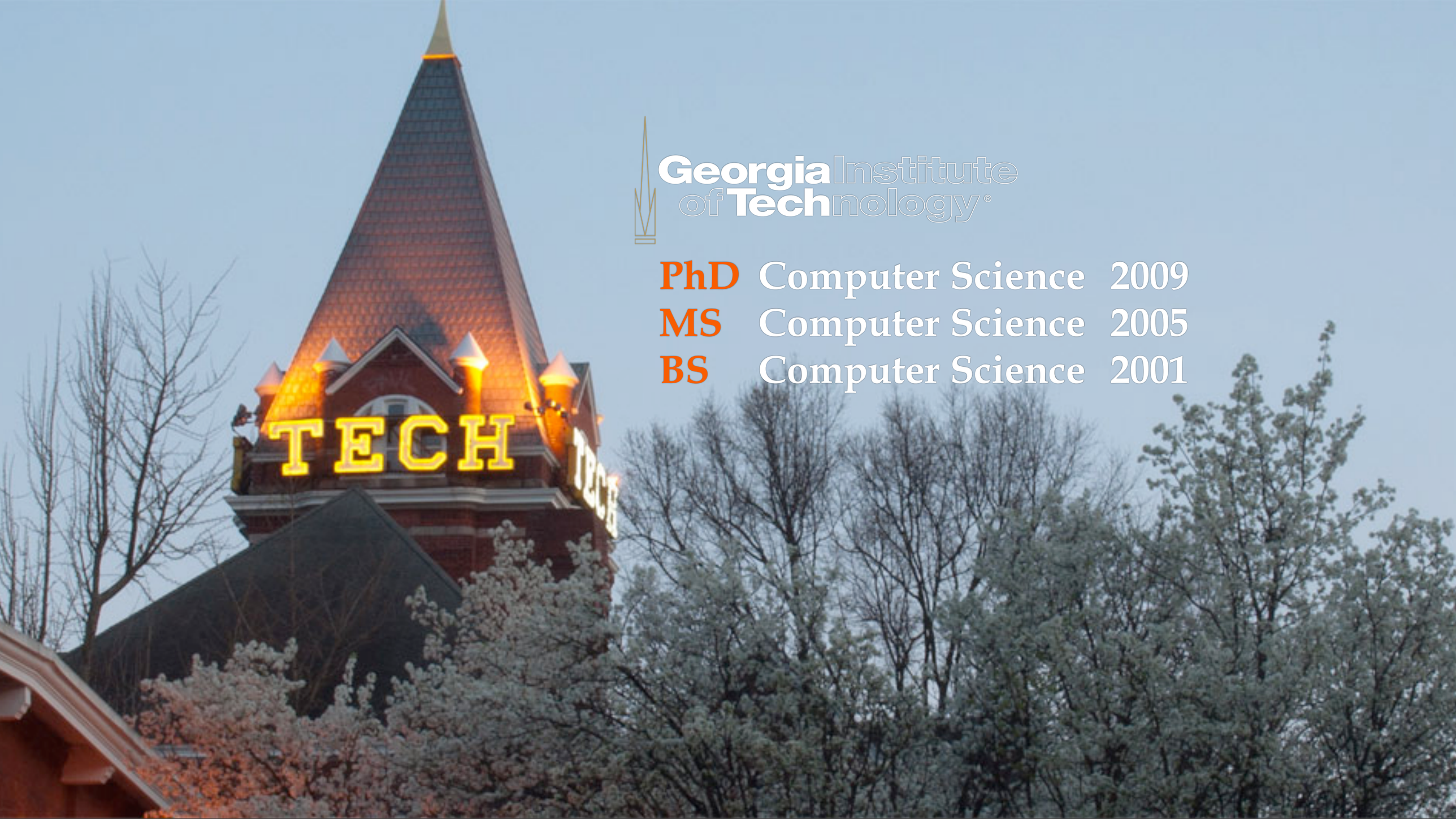
HCIN720
Prototyping Wearable and Internet of Things Devices

Dr. Daniel Ashbrook

Today

- Who are you?
- Overview of the course (what are we going to learn?)
- Course logistics
- Why are we going to learn these things?

About me



Georgia Institute of Technology®

PhD	Computer Science	2009
MS	Computer Science	2005
BS	Computer Science	2001

2009–2013

2013–2014

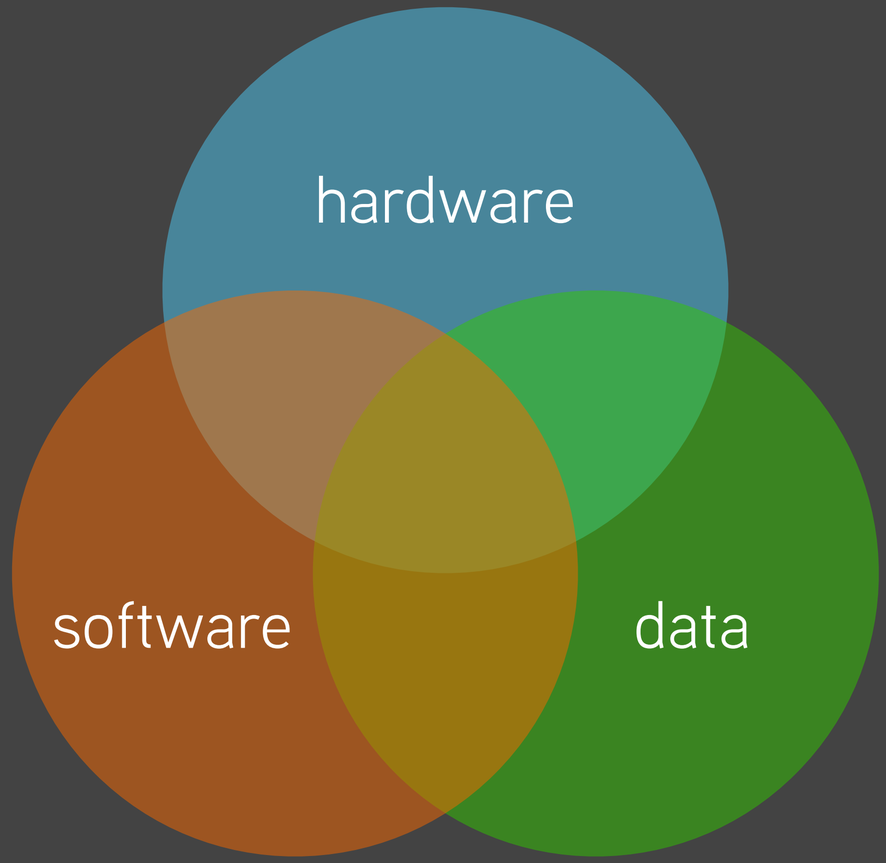
2014–

Course overview

About this course

We can't any longer think only about designing for screen-based devices. There is a whole new world of linked hardware/software/data out there.

These are physical objects that also have digital representations or linkages; alternately, it's digital information that has a physical instantiation.

