Startup Engineering

Week 1: Course Logistics

Signup: coursera.org/course/startup
Class: class.coursera.org/startup-001
Forum: bit.ly/startup-eng-forum

Week 1: Course Logistics

- About Us
  - Lecturers: Balaji S. Srinivasan (balajis), Vijay Pande (pande)
  - TA: Alex Chia (alexchia)
- Motivation
  - The class we wish we'd had before starting up our co/lab
- Syllabus
  - 50% technology + 50% philosophy
  - Spiritual sequel to Thiel's CS183 (~100% philosophy)
  - Multiple choice and programming assignments (solo)
  - Final project
    - Bitcoin Selfstarter: your own simple crowdfunding site
    - Partially graded + public recognition
  - Go to forums/meetups/hackathons; but submit own work

Week 1: Course Logistics

- Web
  - *Primary Course Site (logged-in students)*
    https://class.coursera.org/startup-001
  - *Public signup page*
    http://coursera.org/course/startup
  - *Convenience site (mobile/logged-out/public)*
    http://startup.stanford.edu

- Textbook & Help
  - All notes online; nothing to buy
  - To ask for help or report bugs, use the discussion forums
  - There are ~100,000 students, so email won't work!

About Us

A brief introduction to your instructors

Instructors

- Balaji S. Srinivasan
  - Stanford BS/MS/PhD EE, MS ChemE; taught CS & Stats at Stanford before doing startup
  - Co-founder and CTO of genomics startup Counsyl: won Wall Street Journal's Innovation Award for Medicine, named "Top 10 World Changing Idea" by Scientific American; see also TechCrunch, Stanford Magazine
  - Scaled Counsyl from Stanford dorm room to 60,000 square foot clinical genome center w/ ~200 employees, ~3% of US births (robotics video, tech video)
  - Raised $65M+ in funding from investors including Founders Fund, Felicis Ventures, founders of Paypal/Youtube, Square COO Keith Rabois, Google's Jeff Dean and David Drummond, etc.

Counsyl

The New York Times

Business

WORLD | U.S. | N.Y. / REGION | BUSINESS | TECHNOLOGY | SCIENCE | HEALTH | SPORTS | OPINION

Counsyl Brings Gene Tests to Masses

By ANDREW POLLACK
Published: January 28, 2010

REDWOOD CITY, Calif. — The new movie "Extraordinary Measures" is based on the true story of a father who starts a company to develop a treatment for the rare genetic disease threatening to kill two of his children before they turn 10.

Enlarge This Image

Now, a Silicon Valley start-up is making the bold claim that it can help eradicate that disease and more than 100 others by alerting parents-to-be who have the carrier genes.

Counsyl

Through Dirt-Cheap Genetic Testing, Counsyl Is Pioneering A New Bioinformatics Wave

