

Machine Learning Methods for Family, Youth and Community Sciences

FYC 6932, Spring 2026
Class meets: Thursday 12:50 PM – 3:50 PM @ Norman Hall 3035

Instructor:

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Office Hours: by appointment

Course Description: This is an introductory-level course on applied machine learning, targeting graduate students without prior training in machine learning methods. Students will explore supervised and unsupervised learning algorithms and techniques for handling multimodal data types, such as text. The course focuses on building conceptual understanding of machine learning and practical implementation of these techniques.

Course Objectives -- After completing this course, you will be able to:

- Explain core concepts and assumptions of applied machine learning, including supervised and unsupervised learning, in accessible terms relevant to family, youth, and community research contexts.
- Select appropriate machine learning approaches to address substantive research and evaluation questions common in family, youth, and community sciences, with attention to data structure, research goals, and interpretability.
- Implement basic machine learning workflows (e.g., data preprocessing, model training, validation, and interpretation) using reproducible analytic practices.
- Work with multimodal data sources, such as text and structured survey or administrative data, and apply suitable techniques for feature extraction and modeling.
- Critically evaluate machine learning results, including model performance, bias, fairness, and limitations, and communicate findings clearly to non-technical audiences.
- Integrate machine learning insights with theory and practice, connecting predictive or pattern-based findings to developmental, family, and community science frameworks.

Textbook & Materials

James G., Witten, D., Hastie, T. & Tibshirani, R. (2023). [An Introduction to Statistical Learning](#)

with Applications in R (Second Edition). Springer Publication. (Refereed as “ISL” below)

Wickham, H., Çetinkaya-Rundel, M., & Grolemund, G. (2023). R for Data Science. O'Reilly Media, Inc.

Journal articles for each topic.

Software

This course will primarily use R programming language. The software can be freely accessed at:

R Studio: <https://posit.co/downloads/>; <https://cran.r-project.org/> (need to download both)

Policies for AI Generative Tools

Generative AI tools may be required in this course. Generative AI use is promoted in some tasks and will be clarified in assignment instructions. Any work that is done using generative AI must be cited in your submission.

Policies for Assignment Submissions

- Assignments and all other required are due before 11:59 PM on the date indicated on E-learning.
- Submit all materials through E-learning.
- If you have a valid reason to believe you will be late with a submission, contact the instructor by e-mail to discuss your options.
- Late submissions (assignments, postings, etc.) will result in a reduction of 10 points per day to the assignment score and after 48 hours, a score of 0 will be submitted for the assignment.

Course Requirements & Assessments

Component of Grade	Possible Points
Paper presentation	100
Class discussion participation	100
Project part 1	100
Project part 2	200
Final project	300
Presentation	200
TOTAL	1000

Find below the description for each of the course requirements & assessments. More details are available on E-learning.

Paper Presentation (100 points)

Each student is expected to present two papers throughout the semester. The other students are expected to bring at least one question/comment to the class to share and discuss. The purpose of the discussion is to help you to practice leading academic discussions and critically evaluate and apply your understanding of the material in a real-world research context.

Class discussion participation (100 points)

Everyone in the classroom is expected to be an active and regular participant in class discussions. Students are expected to come to class prepared to discuss the assigned readings and their own research interests and to ask questions related to course topics. Students are also expected to facilitate the engagement of classmates and engage in active listening.

Project Part 1 (100 points)

Students are expected to identify a dataset to work with and complete a research paper using the dataset by the end of the semester. The paper will be developed step by step. To begin with, draft a brief description of the data source, how and when the data were collected, and the research questions that the dataset allows to explore. The draft should be 1-2 pages.

Project Part 2 (200 points)

For the second part of the analysis, students are expected to draft responses for the elements below.

- Purpose of analysis (1-2 page);
 - a. What questions you want to answer? (example Questions below)
 - i. How well can we predict X?
 - ii. What are important features in predicting X?
 - iii. Any meaningful patterns in the dataset?
 - iv. What are topics in the text data?
 - v. Can we cluster the data into interpretable groups?
 - vi. ...
 - b. What the literature says about the question(s)? anything similar done in the past?
- Descriptive statistics (1-2 pages);
 - c. Dimension of the data (# of columns, # of rows)
 - d. Missing data?
 - e. How many of variables are continuous/discrete?
 - f. Choose the corresponding one based on what you want to do for the final project:
 - i. Distribution of the outcome variable(s) for classification/prediction project
 - ii. Word cloud/count for text analysis
 - iii. Distributions of the included variables for cluster analysis (show 5 if more than 5 used)?

