ICTD Capstone
Software Design for Underserved Populations

CSE 482b

Course Overview, March 27, 2023

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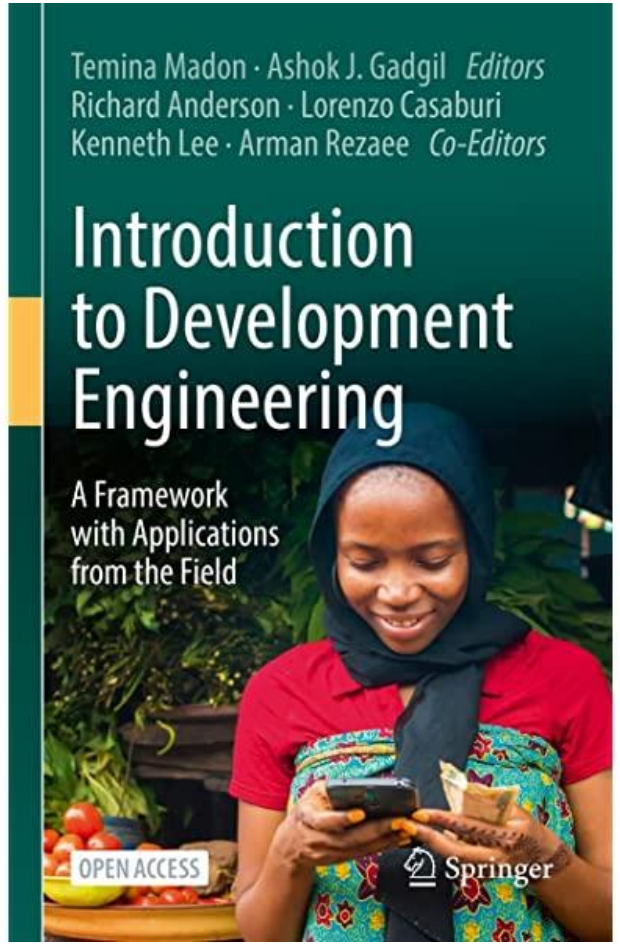
Today

- Capstone Courses
- Project Ideas

Development Engineering

- Technological interventions to improve human and economic conditions in low-resource settings
- An engineering discipline aimed at addressing global inequity
- Develop principles for design, introduction, scaling, and sustainability of Global Good technology



What are the challenges

- Domain challenges: Health, Education, Agriculture, Markets, Livelihoods, Infrastructure, Sanitation, Energy, Environmental Degradation

- Resource constraints: Finance, Infrastructure, Distance, Education and literacy, Governance

- Shocks: Climate Change, Global Pandemics

Setting

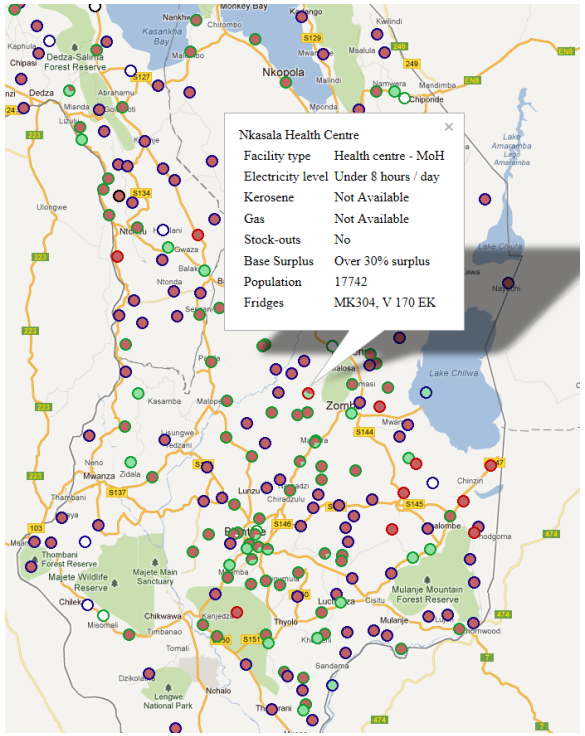
- Rapid, global economic and technological change
  - Many technologies are globally accessible
- Not just a split between “Developed” and “Developing Countries”, but within countries between “Urban-Affluent” and “Rural/Urban-Poor”
- In many ways, the world is getting better
  - Increasing literacy rates
  - Decline in maternal mortality rates
  - Near elimination of diseases such as polio

ICTD, Information and Computing Technologies for Development

- Technology with global impact
- Appropriate for `low resource' settings
- Target development domains
  - Health, Education, Livelihood, Agriculture, Disaster Relief
- This quarter, computing and global health

Previous ICTD Capstone Projects

Vaccine Cold Chain Visualization System



eKichabi Mobile Application

CSE Capstone courses

- **Capstone Goals**
  - Projects must be large enough to require teams of several students to work on over one quarter.
  - Students must apply concepts from more than one sub-area of CSE (at the 300-level and above).
  - The work must involve a substantial design effort.
  - Students must present their work using formal oral presentations and written reports.
  - Efforts must culminate in an interesting, working artifact.