KIM-MAI CUTLER

Tuesday, April 23rd, 2013 **14 Comments**

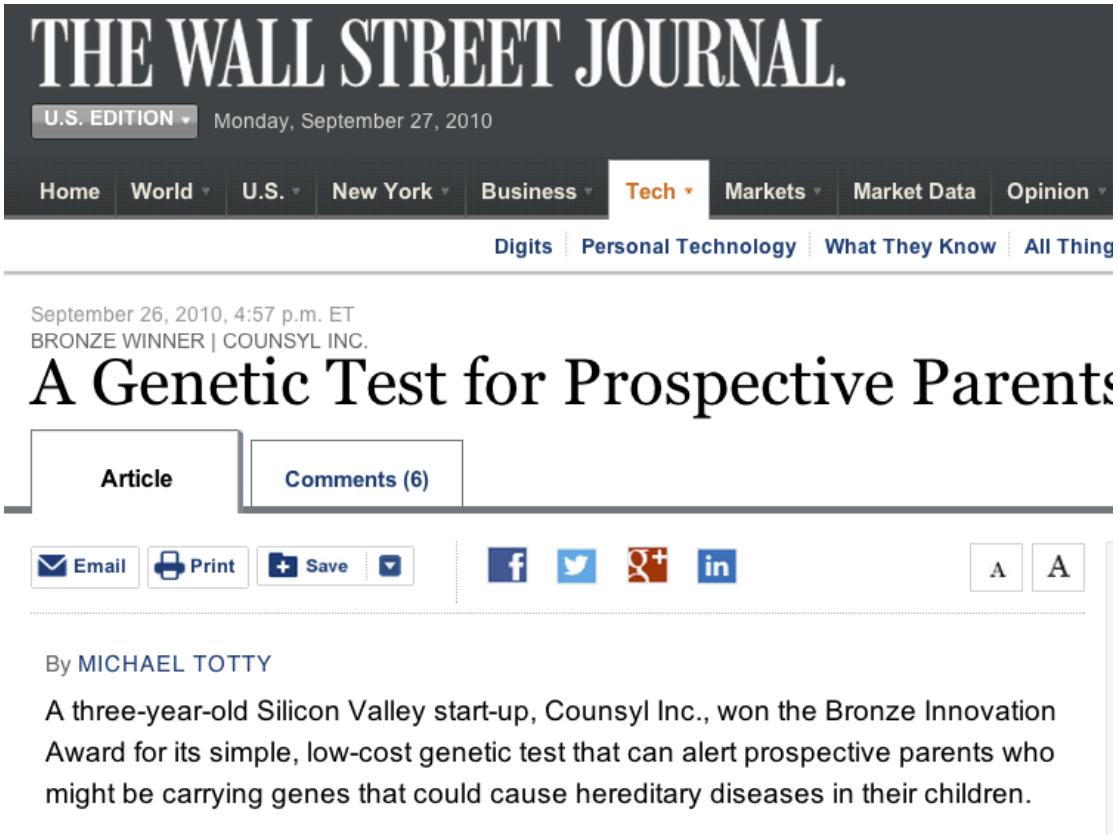
For cynics who say that Silicon Valley has become too mired in photo-sharing apps and addictive games, take a 15-minute drive to South San Francisco.

In a non-descript lab is a company that may be paving the way for the Valley's next wave of disruptive startups, which marry software with data from the human genome.

Jen Baumgartel opted for in-vitro fertilization after learning from a Counsyl test that she and her husband were carriers for the severest form of Smith-Lemli-Opitz syndrome.

Counsyl is doing genetic tests that look for more than 400 mutations and at least 100 genetic disorders for parents who are planning children. At $599 total, or $99 with insurance, their tests cost a fraction of standard ones, which often only look

Counsyl



THE WALL STREET JOURNAL.

U.S. EDITION Monday, September 27, 2010

Home World U.S. New York Business Tech Markets Market Data Opinion

Digits | Personal Technology | What They Know | All Thing

September 26, 2010, 4:57 p.m. ET

BRONZE WINNER | COUNSYL INC.

A Genetic Test for Prospective Parents

Article | Comments (6)

Email Print Save

By MICHAEL TOTTY

A three-year-old Silicon Valley start-up, Counsyl Inc., won the Bronze Innovation Award for its simple, low-cost genetic test that can alert prospective parents who might be carrying genes that could cause hereditary diseases in their children.

Counsyl

INNOVATION

World Changing Ideas

Ten thoughts, trends and technologies that have the power to transform our lives

HEALTH AND MEDICINE

One Hundred Tests

A cheap diagnostic warns couples against passing rare genetic diseases to their offspring *by Mary Carmichael*

Instructors

- Vijay S. Pande
  - Professor of Chemistry and, by courtesy, of Structural Biology and of Computer Science, and the Director of the Program in Biophysics.
  - Princeton/MIT/Berkeley grad; programming since 1982, first company Naughty Dog in 1986 (Crash Bandicoot for Sega); at Stanford since 1999
  - Founder and director of the Folding@Home Distributed Computing Project, one of the world's largest supercomputers; massive distributed/parallel computing project

