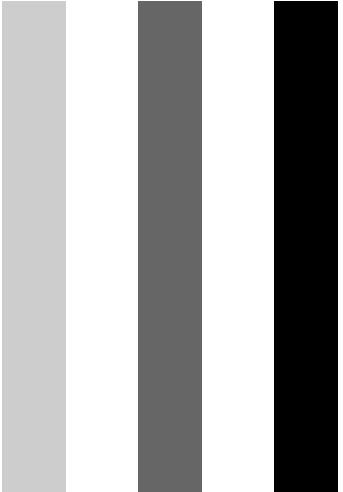


PRAMOD KOTIPALLI <http://p13i.io/>

RESEARCH, ENGINEERING, & DESIGN

PORTFOLIO



Pramod is a graduate student at **Stanford University** in California. He is pursuing a Masters in Computer Science concentrating in *Artificial Intelligence* and *Human-Computer Interaction*.

He is a recent graduate of the **Georgia Institute of Technology** in Atlanta where he researched *wearable computing* and *augmented reality*.

Pramod has developed numerous full-stack experiences across web, desktop, mobile, and wearable platforms with significant professional experience at organizations like SpaceX and the CDC.

He is interested in work at the intersection of HCI, AI, and computer graphics.

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RF-Pick

Wearable RFID verification system for warehouse order-picking

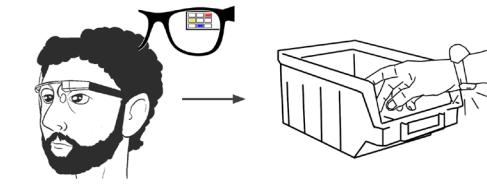
ACM International Symposium on Wearable Computers

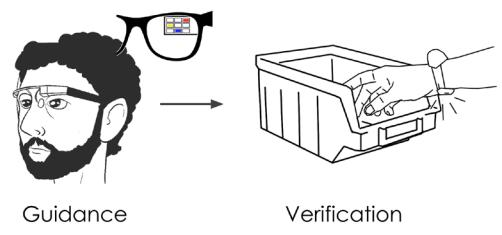
- » 24% Paper Acceptance Rate
 - » One of 62 Accepted Papers to be awarded **BEST PAPER**



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



View through Google Glass

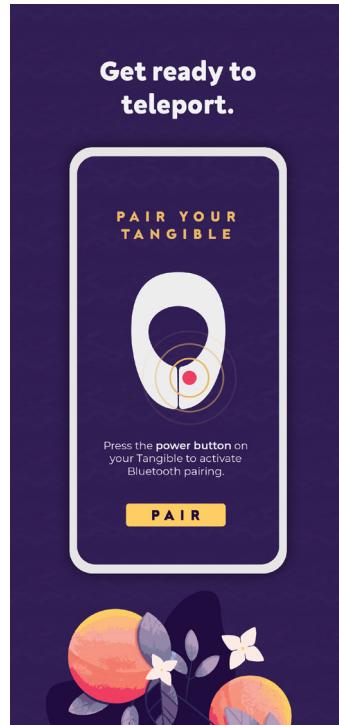
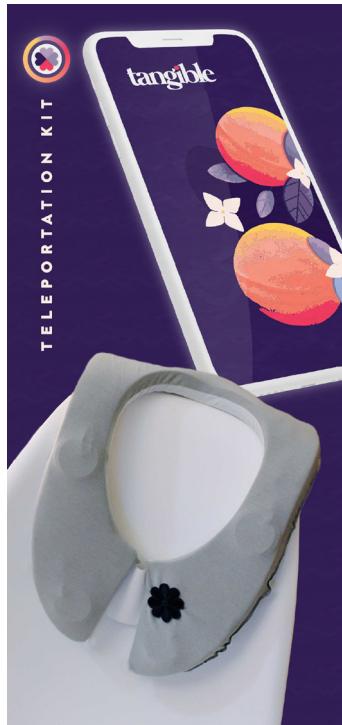
Georgia Tech School of Interactive Computing
College of Computing

Tangible Teleportation Company

Building hardware & software for social telepresence



Meet Tangible, a new communication medium that brings you the physical presence of a loved one over distance, filling the gap between video calls and real life.