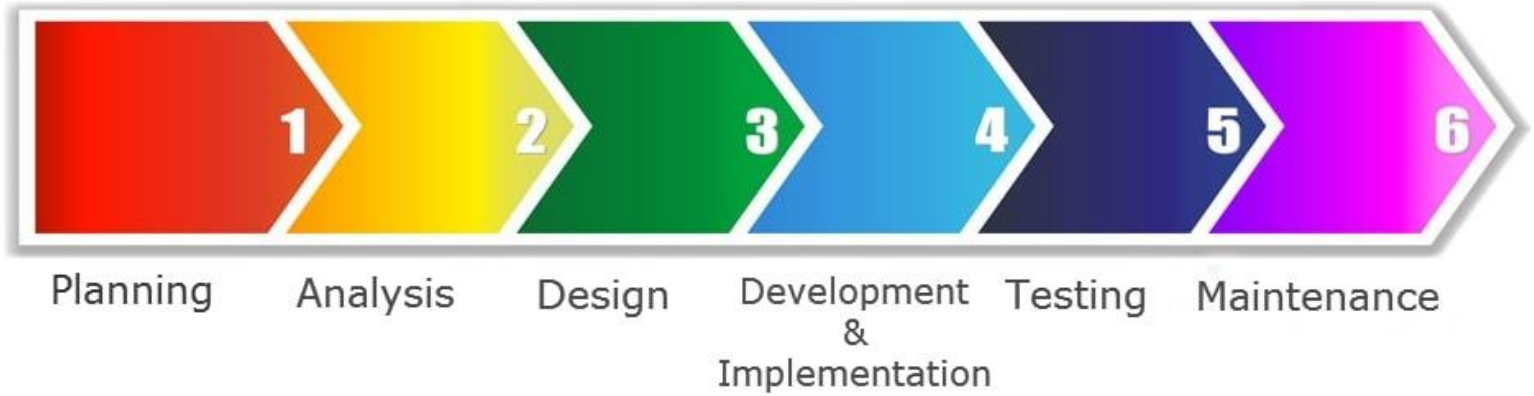
What I expect in a capstone

- Group projects
  - Four or five people per team
  - Different roles
- Design and Implementation
- Multiple check points and expert review
- Working, useful software
- Reasonable software process
- Presentation of results

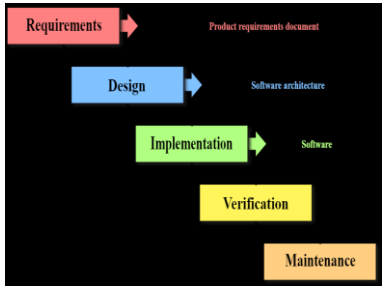
Learning goals

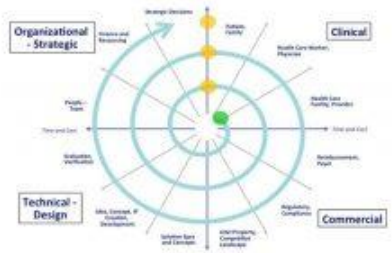
- Working in a team to deliver software
  - Developing a specification and solution idea
  - Choosing technologies and an architecture
  - Working in a team
- Domain expertise
  - General knowledge of problem area
  - Appropriate applications of technology
- Independent acquisition of knowledge

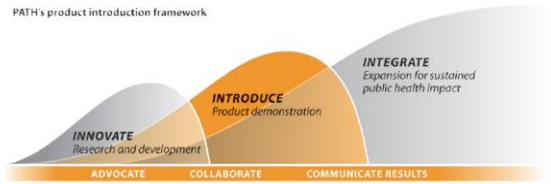
The capstone challenge



- Too much stuff to fit into nine or ten weeks in the spring
- Focus on Design, Development & Implementation
- Choose at start of course from a set of project ideas







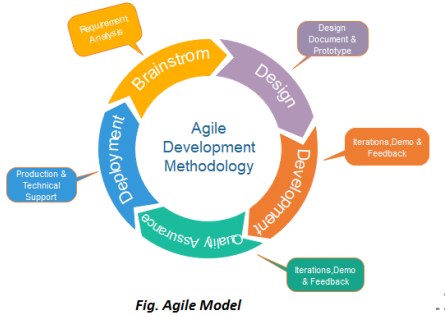


Fig. Agile Model

Schedule

- Today (March 27) – present project ideas
- Wednesday (March 29)– establish project groups
- Domain Presentation (April 3) :
- Domain Presentation (April 5) :

Schedule (Dates tentative)	
Project Pitch	Wednesday, April 12
Progress Report	Wednesday, April 26
Prototype Demo	Wednesday, May 17
Final Presentations	Tuesday, June 6, 2:30 pm
Deliverables due: Code, Write-up	Friday, June 9, 6:00 pm

Course Mechanics

- Group development of projects
- Lectures/class meetings for first few weeks
- Regular group meetings with course staff
- Later class sessions for presentations and demos
- Specific deliverables will be specified during the quarter
- Final turn in will include code and a paper (~10 pages)