Final Project (300 points)

Building on the knowledge gained throughout the semester, you will write a final project including the following:

- Introduction (1 page)
 - o Provide context for your research questions
- Methods (1-2 pages)
 - o Briefly introduce each of the methods you tried;
 - o Try at least two techniques;
- Results (1-2 pages)
 - o Explain your findings;
 - o Provide visual aids (figures or tables);
- Discussion (1-2 pages)
 - o Anything interesting/interpretable
 - o How the results correspond to your research questions?
 - o Limitations and next steps

Final Project Presentation (200 points)

Students will prepare a presentation in PowerPoint and will do a presentation to their fellow classmates for feedback in a constructive environment. The slides are worth 100 points and the presentation is worth 100 points. More instructions are available through E-Learning. Suggested length: 10-12 slides; 12-minute presentation, 3-5 minutes Q&A.

Grading Scale

A	93.5-100%
A-	89.5-93.4%
B+	86.5-89.4%
B	82.5-86.4%
B-	79.5-82.4%
C+	76.5-79.4%
C	72.5-76.4%
C-	69.5-72.4%
D	59.5-69.4%
E	\leq 59.4%

Tentative Schedule

Week	Topic
1 (1/15)	Course overview, Introducing AI & Machine Learning
2 (1/22)	Data foundation, ML workflow - ISL: Chapter 2
3 (1/29)	Linear regression - ISL: Chapter 3
4 (2/5)	Supervised learning: prediction - ISL: Chapter 6 - Luo, J., Ren, S., Li, Y., & Liu, T. (2021). The Effect of College Students' Adaptability on Nomophobia: Based on Lasso Regression. <i>Frontiers in Psychiatry</i> , 12, 641417.

5 (2/12)	Supervised learning: prediction <ul style="list-style-type: none"> - ISL: Chapter 7 & 8 - Pargent, F., Schoedel, R., & Stachl, C. (2023). Best practices in supervised machine learning: A tutorial for psychologists. <i>Advances in Methods and Practices in Psychological Science</i>, 6(3), 25152459231162559.
6 (2/19)	Supervised learning: classification <ul style="list-style-type: none"> - ISL: Chapter 4 - Zhao, L., Zheng, Y., Zhao, J., Li, G., Compton, B. J., Zhang, R., ... & Lee, K. (2023). Cheating among elementary school children: A machine learning approach. <i>Child Development</i>. - Kosinski, M., Stillwell, D., & Graepel, T. (2013). Private traits and attributes are predictable from digital records of human behavior. <i>Proceedings of the National Academy of Sciences</i>, 110(15), 5802-5805. - Yin, Q., Stern, M., Kleiman, E. M., & Rizvi, S. L. (2023). Investigating predictors of treatment response in Dialectical Behavior Therapy for borderline personality disorder using LASSO regression. <i>Psychotherapy Research</i>, 33(4), 455-467.
7 (2/26)	Model interpretation & Expandability <ul style="list-style-type: none"> - Yarkoni, T., & Westfall, J. (2017). Choosing prediction over explanation in psychology: Lessons from machine learning. <i>Perspectives on Psychological Science</i>, 12(6), 1100-1122. - Henninger, M., Debelak, R., Rothacher, Y., & Strobl, C. (2023). Interpretable machine learning for psychological research: Opportunities and pitfalls. <i>Psychological Methods</i>. - Orrù, G., Monaro, M., Conversano, C., Gemignani, A., & Sartori, G. (2020). Machine learning in psychometrics and psychological research. <i>Frontiers in Psychology</i>, 10, 2970.
8 (3/5)	Unsupervised learning <ul style="list-style-type: none"> - ISL: Chapter 12 - Rochat, L., Bianchi-Demicheli, F., Aboujaoude, E., & Khazaal, Y. (2019). The psychology of “swiping”: A cluster analysis of the mobile dating app Tinder. <i>Journal of Behavioral Addictions</i>, 8(4), 804-813. - Di Monte, C., Monaco, S., Mariani, R., & Di Trani, M. (2020). From resilience to burnout: psychological features of Italian general practitioners during COVID-19 emergency. <i>Frontiers in Psychology</i>, 11, 567201. - Di Benedetto, M., Towt, C. J., & Jackson, M. L. (2019). A cluster analysis of sleep quality, self-care behaviors, and mental health risk in Australian university students. <i>Behavioral Sleep Medicine</i>.
9 (3/12)	Natural language processing <ul style="list-style-type: none"> - Kennedy, B., Ashokkumar, A., Boyd, R. L., & Dehghani, M. (2021). Text analysis for psychology: Methods, principles, and practices. - Urban, C. J., & Gates, K. M. (2021). Deep learning: A primer for psychologists. <i>Psychological Methods</i>, 26(6), 743.

