CS584: mHealth Informatics: Affordable and Sustainable Healthcare Technologies
Spring 2016
Day/Time; Campbell Hall G-27 (AS)

Office Hours: gari@gatech.edu 1-2pm daily by appointment or Skype/hangouts

Course Description
This interdisciplinary course will provide an overview of the key issues involved in the introduction of sustainable healthcare technology in resource-constrained regions with a focus on mHealth informatics. The course combines lectures on critical concepts in affordable health care technology development and implementation, including context and needs evaluation, supply chain infrastructure and usability design, financial sustainability, and the ethics of low-cost healthcare provision, with practical learning. Through close faculty mentorship, small groups of students will work in mixed-discipline teams to create a solution to an identified real-world health problem, such as delivering clean water or perinatal monitoring. Students will develop applications for mobile-based devices in recognition that such technologies are increasingly relied upon as a rapid route to implementing and deploying mobile healthcare (mHealth) solutions. Organizations based in relevant resource-constrained settings will be identified that can provide feedback and detailed information important to the solutions; wherever possible, pilot implementation of student-developed apps will be facilitated with local partners at the conclusion of the course.

Students will be divided into assigned cross-disciplinary teams based on skills (public health, social science, engineering, or medicine) and will be provided with a project topic identified by a collaboration organization as a pressing and unresolved health issue. With the aid of faculty mentors and representatives of collaborating organizations, student teams will identify possible approaches to a specific problem and identify potential mHealth solutions using the framework provided in course lectures and materials. Students will create an mHealth app for a smartphone/tablet environment that addresses a key issue in global health. Time spent in class will be divided among lectures (on the global healthcare landscape, needs assessment, logistics, financial sustainability, and process evaluation), workshop time for technical skills building, and interactions with team members and collaborating organizations. Although there are no pre-requisites for this course, it would be useful if you have experience in Java programming (if a CS major), public health planning, clinical medicine or biomedical engineering/informatics. However, these are not requirements.

Example Projects
Malnutrition Monitoring in Rural Guatemala - Indigenous populations in highland Guatemala experience some of the highest rate of stunting in the world. Factors contributing to this include decrease land for subsistence farming, poverty, low levels of nutritional education and limited access to primary health care services. This project will assist an established Guatemalan NGO, Wuqu’ Kawoq, in tracking nutritional status and growth in children under 5 in rural communities.
Preconception Risk Reduction - The VA Medical Center in Atlanta is looking to develop an app which provides preconception information to returning female veterans to provide pregnancy-related risk reduction, including vaccinations, weight reduction, glucose control and stress reduction.

Breast feeding improvement in minority populations - This project addresses the very important health disparity of high levels of obesity among African Americans. The risk for adult obesity and cardiovascular disease is related to maternal obesity, birthweight and early childhood weight gain. Shorter breastfeeding duration is associated with higher velocity of infant weight gain, especially in high-risk babies, such as the offspring of obese mothers. Morehouse School of Medicine is wishes to develop an mHealth intervention to support breastfeeding success and duration through lactation consultation and nutritional education messaging.

ChatSalud - In Nicaragua, barriers to information about sexual and reproductive health contribute to high sexually transmitted diseases and teen-pregnancy rates. ChatSalud is an SMS learning platform that allows users to text and find information about these topics from their phone. The front-end is simple text message interaction. The back-end is a complex mutating decision tree that gives the user the illusion of dynamic interaction. ChatSalud is post-pilot and scaling but dealing with all the technical difficulties that comes with these issues. The project is partnered with AmericaMovil, MoH Nicaragua, Ogilvy & Mathers and Cronos/Aros.

Epi Sample - In a low infrastructural resource environment, EpiSample allows surveyors to perform a geographic census of all households in a region, aggregate locations, and provide a sample of all geographic points for survey. These samples points are then tasked out to surveyors who use a navigation tool to find their household of interest and perform a survey using mobile data collection. Epi Sample was developed by PATH in Seattle for a project set in Ethiopia. The CDC team wishes to revamp the design and functionality of the app.

