11.3	Model Assessment, Selection & Tuning	N/A
Fri 11/13	11.4	Model Assessment, Selection & Tuning	N/A
Week 12: Nov 16–20			
Mon 11/16	12.1	Lab	N/A
Tue 11/17	12.2	Model Assessment, Selection & Tuning	N/A
Wed 11/18	12.3	Model Assessment, Selection & Tuning	N/A
Fri 11/20	12.4	Model Assessment, Selection & Tuning	N/A
Week 13: Nov 23–27			
Mon 11/23	13.1	Lab	N/A
Tue 11/24	13.2	Data Story-Telling	N/A

Date	Session	Topic	Due
Wed 11/25	N/A	**No class: Thanksgiving.**	N/A
Fri 11/27	N/A	**No class: Thanksgiving.**	N/A
Week 14: Nov 30–Dec 2			
Mon 11/30	14.1	Data Story-Telling	N/A
Tue 12/1	14.2	Final Project: development/work session	N/A
Wed 12/2	14.3	Final Project: development/work session	N/A
Week 15: Dec 7–11			
Mon 12/7	15.1	Final Project: presentations	N/A
Tue 12/8	15.2	Final Project: presentations	N/A
Wed 12/9	15.3	Final Project: presentations	N/A
Fri 12/11	15.4	Final Project: presentations	N/A
Final			
Tue 12/15	Final	COMPREHENSIVE FINAL CHALLENGE (cumulative, whole semester)	Comprehensive Final Challenge due

Accessibility and accommodations

Any student registered with the Office of Access & Accommodations (OAA) who would like to use approved accommodations in this course should contact me as soon as possible to arrange a meeting to coordinate them.

Students with disabilities can request reasonable accommodations, auxiliary aids and services, and modifications to University policies through the OAA by following the OAA's procedures for Requesting Accommodations, Modifications, Aids, and Services.

For more information, see the Office of Access & Accommodations page, email accommodations@salisbury.edu, or visit the office at Guerrieri Student Union, Room 229.

If any course material is inaccessible to you, tell me and I will fix it. Examples include a notebook that does not work with your screen reader, a figure without a usable description, or a workstation setup that does not suit your needs. You do not need to be registered with the OAA to raise this.

Student support resources

Communication. MyClasses and email are used extensively for announcements and course material. Check your SU email at least once a day.

Office hours. Office hours exist for your benefit. If you have questions about the course, about a Weekly Challenge, or about anything else, come by. You do not need a specific question prepared.

Writing support. The University Writing Center works with students at any stage of a draft, including technical writing. Bringing a report or reflection there is a good use of your time.

Basic needs. If you have difficulty affording food or lack a stable place to live, SU has resources that can help. Contact the Dean of Students, or talk to me and I will help you find them.

Writing across the curriculum

Students are expected to communicate mathematics and mathematical ideas effectively in speech and writing. At the University Writing Center, trained consultants are ready to help at any stage of the writing process. In addition to the writing instruction that occurs in the classroom and during office hours, the Center offers another site for learning about writing. All students are encouraged to make use of these services.

Learning outcomes

By the end of this course you will be able to:

1. Perform exploratory data analysis to guide the development of associated predictive models.

2. Expand computational and mathematical skills to include contemporary, industry-standard methods in data science.
3. Effectively communicate the results of a data science project using data and model visualizations, dashboards, professional writing, and professional presentations.
4. Generate complex models in solution to real-world problems, and understand the tradeoffs of adopting different model strategies.

DSCI 318, Section 001, Fall 2026. Salisbury University. This syllabus is subject to change; changes will be announced in class and posted in MyClasses.