	<ul style="list-style-type: none"> - LeCun, Y., Bengio, Y., & Hinton, G. (2015). Deep learning. <i>Nature</i>, 521(7553), 436-444
10 (3/26)	<p>Natural language processing</p> <ul style="list-style-type: none"> - Lai, T., Shi, Y., Du, Z., Wu, J., Fu, K., Dou, Y., & Wang, Z. (2023). Psy-LLM: Scaling up Global Mental Health Psychological Services with AI-based Large Language Models. <i>arXiv preprint arXiv:2307.11991</i>. - Nadeem, M. (2016). Identifying depression on Twitter. <i>arXiv preprint arXiv:1607.07384</i>.
11 (4/2)	<p>Causal inference</p> <ul style="list-style-type: none"> - Spechler, P. A., Gutierrez, R. M., Tapert, S. F., Thompson, W. K., & Paulus, M. P. (2023). The beneficial effect of sleep on behavioral health problems in youth is disrupted by prenatal cannabis exposure: A causal random forest analysis of Adolescent Brain Cognitive Development data. <i>Child Development</i>, 94(4), 826-835. - Brand, J. E., Zhou, X., & Xie, Y. (2023). Recent developments in causal inference and machine learning. <i>Annual Review of Sociology</i>, 49(1), 81-110. - Prosperi, M., Guo, Y., Sperrin, M., Koopman, J. S., Min, J. S., He, X., ... & Bian, J. (2020). Causal inference and counterfactual prediction in machine learning for actionable healthcare. <i>Nature Machine Intelligence</i>, 2(7), 369-375.
12 (4/9)	<p>Large language modeling</p> <ul style="list-style-type: none"> - Demszky, D., Yang, D., Yeager, D. S., Bryan, C. J., Clapper, M., Chandhok, S., ... & Pennebaker, J. W. (2023). Using large language models in psychology. <i>Nature Reviews Psychology</i>, 2(11), 688-701. - Abdurahman, S., Atari, M., Karimi-Malekabadi, F., Xue, M. J., Trager, J., Park, P. S., ... & Dehghani, M. (2024). Perils and opportunities in using large language models in psychological research. <i>PNAS nexus</i>, 3(7), pga245. - Pellert, M., Lechner, C. M., Wagner, C., Rammstedt, B., & Strohmaier, M. (2024). Ai psychometrics: Assessing the psychological profiles of large language models through psychometric inventories. <i>Perspectives on Psychological Science</i>, 19(5), 808-826. - Cui, Z., Li, N., & Zhou, H. (2025). A large-scale replication of scenario-based experiments in psychology and management using large language models. <i>Nature Computational Science</i>, 5(8), 627-634.
13 (4/16)	Student presentation

University Policies

More information on UF grading policy may be found at:

[UF Graduate Catalog](#)
[Grades and Grading Policies](#)

Students Requiring Accommodations

Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the [Disability Resource Center](#). It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.

Course Evaluation

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. [Click here for guidance on how to give feedback in a professional and respectful manner](#). Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via ufl.bluera.com/ufl/. [Summaries of course evaluation results are available to students here](#).

University Honesty Policy

UF students are bound by The Honor Pledge which states, “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: “On my honor, I have neither given nor received unauthorized aid in doing this assignment.” [The Honor Code](#) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

Software Use

All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

Student Privacy

There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see the [Notification to Students of FERPA Rights](#).

Campus Resources:

Health and Wellness

U Matter, We Care:

If you or a friend is in distress, please contact umatter@ufl.edu or 352 392-1575 so that a team member can reach out to the student.

Counseling and Wellness Center: counseling.ufl.edu/cwc, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

Sexual Assault Recovery Services (SARS)

Student Health Care Center, 392-1161.

University Police Department at 392-1111 (or 9-1-1 for emergencies), or police.ufl.edu.

Academic Resources

[E-learning technical support](#), 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu.

[Career Resource Center](#), Reitz Union, 392-1601. Career assistance and counseling.

[Library Support](#), Various ways to receive assistance with respect to using the libraries or finding resources.

[Teaching Center](#), Broward Hall, 392-2010 or 392-6420. General study skills and tutoring.

[Writing Studio](#), 302 Tigert Hall, 846-1138. Help brainstorming, formatting, and writing papers.

[Student Complaints Campus](#)

[On-Line Students Complaints](#)

University Policy on In-Class Recording

Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A “class lecture” is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission of the instructor is prohibited. To “publish” means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium,

to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.

Other Course Policies

Rules for Class Discussion

Respect others. This course covers a variety of sensitive issues, and students in the class come from a variety of backgrounds. We expect a class atmosphere of tolerance and respect for every individual and their opinion. If anyone feels they have been harmed or misrepresented—by the instructor or any individual in the class—I urge you to speak with me so that the problem can be dealt with immediately. Please do not let feelings build up and interfere with your experience in this course.

Expectations Of Confidentiality

Respect for confidentiality of personal information shared by your classmates is an absolute must. Do not talk to others about personal information your classmates share in discussions. Likewise, if you choose to share personal information or use a friend or family member as a case example, please refrain from using their names and/or identifying information.

Religious Observance

Please check your calendars against the course schedule. Any student having a conflict in the class schedule due to religious observances should contact the instructor as soon as possible so that they can make necessary arrangements.

Note that the instructor reserves the right to adjust the syllabus as needed.