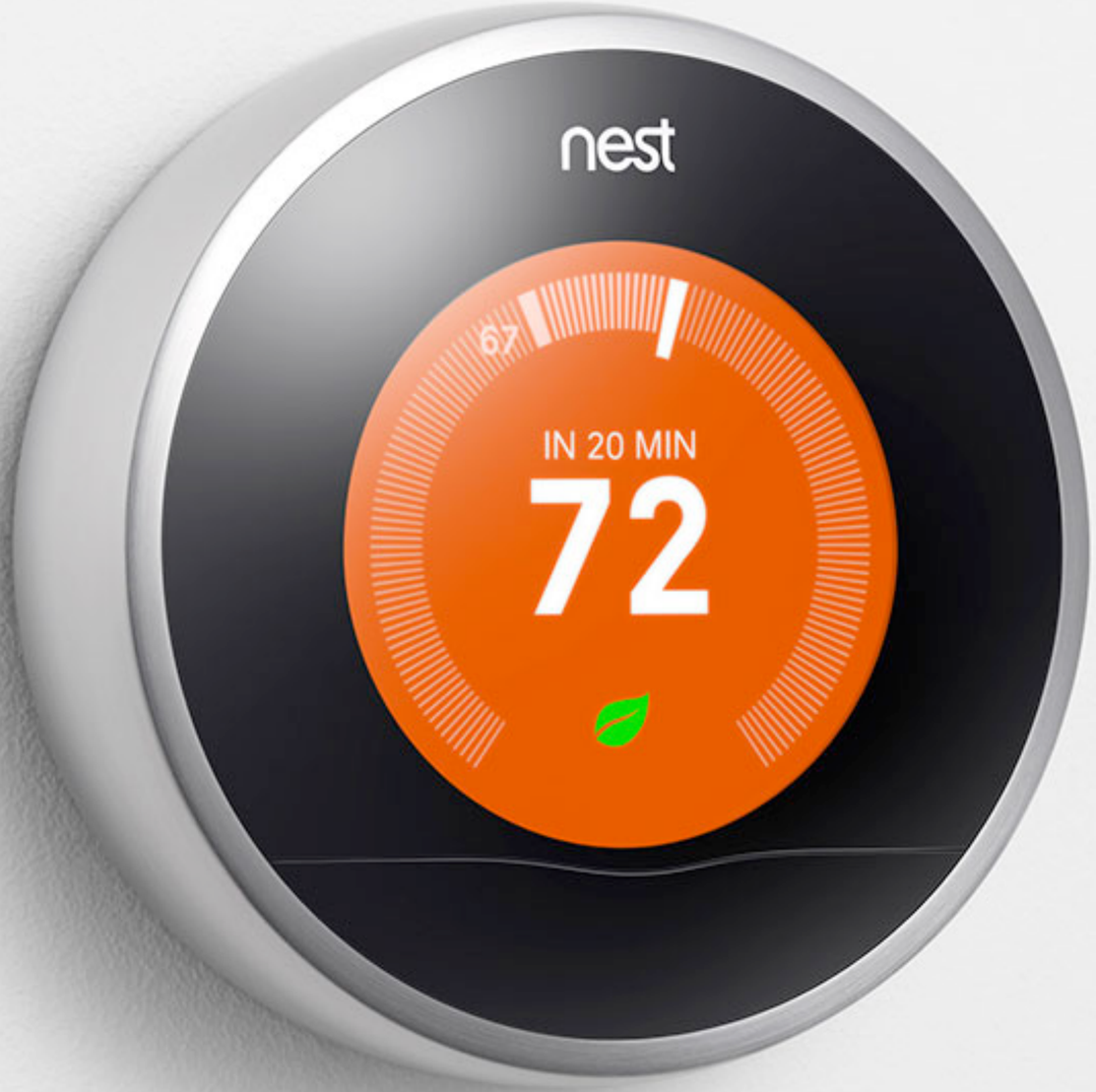


About this course

The focus of this class is on prototyping user experiences for physical artifacts that are connected to the Internet:

devices that allow things sensed about the physical world to be acted on in the cloud,

devices that allow things happening on the Internet to be reflected in the physical world,
devices that we carry on our bodies every day.


nest
67
IN 20 MIN
72


The New York Times


Good evening.
4 new stories
Last updated yesterday

Questions for the course

- What's out there?
- Where did it come from?
- How does information flow amongst the Internet and these devices?
- What are the different kinds of user experiences possible with these devices?
- How do we design these experiences?

Logistics

Communication

- I will not use MyCourses in this class
  - Because it is horrible
- Assignments and everything else will be on the course website: http://fetlab.rit.edu/720
  - (this link is on MyCourses)
- We will use Slack for communication, discussions, help, etc; you will sign up via instructions on the course web site.

Slack

FETLab
Daniel Ashbrook

⌘1 F
⌘2 H

CHANNELS
3d_embedding
augmented_tools
e-nable-study
fetlab_branding
general
kinect_team
laser_cutter
provost_visit
random
teeth
Create a channel...

DIRECT MESSAGES
Ameya Lonkar
caitlynorta
Carlos Tejada
chinar
jeremiah
Jeremiah Parry-Hill
Mohsen Zare
osamu
Sourabh Kulhare
Stan Guo
+1 More...

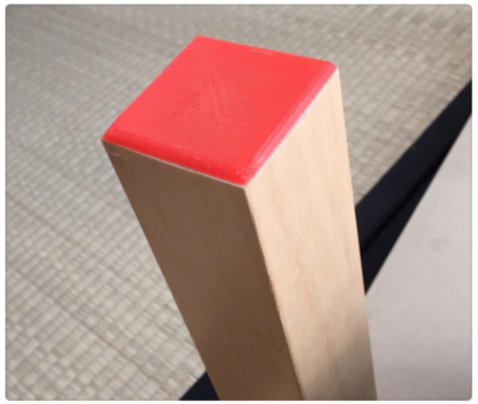
#random Non-work banter and water cooler conversation

11 Search

Today

Jeremiah Parry-Hill 1:22 PM
IKEA hackers at it again: http://www.ikeahackers.net/2015/08/print-piy-ikea-lack-end-cap.html

IKEA Hackers
Print It Yourself (PIY): IKEA Lack end-cap - IKEA Hackers
If you want to shorten the table leg of an IKEA Lack table, you might want to put an IKEA LACK end-cap on the leg after you have sawed it off. (97KB)
Today at 4:16 AM



Skills

- 3D printing
- Laser cutting
- Sewing
- 2D modeling for laser cutting
- 3D modeling for 3D printing
- Generative design
- Soft circuits
- Foam core
- Arduino
- Arduinos and interaction
- Bluetooth/BLE
- Wifi
- Processing
- Machine learning
- Signal processing
- Audio generation
- node.js
- Event-driven programming
- Basic electronics theory
- Motors, servos
- Connecting sensors and actuators via IO pins, I2C, SPI
- Capacitive sensing
- Sketching
- Data visualization
- Web APIs (REST)

Examples

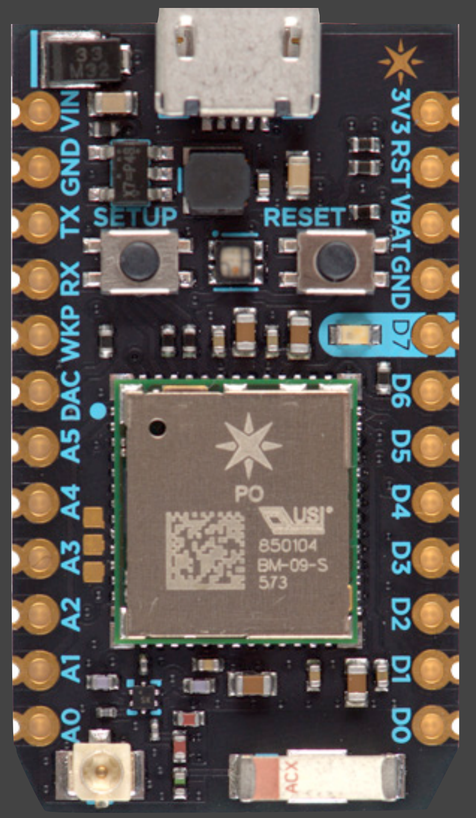

WHAT SHOULD I WEAR OUTSIDE?

