ECE 1778:
Creative Applications for Mobile Devices

Lecture 5

February 2, 2016

Today

1. Fierce Mobile
2. Logistics
3. Assignments P4 and S4
4. Project Management and Execution
5. Proposal Pre-Discussions
6. Group Interaction

Fierce Mobile

Fierce Newsletters – Wireless, Health, IT

- There is a family of newsletters/websites in the mobile world, that keep you apprised on sometimes interesting things:
- Fierce Mobile IT general Info Tech & mobile
  - http://www.fiercemobileit.com
- Fierce Wireless – cellular industry & handsets
  - http://www.fiercewireless.com
- Fierce Mobile Health
  - http://www.fiercemobilehealthcare.com

- To Join – see 'Subscribe' link at bottom; many others
- Recent Examples ..

From Last Week's Fierce Mobile Healthcare

Study: mHealth impact negligible on healthcare costs, patient benefits

A research trial evaluating mobile healthcare technology versus traditional disease management reveals "little evidence" digital medicine intervention reduces healthcare costs or drives greater consumer healthcare interest, though some improvement in health self-management was reported.

The six-month Scripps Translational Science Institute trial provided 160 participants managing hypertension, diabetes and/or cardiac arrhythmia with iPhone-enabled biosensors, blood pressure monitors, blood glucose meters or a mobile ECG device. Participants were provided data aggregation and visualization tools to track and view data via an online dashboard accessible to caregivers. The goal was to ascertain if mHealth utilization impacted healthcare insurance claims.

mHealth impact negligble, cont’d

Overall we found little in terms of differences in health insurance claims between individuals enrolled in the control and monitoring arm," the Scripps researchers said, noting that they expected a moderate impact--approximately a doubling of insurance claims dollars. "This suggests that while there may be small, short-term increases in healthcare utilization as a result of mobile health monitoring, there is likely not a major effect. ”

Chilmark Research analyst Naveen Rao cited three major flaws in the design: the limitation of claims data, the patient workflow process and poor data visualization--the latter cited as the top flaw. "If we want to educate and activate patients, why do data still look like this?" Rao said, noting that there is little benefit in providing patients with "low-value" data that isn't easy to understand.

""There are high school web developers who can juice up these visuals to make them slick and compelling, and college pre-meds who can translate these graphs into English. We simply must get better.” The study's findings fall in line with some notable healthcare leaders' takes on mHealth's value. Rao also noted that study participants weren't given the option to use their own smartphones, which likely proved burdensome for participants.

Logistics

Assignments

- S3 and P3 due next week
  - Except S3 part 1 due this Thursday
- S4 and P4 now available, not due until Feb 22
  - Discussed today
- S2 and P2 are finished being graded
  - Generally quite well done; P2 was hard!
  - If you received a failing grade on P2, or did not finish it, please talk to me today after the lecture is over
  - S2 quite well done!

Assignments S4 and P4

Assignment P4

- Threads, Internet Files and Databases
  - Read a file containing names, a bio and then a picture from an Internet-addressed file, do on a separate thread
  - Put names into a database
  - Emit searches on Google for the names, and display one by one
  - Use a separated thread to do a separate task and communicate back to main UI thread (used in many apps)
  - In addition, make appropriate use of fragments

- Due in 3 weeks – Monday Feb 22th at 6pm.

Assignment S4: Creativity, Sensors and You

- Key outcome of this course is to have Specialists always thinking of ways to use this new Canvas that is a mobile device **and** to evaluate their ideas

- Goal of this assignment is to have you come up with creative apps in your field that make use of the sensors available today, and some from the future
  - And to do a first-level of critical evaluation of the idea

Recall, Mobile devices are:

- Powerful computers, capable of:
  - Optimization
  - Signal Processing
  - Data searching and sorting
- Networked well to the Internet
- Capable of several kinds of ‘output’
  - Screen
  - Sound
  - Vibration
  - Light

Be Creative!

