Pramod Kotipalli // Portfolio

I'm a fourth-year Computer Science student at the Georgia Institute of Technology.

I research *wearable computing* and *augmented reality* under Professor Thad Starner.

I've developed full-stack experiences across web, mobile, and wearable platforms.

I have significant professional experience, most recently at SPACEX

https://github.com/p13i

Resumé

https://linkedin.com/in/pramodkotipalli

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RF-Pick

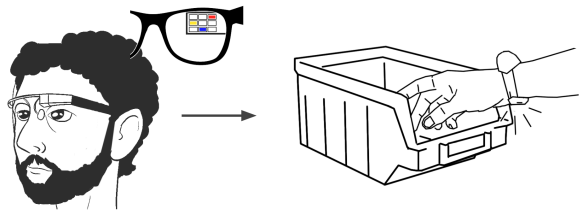
// Wearable RFID verification system for logistical order-picking

Awarded Best Paper, ACM ISWC

ACM International Symposium on Wearable Computers

- 24% Paper Acceptance Rate
- One of 62 Accepted Papers to be **Awarded Best Paper**

ISWC 2018
8-12 October 2018 SINGAPORE



Abstract:

- Order picking accounts for 55% of the annual $60 billion spent on warehouse operations in the United States.
- Reducing human-induced errors in the order fulfillment process can save warehouses and distributors significant costs.
- We investigate a radio-frequency identification (RFID)-based verification method wherein wearable RFID scanners, worn on the wrists, scan passive RFID tags mounted on an item's bin as the item is picked; this method is used in conjunction with a head-up display (HUD) to guide the user to the correct item.
- We compare this RFID verification method to pick-to-light with button verification, pick-to-paper with barcode verification, and pick-to-paper with no verification.
- We find that pick-to-HUD with RFID verification enables significantly faster picking, provides the lowest error rate, and provides the lowest task workload.

Contributions:

- Integration of novel wearable system with HUDs
- Comprehensive and rigorous HCI user study
- Embedded systems and networking programming
- Application of software engineering principles to increase development speed and system robustness

Advisor:

Professor Thad Starner, Technical Lead, Google Glass

View through Google Glass

RF-Pick

Georgia Tech School of Interactive Computing
College of Computing

Hackathon win turned startup

Safely

// Smart wearable technology to end campus violence

Problem identified:

- Almost one in four women and one in 20 men experience sexual assault in college
- Students are often in situations where a smartphone is not accessible for help

Solution created:

- Discrete, wearable button programmed to alert friends, family members, & campus police
- Complimentary smartphone app that manages student's notification prefs. & tracking
- Comprehensive business and financial plan for producing physical products

Achievements:

- Won competition of dozens of teams & six semifinalists, presented to venture capitalists
- Identified an underserved market need in need for a real & permanent solution
- Co-founded a startup (GoSafely, LLC) that has now raised over $20,000 in funding

Hardware renderings:

- Users slide open and press the shielded blue button. Pressing the button once alerts friends and family. Pressing the button twice alerts local police through Wi-Fi or a cellular network.
- The device can be added to a keychain for discrete and easy access in times of emergency.
- We prototyped the plastic casing and internal electronics within the two day hackathon.

Mobile app:

- Users can manage their Safely tags from their mobile phones via Bluetooth.
- Users can also trigger a more specific safety warning (e.g. EMS) from their mobile app. After an event is triggered, interested parties can track a user's location in real-time.

Technologies used:

- Ionic Framework
- AngularJS in TypeScript + HTML/CSS
- SolidWorks CAD + 3D Printing

Georgia Tech Score

Georgia Tech College of Engineering

// Easy, mobile, & comprehensive solution for judging poster sessions

Problem identified

- Managing the evaluation of poster sessions and design expos is a logistical nightmare
- Collecting and processing paper-based evaluation sheets is long, laborious, and error-prone

