

# CS 403X Mobile and Ubiquitous Computing

## Lecture 14: Google Places, Other Useful Android APIs and Cool Location-Aware Apps

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# Google Places

- **Place:** physical space that has a name (e.g. local businesses, points of interest, geographic locations)
  - E.g Logan airport, place type is **airport**
- **API:** Provides Contextual information about places near device.
- **E.g:** name of place, address, geographical location, place ID, phone number, place type, website URL, etc.
- Compliments geographic-based services offered by Android location services

# Sample Place Types



accounting  
airport  
amusement\_park  
aquarium  
art\_gallery  
atm  
bakery  
bank  
bar  
beauty\_salon  
bicycle\_store  
book\_store  
bowling\_alley  
bus\_station  
cafe  
campground  
car\_dealer  
car\_rental  
car\_repair  
car\_wash

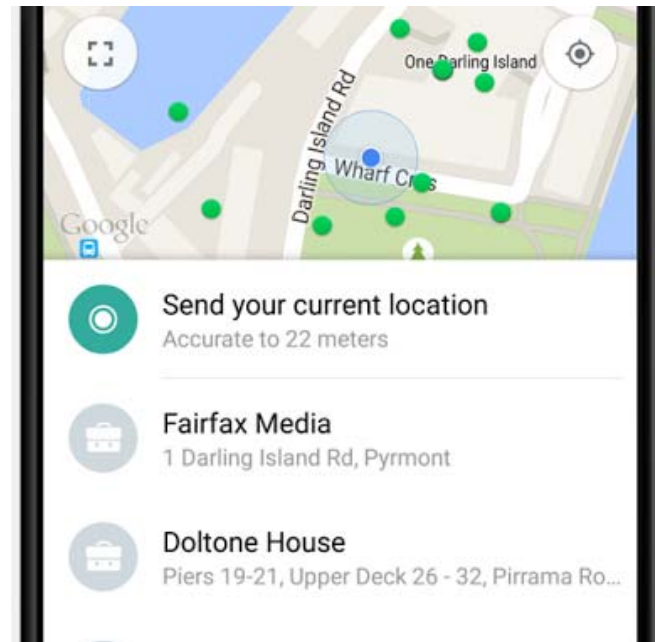
hospital  
insurance\_agency  
jewelry\_store  
laundry  
lawyer  
library  
liquor\_store  
local\_government\_office  
locksmith  
lodging  
meal\_delivery  
meal\_takeaway  
mosque  
movie\_rental  
movie\_theater  
moving\_company  
museum  
night\_club  
painter  
park

city\_hall  
clothing\_store  
convenience\_store  
courthouse  
dentist  
department\_store  
doctor  
electrician  
electronics\_store  
embassy  
establishment (deprecated)  
finance (deprecated)  
fire\_station  
florist  
food (deprecated)  
funeral\_home  
furniture\_store  
gas\_station  
general\_contractor (deprecated)  
grocery\_or\_supermarket  
gym  
hair\_care  
hardware\_store  
health (deprecated)  
hindu\_temple  
home\_goods\_store  
physiotherapist  
place\_of\_worship (deprecated)  
plumber  
police  
post\_office  
real\_estate\_agency  
restaurant  
roofing\_contractor  
rv\_park  
school  
shoe\_store  
shopping\_mall  
spa  
stadium  
storage  
store  
subway\_station  
synagogue  
taxi\_stand  
train\_station  
transit\_station  
travel\_agency  
university  
veterinary\_care  
zoo