Folding@Home

Folding@home

From Wikipedia, the free encyclopedia

Folding@home (**FAH** or **F@h**) is a distributed computing project for disease research that simulates protein folding, computational drug design, and other types of molecular dynamics. The project uses the idle processing resources of thousands of personal computers owned by volunteers who have installed the software on their systems. Its primary purpose is to determine the mechanisms of protein folding, which is the process by which proteins reach their final three-dimensional structure, and to examine the causes of protein misfolding. This is of significant academic interest with major implications for medical research into Alzheimer's disease, Huntington's disease, and many forms of cancer, among other diseases. To a lesser extent, Folding@home also tries to predict a protein's final structure and determine how other molecules may interact with it, which has applications in drug design.
Folding@home is developed and operated by the Pande laboratory at Stanford University, under the direction of Vijay Pande, and is shared by various scientific institutions and research laboratories across the world.[1]

Folding@home

Original author(s)	Vijay Pande
Developer(s)	Pande laboratory, Sony, Nvidia, ATI, Cauldron Development LLC[1]
Initial release	October 1, 2000
Stable release	7.2.9[2]
Operating system	Microsoft Windows, OS X, Linux
Platform	Cross-platform
Available in	English
Type	Distributed computing
License	Partially GPL, partially proprietary[3]
Website	folding.stanford.edu

Folding@Home

Teaching Assistant

- Alex Chia
  - CMU BS Computer Science (*summa cum laude* in two years); Stanford MS Computer Science
  - Google, Square Enix (Final Fantasy), Counsyl, Teza Technologies (Algorithmic Trading)
  - Winner of many programming competitions
    - Microsoft Imagine Cup 2007 Worldwide Top 6 (Algorithms)
    - National Software Competition 2004 1st Place (Singapore)
    - National Olympiad for Informatics 2004 Gold (Singapore)