Demo

Hardware

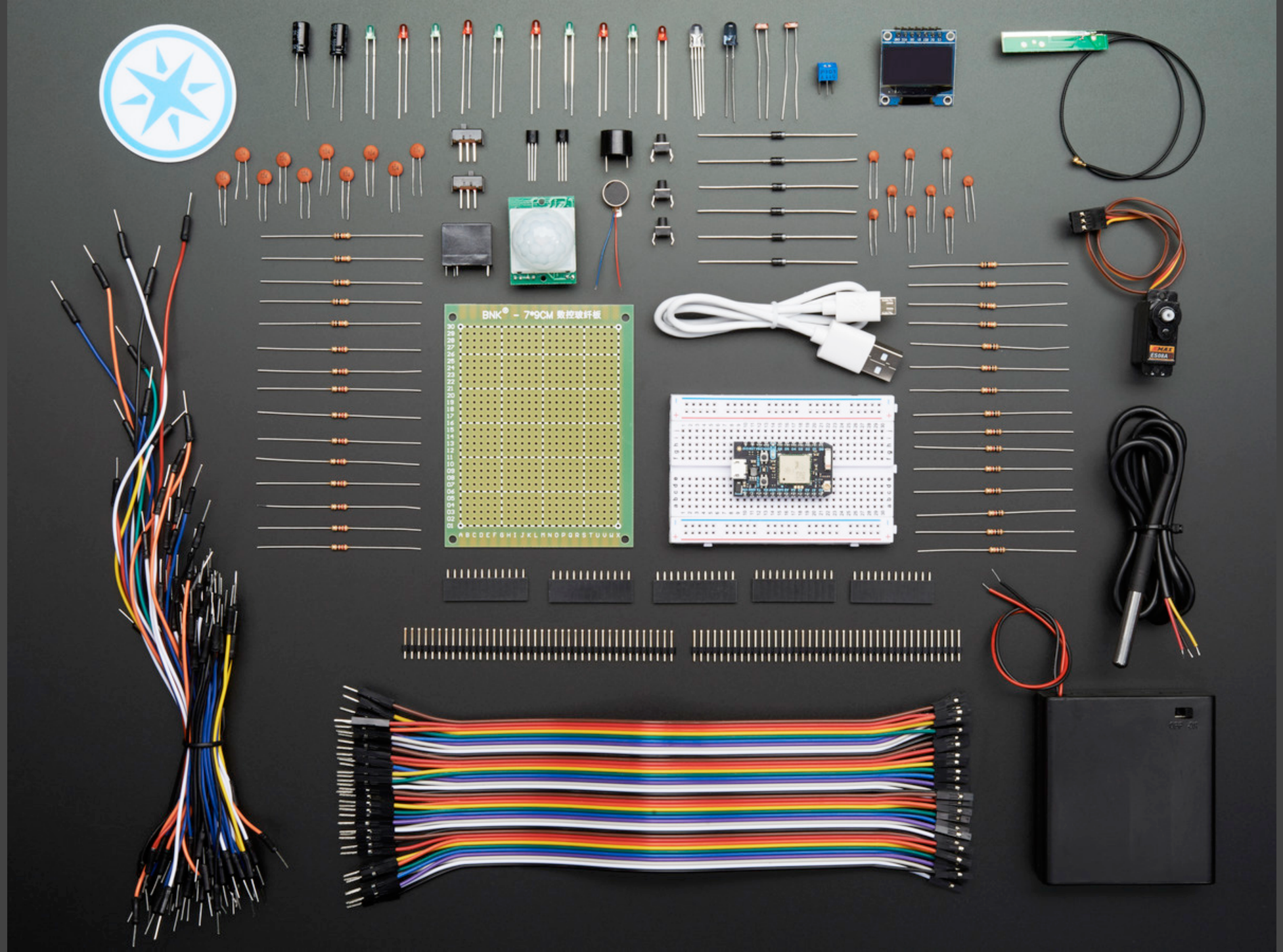
Particle.io Photon

- Arduino-like WiFi-based cloud-magic microcontroller
- $19
- Supported path from prototype → product



Hardware

- $89 (+tax) fee for materials
- You get to keep them!
- Includes Photon and a bunch of stuff


BNK - 7*9CM 数控玻纤板

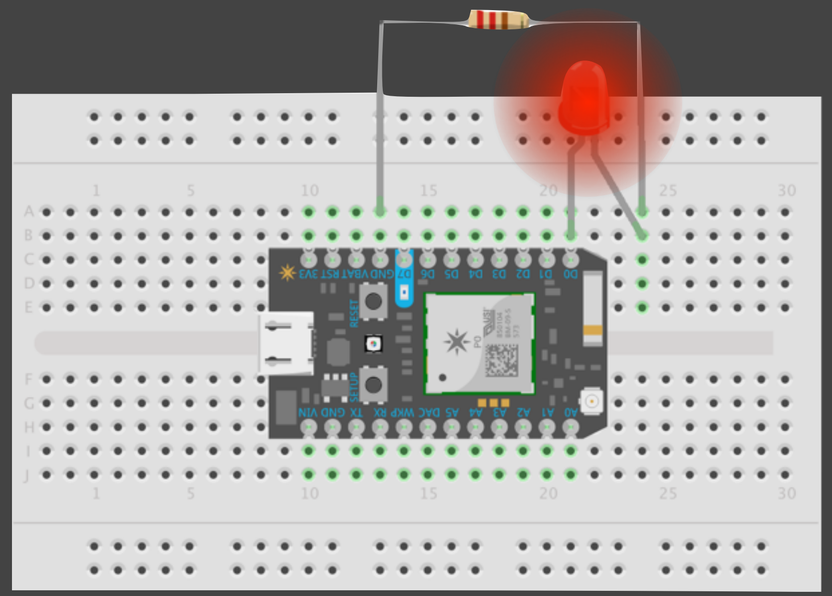
Example: control an LED over the Internet

```
int led1 = D0;
int led2 = D7;

void setup() {
   pinMode(led1, OUTPUT);
   Spark.function("led", ledToggle);
}

void loop() {}

int ledToggle(String command) {
   if(command == “on”) {
      digitalWrite(led1, HIGH);
      return 1;
   }
   else if(command == “off”) {
      digitalWrite(led1, LOW);
      return 0;
   }
   else
      return -1
}
```



https://api.particle.io/v1/devices/0123456789abcdef/led?access_token=1234123412341234&args=off

Grading

Individual assignments (3)	30%
Group assignment	30%
Final project	30%
Class participation	10%
Extra credit (maybe)	5%
Total	*105%*

Individual assignments

- Relatively straightforward—reflect the skills you've learned in class
- Each worth 10% of final grade (30% total)

Group assigment

- Teams of 2 students
- More complex: requires independent learning and research
- 30% of the final grade

Final project

- Teams of 2 students (could be the same or different)
- Integrate everything you've learned
- 30% of final grade

Class participation

- Show up to every class
- Be prepared for class
- Be on time
- Help your classmates
- Participate in your team
- Engage in class discussion
- Various smaller tasks (e.g. fill out survey)
- Worth 10% of final grade!

