

PHC7199-7199(20759) - Top Prec Med PH Infor

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University of Florida

College of Public Health & Health Professions Syllabus

PHC 7199: Topics in Precision Medicine and Public Health Informatics (1 credit hour)
Spring: 2023

Delivery Format: On-Campus

Course Website or E-Learning <https://ufl.instructure.com/courses/469671>

Instructor Name: Simone Marini and Mattia Prospero

Room Number: CTRB 4240C (4th Floor, Large Meeting Room)

Phone Number: 352-273-5860

Email Address: simone.marini@ufl.edu, m.prosperi@ufl.edu

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

Teaching Assistants: None

Preferred Course Communications: email

Prerequisites: Epidemiology Methods I and II and a SAS course, or graduate statistical and quantitative research courses in any relevant department, or permission from the instructor.

Booking presentation

slots: <https://docs.google.com/spreadsheets/d/10ECT1bwU5gcPWBT9aKE0c2Li5qRnYWpZDMAIkH9txq8/edit?usp=sharingLinks to an external site.>

HyFlex

Link: <https://ufl.zoom.us/j/96675840698?pwd=eXVPbjk1VHE2Q0Q3aHI5c1ZVcU5WUT09 Links to an external site.>

PURPOSE AND OUTCOME

Course Overview. The course covers methodological and translational topics in precision medicine and public health informatics, inspired from the White House 2015 initiative “to enable a new era of medicine through research, technology, and policies that empower patients, researchers, and providers to work together toward development of individualized care.”

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.

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. The online material (including this syllabus) will be processed through SensusAccess according to Federal, State and University’s accessibility policies and governance. Students and teachers will be exchanging roles in presenting materials and discussing topics in active engagement.

DESCRIPTION OF COURSE CONTENT

Topical Outline/Course Schedule

Week	Date(s)	Time(s)	Topic(s)	Readings
1	Jan/10/23	10:40am-12:35pm	Precision medicine and precision public health	A
2	Jan/24/23	10:40am-12:35pm	Big data, reproducibility and data dredging	B
3	Feb/07/23	10:40am-12:35pm	Modelling healthcare encounters and care pathways	C

Week	Date(s)	Time(s)	Topic(s)	Readings
4	Feb/21/23	10:40am-12:35pm	Modelling mental health disorders	D
5	Mar/07/23	10:40am-12:35pm	Precision medicine, public health and civil rights	H
6	Mar/21/23	10:40am-12:35pm	Modelling system-level illnesses and aging	F
7	Apr/04/23	10:40am-12:35pm	Modelling infectious diseases	G
8	Apr/19/23	10:40am-11:35am	Modelling cancer risk	E

Course Materials and Technology

*List of journal papers to read for the course (mandatory in **bold**)*

1. Precision Medicine and Precision Public Health:
 - Khoury MJ, Galea S. Will Precision Medicine Improve Population Health?. *JAMA* 2016;316(13):1357–1358. doi:10.1001/jama.2016.12260.
 - **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.**
 - König IR, Fuchs O, Hansen G, von Mutius E, Kopp MV. What is precision medicine? *Eur Respir J.* 2017 Oct 19;50(4). pii: 1700391. doi: 10.1183/13993003.00391-2017.
 - Khoury MJ, Bowen MS, Clyne M, Dotson WD, Gwinn ML, Green RF, Kolor K, Rodriguez JL, Wulf A, Yu W. From public health genomics to precision public health: a 20-year journey. *Genet Med.* 2018 Jun;20(6):574-582. doi: 10.1038/gim.2017.211.
 - Parimbelli E, Marini S, Sacchi L, Bellazzi R. Patient similarity for precision medicine: A systematic review. *Journal of biomedical informatics.* 2018 Jul 1;83:87-96.
 - Slides (in Files)
2. Big data, reproducibility and data dredging:

- 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.
 - Munafo *et al.* A manifesto for reproducible science. *Nature Human Behaviour* volume 1, Article number: 0021 (2017).
 - Prosperi, M, Guo, Y, Sperrin, M, Koopman, JS, Min, JS, He, X, Rich, S, Wang, M, Buchan, IE & Bian, J 2020, 'Causal inference and counterfactual prediction in machine learning for actionable healthcare', *Nature Machine Intelligence*, vol. 2, no. 7, pp. 369-375. <https://doi.org/10.1038/s42256-020-0197-y>Links to an external site.
 - Miotto R, Li L, Kidd BA, Dudley JT. Deep Patient: An Unsupervised Representation to Predict the Future of Patients from the Electronic Health Records. *Sci Rep* 2016;6:26094. doi:10.1038/srep26094.
 - Prosperi, M., Bian, J., Buchan, I.E. et al. Raiders of the lost HARK: a reproducible inference framework for big data science. *Palgrave Commun* 5, 125 (2019). <https://doi.org/10.1057/s41599-019-0340-8>Links to an external site.
 - Roberts, M., Driggs, D., Thorpe, M. et al. Common pitfalls and recommendations for using machine learning to detect and prognosticate for COVID-19 using chest radiographs and CT scans. *Nat Mach Intell* 3, 199–217 (2021).
3. Modelling healthcare encounters and care pathways:
- Lo-Ciganic W-H, Donohue JM, Thorpe JM, et al. Using Machine Learning to Examine Medication Adherence Thresholds and Risk of Hospitalization. *Medical care* 2015;53(8):720-728. doi:10.1097/MLR.0000000000000394.
 - Wellner B, Grand J, Canzone E, et al. Predicting Unplanned Transfers to the Intensive Care Unit: A Machine Learning Approach Leveraging Diverse Clinical Elements. *JMIR Med Inform* 2017;5(4):e45. doi: 10.2196/medinform.8680.
4. Modelling mental health disorders:
- Walsh CG, Ribeiro JD, Franklin JC. Predicting Risk of Suicide Attempts Over Time Through Machine Learning. *Clin Psych Sci* 2017;5(3):457-469. doi:10.1177/2167702617691560.
 - Xu R, Zhang Q. Understanding Online Health Groups for Depression: Social Network and Linguistic Perspectives. *J Med Internet Res* 2016;18(3):e63. doi:10.2196/jmir.5042.
5. Modelling cancer risk:
- Kourou K, Exarchos TP, Exarchos KP, Karamouzis MV, Fotiadis DI. Machine learning applications in cancer prognosis and prediction. *Comput Struct Biotechnol J*. 2014 Nov 15;13:8-17. doi: 10.1016/j.csbj.2014.11.005. eCollection 2015.
 - Zhao D, Weng C. Combining PubMed Knowledge and EHR Data to Develop a Weighted Bayesian Network for Pancreatic Cancer

- Prediction. *Journal of Biomedical Informatics* 2011;44(5):859-868. doi:10.1016/j.jbi.2011.05.004.
- Pergialiotis V, Pouliakis A, Parthenis C, Damaskou V, Chrelias C, Papantoniou N, Panayiotides I. The utility of artificial neural networks and classification and regression trees for the prediction of endometrial cancer in postmenopausal women. *Public Health*. 2018 Nov;164:1-6. doi: 10.1016/j.puhe.2018.07.012.
 - Vitali F, Marini S, Pala D, Demartini A, Montoli S, Zambelli A, Bellazzi R. Patient similarity by joint matrix trifactorization to identify subgroups in acute myeloid leukemia. *JAMIA open*. 2018 Jul;1(1):75-86.
 - Limongelli I, Marini S, Bellazzi R. PaPI: pseudo amino acid composition to score human protein-coding variants. *BMC bioinformatics*. 2015 Dec 1;16(1):123.
6. Modelling system-level illnesses and aging:
- Nead KT. Androgen Deprivation Therapy and Dementia: New Opportunities and Challenges in the Big-Data Era. *J Clin Onc* 2017;35(30):3380-3381. doi:10.1200/JCO.2017.74.8806.
 - Norgeot B, Glicksberg BS, Trupin L, Lituiev 1, Gianfrancesco M, Oskotsky B, Schmajuk G, Yazdany J, Butte AJ. Assessment of a Deep Learning Model Based on Electronic Health Record Data to Forecast Clinical Outcomes in Patients With Rheumatoid Arthritis. *JAMA Netw Open*. 2019 Mar 1;2(3):e190606. doi: 10.1001/jamanetworkopen.2019.0606.
7. Modelling infectious diseases:
- Prospero MC, Altmann A, Rosen-Zvi M, Aharoni E, Borgulya G, Bazso F, Sönnnerborg A, Schülter E, Struck D, Ulivi G, Vandamme AM, Vercauteren J, Zazzi M; EuResist and Virolab study groups. Investigation of expert rule bases, logistic regression, and non-linear machine learning techniques for predicting response to antiretroviral treatment. *Antivir Ther*. 2009;14(3):433-42.
 - Samaneh Kouchaki, Yang Yang, Timothy M Walker, A Sarah Walker, Daniel J Wilson, Timothy E A Peto, Derrick W Crook, David A Clifton, CRyPTIC Consortium, Application of machine learning techniques to tuberculosis drug resistance analysis, *Bioinformatics*, , bty949, <https://doi.org/10.1093/bioinformatics/bty949>Links to an external site.
 - Li LG, Yin X, Zhang T. Tracking antibiotic resistance gene pollution from different sources using machine-learning classification. *Microbiome*. 2018 May 24;6(1):93. doi: 10.1186/s40168-018-0480-x.
 - Rahman SF, Olm MR, Morowitz MJ, Banfield JF. Machine Learning Leveraging Genomes from Metagenomes Identifies Influential Antibiotic Resistance Genes in the Infant Gut Microbiome.