# Google Places API Overview

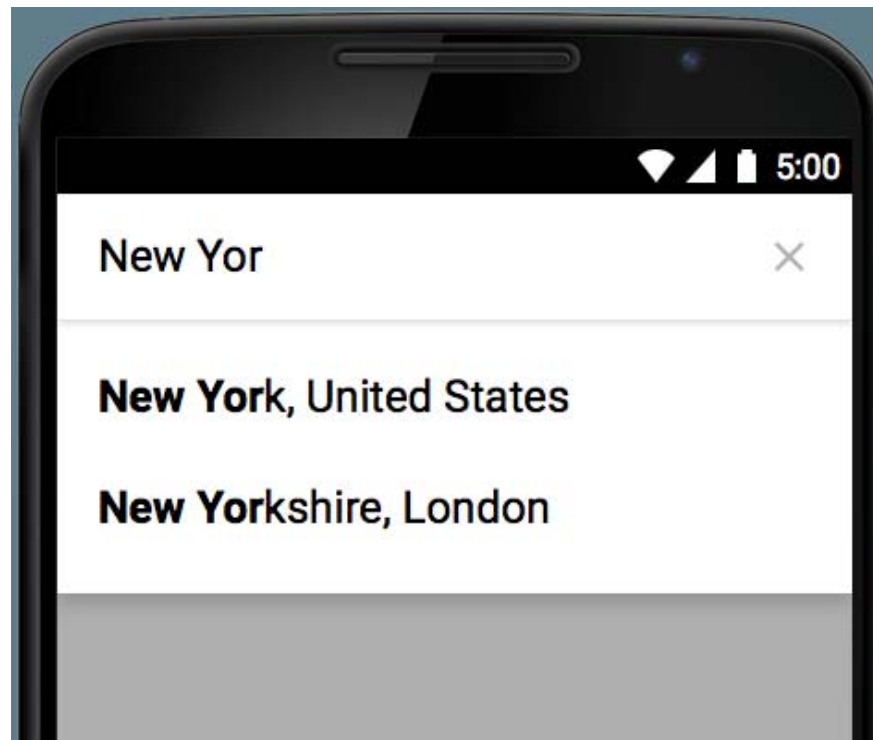
- **Use Place picker UI:** allows users select place from “possible place” on a map
- **Get current place:** place where device is last known to be located
  - Returns **list** of likely places + likelihood device is in that place





# Google Places API Overview

- **Autocomplete:** queries the location database as users type, suggests nearby places matching letters typed in

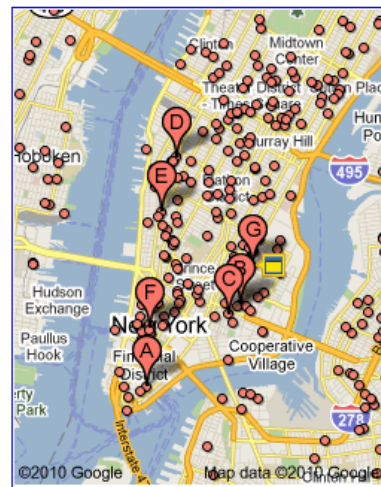




# Google Places API Overview

- Access **high-quality photos** of a place
- Users can also add place information to the database
  - E.g. business owners can add their business as a place in Places database
  - Other apps can then retrieve info after moderation

Local business results for **cupcakes** near **New York, NY**



- A [Crumbs Bake Shop](http://www.crumbs.com) ☆  
www.crumbs.com - (212) 480-7500 - 52 reviews
- B [Sugar Sweet Sunshine](http://www.sugarsweetsunshine.com) ☆  
www.sugarsweetsunshine.com - (212) 995-1960 - 255 reviews
- C [Babycakes Nyc](http://www.babycakesnyc.com) ☆  
www.babycakesnyc.com - (212) 677-5047 - 172 reviews
- D [Billy's Bakery](http://www.billysbakerynyc.com) ☆  
www.billysbakerynyc.com - (212) 647-9956 - 219 reviews
- E [Magnolia](http://www.magnoliabakery.com) ☆  
www.magnoliabakery.com - (212) 462-2572 - 1055 reviews
- F [Tribeca Treats](http://www.tribecatreats.com) ☆  
www.tribecatreats.com - (212) 571-0500 - 63 reviews
- G [Butter Lane Cupcakes](http://www.butterlane.com) ☆  
www.butterlane.com - (212) 677-2880 - 78 reviews
- Visit our website Sponsored
- More results near **New York, NY** »

- **On-device caching:** Can cache places data locally on device to avoid roundtrip delays on future requests



# Learning Google Places API

- Official Google Places website is “decent”, up to date:
  - <https://developers.google.com/places/>
- Tutorial by Paul Trebilcox-Ruiz may be more readable:
  - <http://code.tutsplus.com/articles/google-play-services-using-the-places-api--cms-23715>



