

University of Florida
College of Public Health & Health Professions Syllabus

PHC 7199 Topics in Precision Medicine and Public Health Informatics (1 credit hour)

Spring: 2025

Delivery Format: On-Campus with HyFlex option

Course Website or E-Learning: Canvas

Instructor Name: Mattia Prosperi

Room Number: Large conference room on the 4th floor of CTRB (next to the Dept. Chair's office)

Hyflex option (Zoom) URL:

<https://ufl.zoom.us/j/93815399530?pwd=WIRwFbsGBaeY8GbQ5LSuyHBZaM3bhS.1&from=addon>

Meeting ID: 938 1539 9530; Passcode: 051625

Phone Number: 352-273-5860

Email Address: m.prosperi@ufl.edu

Office Hours: On appointment (Mon-Fri 9:00am-5:00pm)

Teaching Assistants: N/A

Preferred Course Communications: e-mail

Prerequisites: PHC7083 or similar graduate statistical/machine learning/AI course (with permission from the instructor).

PURPOSE AND OUTCOME

Course Overview. The course covers methodological and translational topics in precision medicine and public health informatics.

Relation to Program Outcomes. This course embraces the latest and most advanced topics and ventures of our Epi program in the 'next-generation' era of epidemiological research and data science, in compliance to up-to-date accreditation standards, and with translational relevance to clinical and professional practice.

Course Objectives and/or Goals. This training is valuable for a PhD student who is interested into the 'next-generation' data science of epidemiology and public health informatics.

Upon successful completion of the course, students will be able to: (1) Discriminate between one-size-fits-all medicine and precision medicine; (2) Formulate new hypotheses for prediction modeling; (3) Design precision medicine and public health research plans; (4) Prescribe proper informatics resources; (5) Perform research design using the precision approach; (6) Solve new precision medicine challenges and avoid design bias.

Course Objectives and/or Goals. Knowledge-based goals according to Bloom's taxonomy of educational objectives:

1. Knowledge. Recognition of well-posed precision modelling approaches and proper study designs.
2. Comprehension. Ability to extrapolate the translational value of prediction models or the generalizability of models at the population level.
3. Application. Ability to identify a proper study and modelling design.
4. Analysis. Ability to question the validity of a precision approach and identify possible biases.
5. Synthesis. Ability to combine information from multiple levels and domains both upstream (when designing) and downstream (when interpreting).
6. Evaluation. Ability to formulate new evidence-based research questions; ability to evaluate the generalizability and translational importance of findings.

Instructional Methods. Roundtable sessions (using multimedia aids) upon critical reading of scientific papers divided in three parts: 1) methodological introduction, 2) applied/translational exemplification, 3) discussion and Q&A. Teaching material will be posted online. Students and teachers will be exchanging roles in presenting materials and discussing topics in active engagement.

DESCRIPTION OF COURSE CONTENT

Course Schedule

| Week | Date(s) | Topic(s) | Readings (at least one in the list) |
|------|---------|--|-------------------------------------|
| 1 | 01/14 | Introduction to course | None |
| 2 | 01/21 | Attend AI seminar (virtual or in person) | None |
| 3 | 01/28 | Reading week | 1 |
| 4 | 02/04 | Roundtable slot / reading week | 2 |
| 5 | 02/11 | Roundtable slot / reading week | 3-4 |
| 6 | 02/18 | Roundtable slot / reading week | 5, A-H |
| 7 | 02/25 | Roundtable slot / reading week | 6-7, A-H |
| 8 | 03/04 | Reading week / work on assignments | 8, A-H |
| 9 | 03/11 | Reading week / work on assignments | 9-10, A-H |
| 10 | 03/18 | Spring break | |
| 11 | 03/25 | Roundtable slot / work on assignments | A-H |
| 12 | 04/01 | Roundtable slot / work on assignments | A-H |
| 13 | 04/08 | Roundtable slot / work on assignments | A-H |
| 14 | 04/15 | Attend PPHP days | None |
| 15 | 04/22 | Closing remarks | None |

Course Materials and Technology

List of mandatory readings (see course schedule)