mSystems. 2018 Jan 9;3(1). pii: e00123-17. doi: 10.1128/mSystems.00123-17.

8. Precision medicine, public health and civil rights:
 - o **Barocas S, Bradley E, Honavar V, Provost F. Big Data, Data Science, and Civil Rights. 2017. <https://arxiv.org/abs/1706.03102>**Links to an external site.

Other journal papers for the course

- https://www.nature.com/articles/d41586-018-07535-2?utm_source=facebook&utm_medium=social&utm_content=organic&utm_campaign=NGMT_2_JAL_NatureLinks to an external site.
- <https://www.ncbi.nlm.nih.gov/pubmed/28394905>Links to an external site.
- <https://www.ncbi.nlm.nih.gov/pubmed/29027512>Links to an external site.
- <https://www.ncbi.nlm.nih.gov/pubmed/29298978>Links to an external site.

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/> Links to an external site.

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 lead one of the roundtables (by reading/analyzing one or more scientific papers related to a class topic, preparing and delivering a presentation with slides, discussing strengths, critical points and

perspectives with the course colleagues and the course director during the class) or to deliver a written critical review of one of the papers related to the course topics, in no more than two pages (normal page margins, 1.5 line spacing, Palatino Linotype font 11pt).

Grading. Leading one roundtable or delivering the written critical review will count towards 100 points for the final mark.

Point system used (i.e., how do course points translate into letter grades).

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

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.

Letter Grade	Grade Points
A	4.0
A-	3.67
B+	3.33
B	3.0
B-	2.67
C+	2.33
C	2.0
C-	1.67
D+	1.33
D	1.0
D-	0.67
E	0.0
WF	0.0
I	0.0
NG	0.0
S-U	0.0

More information on UF grading policy may be found at: <http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#grades>Links to an external site.

Exam Policy. There is no formal final exam, and the student final mark will be based on the roundtable lead or the written critical review.

Policy Related to Make up Exams or Other Work. If a student chose to deliver the written critical review, it must be sent by e-mail to the teacher before the penultimate class (i.e. 05/Mar/22). If the deadline is missed, a 20 points penalty is applied. If there is no delivery by the end of the course, the mark will be an Incomplete. 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.

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>Links to an external site.). Additional information can be found here: <https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>Links to an external site.

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>Links to an external site.

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/Links to an external site.](https://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/Links%20to%20an%20external%20site)

[http://gradschool.ufl.edu/students/introduction.htmlLinks to an external site.](http://gradschool.ufl.edu/students/introduction.htmlLinks%20to%20an%20external%20site)

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: <http://facstaff.php.ufl.edu/services/resourceguide/getstarted.htm>[Links to an external site.](#)

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.ua.ufl.edu/students/Links to an external site.>. 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/Links to an external site.>. Summaries of course evaluation results are available to students at <https://gatorevals.ua.ufl.edu/public-results/Links to an external site.>.

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>[Links to an external site.](#) 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>[Links to an external site.](#). On line and in person assistance is available.

U Matter We Care website: <http://www.umatter.ufl.edu/Links to an external site.>. 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/Links to an external site.>

Crisis intervention is always available 24/7 from: Alachua County Crisis Center: (352) 264-6789

<http://www.alachuacounty.us/DEPTS/CSS/CRISISCENTER/Pages/CrisisCenter.aspxLinks to an external site.>

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.eduLinks to an external site.