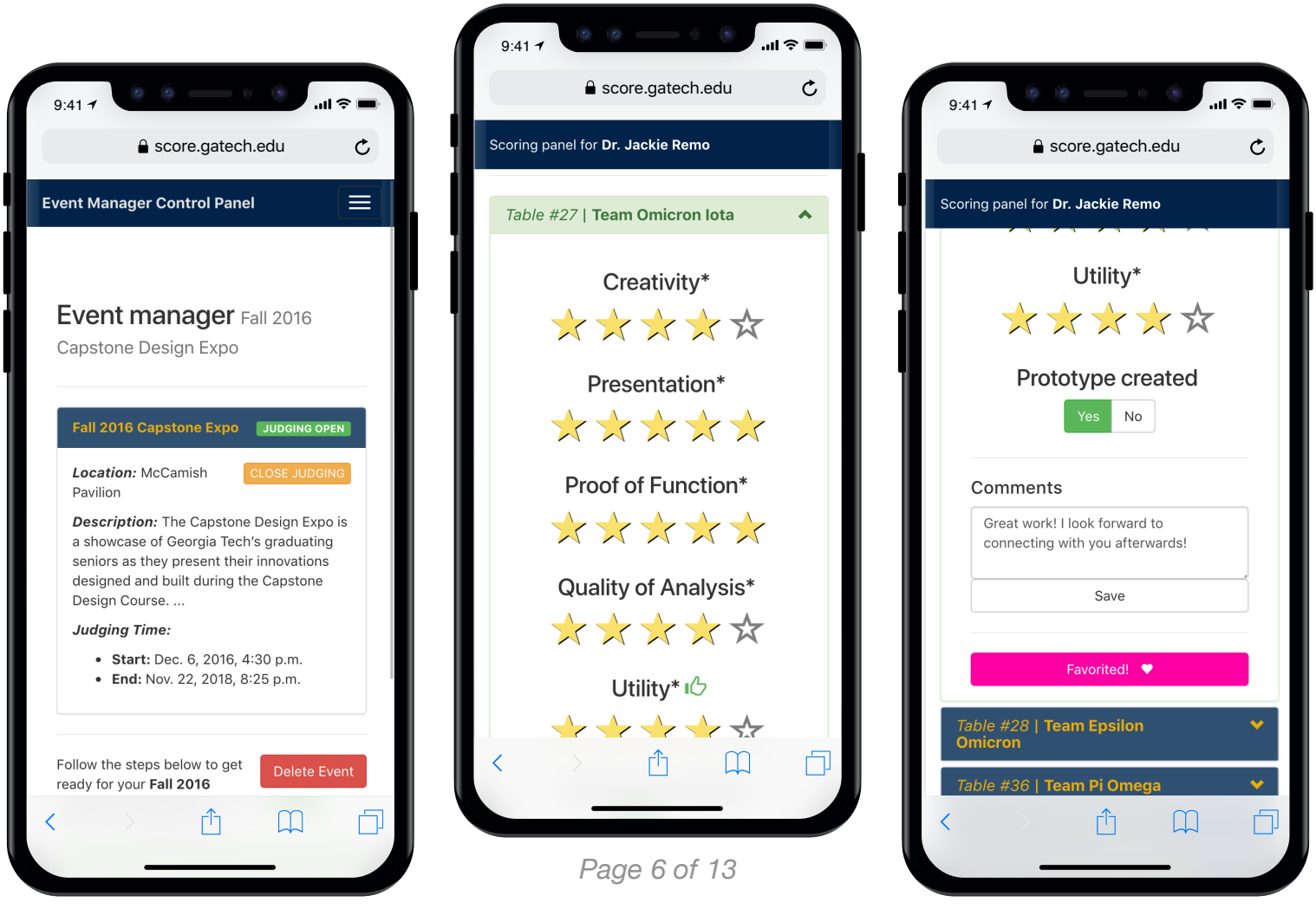
Solution created

- Created a highly-automated system for collecting information about judges and presenting teams/students
- Includes comprehensive integration with email systems
- Provides visualizations and raw Excel values for team evaluations in a fraction of a second, allowing for rapid evaluation

Automated the generation of judges' nametags, a key pain-point for those running the Expo.

Advisor: Dr. Amit Jariwala, Director of Design and Innovation

Sponsor: School of Mechanical Engineering



Personal project exploring AR

dARts

// Play darts in augmented reality

Created an iOS application in one weekend to have fun in the virtual space!

Uses ARKit to overlay SceneKit objects in the virtual world.

Allows user to select detected walls to place a dartboard.

User then taps on dartboard to throw virtual "darts" at the virtual dartboard.