Policies

Late assignment policy

- Late assignments are not accepted
  - Unless you get my **prior permission**; then 50% penalty

Attribution

- Lots of coding and making in this course
- You will find help on the Internet. This is ok!
- Give proper credit for what helped you
  - Comments in code
  - Mentions in documentation or on slides
  - See syllabus
- Don’t plagiarize!

Plagiarism

Plagiarism is the **representation of others' ideas as one's own without giving proper attribution** to the original author or authors. **Plagiarism occurs when a student copies direct phrases or code from a source** (e.g. books, journals, and internet) and does not provide quotation marks, paraphrases, or attribution; or summarizes those ideas without giving credit to the author or authors.

Plagiarism

In other words:
if you use something
someone else did,
you **must** acknowledge
that other person's work.

Attribution

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RIT gender-based discrimination policy

RIT is committed to providing a safe learning environment, free of harassment and discrimination as articulated in our university policies located on our governance website.
RIT's policies require faculty to share information about incidents of gender based discrimination and harassment with RIT's Title IX coordinator or deputy coordinators, regardless whether the incidents are stated to them in person or shared by students as part of their coursework.

If you have a concern related to gender-based discrimination and/or harassment and prefer to have a confidential discussion, assistance is available from one of RIT's confidential resources on campus (listed in syllabus).

RIT gender-based discrimination policy

In other words:
be kind.

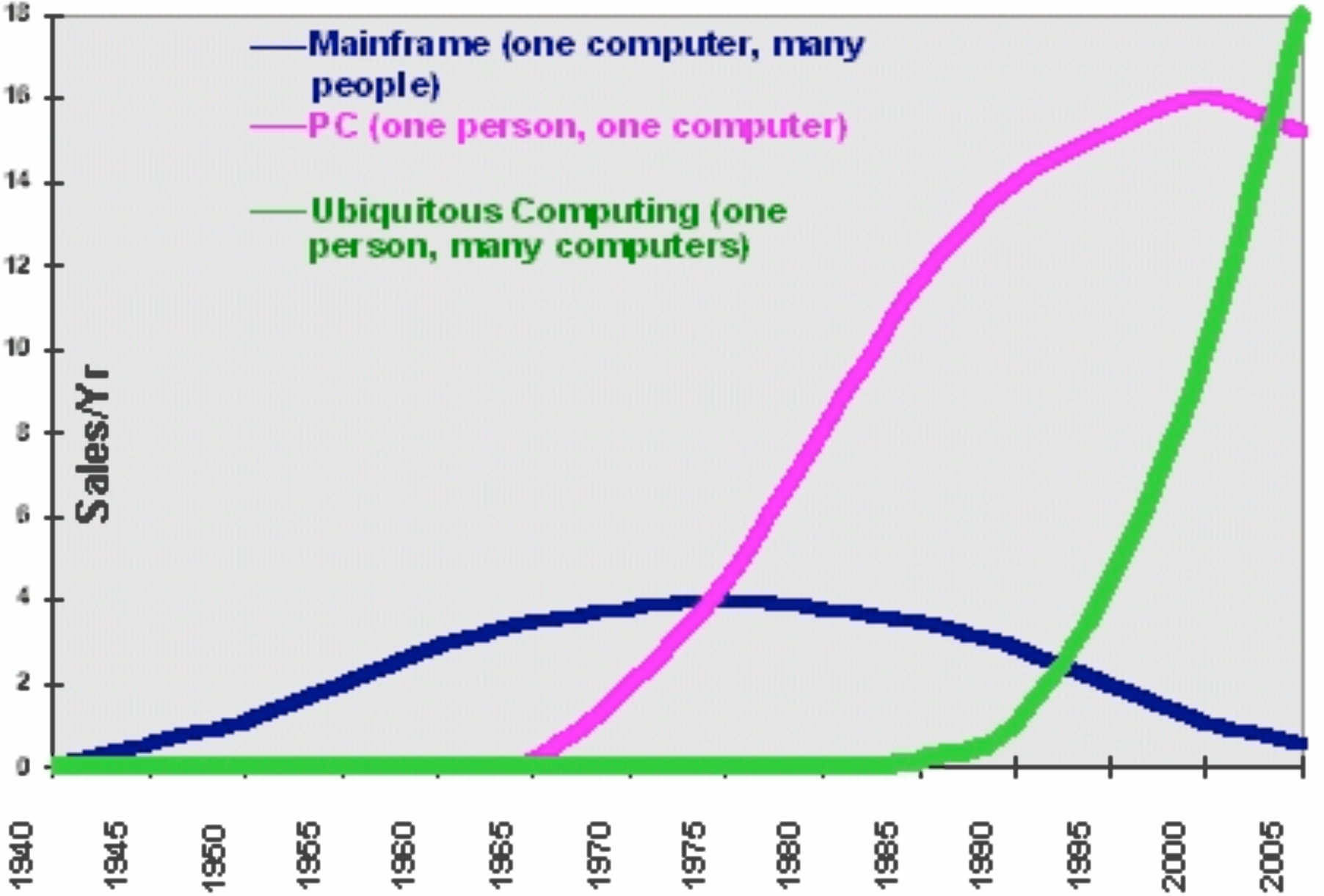
Failure

- Failure is how we learn!
- This is my second time teaching this course. My lectures, projects, etc ~~might~~ probably will fail.
- We'll all fail & learn collaboratively!
- Key: try!

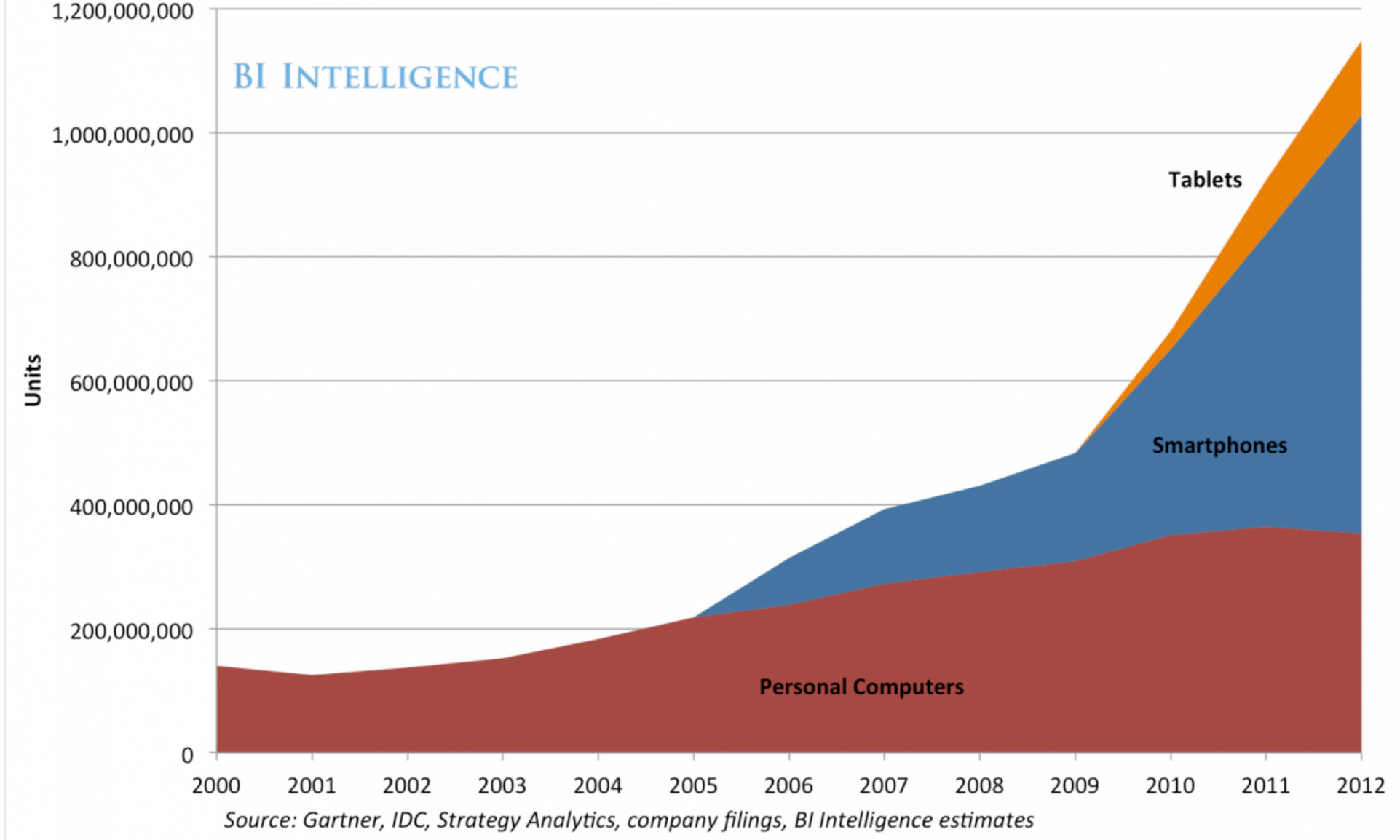
Questions?