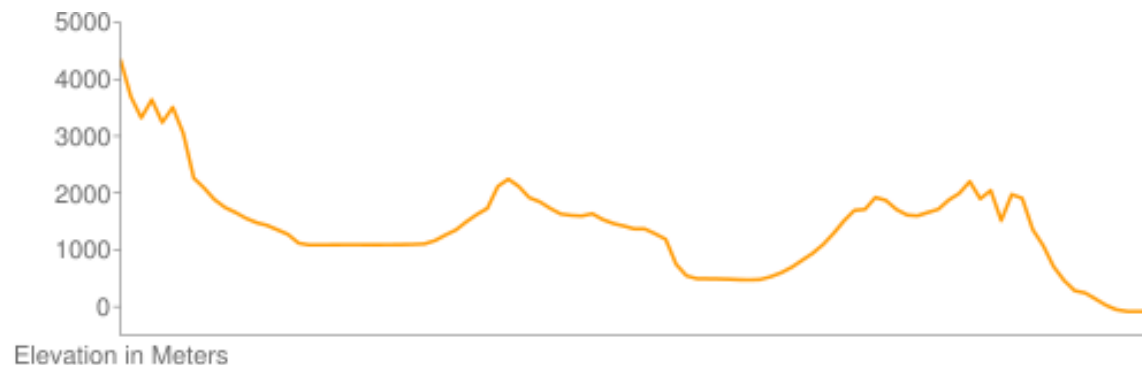
# Other Useful Google Maps/Location APIs





## Other Maps/Useful Location APIs

- **Maps Directions API:** calculates directions between locations (walking, driving) as well as public transport directions
- **Distance Matrix API:** Calculate travel time and distance for multiple destinations
- **Elevation API:** Query locations on earth for elevation information, calculate elevation changes along routes





## Other Useful Maps/Location APIs

- **Geocoding API:** access to **geocoding** and **reverse geocoding** services using HTTP requests
  - **Geocoding:** Convert addresses into longitude/latitude coordinates
  - **Reverse geocoding:** convert longitude/latitude coordinates into human readable address

Latitude: 37.422005 Longitude: -122.084095

Address:  
1600 Amphitheatre Pkwy  
Mountain View, CA 94043  
Mountain View  
94043  
United States

- **Roads API:**
  - snaps set of GPS coordinates to road user was likely travelling on (best fit)
  - Returns posted speed limits for any road segment (premium plan)
- **Time Zone API:** request time zone for location on earth



**What other Android APIs may  
be useful for ubicomp?**

# Google Now

- Intelligent assistant
- Make recommendations (travel time, traffic, etc)
- Information (e.g. scores from favorite sports teams)
- Works by recognizing repeated user actions on device (common locations, repeated calendar appointments, search queries, etc)
- Displayed as Information “Cards”



The screenshot displays two columns of information cards. The left column, titled 'Stories to read', features three news items: 'Apple Now Sells An Official \$79 Apple Watch Dock' from TechCrunch, 'Apple Pay switched on in Australia, but only for Amex' from Sydney Morning Herald, and 'iPad Pro hit by production issues, says analyst' from CNET. The right column, titled 'Updates for you', includes a weather card for Zagreb showing a high of 9° and a low of 3°, and a stocks card listing Apple Inc. at 117.29 USD (up 3.17%), HP Inc at 13.64 USD (up 2.71%), and Facebook Inc at 107.77 USD (up 2.51%).

Day	WED	THU	FRI	SAT	SUN
High	18°	17°	18°	9°	6°
Low	3°	7°	9°	1°	-3°

Stock	Price (USD)	Change
Apple Inc. (AAPL)	117.29	3.60 (3.17%) ↑
HP Inc (HPQ)	13.64	0.36 (2.71%) ↑
Facebook Inc (FB)	107.77	2.64 (2.51%) ↑

# Specialized Google Now Cards

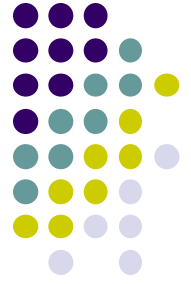
[https://en.wikipedia.org/wiki/Google\\_Now](https://en.wikipedia.org/wiki/Google_Now)