1. Prosperi M, Min JS, Bian J, Modav. Big data hurdles in precision medicine and precision public health. *BMC Med Inform Decis Mak*. 2018 Dec 29;18(1):139. doi: 10.1186/s12911-018-0719-2.
2. Pendergrass SA, Crawford DC. Using Electronic Health Records To Generate Phenotypes For Research. *Curr Protoc Hum Genet*. 2019 Jan;100(1):e80. doi: 10.1002/cphg.80. Epub 2018 Dec 5. PMID: 30516347; PMCID: PMC6318047.
3. Collins GS, Reitsma JB, Altman DG, Moons KGM. Transparent Reporting of a multivariable prediction model for Individual Prognosis Or Diagnosis (TRIPOD): The TRIPOD Statement. *Ann Intern Med* 2015;162:55–63. doi:10.7326/M14-0697.
4. Collins G S, Moons K G M, Dhiman P, Riley R D, Beam A L, Van Calster B et al. TRIPOD+AI statement: updated guidance for reporting clinical prediction models that use regression or machine learning methods *BMJ* 2024; 385 :e078378 doi:10.1136/bmj-2023-078378.
5. Christodoulou E, Ma J, Collins GS, Steyerberg EW, Verbakel JY, Van Calster B. A systematic review shows no performance benefit of machine learning over logistic regression for clinical prediction models. *J Clin Epidemiol*. 2019 Jun;110:12-22. doi: 10.1016/j.jclinepi.2019.02.004. Epub 2019 Feb 11. PMID: 30763612.
6. Hernán MA, Hsu J, & Healy B. (2019). A Second Chance to Get Causal Inference Right: A Classification of Data Science Tasks. *CHANCE*, 32(1), 42–49. <https://doi.org/10.1080/09332480.2019.1579578>
7. Prosperi M, Guo Y, Sperrin M. et al. Causal inference and counterfactual prediction in machine learning for actionable healthcare. *Nat Mach Intell* 2, 369–375 (2020). <https://doi.org/10.1038/s42256-020-0197-y>
8. Feuerriegel S, Frauen D, Melnychuk V et al. Causal machine learning for predicting treatment outcomes. *Nat Med* 30, 958–968 (2024). <https://doi.org/10.1038/s41591-024-02902-1>
9. Thirunavukarasu AJ, Ting DSJ, Elangovan K et al. Large language models in medicine. *Nat Med* 29, 1930–1940 (2023). <https://doi.org/10.1038/s41591-023-02448-8>.
10. Hager P, Jungmann F, Holland R. et al. Evaluation and mitigation of the limitations of large language models in clinical decision-making. *Nat Med* 30, 2613–2622 (2024). <https://doi.org/10.1038/s41591-024-03097-1>

Suggested papers to discuss in presentation or for assignments

- A. Any paper that develops a machine learning model for diagnostic, prognostic or medical intervention (please consult with instructor first).
- B. Huang RJ et al. A Comparison of Logistic Regression Against Machine Learning Algorithms for Gastric Cancer Risk Prediction Within Real-World Clinical Data Streams. *JCO Clin Cancer Inform* 6, e2200039(2022). DOI:10.1200/CCI.22.00039.
- C. Ramgopal S, Horvat CM, Yanamala N, Alpern ER. Machine Learning To Predict Serious Bacterial Infections in Young Febrile Infants. *Pediatrics*. 2020 Sep;146(3):e20194096. doi: 10.1542/peds.2019-4096. PMID: 32855349; PMCID: PMC7461239.
- D. Garriga, R., Mas, J., Abraha, S. et al. Machine learning model to predict mental health crises from electronic health records. *Nat Med* 28, 1240–1248 (2022). <https://doi.org/10.1038/s41591-022-01811-5>
- E. Xu X, Fairley CK, Chow EPF et al. Using machine learning approaches to predict timely clinic attendance and the uptake of HIV/STI testing post clinic reminder messages. *Sci Rep* 12, 8757 (2022). <https://doi.org/10.1038/s41598-022-12033-7>
- F. Liu Y, Siddiqi KA, Cook RL, Bian J, Squires PJ, Shenkman EA, Prosperi M, Jayaweera DT. Optimizing Identification of People Living with HIV from Electronic Medical Records: Computable Phenotype Development and Validation. *Methods Inf Med*. 2021 Sep;60(3-04):84–94. doi: 10.1055/s-0041-1735619. Epub 2021 Sep 30. PMID: 34592777; PMCID: PMC8672443.
- G. Goh E, Gallo R, Hom J, et al. Large Language Model Influence on Diagnostic Reasoning: A Randomized Clinical Trial. *JAMA Netw Open*. 2024;7(10):e2440969. doi:10.1001/jamanetworkopen.2024.40969

H. Schmidgall S, Harris C, Essien I et al. Evaluation and mitigation of cognitive biases in medical language models. *npj Digit. Med.* 7, 295 (2024). <https://doi.org/10.1038/s41746-024-01283-6>

TECHNICAL SUPPORT

For technical support for this class, please contact the UF Help Desk at:

- helpdesk@ufl.edu
- (352) 392-HELP - select option 2
- <https://helpdesk.ufl.edu/>

ADDITIONAL ACADEMIC RESOURCES

[Career Connections Center](#): Reitz Union Suite 1300, 352-392-1601. Career assistance and counseling services.