What is the point of this course?

The Major Trends in Computing

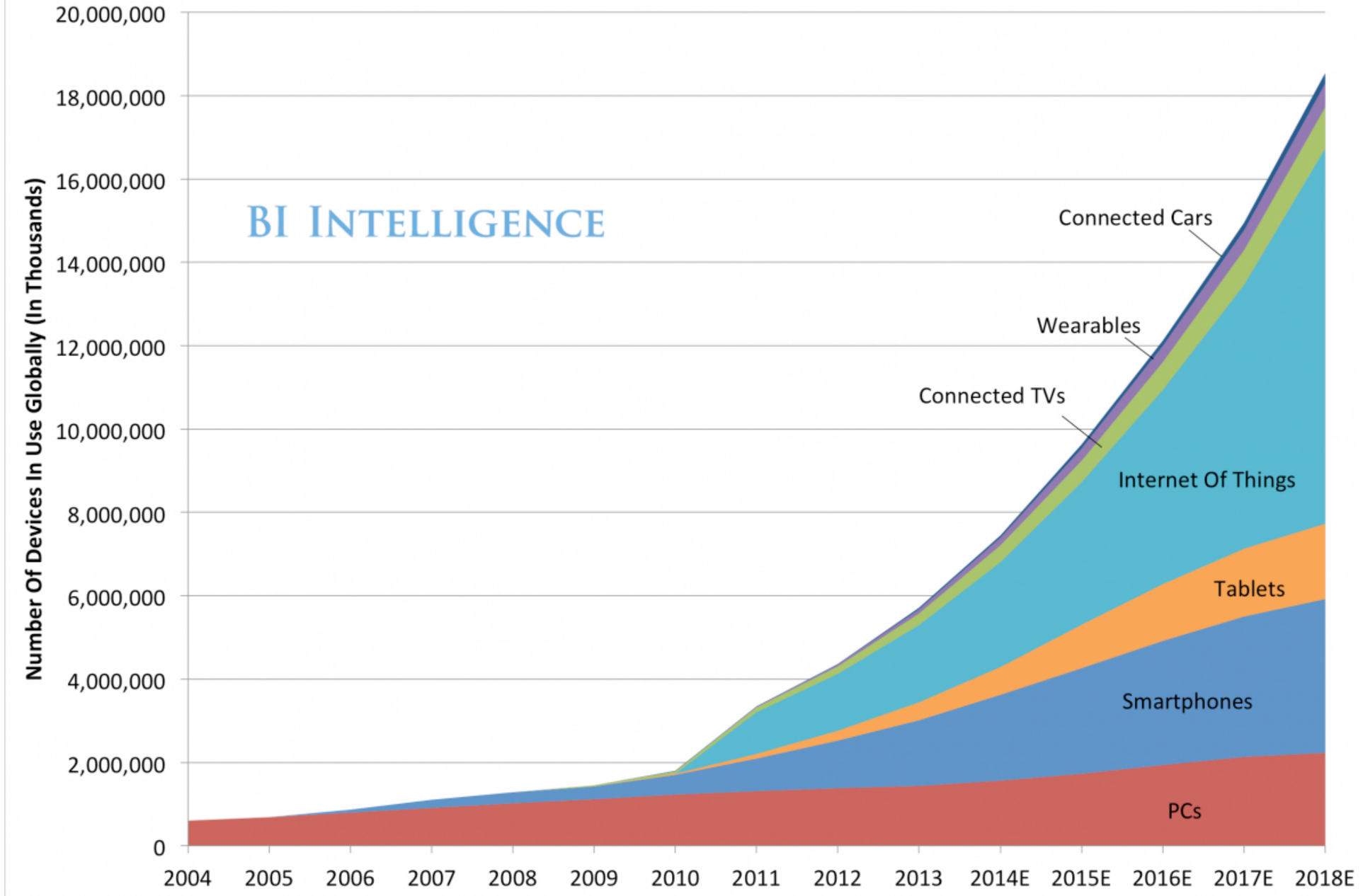


Global Internet Connected Device Shipments



Source: Gartner, IDC, Strategy Analytics, company filings, BI Intelligence estimates