- Part 1
  - Reprise & augment the description of your field, like that in S1
- Part 2
  - Given these sensors:
    1. Accelerometer
    2. Gyroscope
    3. Barometer
    4. Camera
    5. Light Sensor
    6. Proximity Detector
    7. Humidity Sensor

S4, Part 2, continued

1. **Invent** 2 Novel apps that make use of these sensors, **in your field**
   - Novel = no direct hit as an app for a Google search that there is a mobile app that already does this.
2. **Evaluate** your idea, by imagining the use of the app and thinking through its strengths & weaknesses
   - use the evaluation criteria from your field
   - can only be subjective at this point
   - Also give some sense of the amount of the processing you're asking for – with some help from partners
   - e.g. Vision processing is hard because it has to look at many things (many pixels/frame, many frames/sec)

S4 Part 3

Consider the future, many more cool sensors invented:

1. 3D Sensing e.g. XYZ sensor – see video.
2. An ultrasound sensor that can image inside a body.
3. A mind activity sensor, that tells you how active the brain is from 0 (meaning deep sleep) to 10 (wide awake and running for your life)
4. A Blood Pressure Sensor
5. An eye tracker, that tells you, every tenth of a second, where on a screen a user is looking at the screen.

- Invent two more Novel apps in your field & analyze
- Due in 3 weeks – Monday, February 22nd at 6pm

Project Time Line

Project Stages 16

1. **Forming Groups**
2. **Project Approval-in-Principle**
3. **Project Proposal/Plan**
   - Document Due yesterday
4. **Proposal & Plan Presentations**
   - February 9 & 10
   - **CHANGE: EXTRA LECTURE Wed Feb 10, 6-8pm, MB 128**
   - **No Lecture Reading Week (Feb 16)**
   - **Special User-Interface/User Experience Lecture Feb 23**
5. **Spiral 2 & Spiral 4 Presentations**
   - 2: March 1/8 4: March 15/22
6. **Final Presentations**
   - Weeks of March 29/April 5
7. **Final Report Due April 7th**

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Project Management and Execution

Your Project Plans

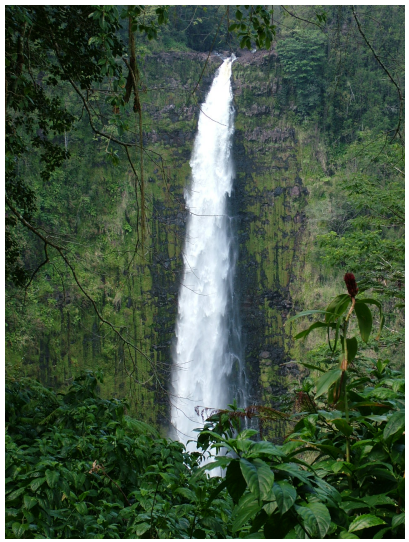
- Will have given you a well-defined final goal
- Should also have broken up work up into pieces
  - The block diagrams required in proposal

Soon: Start Executing! How?

Focus: Spiral/Agile/Incremental Method

- Get the smallest part of your App working as soon as possible.
  - Exercise it, revise it, and build on it
  - Use your common sense to see if it is working, and if your goals need to be adjusted
  - After today's discussions, you should identify what the first working useful version should be 'Spiral 1' done in 3 weeks.