**Course Objectives**

Upon completing this course, students will be able to:

1) Understand the informatics infrastructure and key healthcare delivery barriers in resource-constrained settings
2) Conduct needs assessment for a critical healthcare delivery issue in a specific resource-constrained setting
3) Design a mobile device-based application to address a healthcare delivery problem
4) Plan for pilot implementation and potential sustainability of a mobile device-based healthcare solution
5) Apply analytic methods to contemporary health disparity issues
6) Describe the roles of key disciplines and perspectives in creating, implementing, and evaluating mHealth solutions
## Course Schedule

*Please note that course schedule is subject to change.*

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<tr>
<th>DATE</th>
<th>TOPIC AND ASSIGNMENT</th>
<th>READING</th>
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<td>HSR = Designing and Conducing Health Systems Research</td>
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### Week 1
- **Introduction & overview**
  - Course introduction and project team assignment
  - Lecture 1: Overview of mHealth informatics

### Week 2
- **Device design & information engineering**
  - Team roles description due at 5:00 p.m.
  - Lecture 2: What is “appropriate technology”?
  - Review and analysis of available information
  - Lecture 3: mHealth informatics infrastructures; from text messages to WiFi
  - HSR: Modules 4 & 5

### Week 3
- **Problem Statement, Logic Model & App Design**
  - Annotated bibliography due at 5:00 p.m.
  - Lecture 4: Designing an mHealth App
  - Lecture 5: Building an ecological model
  - HSR: Module 8; “Five Reasons to Embrace Logic Models” Clip (Moodle)
  - [https://www.udacity.com/course/android-development-for-beginners--ud837](https://www.udacity.com/course/android-development-for-beginners--ud837)
  - [http://pactworld.org/sites/default/files/Mobile%20Technology%20Handbook%202014.pdf](http://pactworld.org/sites/default/files/Mobile%20Technology%20Handbook%202014.pdf)

### Week 4
- **Project Objectives**
  - Problem statement and logic model due at 5:00 p.m.
  - Project scope and proximal objectives
  - Lecture 6: Selecting a language, platform & device
  - HSR: Module 6
  - [http://ai2.appinventor.mit.edu/](http://ai2.appinventor.mit.edu/)

### Week 5
- **Needs Assessment: Quantitative Research & Prototyping**
  - Proximal objectives due at 5:00 p.m.
  - Lecture 7. Quantitative Sampling in the field and Instrument Design (Introduction to EpiInfo)
  - Lecture 8: Rapid Prototyping and Agile Development
  - HSR: Modules 10A & 11; Download EpiInfo (Moodle)

### Week 6
- **Needs Assessment: Qualitative Research & PHI**
  - Sampling strategy and survey due
  - Lecture 9: Qualitative Sampling and Instrument Design
  - Lecture 10: Managing Data: Protected Health Information and mHealth Security
  - HSR: Modules 10B & 10C; “Focusing on Focus Groups” Clip (Moodle)

### Week 7
- **Intervention Methods and Components**
  - Sampling strategy and interview or FGD guide due
  - Lecture 11: Intervention best practices

### Week 8
- **Implementation Planning – Timeline, Staff & Budget**
  - Intervention strategy and app prototype layout due at 5:00 p.m.
  - Lecture 12: Practicalities of implementation
  - Lecture 13: Sustainable telemedicine example
  - HSR: Modules 12, 15 & 16

### SPRING BREAK – NO CLASSES

### Week 9
- **Individual Project Updates**
  - Gantt chart and budget due
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<tr>
<th>Week 10</th>
<th>Revisions</th>
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<td>Revised intervention strategy due</td>
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<td><strong>GOOD FRIDAY HOLIDAY – NO CLASSES</strong></td>
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<th>Week 11</th>
<th>Evaluation Planning – Outcome Evaluation</th>
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<td>Revised sampling strategy and research instruments due</td>
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<td>Lecture 15: Measuring impacts, project accountability and process evaluation</td>
<td>HSR: Module 17; Saunders et al. – “Process Evaluation” (Moodle); GA Evaluation Resource Center Modules (Moodle)</td>
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<th>mHealth Ethics</th>
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<td>Evaluation plan due</td>
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<td>Lecture 16: Ethics and implementation Realities</td>
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<th>Week 13</th>
<th>Sustainability and Scalability</th>
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<td>Draft proposal due at 5:00 p.m.</td>
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<td>Lecture 17: Funding models and longevity of projects – social enterprise</td>
<td>Davis et al. – “Knowledge Translation” (Moodle)</td>
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<th>Presentations</th>
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<td>Final proposal due at 5:00 p.m.</td>
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<td>Final presentations</td>
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