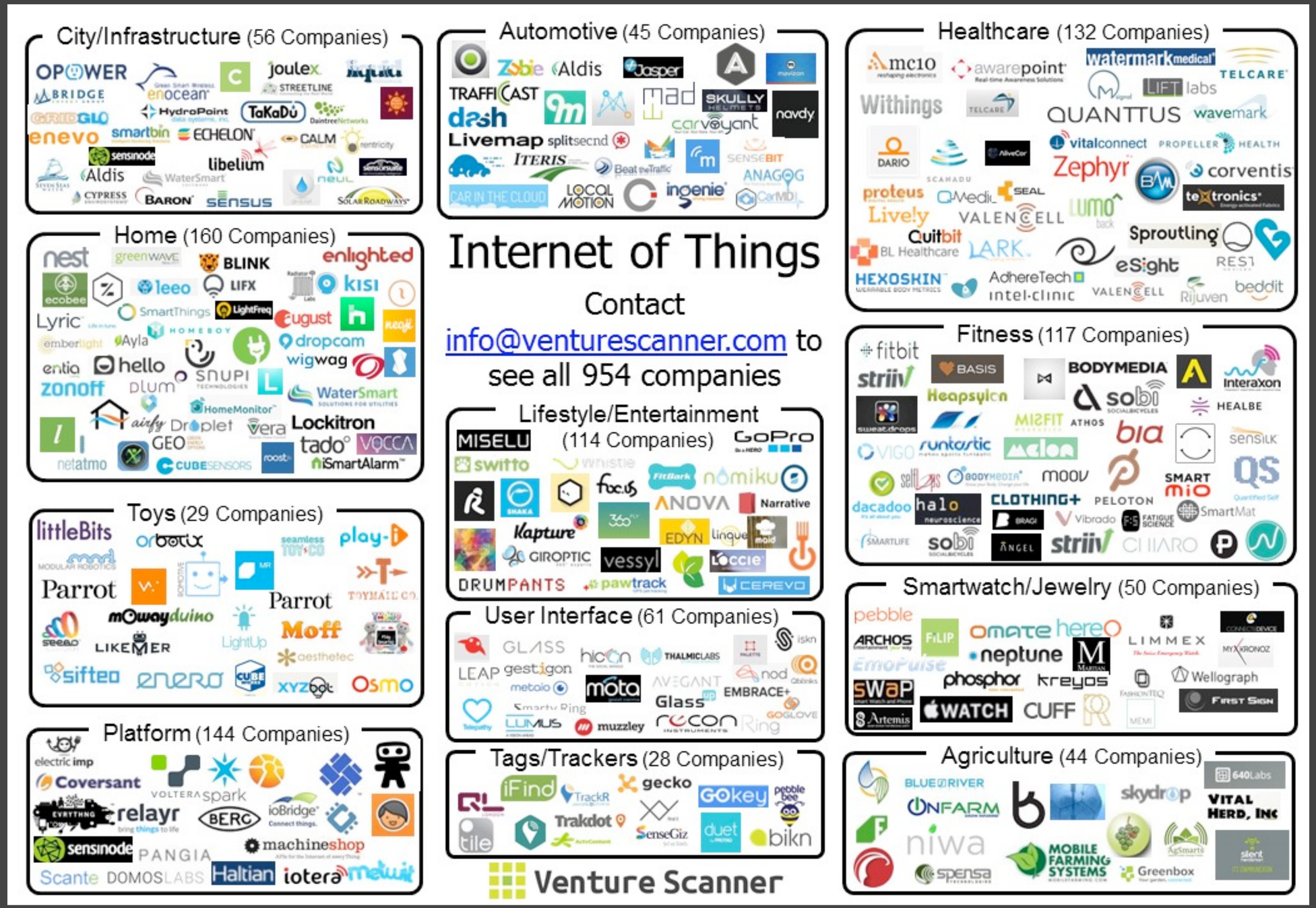
The Internet Of Everything



Source: BI Intelligence Estimates

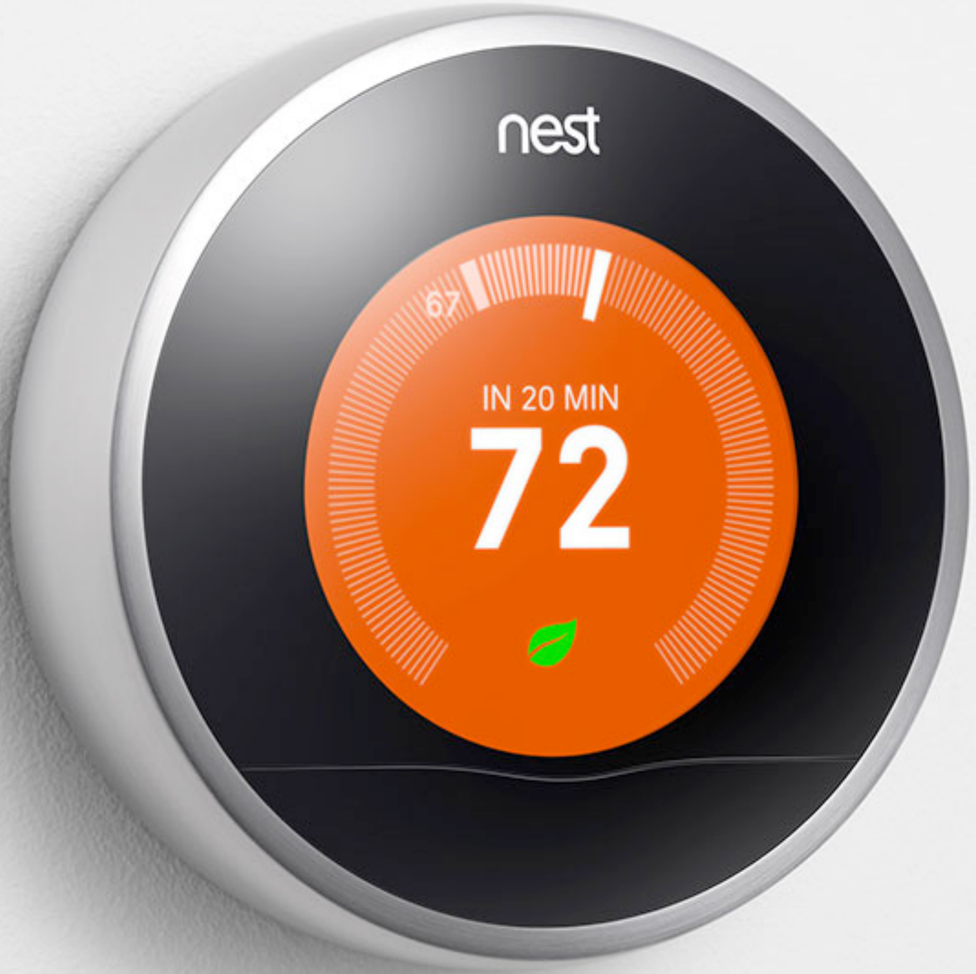
Why do we care?

- Old paradigms:
  - one user per computer
  - several users per computer
  - software ↔ software
- New paradigms:
  - many computers per user
  - many computer for many users
  - hardware ↔ software ↔ cloud


City/Infrastructure (56 Companies)
Automotive (45 Companies)
Healthcare (132 Companies)
Internet of Things
Contact
info@venturescanner.com to see all 954 companies
Home (160 Companies)
Lifestyle/Entertainment (114 Companies)
Fitness (117 Companies)
Toys (29 Companies)
User Interface (61 Companies)
Smartwatch/Jewelry (50 Companies)
Platform (144 Companies)
Tags/Trackers (28 Companies)
Agriculture (44 Companies)
Venture Scanner

The Parts

- User experience
- input *(e.g. sensors)*
- actuators *(e.g. displays)*
- microcontrollers (abbrev: *μC)*
- Internet *(you know what this is)*