At *Tangible*, We've built a wearable haptic garment that uses immersive haptics to allow you to literally "reach out and touch" your loved ones during video calls.

Through a new form of remote sensation, what we call Social Touch, you can convey emotions and share media together in a new, more emotionally-satisfying way.

We are a venture capital-backed, growing team of designers and engineers passionate about a human-first approach to computing.

As *Head of Software*, I am responsible for needfinding, prototyping, architecting, developing, and deploying our mobile app. Through a real-time database connection between two remote mobile devices, our companion apps are able to effectively mediate haptic interactions between two remote haptic garments.

I am also involved in user interviews, business strategy, graphic design, and a variety of other tasks as our business requires.

Project Miranda

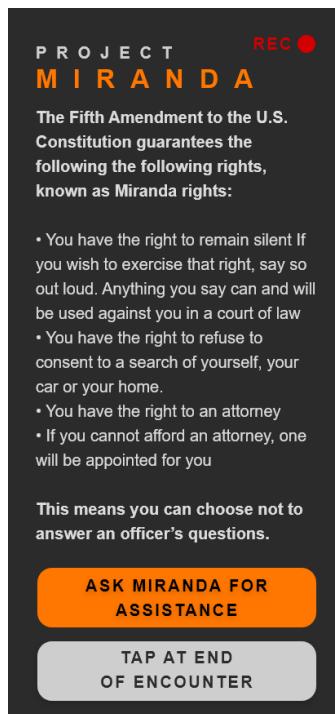
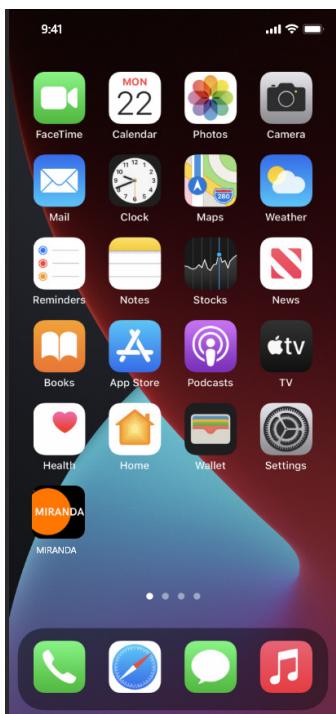
Supporting citizens during traffic stops by police

WINNER @ University of Washington's
Hack'20 & Dubhacks for Social Good



Summer 2020 was witness to mass protests following the unlawful murders of unarmed Black and minority Americans. Many people interrogated by police are not aware of their rights, nor when a seemingly innocent may become heightened or dangerous.

We created a mobile application that presents users with their Constitutional, Fifth Amendment rights and monitors the audio and video of the encounter to register racism and detect escalating tensions between police officers and



Remembrance Agent & Glass Notes

Note-taking Android app for Google Glass w/ contextual A.I. recall

A Desktop Remembrance Agent

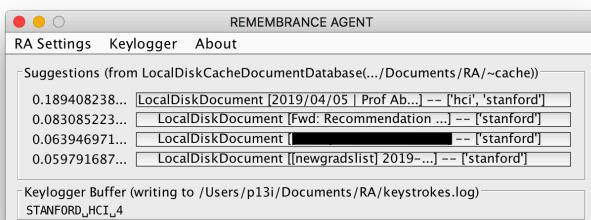
The concept of a Remembrance Agent (RA) was first outlined by [Rhodes and Starner in 1997](#) as a system that would automatically present contextually-relevant notes, documents, and contacts.

In 1997, it became more evident that the perfect memory of computers could augment the evolutionarily-honed intuition of humans. Computers began to take more and more of a role in note-taking, planning, and managing contacts. However, all this information was typically not indexed in a way is useful to people; documents would need to be remembered by file name and needed to be scanned through file structures when required. Rhodes sought to bridge this gap by conceptualizing and developing a wearable RA.

