ESI 4611: Advanced Data Analytics

ESI 4611 Section 1668
Class Periods: Mon., Wed., Fri., 9:35–10:25am (pd. 3)
Location: FLG 0265
Academic Term: Fall 2025

Instructor:
Aleksandr Kazachkov
akazachkov@ufl.edu
Weil 401B, 352.273.4902s
Office Hours: Weil 401E, Mon. 10:30–11:30am and Tues. 1:30–2:30pm

Teaching Assistant/Peer Mentor/Supervised Teaching Student:
Please contact through the Canvas website

- N/A

Course Description
3 credits (Letter Grade)
Second course in the data analytics ISE sequence that focuses on how and why algorithms work using an application-oriented approach. Studies advanced analytical and learning models that enhance decision making by converting data to information. Provides insights into how to choose the most effective tool for implementing a specific model.

Course Pre-Requisites / Co-Requisites
ESI 4610 (Introduction to Data Analytics) with a minimum grade of C.

Course Objectives
By the end of this course, you will be expected to:

- Identify appropriate supervised learning models for regression and classification tasks.
- Define loss functions, including penalization terms for regularization.
- Apply validation to reduce overfitting and trade off bias versus variance in models.
- Assess and select machine learning approaches such as decision trees, ensemble methods, and artificial neural networks, based on relevant metrics.
- Implement computer code to solve analytics problems.

The course objectives will be pursued through exercises in various forms to help you understand and communicate these concepts, including assignments asking you to implement and analyze models of real-world phenomena and analytics algorithms.

Materials and Supply Fees
N/A

Relation to Program Outcomes (ABET):

Outcome	Coverage*
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	Medium
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors	Medium

3. An ability to communicate effectively with a range of audiences	
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts	Low
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative environment, establish goals, plan tasks, and meet objectives	Low
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	High
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies	High

*Coverage is given as high, medium, or low. An empty box indicates that this outcome is not covered or assessed in the course.

Required Textbooks and Software
There is no required textbook.

Recommended Materials
- Raschka, Liu, Mirjalili. *Machine Learning with PyTorch and Scikit-Learn*, 2022, ISBN 978-1801819312. Accessible for free by UF students.
  Repository with Python code: https://github.com/rasbt/machine-learning-book
- James, Witten, Hastie, Tibshirani. *An Introduction to Statistical Learning: with Applications in Python*, 2023, ISBN 978-3-031-38747-0.
  Repository with Python code: https://github.com/intro-stat-learning/ISLP_labs

Required Computer
- Recommended Computer Specifications: https://it.ufl.edu/get-help/student-computer-recommendations/
- *HWCOE Computer Requirements: https://www.eng.ufl.edu/students/advising/fall-semester-checklist/computer-requirements/*

Course Schedule
Week 1: Course intro & tools
Week 2: Predictive analytics basics
Week 3: Decision trees
Weeks 4–5: Overfitting, validation, regularization
Week 6: Bagging and random forests
Week 7: Boosting
Week 8: Gradient-boosted trees
Week 9: **Exam 1**
Week 10: Artificial neural networks
Week 11: Training neural networks
Weeks 12–14: Advanced neural networks (e.g., CNNs, GNNs, representation learning, transformers)
Week 15: *Thanksgiving Break*
Week 16: Societal impact

Important Dates
2025-10-15 Exam 1 (in class)
2025-12-06 Exam 2 (FLG 0265 10am–12pm)

Evaluation of Grades

Assignment	Total Points	Percentage of Final Grade
Participation	100	5%
Quizzes (~7-8)	100 each	5%
Homework (~8-9)	100 each	40%
Exam 1	100	25%
Exam 2	100	25%
		100%

Grading Policy

The following is given as an example only.

Percent	Grade	Grade Points
93.4 - 100	A	4.00
90.0 - 93.3	A-	3.67
86.7 - 89.9	B+	3.33
83.4 - 86.6	B	3.00
80.0 - 83.3	B-	2.67
76.7 - 79.9	C+	2.33
73.4 - 76.6	C	2.00
70.0 - 73.3	C-	1.67
66.7 - 69.9	D+	1.33
63.4 - 66.6	D	1.00
60.0 - 63.3	D-	0.67
0 - 59.9	E	0.00

Academic Policies & Resources

To support consistent and accessible communication of university-wide student resources, instructors must include this link to academic policies and campus resources: https://go.ufl.edu/syllabuspolicies. Instructor-specific guidelines for courses must accommodate these policies.

Commitment to a Positive Learning Environment

The Herbert Wertheim College of Engineering values varied perspectives and lived experiences within our community and is committed to supporting the University's core values.

If you feel like your performance in class is being impacted, please contact your instructor or any of the following:

- Your academic advisor or Undergraduate Coordinator
- HWCOE Human Resources, 352-392-0904, student-support-hr@eng.ufl.edu
- Pam Dickrell, Associate Dean of Student Affairs, 352-392-2177, pld@ufl.edu