Domain – Global Health

- Target health care in low resource settings
- Key challenges
  - Lack of trained doctors
  - Poor infrastructure

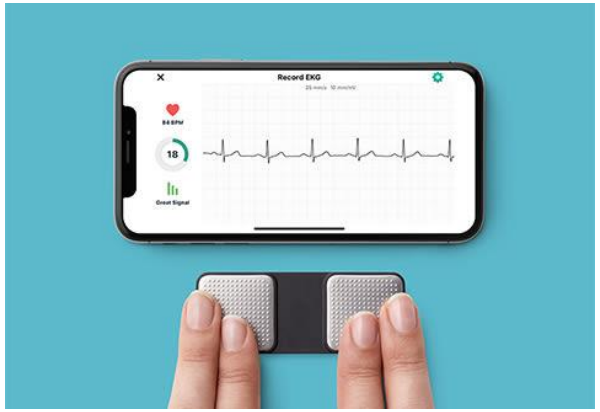
mHealth

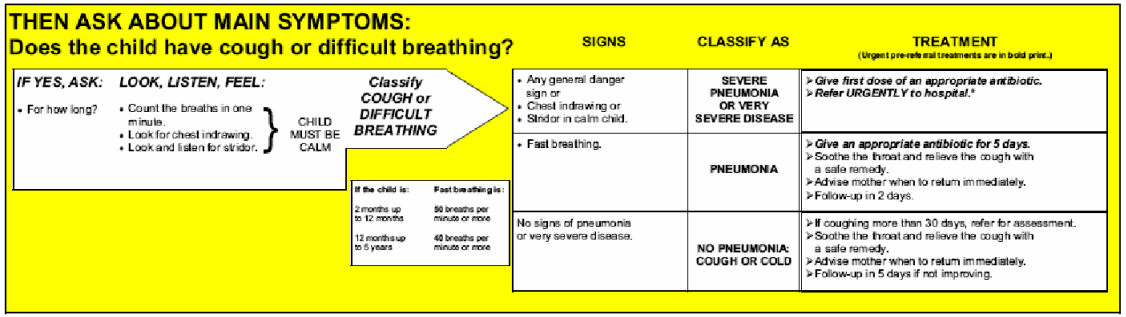
- Low-cost mobile devices (smart phones and tablets) to assist health care providers
- Feasible in many settings (device availability, connectivity)
- Many different types of interventions have been developed

Project Ideas

- This part of the slide deck needs to be worked on. We will begin with a description of the target environment – remote health centers in developing countries. These are under resourced and infrastructure constrained.
- The hope is that mobile devices can be utilized to help with service delivery – this will be the main focus of the course
- We have two domains planned – cardiology and pulmonology (hearts and lungs)
  - Leading health concerns

Projects





THEN ASK ABOUT MAIN SYMPTOMS:
Does the child have cough or difficult breathing?

IF YES, ASK:
- For how long?

LOOK, LISTEN, FEEL:
- Count the breaths in one minute.
- Look for chest indrawing.
- Look and listen for stridor.

} CHILD MUST BE CALM

Classify COUGH or DIFFICULT BREATHING

If the child is: | Fast breathing is:
2 months up to 12 months | 50 breaths per minute or more
12 months up to 5 years | 40 breaths per minute or more

SIGNS	CLASSIFY AS	TREATMENT (Urgent pre-referral treatments are in bold print.)
• Any general danger sign or • Chest indrawing or • Stridor in calm child.	SEVERE PNEUMONIA OR VERY SEVERE DISEASE	➢ *Give first dose of an appropriate antibiotic.* ➢ *Refer URGENTLY to hospital.**
• Fast breathing.	PNEUMONIA	➢ *Give an appropriate antibiotic for 5 days.* ➢ Soothe the throat and relieve the cough with a safe remedy. ➢ Advise mother when to return immediately. ➢ Follow-up in 2 days.
No signs of pneumonia or very severe disease.	NO PNEUMONIA: COUGH OR COLD	➢ If coughing more than 30 days, refer for assessment. ➢ Soothe the throat and relieve the cough with a safe remedy. ➢ Advise mother when to return immediately. ➢ Follow-up in 5 days if not improving.

Cardiovascular Disease

- Can a personal EKG be integrated health care in low income settings
  - Likely setting – triage tool by nurses
- Project 1
  - Explainable AI to explain diagnosis
- Project 2
  - Training tools to support Community Health workers

Pediatric Pulmonology

- IMCI integrated management of Childhood Illness mobile app
  - Step through a diagnosis protocol
- Alrite project has been prototypingand Android App in Uganda which we will extend
- Project 1
  - Develop the app to allow customization by non-programmers
- Project 2
  - Integrate App into health work flows including a medical record system

Project: Technical Domains

- Cardio-AI Explainability
  - Technical AI, Training data sets and models available
- Cardio-Health Worker Training
  - HCI/Usability – Recommend some type of Tablet/Smartphone training app
  - Recommended setting – Indian CHWs
- ALRITE Extensibility
  - Design challenge – Framework for “decision tree” protocol apps
- ALRITE Workflow
  - Medical Record Systems – Global Goods Software (OpenMRS or DHIS2)