Rhodes focused their work on wearable RAs, systems that could live with you and help you live a more productive and information-rich life.

In this project, I implemented Rhodes' RA for use on any desktop computer.

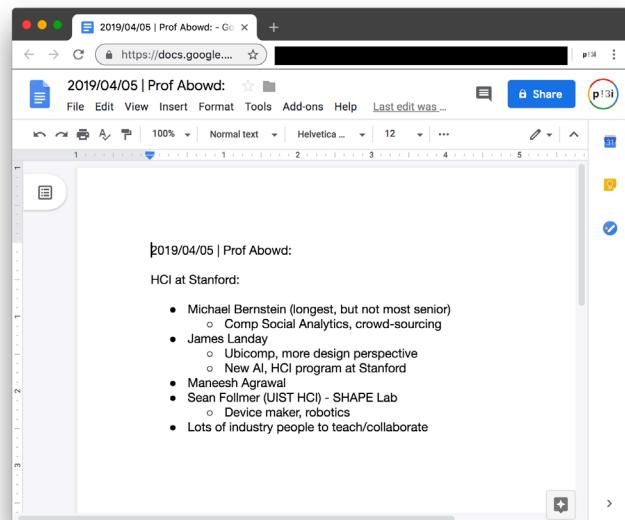
Usage is streamlined for non-technical users. No knowledge of programming or editing of config files is required. A simple GUI presents all the features and settings you'd need to use:



As you type, every five seconds the prior 60 characters of your keyboard buffer are sent to the RA. Suggestions are presented as clickable buttons. To the left of each suggestion is the relevance score of that document accounting for contextual factors like date and subject of a document (these factors can be re-weighted in the code as done by Rhodes).

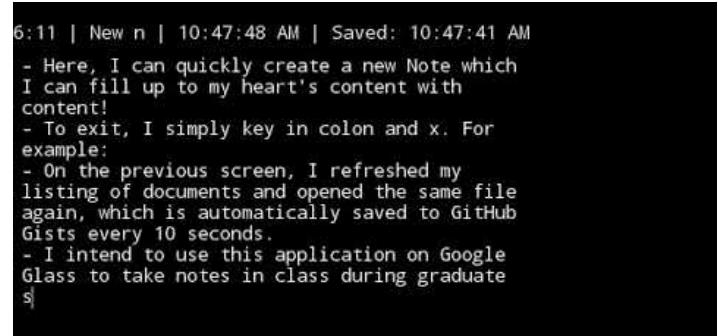
The core algorithm used to determine the similarity between two documents is TFIDF, or Term-Frequency Inverse Document Frequency: documents are weighted by both the frequency of a word in a document and the frequency of the word in the larger corpus of documents (i.e. a “document database” in this project’s parlance).

Upon clicking the first button (my meeting notes with Professor Abowd at Georgia Tech), the RA client will open the corresponding Google Doc in Chrome:



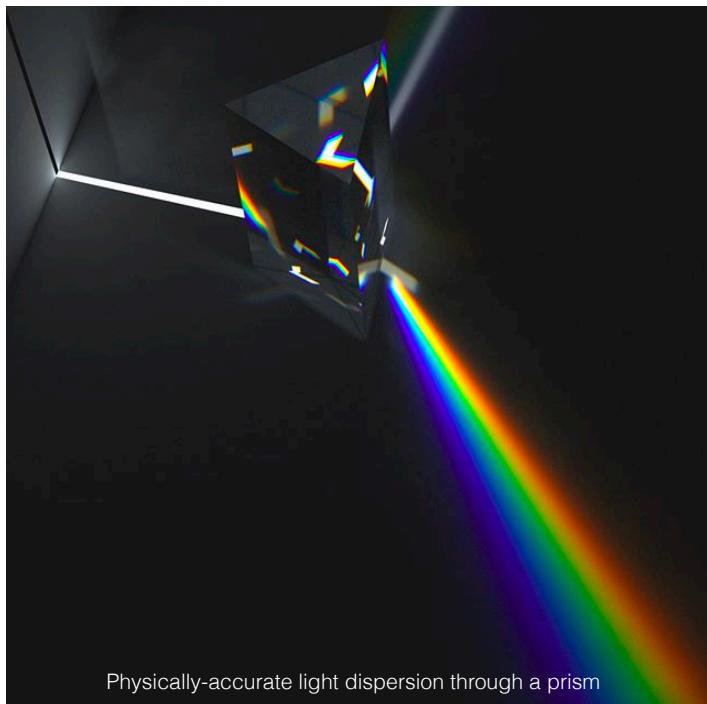
A Head-Worn Remembrance Agent

Part of my experiment of living with a Head-Worn Display involved integrating this suggestion-generating software into a custom note-taking app for Google Glass.

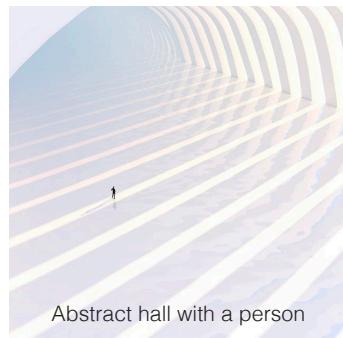


More details as well as links to the open-source code can be found with my [writing on Remembrance Agents](#).