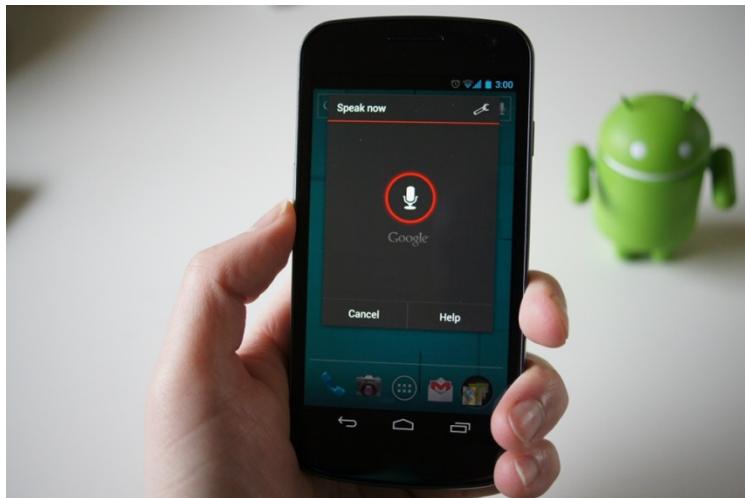
- Activity summary (walking/cycling)
- Birthday
- Boarding pass
- Concerts
- Currency
- Developing story and breaking news
- Events
- Event reminders
- Flights
- Friends' birthdays
- Hotels
- Location reminders
- Movies
- Nearby attractions
- Nearby events
- Nearby photo spots
- New albums/books/video games/TV episodes
- News topic
- Next appointment
- Packages
- Parking location
- Places
- Product listing
- Public alerts
- Public transit
- Research topic
- Restaurant reservations
- Sports
- Stocks
- Time to home
- Time reminders
- Traffic and transit
- Translation
- Weather
- Website update
- What to watch

# Speaking to Android

<http://developer.android.com/reference/android/speech/SpeechRecognizer.html>



- Speech recognition:
  - Accept inputs as speech (instead of typing) e.g. dragon dictate app?
  - Note: Google (remote) service Requires internet access
- Speech-to-text
  - Convert user's speech to text. E.g. display voicemails in text

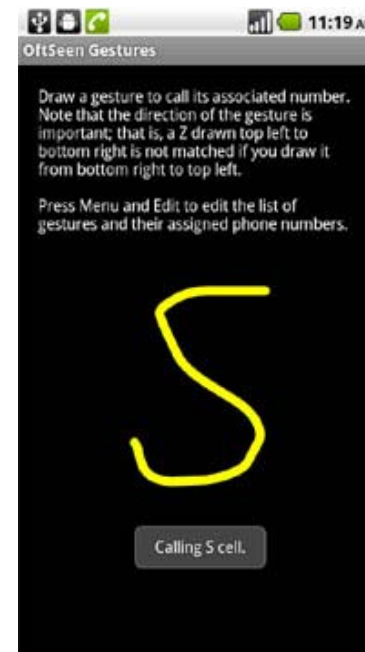
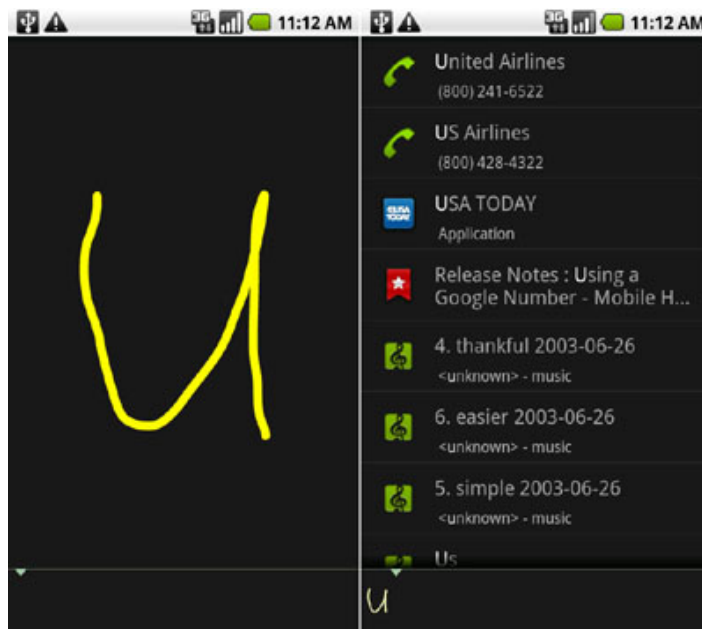


# Gestures

<http://developer.android.com/reference/android/speech/SpeechRecognizer.html>  
<http://www.computerworld.com/article/2469024/web-apps/android-gestures--3-cool-ways-to-control-your-phone.html>



- **Gesture:** Hand-drawn shape on the screen
- Search your phone, contacts, etc by handwriting onto screen
- Speed dial by handwriting first letters of contact's name
- Also multi-touch, pinching