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

[Teaching Center](#): Broward Hall, 352-392-2010 or to make an appointment 352- 392-6420. General study skills and tutoring.

[Writing Studio](#): 2215 Turlington Hall, 352-846-1138. Help brainstorming, formatting, and writing papers.

Student Complaints On-Campus: [Visit the Student Honor Code and Student Conduct Code webpage for more information.](#)

On-Line Students Complaints: [View the Distance Learning Student Complaint Process.](#)

ACADEMIC REQUIREMENTS AND GRADING

Assignments. Each student is required to read mandatory papers from the list provided above (1-10, see course schedule). Then, each student shall complete one assignment choosing between: (1) lead one roundtable in class after reading/analyzing one scientific paper from the suggested list (A-H), preparing and delivering a presentation with slides, discussing strengths and limitations; (2) write and submit by 04/08/2025 a critical assessment of one scientific paper from the suggested list (A-H), using two different large language models, and compare the large language models' reviews with their own.

Exam Policy. There is no formal final exam, and the final mark will be based on the attendance (up to 50 points), roundtable participation (up to 50 points), and on-time delivery/completion of assignments (up to 50 points as alternative to roundtable presentation or combination thereof).

Grading. A letter grading scale is used (see table below). Please be aware that a C- is not an acceptable grade for graduate students. The GPA for graduate students must be 3.0 based on 5000 level courses and above to graduate. A grade of C counts toward a graduate degree only if based on credits in courses numbered 5000 or higher that have been earned with a B+ or higher.

| Percentage Earned | Letter Grade |
|-------------------|--------------|
| 93-100 | A |
| 90-92 | A- |
| 87-89 | B+ |
| 83-86 | B |
| 80-82 | B- |
| 77-79 | C+ |
| 73-76 | C |
| 70-72 | C- |
| 67-69 | D+ |
| 63-66 | D |
| 60-62 | D- |
| Below 60 | E |

More information on UF grading policy may be found at: <https://catalog.ufl.edu/UGRD/academic-regulations/grades-grading-policies/>

Policy Related to Make up Exams or Other Work.

Please note: Any requests for make-ups due to technical issues MUST be accompanied by the UF Computing help desk (<http://helpdesk.ufl.edu/>) correspondence. You MUST e-mail me within 24 hours of the technical difficulty if you wish to request a make-up.

Policy Related to Required Class Attendance. Absence is defined as not showing up at class (in person or any synchronous online session) or being more than 15 minutes late. More than three absences result in an E mark. In case of events of special interest related to the course topics (e.g., AI seminars, research days), the instructor will count the participation to such events as a class attendance.

Please note all faculty are bound by the UF policy for excused absences. Excused absences must be consistent with university policies in the Graduate Catalog (<https://catalog.ufl.edu/graduate/regulations/#text>). Additional information can be found here: <https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>

STUDENT EXPECTATIONS, ROLES, AND OPPORTUNITIES FOR INPUT

Expectations Regarding Course Behavior. Keep cell phones silenced in class. Ask permission to teacher and students for using audio/video/image recording devices. Be well behaved and polite.

Communication Guidelines. Follow netiquette for online communications:

<http://teach.ufl.edu/wp-content/uploads/2012/08/NetiquetteGuideforOnlineCourses.pdf>

Academic Integrity

Students are expected to act in accordance with the University of Florida policy on academic integrity. As a student at the University of Florida, you have committed yourself to uphold the Honor Code, which includes the following pledge:

“We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity.”

You are expected to exhibit behavior consistent with this commitment to the UF academic community, and on all work submitted for credit 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.”

It is your individual responsibility to know and comply with all university policies and procedures regarding academic integrity and the Student Honor Code. Violations of the Honor Code at the University of Florida will not be tolerated. Violations will be reported to the Dean of Students Office for consideration of disciplinary action. For additional information regarding Academic Integrity, please see Student Conduct and Honor Code or the Graduate Student Website for additional details:

<https://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/>

<http://gradschool.ufl.edu/students/introduction.html>

Please remember cheating, lying, misrepresentation, or plagiarism in any form is unacceptable and inexcusable behavior.