Waterfall vs. Spiral Method



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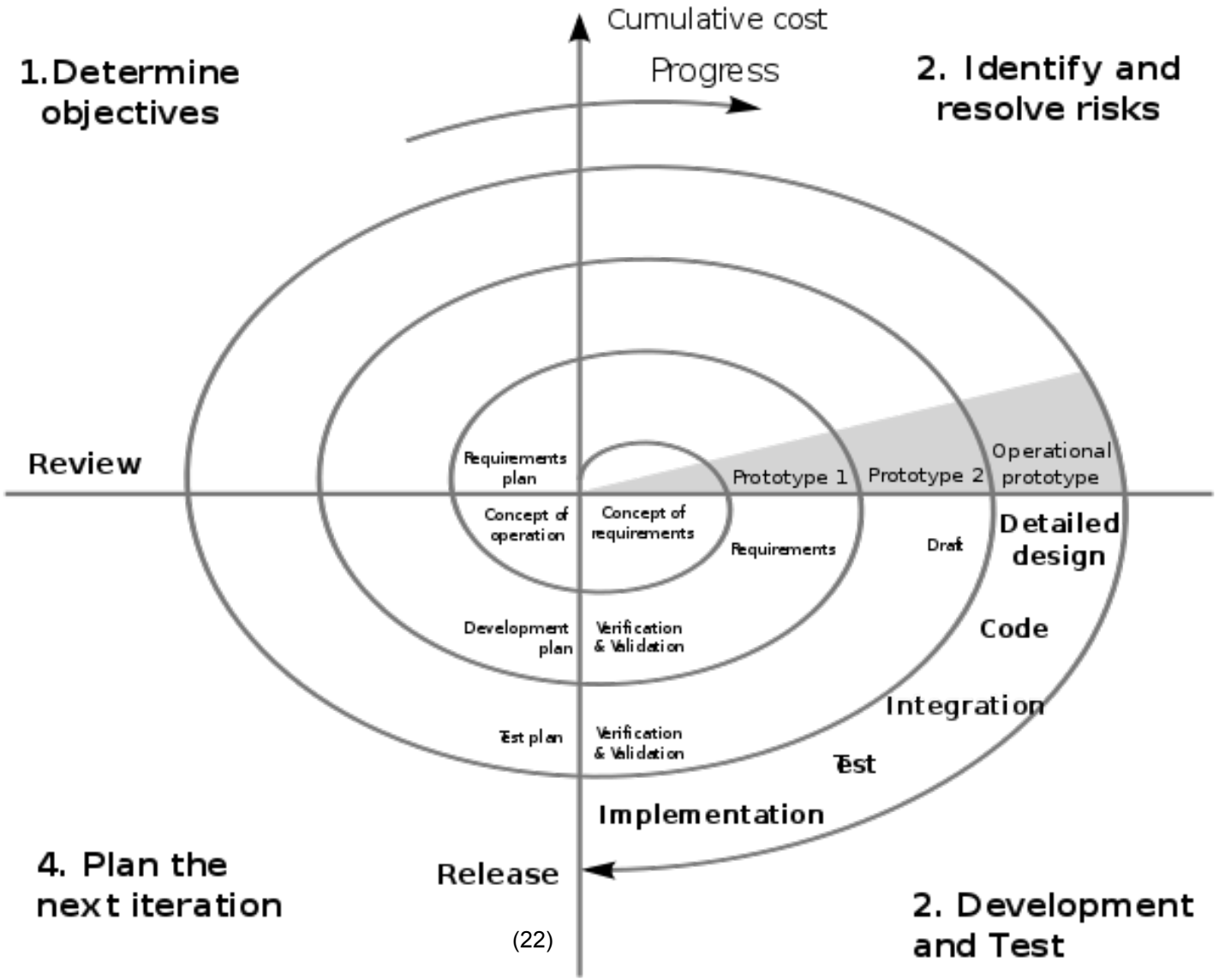
- Waterfall means plan everything out, documenting carefully
- But Software really needs to be exercised to see how well it works -> Spiral
- Particularly true for user interface oriented software
  - but essentially true in all projects!

Boehm's Spiral Model



Agile Software Manifesto

Agile Software Values: Choose

- **Individuals and interactions** over processes and tools
- **Working software** over comprehensive documentation
- **Customer collaboration** over contract negotiation
- **Responding to change** over following a plan

- while there is value in the items on the right, we value the items on the left more
  - From http://en.wikipedia.org/wiki/Agile_software_development

Spiral Method of Development

- To emphasize how important this is, the next key milestone in the course, is **Spiral 2**

- **Spiral 1** is what you get plan to get working the week of Feb 23
  - You should describe what this will be in your proposal/plan presentation next week – functionality and features achieved.