Personal project for education

RichCaptions

// Symbolic math captions for educational videos

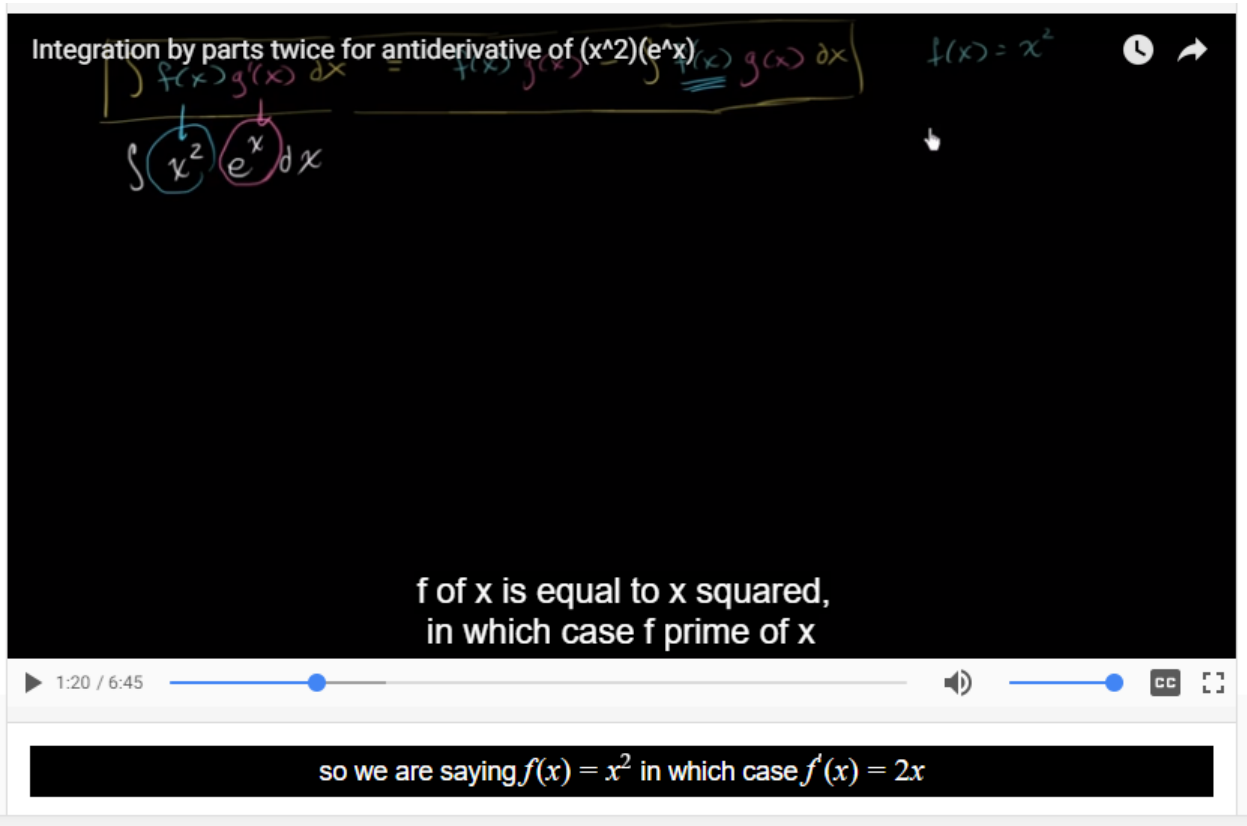
Problem identified

- Online education is rapidly gaining momentum
- Video captioning systems are limited to displaying simple plain-text
- Math/science students learn better by reading semantically-useful symbols

Solution created

- Create web application where content creators can easily caption their videos in LaTeX
- Allows anyone on the internet to watch these captioned videos without cost

Illustrative example



Design paradigms & technologies used

- REST API design and docs with Django REST framework
- Material Design front-end with AngularJS + Javascript/jQuery
- YouTube <iframe/> API
- LaTeX, KaTeX

Personal project for real need

Twitter Sentiment Analysis

// Understanding user sentiment to aid mental health diagnosis

Motivation

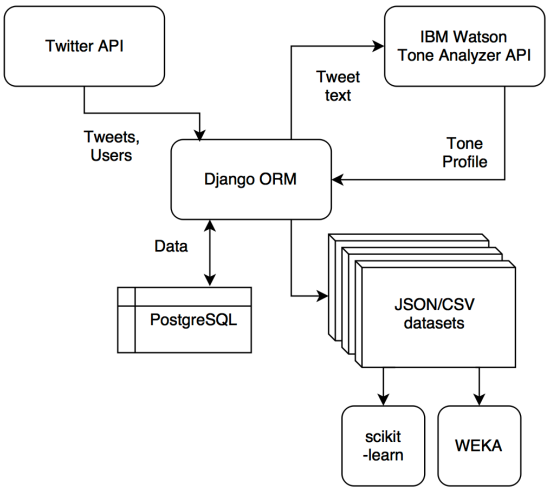
- The United States, in particular, features extremely high costs for healthcare
- Public awareness and support mental health care is increasing