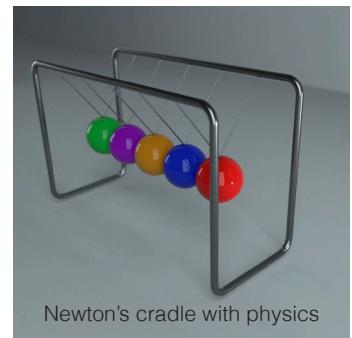
Graphic Design Portfolio



Physically-accurate light dispersion through a prism



Abstract hall with a person



Newton's cradle with physics



Neon sign with camera effects



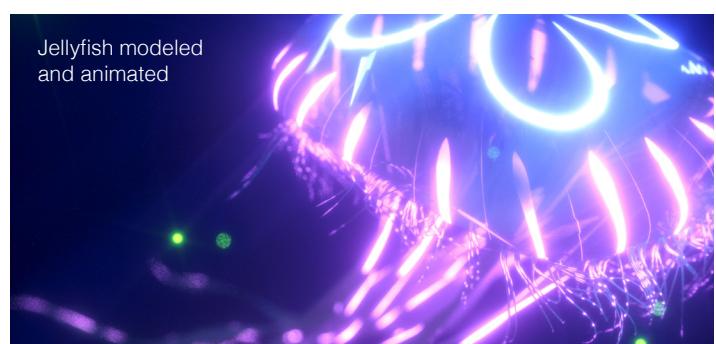
Displacement effect



Fog effects at a bus stop



Modeling a Rolex



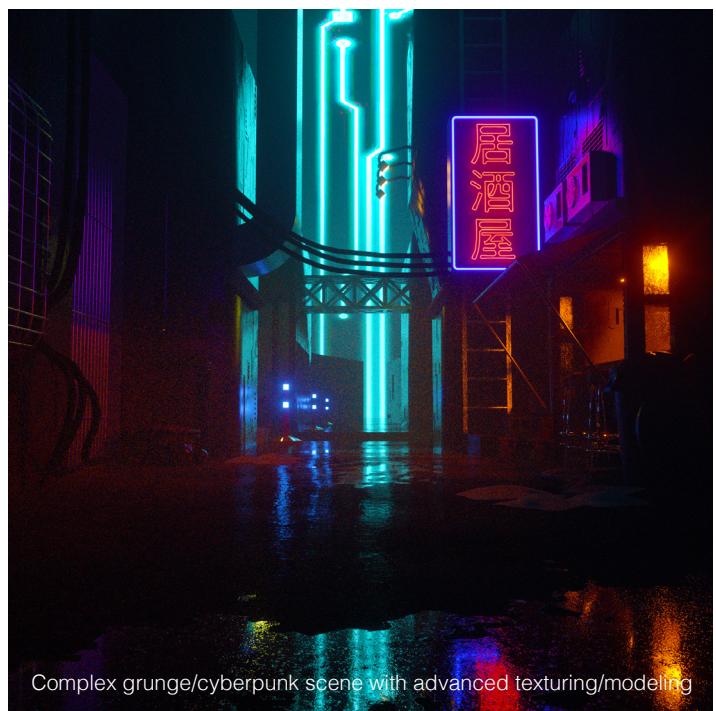
Jellyfish modeled and animated



Abstract pill rendered in a studio



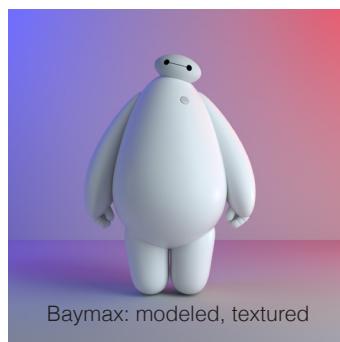
Apple Watch: modeled, textured



Complex grunge/cyberpunk scene with advanced texturing/modeling



MacBook Pro: modeled, textured



Baymax: modeled, textured

One Moment Apart

Award-winning 48-Hour film production

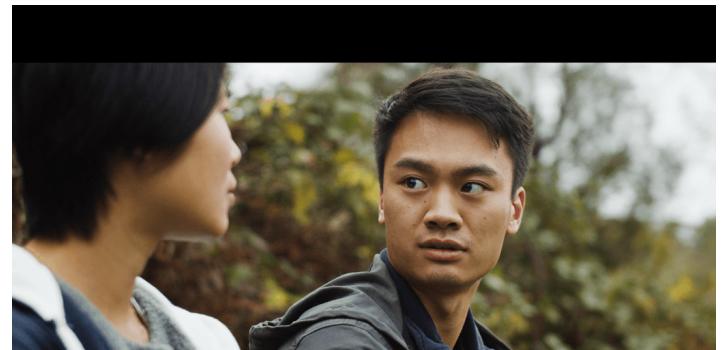
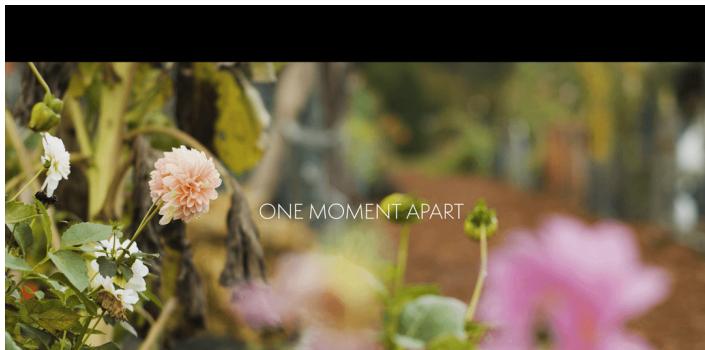
WINNER, ALL CATEGORIES

@ Seattle 48 Hour Film Festival



One Moment Apart follows a young woman and her brother as she becomes a more independent photographer. This film was entirely scripted, shot, and edited in over one weekend in Redmond, WA.

I worked as a Composer (for which we earned Best Music), Script Supervisor, and Production Assistant on this film. We won all major categories at the Seattle 48 Hour Film Festival. We will be representing Seattle in a national-level film competition, Filampoolza 2021.



Safety

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



Hardware renderings:

- » 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
- » 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.