- **Spiral 2** is what you get working by Tuesday March 1
  - The complete set of (additional to Spiral 1) features and functions

You'll Present Spiral 2 on March 1

- March 1 is four weeks from now, a long time
  - You'll want the Spiral 1 working well before!
  - You should think now what your Spiral 1 is going to be
  - Include Spiral 1 and Spiral 2 description in the plan you present next week

Key Coming Steps in Project

1. **Identify a Spiral 1 and Spiral 2**
   - Take your block diagrams, and break down into tasks
   - Those tasks will tell help you decide what to shoot for in Spiral 1 and Spiral 2
   - Be prepared, of course, to adjust goals as you go along

2. Define the tasks that need to happen
   - Estimate how long they will take
   - If too long, re-do goals
   - Estimation is difficult; have to try; failure OK; can ask for help
   - Assign Tasks to Each Team Member

Project Execution

- You're in a team, and you need to find an effective way to coordinate the team's work

- Agree
  - Who is doing what
  - When work will be done
  - Explicitly, in writing of a group email

- Have weekly or more frequent meeting; every 3 days?
  - If not in person, use Skype video or phone

Rule 1 for Effective teams:

- Make commitments,
  - check on commitments (task execution) each meeting
- Don't be unpleasant or nasty if commitment's not met, work together
  - However, don't 'look away' from it – face it and make a plan
  - Figure out if commitment was too ambitious
  - Re-work goals/commitments to be done next
- Do have expectation that contributions of each team member are equal

What About Disagreements?

- You're in a team, you're likely to have disagreements
- If this is your first project experience of this kind, this can be stressful

- **Resolution of disagreements is a crucial skill**
  - Take this as a opportunity to learn how to do it

Issues and Relationships

There are often two things going on when there is conflict:

1. Specific issues that give rise to a problem
   - Factual/strategic differences of opinion
2. Relationship between people
   - Trust, respect

Modified from: http://www.execstrategies.com/Facilitator/ConflictResolutionStrategies.htm

Relationship Focus

- Trust is at the root of all good relationships
  - Personal and professional
  - Must establish common goals and work towards them together
  - Trust is created when everyone believes that everyone else has the same goals

1. Maintain a fair, respectful communication style
   - with careful listening
2. Expect and accept another's right to disagree
3. Realize the value of disagreement
   - it can lead to something better

