CSE4095/5810 Introduction to Biomedical Informatics
Design/Research Project – Indepth Exploration of BMI Topic
Due Dates: Short Presentation Friday 11/09/18
Paper/Long Presentation 12/07/18

The goal of this project is for each student to explore a course topic in greater detail, to provide future material for subsequent offerings of CSE5810. This project has the deliverables:

- A 15 page paper (single-spaced 12 point, 1 inch margins, Times New Roman) excluding references and figures on the topic with an extensive reference list.
- Electronic links of the five key papers on the topic.
- Two presentations:
  - Short: A 30 minute lecture (25-30 PowerPoint 2010 slides using class template)
  - Long: A 1 hour 15 minute lecture (45+ PowerPoint 2010 slides using class template)

Short presentations will be in class with two presentations per class. Currently there are six days allotted for presentations in the week before Thanksgiving and the two weeks after. This may change depending upon the size of the class.

In terms of topics, there are two possible approaches. First, you can choose a computer science & engineering area and explore its relevance, scope, and application to biomedical informatics.

- Security and Data Protection/Privacy
- Sensor Networks to Monitor Elderly
- Artificial Intelligence & Clinical Decision Support
- Software Architectures for Integrating Health Information
- Bioinformatics (BI) to Process Biological Data
- Super and Grid computing for Genomic and Clinical Data Analysis
- Visualization to Conceptualize BMI/BI Data
- Algorithms for BMI/Clinical Data Analysis
- Mobile Computing to Impact Patient Health and Data Availability

Again – the key issue is for you to choose a topic that is of interest to you, and to clear that topic with the instructor before beginning work (to avoid duplication of topics). Note that you can choose topics other than on this list! Within these areas you are to identify a relevant area related to a medical or clinical interest such as:

1. Clinical Decision Support Systems – these systems are intended to provide providers, from an active knowledge (AI) perspective, with advice and guidance for addressing a particular medical (patient) case.
2. Ontologies and their usage in biomedical informatics and medicine– there is a wide range of utilization of ontologies in a medical context.
3. Open Source EMR and Health Information Exchange.
4. Other national or international BMI initiatives.

For these examples, the focus is on the medical side; once a medical topic of interest is chosen, this topic should naturally lead you to corresponding and appropriate computer science & engineering research areas. Note that you can propose your own topic by sending me a short email message describing your idea.
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Additional Topic Suggestions:

A. Computer Science issues and solutions for supporting a Master patient index/Unified Health ID with respect to HIT systems, Interoperability, patient access to own data, etc.
   - Try a Google Search: unique (or national) patient identifier

B. Exploring Computer Science Issues in Privacy from a patient perspective. This can be done from many different computing perspectives ranging from theory to practice in security.

C. Honest Brokers for Secure De-identification of Patient Records
   - http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3002130/

D. Classifying, Sharing, and Exchanging health care data
   - http://article.sapub.org/10.5923.j.database.20120101.01.html
   - Try a Google Search: Classify health care data

E. Remote health monitoring that explores the use of sensor networks for patient monitoring, mobile apps, wearables, medical devices, etc. – within a medical facility, elderly housing, etc. and to explore the use of computer science as applied to healthcare to monitory health. This could be two individual – one from a sensor network perspective and one from a mobile/wearable/medical device perspective.

F. Biomedical Informatics and Cloud Computing – there is enough work for this to involve two individuals.
   - Try a Google Search: biomedical informatics and cloud computing

G. Biomedical Informatics and HPC – there is enough work for this to involve two individuals.
   - http://hpc.sagepub.com/content/early/2009/06/16/1094342009106192.short
   - http://www.hindawi.com/journals/bmri/2013/185679/abs/
   - http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3808097/
   - Try a Google Search: biomedical informatics and HPC
References

2. http://dlist.sir.arizona.edu/426/
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