

CS584: mHealth Informatics: Affordable and Sustainable Healthcare Technologies

Spring 2016

Day/Time; Campbell Hall G-27 (AS)

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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 consultant 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.

DATE	TOPIC AND ASSIGNMENT	READING HSR = Designing and Conducting Health Systems Research
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 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/
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	

	Individual Skype Check-Ins Lecture 14: Rapid Prototyping and Agile Development	http://viewpoints.kalypso.com/entry/four-reasons-to-take-a-rapid-prototyping-approach-to-your-plm-implementation
Week 10	Revisions	
	Revised intervention strategy due	
	GOOD FRIDAY HOLIDAY – NO CLASSES	
Week 11	Evaluation Planning – Outcome Evaluation	
	Revised sampling strategy and research instruments due	
	Lecture 15: Measuring impacts, project accountability and process evaluation	HSR: Module 17; Saunders et al. – “Process Evaluation” (Moodle); GA Evaluation Resource Center Modules (Moodle)
Week 12	mHealth Ethics	
	Evaluation plan due	
	Lecture 16: Ethics and implementation Realities	
Week 13	Sustainability and Scalability	
	Draft proposal due at 5:00 p.m.	
	Lecture 17: Funding models and longevity of projects – social enterprise	Davis et al. – “Knowledge Translation” (Moodle)
Week 14	Presentations	
	Final proposal due at 5:00 p.m.	
	Final presentations	