Solution created

- Pipeline to gather tweets on two polar topics to understand users' sentiment towards them
- Demonstration that identifies those users who use depression-indicative language
- Useful to mental health professionals to identify long-term trends in user's mental health

Pipeline overview

1. Data collection: Collected nearly 4,000 tweets from the Twitter Developer API and labelled them based on hashtags present. For example, tweets containing "depressed" (or related hashtags) will be labelled as belonging to the "depressive-indicative" class; tweets containing "happy" (or related hashtags) will be labelled as part of the "non-depressive-indicative" class.
2. Understand the user's position in the Twitter community: Call the Twitter API to gain information about the user's followers, followees, average retweet counts, and more.
3. Data analysis: Send each of the 4,000 tweets through IBM Watson's Tone Analyzer API to gain more dimensions of sentiment information about each tweet.



4. Classification model: Use the labelled data to discriminate between tweets that are "depressive-indicative" or not in terms of their language characteristics. Trained classification model with scikit-learn's k-Nearest Neighbors implementation.
5. Classify an unknown user: Given an unknown user, generate visualizations and an overall classification of their Twitter tweet language.

Technologies used

- Python + Django web framework
- scikit-learn & IBM Watson intelligence APIs
- chart.js & Material Bootstrap

Twitter Sentiment Analysis (cont.)

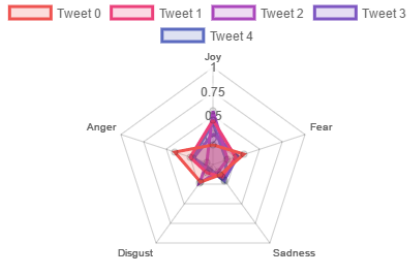
Visualizations

Analyzing tweets for @barackobama

Profile overview

Followers: 77510571
Followees: 634144
Tweets/day: 4.3833
Average favorites: 0.0500
Average retweets: 1878.0950

IBM Watson Tone Analyzer
Emotional tone



Tweet-focused analytics **@barackobama**

Senate leaders have blocked Judge Garland's hearing for over six months now. Keep pushing: https://t.co/peV6aCYswa #DoYourJob

Word count: 70 | Retweets: 625 | Favorites: | #1 | @0

Depressive: No

Standard | Depressive

Senate leaders need to work for the good of the American people, not seek out political points. https://t.co/Tdx3xk6gYi

Word count: 72 | Retweets: 1753 | Favorites: | #0 | @0

Depressive: No

Standard | Depressive

Overall classification

From his/her language and status within the Twitter community, **@barackobama** is likely Ambiguous (56.57)

On a scale of 0 (indicative) to +100% (standard) for this particular class with an 85% accuracy.

Academic research project

Modeling / Analysis of BCG and ECG Signals

// Work with Professor Jim Rehg and UC San Francisco

Problem identified:

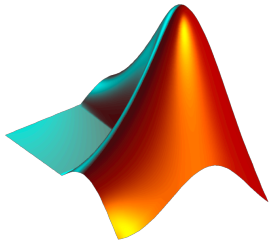
- Increased adoption of wearable heart-rate sensors opens opportunity to understand mobile health behavior
- Classification of arrhythmias and other heart complications saves lives and costs

Solution created:

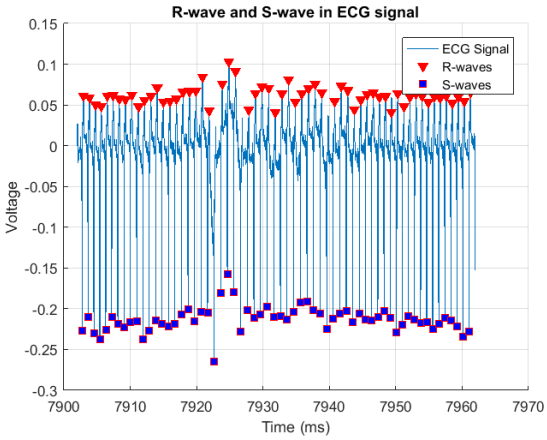
- Pipeline to input, clean, de-trend, process, and fit ballistocardiogram (BCG) and electrocardiogram (ECG) waveforms to Hidden Markov Models.

