Biomedical Informatics
Internship Projects – Summer 2019

Semi-structured Information Retrieval in Clinical Text for Cohort Identification
Faculty: William Hersh, MD; Steven Bedrick, PhD; Aaron Cohen, MD
The overall goal of this project is to develop methods for identifying patients who are potential candidates in clinical studies from the data in their electronic health record. Identifying patients and recruiting them to participate in specific studies can be very difficult. In this project, we are using a data set of patient records to develop generalized approaches to address this problem.

Most of the will involve some programming, with different aspects of the project requiring Python, R, or Java. The specific part of the project and language required will depend on the project needs and student capabilities. On campus intern preferred.

Care Management Plus
Faculty: David Dorr, MD
Care Management Plus focuses on understanding how data, information, and knowledge can improve the health and well-being of our most vulnerable populations, including older adults and those with multiple chronic conditions. Working with this team might include focusing on risk stratification, predictive analytics, or studying models of care intended to improve coordination and management of high needs patients.

Integrating care through standards-based information exchange between a patient risk assessment tool and electronic health record
Faculty: Karen Eden, PhD; Ben Orwoll, MD; Heidi Nelson, MD, MPH; William Hersh, MD
Although computer-based decision aids have guided health care for years, they are typically standalone applications that fail to connect with the patient’s larger healthcare experience. Clinicians and health systems seek further integration of decision aids into point of care encounters with patients as well as into the electronic health record (EHR) itself. Decision aids could be enhanced by connecting directly to the EHR to leverage existing data, improve accuracy and consistency of patient information, and reduce data collection efforts of patients and clinicians. Integration would also provide the patients and clinicians opportunities to verify, update, and correct information. We are working toward such an integration, and we seek the help of a student to develop an interface between the EHR and Mammoscreen (mammoscreen.org) using the emerging Fast Health Interoperability Resources (FHIR, hl7.org/fhir) standard and the Substitutable Medical Apps, Reusable Technology (SMART, smarthealthit.org) framework. Initial work will include configuring a test environment and a simulated dataset that can be used to prototype the integration. Basic experience with Javascript or a similar programming language is required. This internship could be completed remotely or on campus.

Evaluation of EHR system implementation and workflow at an academic medical center.
Faculty: Drs. Michael Chiang & Michelle Hribar
Ongoing projects involve analysis of outcome measures such as speed, efficiency, and documentation quality; as well as optimization of clinical workflow using EHR data and computer simulations. Skills: statistical analysis (e.g. R), computer programming. On campus intern preferred.

**Artificial Intelligence for Diagnosis of Retinal Disease**
Faculty: Drs. Michael Chiang, Jayashree Kalpathy-Cramer, and Kemal Sonmez:
This project involves design and evaluation of diagnostic algorithms (e.g. machine learning, deep learning) and comparison to interpretation by human experts. Skills: computer programming, database architecture, statistical analysis. On campus intern preferred.

**Understanding the Role of the Microbiome in Bladder Health**
Faculty: Lisa Karstens, PhD
Understanding the role of the microbiome in bladder health. The overall goal of this research is to understand how the microbiomes of the gut, vagina, and bladder contribute to bladder health and overactive bladder symptoms. Intern projects include developing, testing, and improving the pipelines for handling the clinical data associated with these projects (using REDCap), and bioinformatic pipelines for handling 16S rRNA gene sequencing data as well as NMR metabolomics data (primarily in R). The projects will provide experience of analysis and biological interpretation of so-called 'big data' that arises from the rich and complex datasets generated by high throughput techniques used in basic research. Excellent record-keeping skills and self-motivation are essential. Some familiarity with programming and statistical analysis are preferred but not essential.

**Understanding the brain – bladder connection**
Dr. Lisa Karstens, PhD - In collaboration with Drs. Damien Fair and Rahel Nardos, we are using advanced neuroimaging techniques to understand how the brain regulates bladder function and if there are functional and structural differences between women with overactive bladder syndrome and healthy controls. Interns will become exposed and learn state of the art neuroimaging techniques and data analysis, including using the Human Connectome Project (HCP) pipeline for data processing. Familiarity with command line programming and statistics are beneficial but not necessary. Self-motivation and organization skills are essential.

**Reactome Biological Pathway Knowledgebase**
Dr. Guanming Wu
Reactome is the most comprehensive open source biological pathway knowledgebase, widely used in the research community as a systems biology platform for biological big-data visualization and analysis. Intern projects will help the team to implement new features to the project’s web application (www.reactome.org) and/or its Cytoscape app, ReactomeFIViz (http://apps.cytoscape.org/apps/reactomefiplugin) and facilitate the project’s software infrastructure. By working with these projects, interns will learn how to work in a globally collaborative open source project within an academic setting, acquire valuable experience with
modern software development techniques and practice, and expose to bioinformatics and computational biology, especially systems biology. Skills: Java programming with biological related course work, self-motivated and willing to learn.

Assistant for Qualitative Study of Electronic Health Records Use by Medical Scribes
Joan Ash
Description to follow