# More MediaPlayer RenderScript

<http://developer.android.com/guide/topics/renderscript/compute.html>



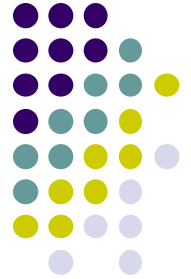
- Media Player can also:
  - Record audio and video
  - Manipulate raw audio from microphone/audio hardware, PCM buffers
    - E.g. if you want to do audio signal processing, speaker recognition, etc
    - **Project idea:** process user's speech, detect emotion, nervousness?
- RenderScript
  - High level language for GPGPU
  - Use Phone's GPU for computational tasks
  - Very few lines of code = run GPU code
  - Useful for heavy duty tasks. E.g. image, video processing



# Wireless Communication

<http://developer.android.com/guide/topics/connectivity/bluetooth.html>

<http://developer.android.com/reference/android/net/wifi/package-summary.html>



- Bluetooth

- Discover nearby bluetooth devices
- Communicating over bluetooth



- WiFi

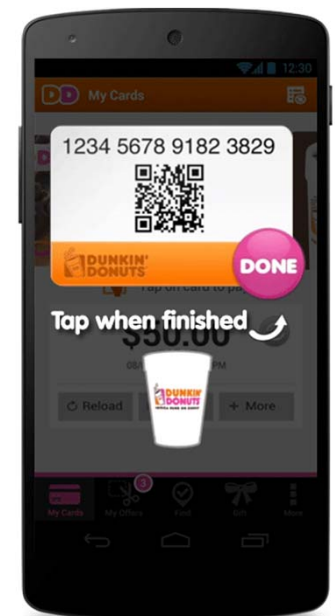
- Scan for WiFi hotspots
- Monitor WiFi connectivity, Signal Strength (RSSI)
- Do peer-to-peer (mobile device to mobile device) data transfers

# Wireless Communication

<http://developer.android.com/guide/topics/connectivity/nfc/index.html>



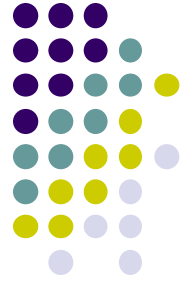
- NFC:
  - Contactless technology
  - Transfer small amounts of data over short distances
  - **Applications:** Share spotify playlists, Google wallet
  - **Google wallet?**
    - Store debit, credit card on phone
    - Pay by tapping terminal



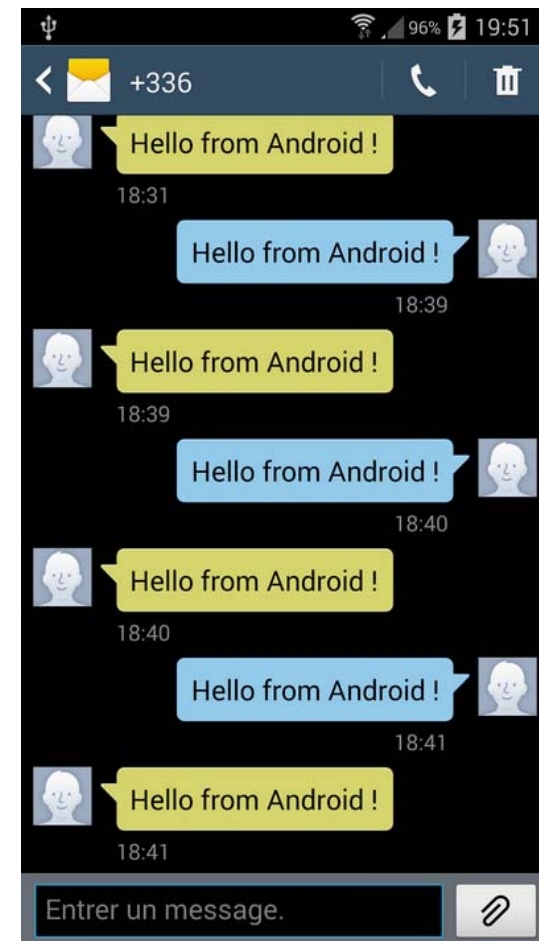
# Telephony and SMS

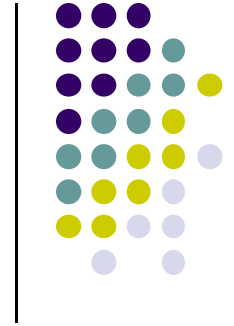
<http://developer.android.com/reference/android/telephony/package-summary.html>

