HEALTH INFORMATICS

From medical centers and individual physicians adopting electronic medical records, to patients keeping track of chronic diseases through websites and apps, we live in an era of unprecedented access to health data. These data enable inference of drug side effects, causes of disease, and new treatments, but the new terminologies, policies, and challenges in understanding the data itself can make it difficult for computational researchers to apply their techniques to this new area and for health professionals to begin using informatics to solve practical problems. This course will give both groups the foundation needed to propose, evaluate and develop projects such as secondary analysis of health data and will enable them to begin effective interdisciplinary collaborations. Students will learn how health data is collected (in both hospital and non-hospital settings), how the structure of record systems impacts the research process and interpretation of results, and how to design and evaluate studies involving secondary use of health data (while complying with HIPAA and IRB regulations) in order to gain new medical knowledge and improve healthcare delivery.

Prerequisites None. The course is intended for advanced undergraduate and graduate students from computer science and other disciplines.

Text There is no required textbook. Readings are articles that will be provided.

Evaluation Discussion of the readings is an important part of the course and will count towards the final grade. It is not possible to succeed in this course without participating. There will be a final project (and presentation), as well as one presentation for the journal club assignment and discussions of case studies.

Grades will be: 10% homework, 15% participation, 25% midterm exam, 50% final project.

Contact

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Office hours are Monday 2-2:45pm and by appointment.

Lecture Monday 3-5:30pm

Schedule

Below is the weekly schedule of topics, readings for each session, and deadlines. All journal articles will be available electronically through the library or in moodle. Readings may change, but in that case an announcement will be made in class.

1/25 (Snow day)

2/2 Introduction to health informatics. Overview of field, relation to bioinformatics

2/8 Where and why is health data collected? (including meaningful use and PPACA). Including claims data, clinician-generated data, and information exchange.
- P. Wicks, T. E. Vaughan, M. P. Massagli, and J. Heywood. Accelerated clinical discovery using self-reported patient data collected online and a patient-matching algorithm. *Nature biotechnology*, 29(5):411–414, 2011 [pdf]

2/15 What are the data? EMRs, PHRs, and data standards (narrative vs. structured data, ontologies)
- S. Abhyankar, D. Demner-Fushman, F. M. Callaghan, and C. J. McDonald. Combining structured and unstructured data to identify a cohort of icu patients who received dialysis. *Journal of the American Medical Informatics Association*, 1 2014 [pdf]

2/22 Data reuse and evaluation challenges (what is a diagnosis really?)
- S. Kleinberg and N. Elhadad. Lessons learned in replicating data-driven experiments in multiple medical systems and patient populations. In *AMIA Annual Symposium*, 2013 [pdf]

2/29 Ethics in biomedical research. HIPAA, IRBs, and de-identification. We will discuss the rules and regulations governing health research and, from a practical standpoint, how to preserve privacy when conducting research
- T. Tsang, R. Orr, P. Lam, E. J. Comino, and M. F. Singh. Health benefits of tai chi for older patients with type 2 diabetes: The "move it for diabetes study"–a randomized controlled trial. *Clinical interventions in aging*, 2(3):429, 2007 [pdf]

3/7 Research with EMR data, mobile health
- Reading to be announced

3/14 Midterm exam

3/28 Methods for evaluation. How can we compare systems and determine if a project is successful?
- Reading to be announced

4/4 Pharmacovigilance and drug discovery
- R. W. White, N. P. Tatonetti, N. H. Shah, R. B. Altman, and E. Horvitz. Web-scale pharmacovigilance: listening to signals from the crowd. *Journal of*

the American Medical Informatics Association, pages amiajnl–2012, 2013 [pdf]

4/11 Journal club discussion of recent papers in health informatics

4/18 Decision Support
- P. J. O'Connor, J. M. Sperl-Hillen, W. A. Rush, P. E. Johnson, G. H. Amundson, S. E. Asche, H. L. Ekstrom, and T. P. Gilmer. Impact of electronic health record clinical decision support on diabetes care: a randomized trial. *The Annals of Family Medicine*, 9(1):12–21, 2011 [pdf]

4/25 Public health and epidemiology
- W. D. Evans, J. L. Wallace, and J. Snider. Pilot evaluation of the text4baby mobile health program. *BMC public health*, 12(1):1031, 2012 [pdf]

5/2 Presentations of final projects
- Written project reports due