Recording Within the Course:

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.

Policy Related to Guests Attending Class:

Only registered students are permitted to attend class. However, we recognize that students who are caretakers may face occasional unexpected challenges creating attendance barriers. Therefore, by exception, a department chair or his or her designee (e.g., instructors) may grant a student permission to bring a guest(s) for a total of two class sessions per semester. This is two sessions total across all courses. No further extensions will be granted. Please note that guests are **not** permitted to attend either cadaver or wet labs. Students are responsible for course material regardless of attendance. For additional information, please review the Classroom Guests of Students policy in its entirety. Link to full policy: <https://phhp.ufl.edu/policy-classroom-guests-of-students/>

Online Faculty Course Evaluation Process

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.aa.ufl.edu/students/>. 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 <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/>.

SUPPORT SERVICES

Accommodations for Students with Disabilities

If you require classroom accommodation because of a disability, it is strongly recommended you register with the Dean of Students Office <http://www.dso.ufl.edu> within the first week of class or as soon as you believe you might be eligible for accommodations. The Dean of Students Office will provide documentation of accommodations to you, which you must then give to me as the instructor of the course to receive accommodations. Please do this as soon as possible after you receive the letter. Students with disabilities should follow this procedure as early as possible in the semester. The College is committed to providing reasonable accommodations to assist students in their coursework.

Counseling and Student Health

Students sometimes experience stress from academic expectations and/or personal and interpersonal issues that may interfere with their academic performance. If you find yourself facing issues that have the potential to or are already negatively affecting your coursework, you are encouraged to talk with an instructor and/or seek help through University resources available to you.

- The **Counseling and Wellness Center** 352-392-1575 offers a variety of support services such as psychological assessment and intervention and assistance for math and test anxiety. Visit their web site for more information: <http://www.counseling.ufl.edu>. Online and in person assistance is available.
- **U Matter We Care** website: <http://www.umatter.ufl.edu/>. If you are feeling overwhelmed or stressed, you can reach out for help through the You Matter We Care website, which is staffed by Dean of Students and Counseling Center personnel.
- The **Student Health Care Center** at Shands is a satellite clinic of the main Student Health Care Center located on Fletcher Drive on campus. Student Health at Shands offers a variety of clinical services. The clinic is located on the second floor of the Dental Tower in the Health Science Center. For more information, contact the clinic at 392-0627 or check out the web site at: <https://shcc.ufl.edu/>
- Crisis intervention is always available 24/7 from: Alachua County Crisis Center: (352) 264-6789 <http://www.alachuacounty.us/DEPTS/CSS/CRISISCENTER/Pages/CrisisCenter.aspx>
- **University Police Department:** [Visit UF Police Department website](#) or call 352-392-1111 (or 9-1-1 for emergencies).
- **UF Health Shands Emergency Room / Trauma Center:** For immediate medical care call 352-733-0111 or go to the emergency room at 1515 SW Archer Road, Gainesville, FL 32608; [Visit the UF Health Emergency Room and Trauma Center website](#).

Do not wait until you reach a crisis to come in and talk with us. We have helped many students through stressful situations impacting their academic performance. You are not alone so do not be afraid to ask for assistance.

Inclusive Learning Environment

Public health and health professions are based on the belief in human dignity and on respect for the individual. As we share our personal beliefs inside or outside of the classroom, it is always with the understanding that we value and respect diversity of background, experience, and opinion, where every individual feels valued. We believe in, and promote, openness and tolerance of differences in ethnicity and culture, and we respect differing personal, spiritual, religious and political values. We

further believe that celebrating such diversity enriches the quality of the educational experiences we provide our students and enhances our own personal and professional relationships. We embrace The University of Florida's Non-Discrimination Policy, which reads, "The University shall actively promote equal opportunity policies and practices conforming to laws against discrimination. The University is committed to non-discrimination with respect to race, creed, color, religion, age, disability, sex, sexual orientation, gender identity and expression, marital status, national origin, political opinions or affiliations, genetic information and veteran status as protected under the Vietnam Era Veterans' Readjustment Assistance Act." If you have questions or concerns about your rights and responsibilities for inclusive learning environment, please see your instructor or refer to the Office of Multicultural & Diversity Affairs website: www.multicultural.ufl.edu