nest
67
IN 20 MIN
72

Dual zone temperature

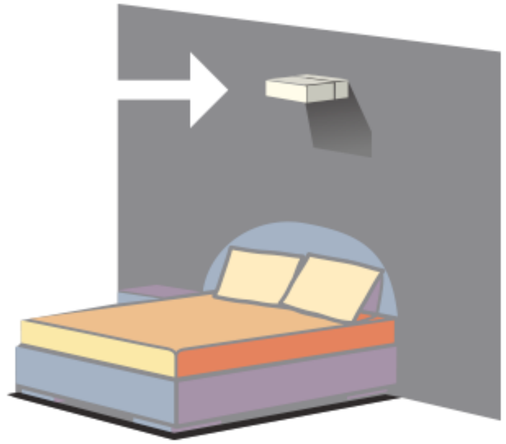
Sleep tracking

Smart alarm

Auto learning

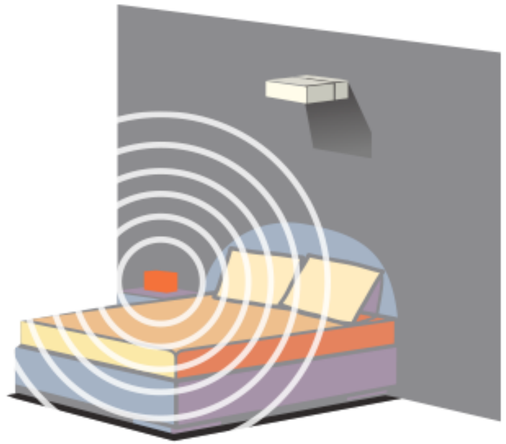
Mobile controlled

Smart home integration



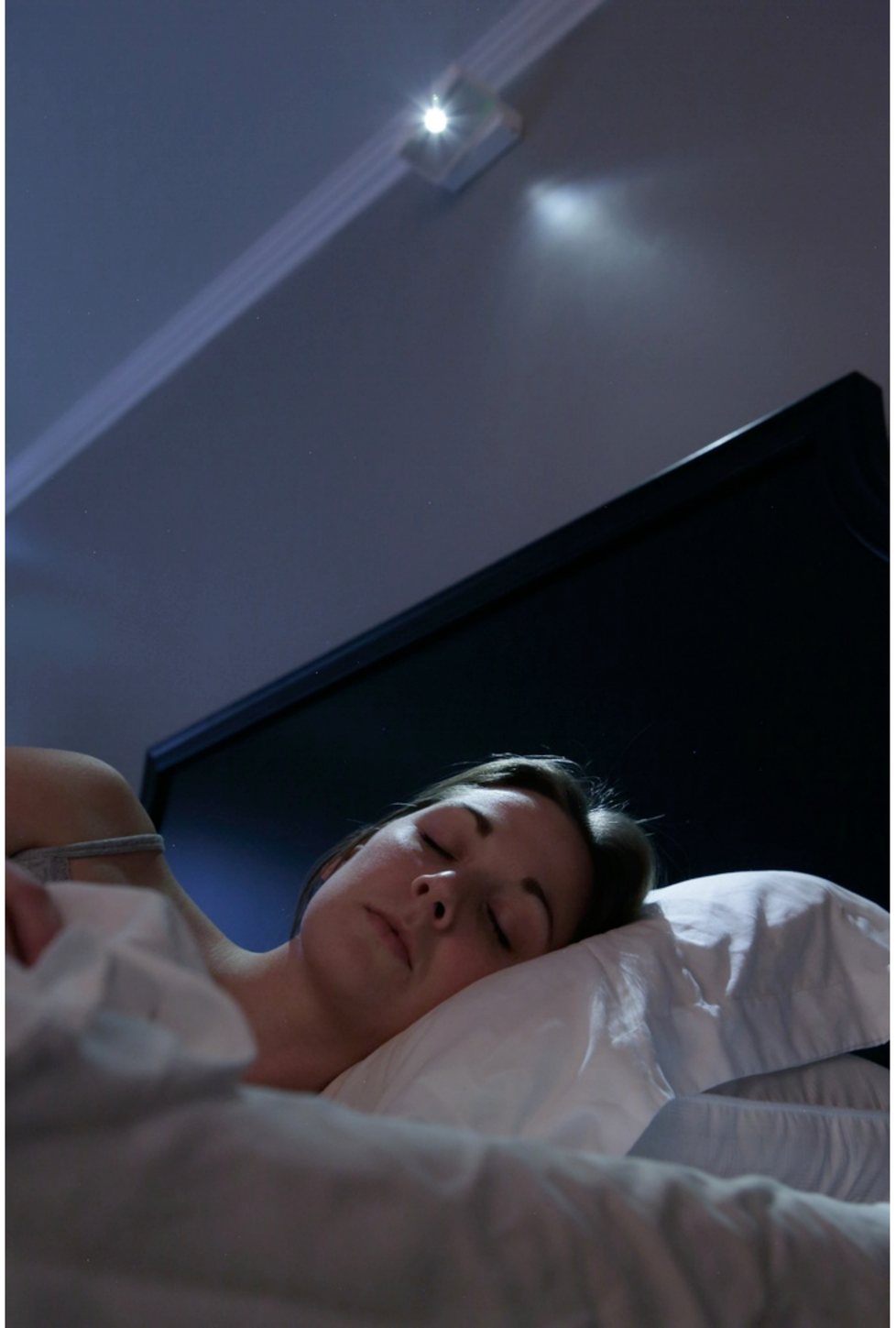
1 **Wakē** mounts to the wall behind your bed and works with your smartphone

2 When its time to get up, **Wakē** uses a body heat sensor to find where you are



3 Instead of using normal speakers that wake up everyone ...

4 **Wakē** uses focused beams of light and sound sent exactly to your location




The New York Times

Skill #1: git

What's git?

- A *Version Control System (VCS)*—a way to manage changes in files
- Keeps track of changes
- Go back to a previous change
- Work on code in teams

Why do you care?

- With github, a great way to share and back up code
- Experimenting is easy without losing changes
- Current industry standard: employers will like that you know it

What's github?

- Social coding website
- It *uses* git, but it git is separate from github
- Supports documentation, wikis, websites too

anjiro / statipy

Unwatch 1 Star 0 Fork 0

Code Issues 0 Pull requests 0 Wiki Pulse Graphs Settings

Very simple not-for-blogging static site generator in Python. — Edit

22 commits 1 branch 0 releases 1 contributor

Branch: master New pull request Create new file Upload files Find file Clone or download

anjiro add `root_subdir` option, comments, code clarity Latest commit 692205f on Jul 7

example	Rename examples to example, add simple example	2 months ago
statipy	add `root_subdir` option, comments, code clarity	a month ago
.gitignore	add gitignore	2 months ago
Readme.md	add `root_subdir` option, comments, code clarity	a month ago
setup.py	Initial commit	2 months ago

Readme.md

Statipy

Statipy is a very simple static site generator, written in Python, and heavily inspired by the more complex Pelican.

Most static site generators are aimed at blogging and make it difficult to make a truly static, modular site without a lot of messing around. Statipy aims to fix this problem.

Features

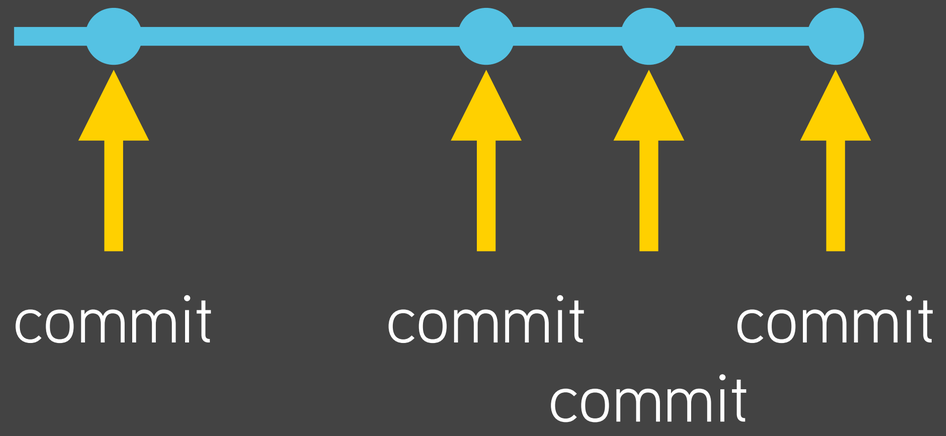
Like many other static site generators, Statipy uses Jinja2 templates. However, the main features that differentiate Statipy are:

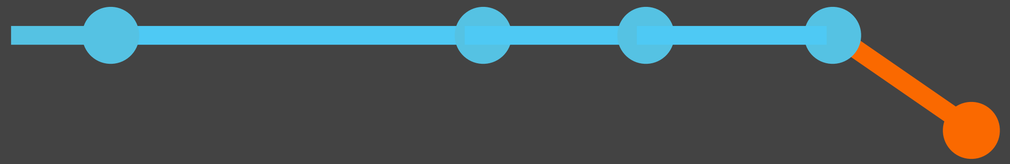
- Mirrored site layout: set up your site in `content/` as you want it, and Statipy will copy the same structure into your site's `output/` directory.
- Non-centralized templates: templates (with a `.jinja` extension) live in the same directories as your content, rather than in a central template directory.