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

Technologies used:

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

Georgia Tech Score



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

Advisor:

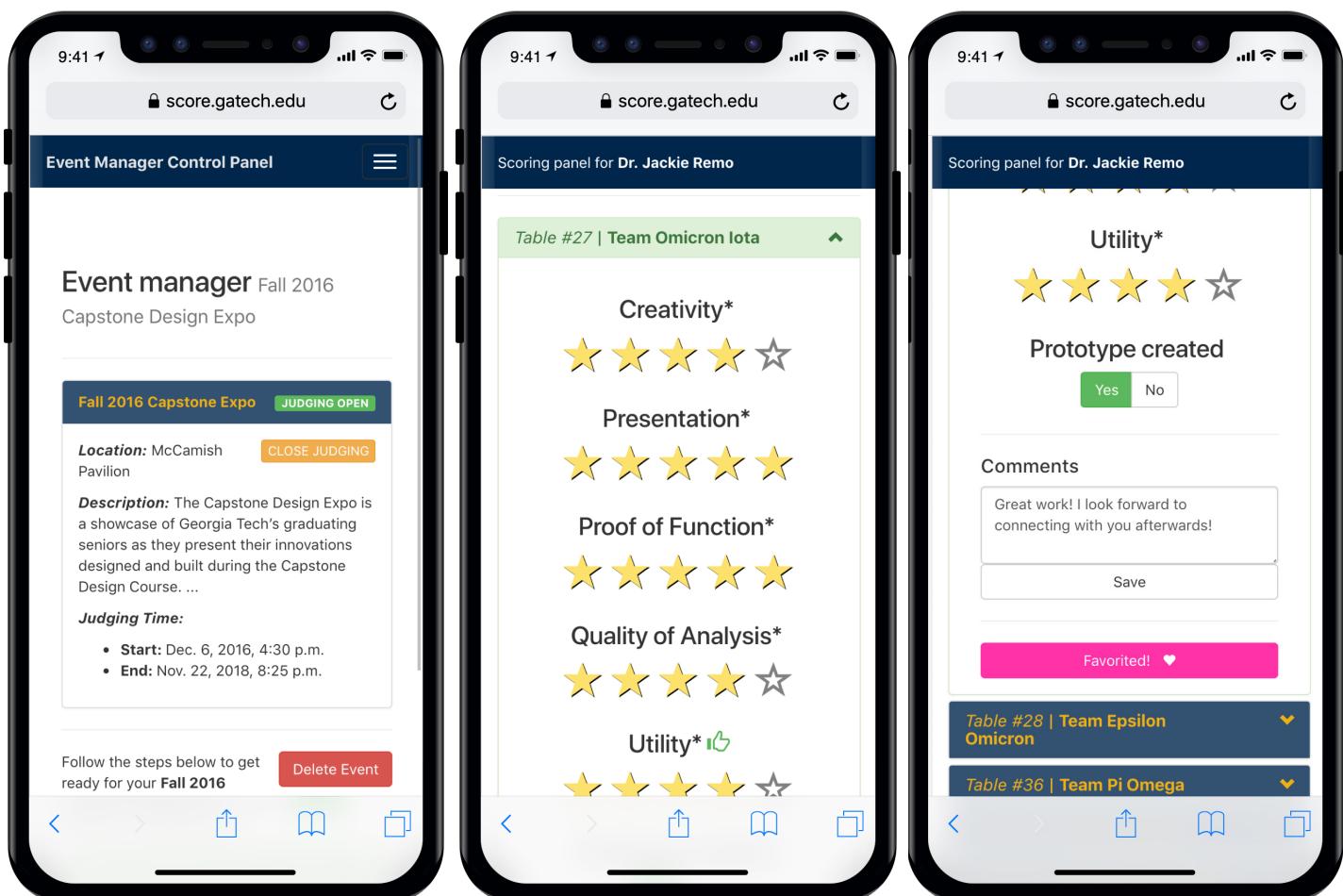
- » Dr. Amit Jariwala, Director of Design and Innovation

Sponsor:

- » School of Mechanical Engineering, College of Engineering, Georgia Institute of Technology



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



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.



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:

The screenshot shows a video player interface. At the top, there is a handwritten mathematical derivation for integration by parts. The formula $\int f(x)g'(x) dx = f(x)g(x) - \int f'(x)g(x) dx$ is written, with $f(x) = x^2$ and $\int x^2 e^x dx$ circled in blue. Below this, a text box contains the LaTeX code: $f of x is equal to x squared, in which case f prime of x$. At the bottom, another text box contains the rendered text: $so we are saying f(x) = x^2 in which case f'(x) = 2x$.