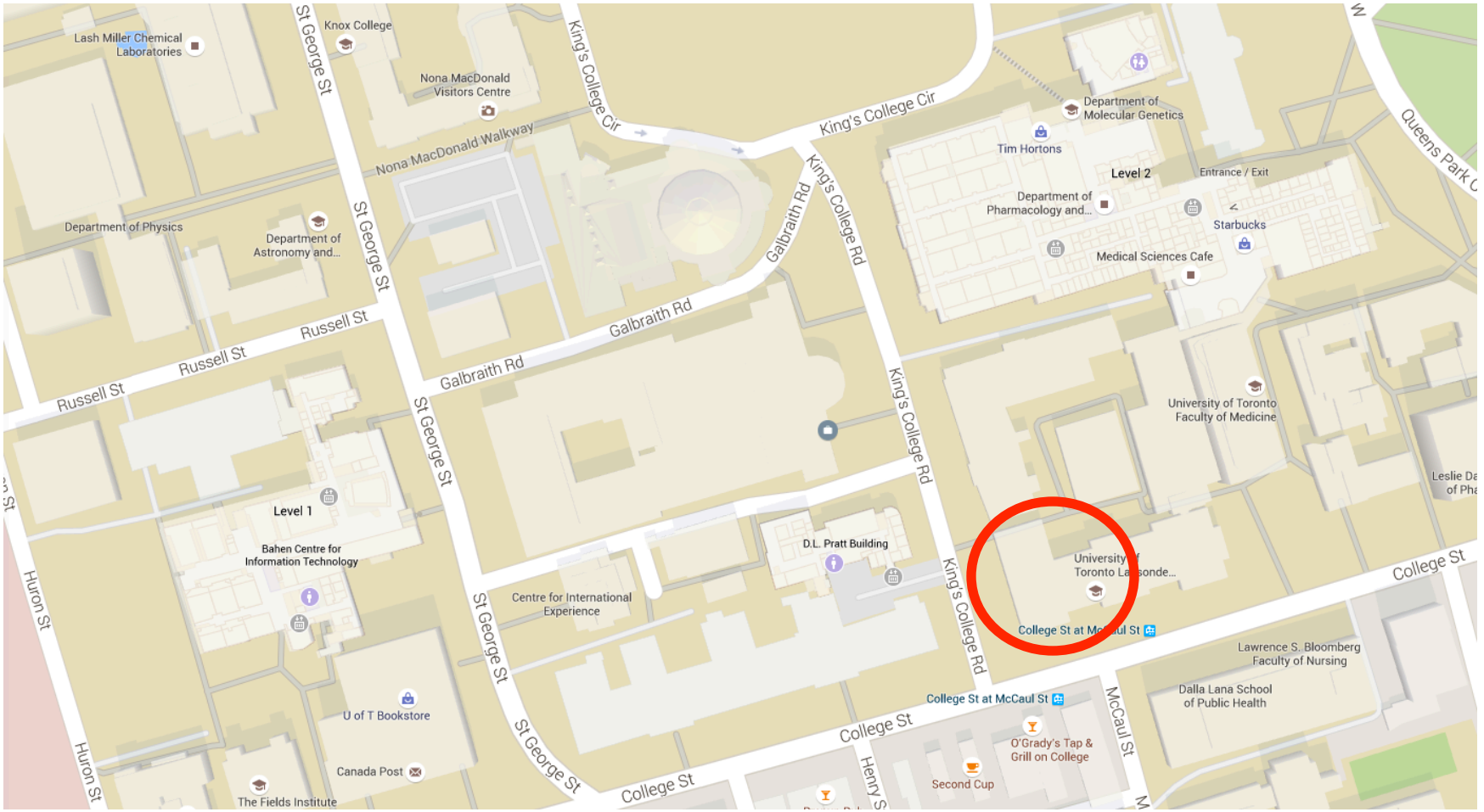
Proposal/Plan Presentations

Next Week in 2 Classes:

Tuesday February 9th 9-11am (Usual)

Wednesday February 10th, 6-8pm (MB 128)

Location of MB (Mining Building)



Plan Presentations on Feb 9 and 10

- Formal Presentation
  - Using PowerPoint, Keynote, PDF or OpenOffice
- Extra lecture on Feb 10, 6-8pm, MB 128
- You will not know in advance if you're presenting on the 9th or 10th, to be fair, so come prepared to talk
  - Unless you've expressed a **hard** constraint to me, already (or soon)

- Send the presentation to me by email by **Monday, February 8th, at 6pm**
  - Jonathan.Rose@ece.utoronto.ca

Time Limit

- **5 Minute Time Limit**
  - I will start timer that makes annoying sound when done, and expect you to be finished within 10 seconds after that.
  - **Omit needless words**
- Three Minutes for Questions

Proposal/Plan Presentation Contents

The Essence of the Proposal/Plan submitted yesterday:

1. Goal (What & Why)
2. Give Mock-ups of What User Will See
3. Top-level Block Diagram of Code briefly explained
4. Statement of Risks/Issues
5. **Spiral 1 and 2 targets**
6. Specialist Statement
   - 1 minute, for Specialist to say what their contribution will be

Notes on Time Limit & Clarity

- Time Limit is both serious and important
  - To this course and your ability to communicate going forward
- How many slides can there be in 5 minutes?
- How much can go on a slide?
- Are pictures good things in presentations?
- Do you start with the details or the big picture?
- What place does jargon have in a short presentation?

How Do You Know if Presentation is Good?

