

University of Florida
College of Public Health & Health Professions Syllabus
PHC 7199: Topics in Precision Medicine and Public Health Informatics (1 credit hour)

Spring 2020

(irregular times)

Delivery Format: On-Campus

Course Website or E-Learning <https://ufl.instructure.com/courses/329604>

Instructor Name: Mattia Prosperi

Room Number: CTRB 4234

Phone Number: 352-273-5860

Email Address: m.prosperi@ufl.edu

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

Canvas url: <http://elearning.ufl.edu/>; <https://ufl.instructure.com/courses/329604>

Teaching Assistants: TBA

Preferred Course Communications: e-mail

Prerequisites None

PURPOSE AND OUTCOME

Course Overview. The course covers methodological and translational topics in precision medicine and public health informatics, inspiring 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; *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 teacher will be exchanging roles in presenting materials and discussing topics in active engagement.

DESCRIPTION OF COURSE CONTENT

Topical Outline/Course Schedule. The course times are irregular. The course is held every other week and each class lasts for two hours.

Unit	Date(s)	Time(s)	Topic(s)	Readings
1	14/Jan/20	10:30am-12:30pm	Precision Medicine and Precision Public Health	A
2	28/Jan/20	10:30am-12:30pm	Big data, reproducibility and data dredging	B
3	11/Feb/20	10:30am-12:30pm	Modelling healthcare encounters and care pathways	C
4	25/Feb/20	10:30am-12:30pm	Modelling mental health disorders	D
5	10/Mar/20	10:30am-12:30pm	Modelling cancer risk	E
6	24/Mar/20	10:30am-12:30pm	Modelling system-level illnesses and aging	F
7	7/Apr/20	10:30am-12:30pm	Modelling infectious diseases	G
8	21/Apr/20	10:30am-11:30am	Precision medicine, public health and civil rights	H

Course Materials and Technology

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

A. 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.

B. 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).**
- 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.

C. 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.

D. 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.

E. 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.

F. 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.

G. Modelling infectious diseases:

- Prosperi 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>
- 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.

H. Precision medicine, public health and civil rights:

- **Barocas S, Bradley E, Honavar V, Provost F. Big Data, Data Science, and Civil Rights. 2017. <https://arxiv.org/abs/1706.03102>**

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_Nature
- <https://www.ncbi.nlm.nih.gov/pubmed/28394905>
- <https://www.ncbi.nlm.nih.gov/pubmed/29027512>
- <https://www.ncbi.nlm.nih.gov/pubmed/29298978>

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

- Learning-support@ufl.edu
- (352) 392-HELP - select option 2
- <https://lss.at.ufl.edu/help.shtml>

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).

Example:

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

You must include the letter grade to grade point conversion table below. Letter grade to grade point conversions are fixed by UF and cannot be changed.

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

For greater detail on the meaning of letter grades and university policies related to them, see the Registrar's Grade Policy regulations at:

<http://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

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. 9/Apr/18). 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.

Any requests for make-ups due to technical issues MUST be accompanied by the ticket number received from LSS when the problem was reported to them. The ticket number will document the time and date of the problem. 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. In special circumstances a student can join the class by Skype, by informing the teacher with reasonable time in advance. Absence is defined as not showing up at class or being late more than 15 minutes. More than three absences result in an E mark.

Please note all faculty are bound by the UF policy for excused absences. For information regarding the UF Attendance Policy see the Registrar website for additional details:

<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 educated 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.

Online Faculty Course Evaluation Process

Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at <https://evaluations.ufl.edu>. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at <https://evaluations.ufl.edu/results/>.

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>. On line and in person assistance is available.
- You 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>

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.

Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact umatter@ufl.edu so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

SUPPORT SERVICES

Accommodations for Students with Disabilities

If you require classroom accommodation because of a disability, you must register with the Dean of Students Office <http://www.dso.ufl.edu> within the first week of class. 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 make sure you provide this letter to me by the end of the second week of the course. The College is committed to providing reasonable accommodations to assist students in their coursework.

Counseling and Student Health

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- 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>

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
