City University of New York (CUNY)

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Biomedical Informatics Colloquium, BIO 4050, Course Outline

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BIO4050 Biomedical Informatics Colloquium

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Welcome!

This is the OER material for BIO 4050 (Fall 2021).

Course Information

- Meeting through Blackboard Collaborate Ultra or Zoom.
- 2 class hours

- 1 credit

Course Description

A seminar-based course that exposes students to current research topics in the fields of Bioinformatics and Medical Informatics. Weekly presentations by invited speakers and/or faculty introduce students to the broad diversity of research areas in both fields, and engages them in critical thinking and writing. Online lectures and reading activities will be given periodically.

Prerequisites: BIO 3352 or MED 4229

Course Objectives

Upon completion of the course, the students will be able to:

- Comprehend specific methodologies and results described in current biomedical informatics literature and oral presentations.
- Summarize, evaluate, and criticize the biomedical informatics topics presented in class.
- Present and explain the topics presented in class.
- Engage in conversations to promote critical thinking.

Grading schema

In-class participation	Weekly attendance and participation in discussion	20%
Student-lead discussions	Performance on student-lead discussions of weekly seminars	20%
Seminar reports	Weekly submission of reports for each seminar/presentation	60%

Course Topics

A description of some of the topics that will be covered in class follows below. Related resources are provided for each topic.

R for reading

V for video

T for twitter account

Mobile Health (mHealth), Digital Health and Electronic Health records (EHRs)

Mobile Health (mHealth) is the field defined as "medical and public health practice supported by mobile devices", such as smartphones, tablets, and wearable devices.

- [Mobile Health](#) **R**
- [Is telemedicine the future of healthcare?](#) **V**
- Federated Learning in Medicine: Breaking Down Silos to Advance Medical Research – Thomas Clozel, 5 Nov 2019 **V**
- https://twitter.com/mHealthInsight **T**

Personalized Medicine (Precision Medicine)

In Personalized (or Precision) Medicine, the medical treatment to an individual is guided by the individual's genetic information. The doctors select treatments that are most likely to help patients based on a genetic understanding of their disease.

- [Medical Marvels: Precision Medicine and a Doctor/Patient collaboration stops cancer in its tracks, 26 Feb 2019](#) **V**
- Introduction to Big Data at the Englander Institute for Precision Medicine – Olivier Elemento, 2 Aug 2020 **V**
- https://twitter.com/PMWCintl **T**

Deep Learning

Deep learning is a branch of artificial intelligence that uses mathematical models (neural networks) to complete complex classification tasks. Deep learning in healthcare has been applied in many forms, medical imaging and diagnostics, decision support systems, electronic medical records systems, drug discovery, disease prediction, and more.

- [Decoding the human genome with deep learning models – Olga Troyanskaya, 3 Feb 2020](#) **V**
- [Sakellaropoulos T, Vougas K, Narang S, et al. A Deep Learning Framework for Predicting Response to Therapy in Cancer. *Cell Rep*. 2019;29(11):3367-3373.e4. doi:10.1016/j.celrep.2019.11.017](#) **R**
- [Khosravi P, Kazemi E, Zhan Q, et al. Deep learning enables robust assessment and selection of human blastocysts after in vitro fertilization. *NPJ Digit Med*. 2019;2:21. Published 2019 Apr 4. doi:10.1038/s41746-019-0096-y](#) **R**

Epigenomics

Epigenomics is the field that studies epigenetic modifications on the genetic material of a cell, such as post-translational modifications and DNA methylation. Epigenetic changes do not alter the nucleic acids, and are heritable.

- [Precision Medicine for Astronauts and COVID Patients – Chris Mason, 13 Aug 2020](#) **V**
- [EpiMap – Manolis Kellis, 16 Dec 2020](#) **V**

Genetic Privacy

The discussion around the ability to identify individuals or infer specific characteristics of individuals based on their genetic sequence.

- [Genetic privacy, friend of foe? – Yaniv Elrich, 25 April 2019](#) **V**

Decision Support Systems in Healthcare

Computer-based programs that analyze data within electronic health records and provide timely information to assist healthcare providers in making decisions about a patient's care.

- [Automation in nursing support systems – Saba Akbar, 23 Nov 2020](#) **V**
- [Understanding the Basics of Clinical Decision Support Systems](#) **R**

Natural Language Processing

Natural language processing (NLP) is an artificial intelligence branch that allows computers to analyze and interpret speech and text. In healthcare NLP has been used in a plethora of applications, from speech recognition, data mining research, chatbots, clinical documentation, to population surveillance, and computational phenotyping.

- [Overview of NLP Applications in Healthcare in 8 minutes](#) **V**
- [Natural Language Processing In 10 Minutes](#) **V**
- [Sutton RT, Pincock D, Baumgart DC, Sadowski DC, Fedorak RN, Kroeker KI. An overview of clinical decision support systems: benefits, risks, and strategies for success.](#) *NPJ Digit Med.* [2020;3:17. Published 2020 Feb 6. doi:10.1038/s41746-020-0221-y](#) **R**

Evolutionary Genomics

The field that studies how genetic variation contributes to evolutionary changes.

- [Dragon slayer: how a prehistoric Australian goanna seduced the mighty Komodo, 2 March 2021](#) **R**
- [Origin of the world's largest lizard, 3 March 2021](#) **R**

Schedule

The schedule will be finalized mid-August, because it depends on the availability of invited speakers.

It will be a mix of synchronous (live) meetings and asynchronous (pre-recorded) lectures.

Week 1 –	Wed 8/25, 10-11.40am
Week 2 –	Wed 09/01, 10-11.40am
Week 3 –	Wed 09/22, 10-11.40am
Week 4 –	Wed 09/29, 10-11.40am
Week 5 –	Wed 10/6, 10-11.40am
Week 6 –	Wed 10/13, 10-11.40am

Week 7 –	Wed 10/20, 10-11.40am
Week 8 –	Wed 10/27, 10-11.40am
Week 9 –	Wed 11/3, 10-11.40am
Week 10 –	Wed 11/10, 10-11.40am
Week 11 –	Wed 11/17, 10-11.40am
Week 12 –	Wed 11/24, 10-11.40am
Week 13 –	Wed 12/1, 10-11.40am
Week 14 –	Wed 12/8, 10-11.40am
Week 15 –	Wed 12/15, 10-11.40am