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



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:

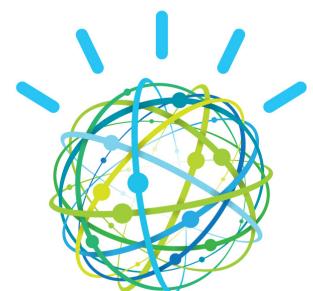
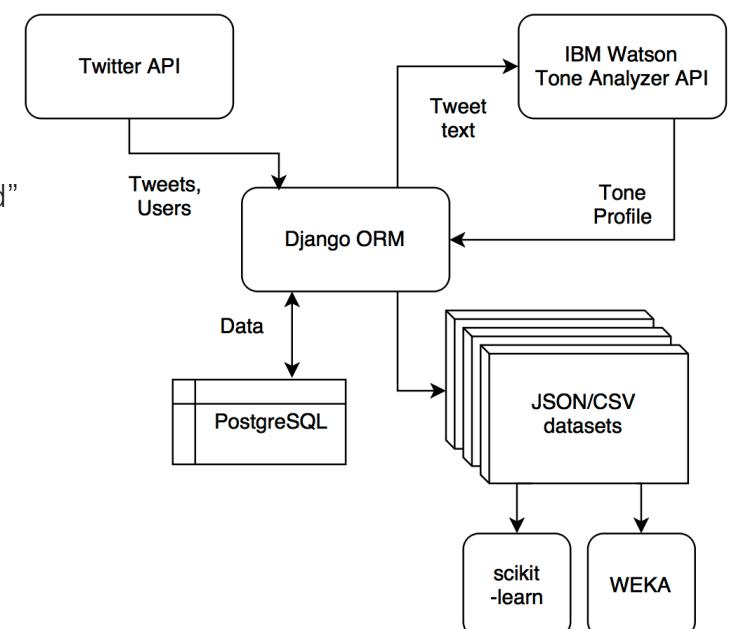
- » Pipeline to gather tweets on two polar topics to understand users' sentiment towards them
- » Demonstration that identifies those users who use depression-indicative language
- » Useful to mental health professionals to identify long-term trends in user's mental health

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



Screenshots:

Analyzing tweets for

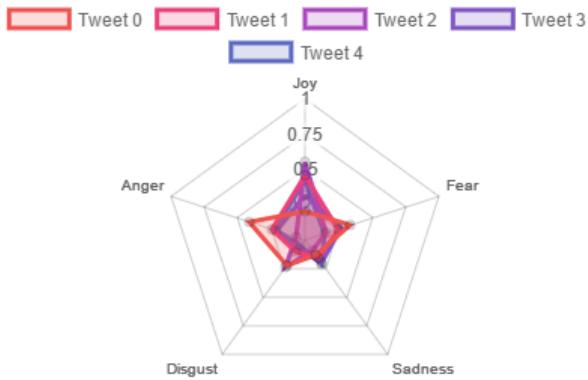
@barackobama

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 (Red) | Depressive (Blue)



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 (Red) | Depressive (Blue)

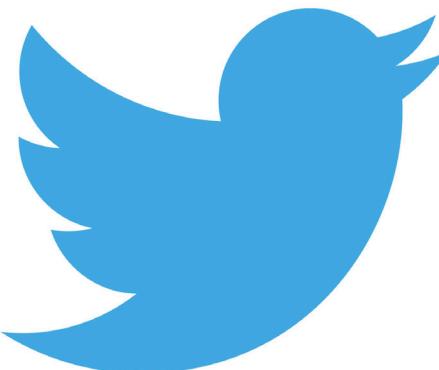


Overall classification

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.