Technologies used:

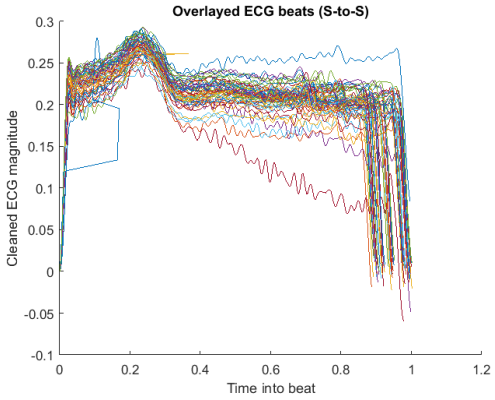
- MATLAB + DSP Toolbox
- Python hmmlearn



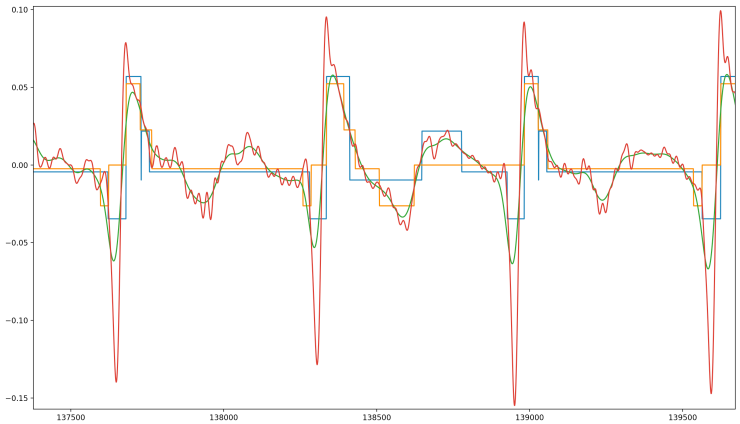
Visualizations:



De-trended signals and labelled R and S peaks



Overlaying S-to-S ECG complexes



HMM applied to processed ECG signals

Personal project following course

Constraint Satisfaction Problem Solver

// Follow up from Georgia Tech's A.I. course for undergraduates

Efficient C# implementation of CSP available publicly at https://github.com/p13i/CSP.

Features extremely-readable, well-documented, and professional C# code.

Includes comprehensive unit test suite and continuous integration with Travis CI: build passing

Features sample usage of library solving Sudoku puzzles, including this "expert" puzzle:

```
. . . | . . . | . . 4
. . . | . . . | 5 2 .
. . . | . 6 . | 8 1 3
------|-------|------
. 7 . | . 2 6 | . . .
. . 4 | . 5 3 | 7 8 .
3 2 . | . . 8 | . . .
------|-------|------
6 . 5 | . 7 . | . . 1
. . . | . . . | 2 3 .
4 . . | . . . | . . .
```

Before ...

```
2 5 3 | 8 1 7 | 9 6 4
8 1 6 | 4 3 9 | 5 2 7
9 4 7 | 2 6 5 | 8 1 3
------|-------|------
5 7 8 | 1 2 6 | 3 4 9
1 6 4 | 9 5 3 | 7 8 2
3 2 9 | 7 4 8 | 1 5 6
------|-------|------
6 8 5 | 3 7 2 | 4 9 1
7 9 1 | 6 8 4 | 2 3 5
4 3 2 | 5 9 1 | 6 7 8
```

... after

```
- Running Expert 1...
|-- Finished test in expert-1 after 249433 steps in 2646 milli-seconds.
|-- PASS Expert 1
```

Console output

Academic research project

Traveling Salesperson Problem (TSP) Solver

// Python Package created for Contextual Computing Group

Created globally-available `gt-tsp` package: https://pypi.org/project/gt-tsp/

Features extremely-readable, well-documented, and professional Python code.

Includes comprehensive unit test suite and continuous integration with Travis CI: build passing

Employed TSP solver to generate pick paths for novel sparse order-picking study, visualizing the shortest pick paths inside a model warehouse (dense graph) environment.