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:

* Research project proposal: at most one page (single-spaced 12 point, 1 inch margins, Arial)
* A 15 page paper (single-spaced 12 point, 1 inch margins, Arial) excluding references and figures on the topic with an extensive reference list.
* Soft electronic copies of the five key papers on the topic.
* A 1 hour minute lecture (45+ PowerPoint slides using class template).
* Shortened version of lecture for a presentation to class

This may culminate for the final weeks of the class with student presentations. The due date for all of this material is TBD.

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
  + Biomedical Engineering Related area to Informatics

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 choose topics other than on this list!

When you even have an initial idea I encourage you to contact me via email and I can go back and forth with you to help you crystallize the idea. This is a non-graded assignment.

Additional Topic Suggestions for Spring 2016 semester

1. 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.

* <http://www.statnews.com/2016/01/28/patient-mixups-universal-identification/>
* <http://www.statnews.com/2016/01/28/experts-argue-unique-patient-identifier/>
* Try a Google Search: unique (or national) patient identifier

1. 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.

* <http://www.ncbi.nlm.nih.gov/pubmed/20696276>
* <http://www.ncbi.nlm.nih.gov/pubmed/23228807>
* <http://www.ncbi.nlm.nih.gov/pubmed/23184192>
* <http://www.ncbi.nlm.nih.gov/pubmed/?term=patient+privacy>

1. Honest Brokers for Secure De-identification of Patient Records

* <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3002130/>
* <https://peerj.com/articles/1506.pdf>
* <http://www.ncbi.nlm.nih.gov/pubmed/?term=Honest+Broker>

1. Classifying, Sharing, and Exchanging health care data

* <http://article.sapub.org/10.5923.j.database.20120101.01.html>
* <http://www.databreachtoday.com/blogs/importance-data-classification-p-1153>
* <http://www.ncbi.nlm.nih.gov/books/NBK54296/>
* Try a Google Search: Classify health care data

1. 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 usage 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.

* <http://www.ncbi.nlm.nih.gov/pubmed/26788055>
* <http://www.ncbi.nlm.nih.gov/pubmed/26737852>
* <http://www.ncbi.nlm.nih.gov/pubmed/26736485>
* <http://www.ncbi.nlm.nih.gov/pubmed/?term=remote+patient+monitoring>

1. Biomedical Informatics and Cloud Computing – there is enough work for this to involve two individuals.

* <http://www.j-biomed-inform.com/article/S1532-0464(09)00115-4/abstract>
* <http://bmcmedinformdecismak.biomedcentral.com/articles/10.1186/s12911-015-0145-7>
* <http://www.ncbi.nlm.nih.gov/pubmed/26146645>
* Try a Google Search: biomedical informatics and cloud computing

1. 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**

1. <http://www.icaen.uiowa.edu/~ankusiak/Res-in-Prog/IIE-0.pdf>
2. <http://dlist.sir.arizona.edu/426/>
3. <http://citeseer.ist.psu.edu/457168.html>
4. <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1479907>
5. <http://linkinghub.elsevier.com/retrieve/pii/S0933365703000381>
6. <http://www.nla.gov.au/xinq/documents/access-tool-specifications.html>
7. <http://www-03.ibm.com/grid/medical_archive_solution.shtml>
8. <http://thepersonalgenome.com/2004/01/grid_computing_/>
9. <http://linkinghub.elsevier.com/retrieve/pii/S1386505602000357>
10. <http://www.ppci.ca/system/files/WMP07-MakingDecision.pdf>
11. <http://hssp-education.wikispaces.com/space/showimage/Presentation2_SOAinHealthcare.ppt>
12. <http://linkinghub.elsevier.com/retrieve/pii/S1386505606002541>
13. <https://www.i2b2.org/>
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17. <http://www.openclinical.org/dss.html>
18. <http://www.hhs.gov/healthit/healthnetwork/background/>