University of Florida

College of Public Health & Health Professions Syllabus

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

Spring: 2026

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 Epidemiology Dept. Chair's office)

Hyflex option (Zoom) URL:
https://ufl.zoom.us/j/93815399530?pwd=WlRwFbsGBaeY8GbQ5LSuyHBZaM3bhS.1&from=addon

Meeting ID: 938 1539 9530; Passcode: 051625

Class dates/times: Starting on Jan 13th 2026 and ending on April 21st 2026, every Tuesday from 1PM EST to 2:30 PM EST

Phone Number: 352-273-5860

Email Address: m.prosperi@ufl.edu

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

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	01/13	Introduction to course	None
2	01/20	Attend AI seminar (virtual or in person)	None
3	01/27	Reading week	1
4	02/03	Roundtable slot / reading week	2
5	02/10	Roundtable slot / reading week	3-4
6	02/17	Roundtable slot / reading week	5, A-H
7	02/24	Roundtable slot / reading week	6-7, A-H
8	03/03	Reading week / work on assignments	8, A-H
9	03/10	Reading week / work on assignments	9-10, A-H
10	03/17	Spring break	
11	03/24	Roundtable slot / work on assignments	A-H
12	03/31	Roundtable slot / work on assignments	A-H
13	04/07	Roundtable slot / work on assignments	A-H
14	04/14	Attend PHHP days	None
15	04/21	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

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).

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

ACADEMIC POLICIES AND RESOURCES

https://syllabus.ufl.edu/syllabus-policy/uf-syllabus-policy-links/