I399 Research topic ideas

These are research project ideas proposed by graduate student mentors. You’ll hear brief descriptions of these projects today in class. Please keep track of the projects that seem most interesting to you. After class, please go to OnCourse to fill out the survey called HW #0 (under the Surveys and Tests tab) to mark your top 3 project topics. Please do this by Friday (tomorrow) at 11:59PM; you’ll receive full credit on HW #0 for doing this by the deadline.

Health informatics

• **H1. Health and eldercare:** Many older adults prefer to remain in the comfort of their home, but millions fall each year. What kinds of technology can help them live safely at home? How do older adults feel about various technologies? What kinds of technologies succeed and which fail?

• **H2. Depression treatment:** Clinical depression is a major public health problem. Could applications on mobile devices help to monitor and/or alleviate depression?

Human-Computer Interaction and Design

• **D1. Operating systems user interfaces:** How does Windows 8 interface compare to other operating systems? What tasks do everyday users find easy and which do they struggle with? How could it be improved?

• **D2. Smartphone training:** What features of smartphones do new users struggle to use? How can tutorials be designed or re-designed to help these new users?

• **D3. Mobile shopping:** How can mobile devices be used to improve the shopping experience? How can social media tools be used to design and market fashion for the masses?

• **D4. Technology design in developing countries:** What makes technology projects succeed (or fail) in developing countries? How do cultural theories help or hinder? How do products developed locally differ from those abroad, both in content and success?
Library and Information Science

• **L1. Academic citations:** Citation practices vary widely, making it difficult to match citations with papers automatically, or even to detect duplicates in a list of references. For this project, you'll work with the Cognitive Science Program's Pubs system to align partial data structures and improve duplicate detection in a database of over 400,000 records.

• **L2. Faculty demographics:** Faculty are key to student education and shaping universities, but only some people go on to become faculty. Who chooses to become a faculty member? Do graduates of certain institutions usually go to certain institutions? How frequently do faculty members move among institution?

• **L3. University rankings:** In the latest Shanghai global ranking of Computer Science programs, Purdue is ranked 19 and IU is ranked between 150 and 200. No one knows exactly how these rankings are made. How do the rankings correlate with the faculty’s scientific productivity, in terms of number of papers and number of citations (h-index)? Do these data support this disparity in the rankings?

Security and Privacy

• **P1. Security:** Managing strong passwords is a challenge; multiple passwords for different accounts are a frustration. Can we use maps and/or photos to generate hard-to-break, easy-to-remember passwords?

• **P2. Mobile privacy and security:** Malicious apps on Android and iPhone can steal your personal information and more. How can we build a scanner to detect these malicious apps before they do harm?

• **P3. Botnets:** What are botnets and how do they work? What impact do they have on systems? How prevalent are these infections? How can one prevent them from infesting a network?

• **P4. Secure communication:** Many people use video conferencing software like Skype and Google Hangouts. How can users protect themselves against eavesdropping on their conversations?
• **P5. Privacy in the age of Google Glass.** What are the privacy implications of first-person video devices like Google Glass? How will people react to these devices? How can people protect their privacy?

**Social informatics**

• **S1. Comments on news posts and blogs:** Anonymous comments on news pages and blog posts are often very negative. What types of discourse arise in these posts and what fuels them? For instance, we can examine comments related to Wendy Davis’s recent filibuster of the Texas Legislature to gain insight into disagreements over gender issues as related to legislative policy.

• **S2. Local currency:** Local currency (money) is used by groups with a common bond, like members of a locality or association. Digital currency such as BitCoin is a similar idea. Which of these currencies succeed and which fail? How can we design a local digital currency system based on current open source digital currency platforms, and what is the best way of making it catch on?

• **S4. Improving teaching in developing countries:** Education is the basic building block of every society. What particular issues do developing countries face? How can technology create new more effective methods of teaching?

**Social media**

• **M1. Social media for science:** The polar ice sheets are being monitored by ground-penetrating radar systems that produce large numbers of noisy cross-sectional views of the ice structure. Can we develop social media tool (Facebook app) to have everyday users help make sense of these images?

• **M2. Sentiment analysis:** Can sentiment analysis be used to monitor Twitter feeds, to find particularly positive or particularly negative people? How does sentiment vary according to demographic characteristics (country, age, ethnicity, etc)?

• **M3. Next generation social media:** What parts of current social media platforms are effective and which parts can be improved? What could the next generation of social media look like, and how would people respond to these possibilities?
• **M4. Social media in developing countries:** How can social media help better lives in developing countries? For instance, why have mobile payment systems become so popular in developing countries but not in more developed ones?

• **M5. Photo sharing.** Sites like Flickr are very popular for sharing photos. These sites include images and metadata, like time stamps, geo-tags, text tags, etc. We know that much of this metadata is incorrect, because of bad GPS signals, incorrect clocks, etc. Can we estimate the accuracy of this metadata? How accurate are the text tags people add to photos? What kinds of photos do they tag, and what do they use the tags for?

**Visualization**

• **V1. Visualization:** Visualizations of data are becoming very important, especially with rise of “big data.” We see graphs, infographics, and other visualizations everyday. How well do average citizens understand these? What kinds of visualizations are most effective in different areas of interest?

**Artificial Intelligence**

• **A1. Privacy and face recognition:** Face recognition technology is now common in surveillance systems and social network platforms. What if someone wants to hide? How do disguises and/or image distortions affect modern face recognition algorithms?