<http://developer.android.com/reference/android/telephony/SmsManager.html>



- **Telephony:**
  - Initiate phone calls from within app
  - Access dialer, etc
- **SMS:**
  - Send/Receive SMS/MMS from app
  - Handle incoming SMS/MMS in app



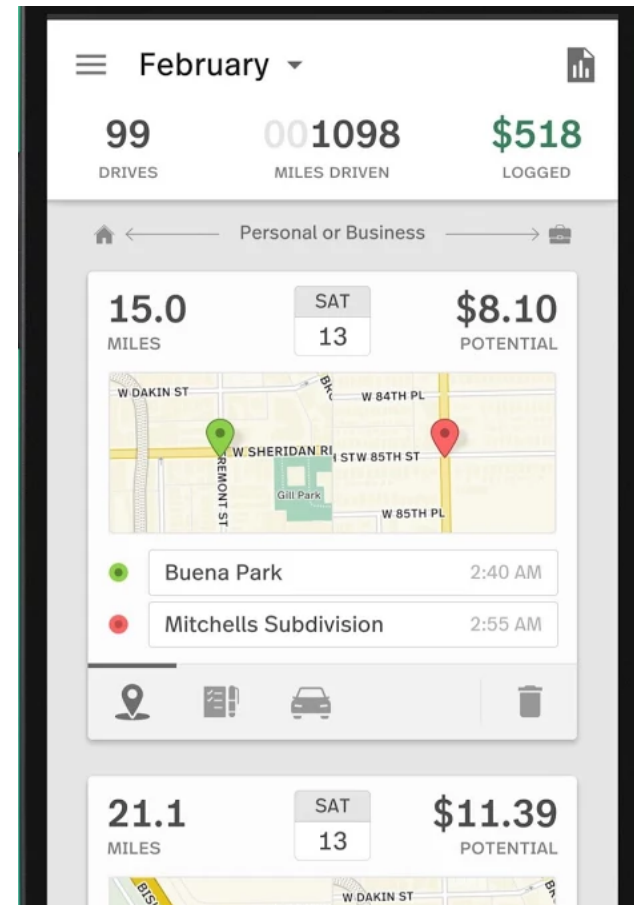


# Some Interesting Location-Aware Apps



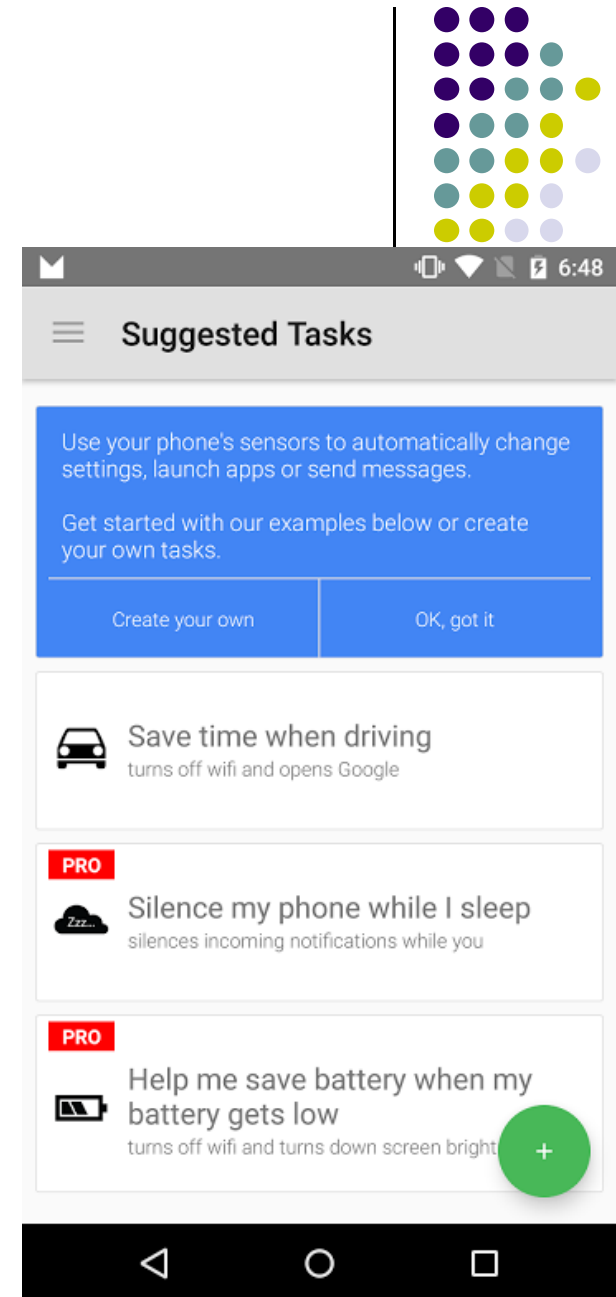
# MileIQ

- **The Problem:** Mileage tracking is useful but a burden.
  - IRS deductions on taxes
  - Some companies reimburse employees for mileage,
- Passively, automatically tracks business mileage, IRS compliant
- Swipe right after drive to indicate it was a business trip
- Project idea? Implement some of this functionality
- **How Android modules? For what?**
- **What stats to decide if this is tackling important problem?**



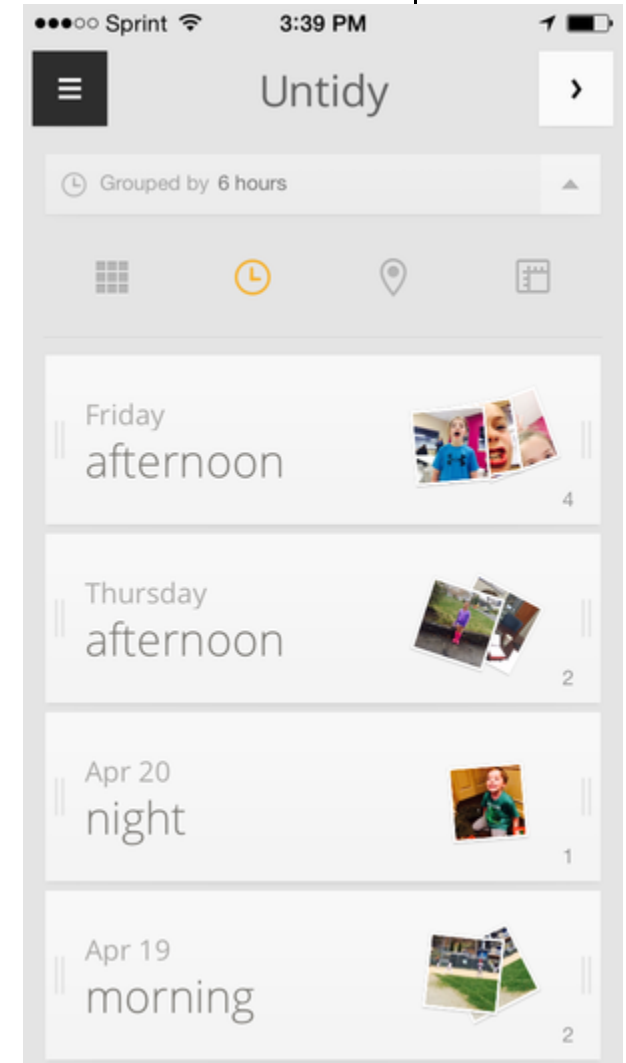
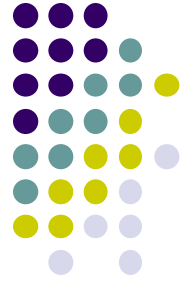
# Trigger

- Use geofences, NFC, bluetooth, WiFi connections, etc to set auto-behaviors
  - Battery low -> turn off bluetooth + auto sync
  - Silence phone every morning when you get to work
  - Turn off mobile data when you connect to your home WiFi
  - Silence phone and set alarm once I get into bed
  - Use geofence for automatic foursquare checkin
  - Launch maps when you connect to your car's bluetooth network
- Project idea? Implement subset of these features
- **What triggers would be useful for a WPI student?**



# Tidy

- Use picture meta-data to organize pics for you
  - Location taken
  - Time
  - Date
- **What stats to decide if this is tackling important problem?**





# References

- John Corpuz, 10 Best Location Aware Apps
- Liane Cassavoy, 21 Awesome GPS and Location-Aware Apps for Android,
- Head First Android
- Android Nerd Ranch, 2<sup>nd</sup> edition
- Busy Coder's guide to Android version 6.3
- CS 65/165 slides, Dartmouth College, Spring 2014
- CS 371M slides, U of Texas Austin, Spring 2014