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

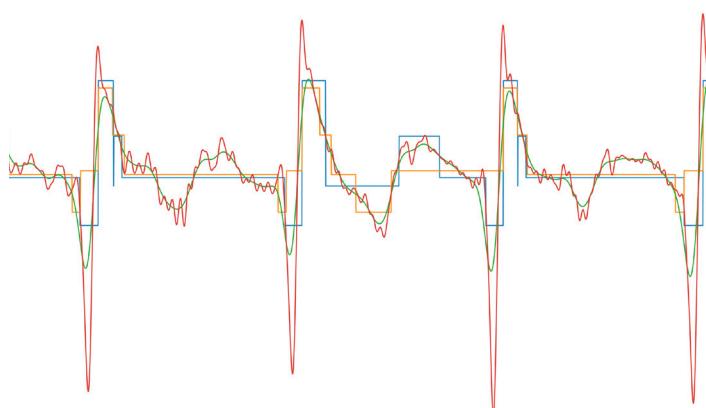
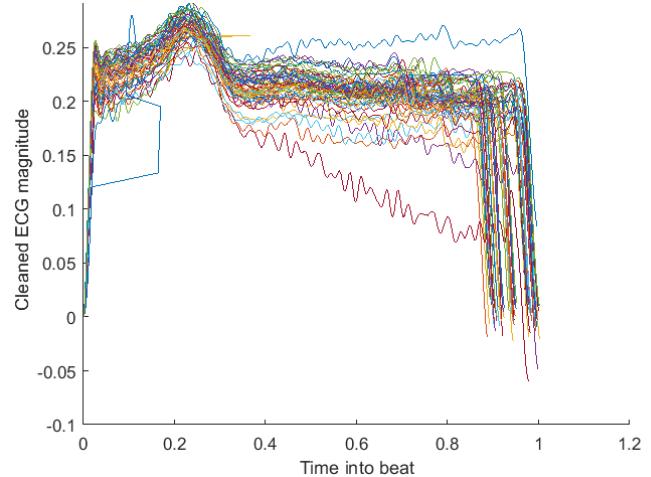
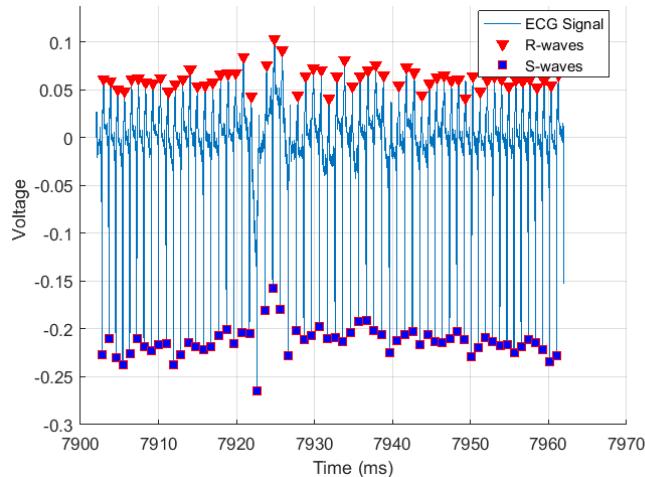
Solution created:

- » 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:



HMM applied to processed ECG signals

Constraint Satisfaction Problems

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: 
- » Features sample usage of library solving Sudoku puzzles, including this “expert” puzzle:

. 4	2 5 3 8 1 7 9 6 4
. 5 2 .	8 1 6 4 3 9 5 2 7
. . . . 6 . 8 1 3	9 4 7 2 6 5 8 1 3
----- ----- -----	----- ----- -----
. 7 . . 2 6 . . .	5 7 8 1 2 6 3 4 9
. . 4 . 5 3 7 8 .	1 6 4 9 5 3 7 8 2
3 2 . . . 8 . . .	3 2 9 7 4 8 1 5 6
----- ----- -----	----- ----- -----
6 . 5 . 7 . . . 1	6 8 5 3 7 2 4 9 1
. 2 3 .	7 9 1 6 8 4 2 3 5
4	4 3 2 5 9 1 6 7 8

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

Console output

Traveling Salesperson Problems

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: 
 - » 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.