- Practice it, standing up, in front of:
  - First, no-one
  - Then, a few others
  - Not too much, though, either, as it shouldn't sound memorized

- **Time it**
  - if too long, cut it
  - Get to the point quicker

- Gulak's law: "You can describe anything to anyone in any amount of time"
  - Just have to pick the right level of abstraction

How Do You Know if Presentation is Good?

In Practice:

- Listen to what you are saying
- Does it make sense **listening with the ears of the audience?**

Who is Your Audience?

- A mixture of technically-literate and people with expertise in some another area [different from your own!]
- Make sure the lay people know **what** you're doing - the goal
- OK to go somewhat technical after that, but don't assume we're all expert in every sub-field of ECE and CS

Selected Proposal Discussions

Discussion

- Would like to review some (not all) of the proposals submitted last week, and engage in a discussion
  - To help all of you with your planning & execution

- Be prepared to stand up, and describe your proposal
  - What & Why
    - Describe the idea, and its motivation
  - Thoughts on a Spiral 1 and 2

Project Names

Portable Perimieter	MySungRussian
FlipFinance	MoniToddler
safeMedicare	Graph Master
ASD PlayDate	MIToc
Gallery Composer	M3 (Mindful Meditative Minds)
Journey	Flip the Script
Practice Cactus	CardiACT
Rounds	BardFinder
SuperFit	SoundSpread
On My Feet	DementiaObs
Simplify	BeHave
Balanced Arm Trainer	UncertaintyGame

Balanced Arm Trainer

- **What**: The goal of our App is to help children with 1-sided weakness increase functional use of their weak arms by measuring functional arm movements and rewarding with onscreen visual for increasing his/her use of the weak arm.

- **Why:** An app providing real-time monitoring is more convenient for children with 1-sided weakness.

BeHave

- **What**: Our app gathers information from sensor tags, does analysis of gathered information, provides tailored intervention to the user to reduce resource consumption.

- **Why**: Personal environmentally relevant behavior is just as important as products' technical efficiency.

Mindful Meditative Minds

- **What:** The goal of our app is to
  1. encourage mindfulness meditation in users by measuring brain waves and heart rate and providing feedback
  2. measure performance on several cognitive tasks (high-level executive functions), and
  3. link the user's success in mindfulness meditation to their performance on mental tasks.

- **Why:** In literature, mindfulness meditation has been linked to better mental performance in particular higher-level executive functions (e.g., ignoring distraction; Gallant, 2016). These particular mental abilities make use of the frontal lobes, which may deteriorate with normal aging as well as in age-related pathology, e.g. Alzheimer's. Encouraging mindfulness mediation in older adults in an easy to use home-based application and demonstrating how it relates to their own mental performance could be used to inspire continuous mindful-based practice in this population, who disproportionately show declines in executive functions. We also hope to make use of this application for individuals suffering from dementia, e.g., Alzheimer's.

CARDiAct

- **What:** The goal of our App is to help local EMS increase awareness of, and create a bystander response system for cardiac arrest (CA) events. The response system focuses on two aspects: 1) bystander treatment: directing bystanders to CA victims (for CPR) and/or automated external defibrillators - optimizing logistic details based on historical cardiac arrest data, 2) basic level/bystander level diagnostic tools: examining pupil dilation, airway obstruction, and ECGs (automated classification).

- **Why:** While bystander treatment (CPR and/or AED use) have been shown to improve survival outcomes, however bystander involvement remains low. We aim to increase bystander's role and participation by targeting 3 endpoints to improve: 1) bystander witnessed, 2) bystander CPR applied, and 3) bystander AED used cardiac arrests.

Journey

- **What: J**ourney is an app that enables clinicians to measure and track quantitative gait parameters of patients who are undergoing rehabilitation.

- **Why:** Research suggests that certain gait features, such as stride time variability, may be an indicator of cognitive dysfunction and falls risk, but this is difficult to measure without complex equipment. We are developing a tool that enables clinicians to perform gait analysis, and store the data to track changes over the course of recovery.