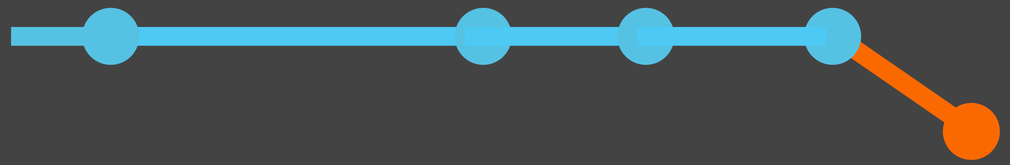
git walkthrough

some
code

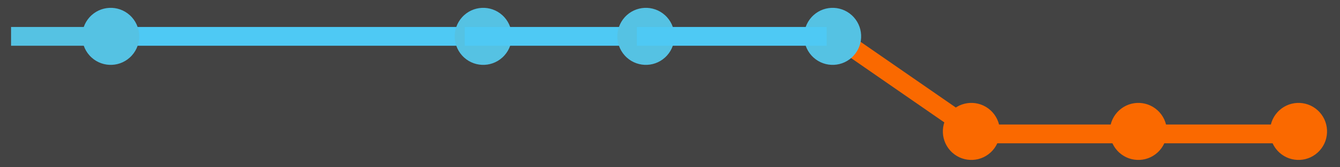
“commit”


commit
commit
commit
commit





Branch



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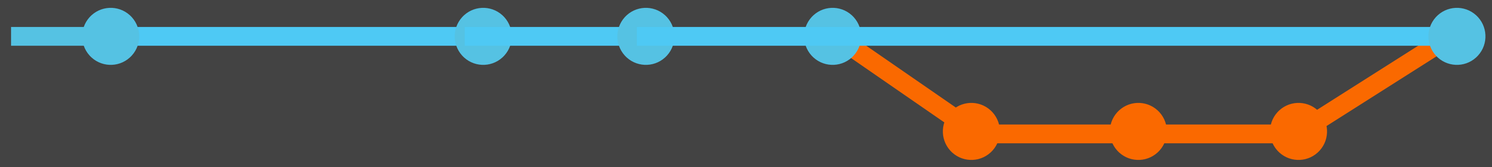

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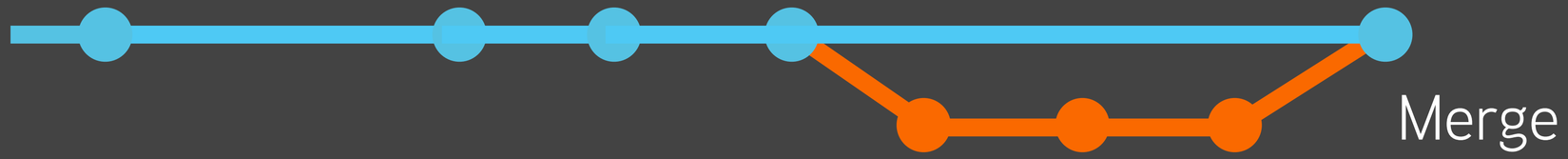

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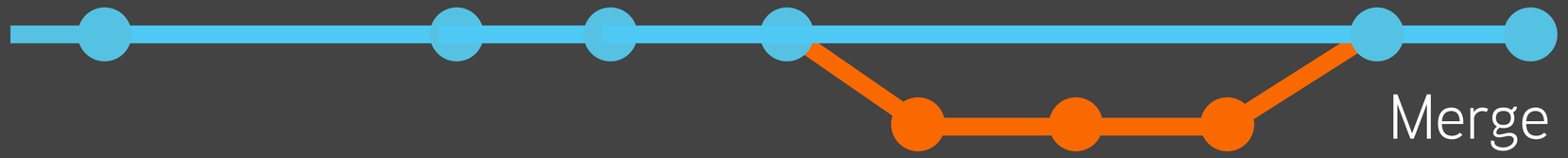

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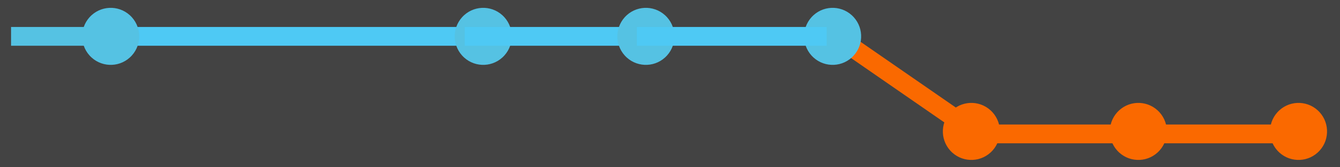
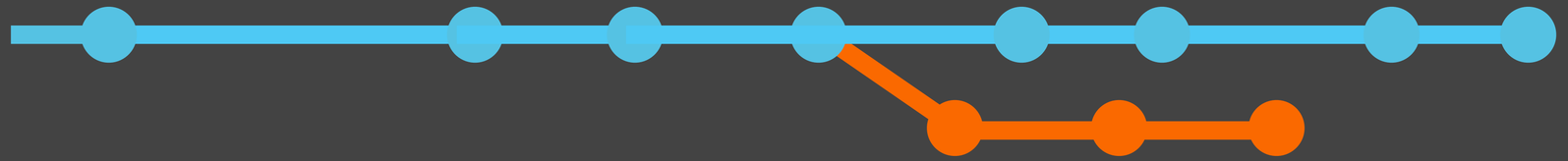


Branch



git terminology 1

- Repository: *a collection of related code—usually a single project*
- Stage: *a temporary list of all of the things that will be put into a single commit*
- Commit: *a group of related changes; often entire files, but can consist of parts of files as well*
- Branch: *a line of history in a repository*
- Merge: *an operation to bring all of the historical changes from one branch into another one*
- Conflict: *a problem when a merge would result in incompatible changes*

git terminology 2

- Remote: *a repository not on your computer; e.g. one on github*
- Clone: *to make a copy of a (remote) repository, including all of its history and branches*
- Pull: *get all of the new changes from another repository and put them into your current branch*
- Push: *send all of your changes to a remote repository*
- Fork: *on github, make a clone in your account of another repository so you can make changes*

Using git

- git is for *managing changes*, not *making changes*
- Create your own directories, use your favorite editors, just as always; but use git to make sure your work is backed up and shared
- now: github desktop demo

Questions?

What's next?

- Due tomorrow: course survey (on web page)
  - So I can get an idea of your skills and knowledge
- Due Thursday: class set up (on web page)
- Thursday: hands-on skills—reading public data sources, visualizing data, jquery, paper.js
  - **Get set up for class Thursday—see web page!**