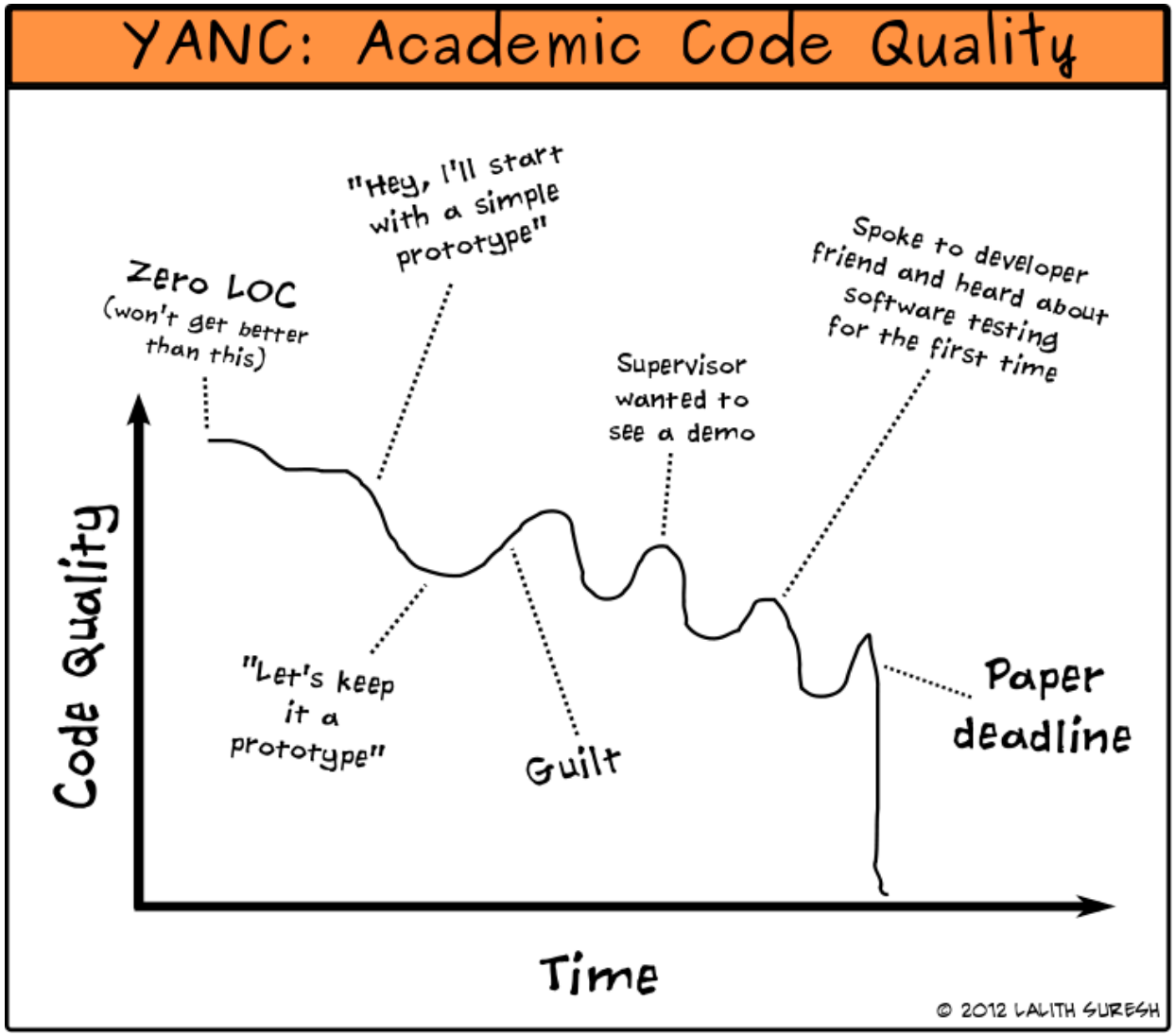
Motivation

This is the class we wish we'd had

Motivation

- Startups are huge...
  - And Stanford is the epicenter of Silicon Valley (1, 2, 3, 4)
  - But, surprisingly, you don't really learn how to start a company at Stanford
  - It's just something people around you do; skills transmitted by osmosis and hard experience, not formally
- We love academia, but...
  - Academia teaches details of black boxes (balancing red/black trees, hash functions), not how they fit together.
  - Academia teaches how to solve problems, not what problems are valuable to solve.
  - First year grad students & fresh grads don't know how to ship production code (editing, testing, dev/staging/prod)

Motivation



http://lalith.in/2012/06/07/academic-code-quality

Motivation

- Scaling a startup
  - Once you achieve product-market fit, you start scaling the company and hiring many new engineers
  - New engineers weren't taught how to code in college, so the first 3-6 months are spent training them...
  - ...but as the employer you are also effectively paying their student loans.
- Scaling a research lab
  - Similar problem, except with first year grad students
  - Each CS grad student reinvents the wheel; no shared code
  - More systematic onboarding = more papers, more rapidly
- Purpose of this class
  - Go upstream, communicate some useful concepts upfront

Who should take this course?

- Course is ideal for
  - STEM grad student who'd otherwise code for up to six years w/o knowing software engineering
  - Undergrad who knows how to balance a tree, not how to deploy a website
  - Interested in startups, want to learn from people who've actually done and scaled them
  - Broad understanding of startups, not just code
- May be challenging
  - Startups are hard: "there is no speed limit"
  - Programming/project course; CS106B or equivalent req'd
  - There will be a lot of Javascript related material
  - No curve: in theory, everyone can get a grade of 100%

Syllabus

You can take the course for the technology, the (highly applied) philosophy, or both.

Stanford Bulletin

Spiritual sequel to Peter Thiel's CS183 course on startups. Bridges the gap between academic computer science and production software engineering. Fast-paced introduction to key tools and techniques (command line, dotfiles, text editor, distributed version control, debugging, testing, documentation, reading code, deployments), featuring guest appearances by senior engineers from successful startups and large-scale academic projects. Over the course of the class, students will build a command line application, expose it as a web service, and then link other students' applications and services together to build an HTML5 mobile app. General principles are illustrated through modern Javascript and the latest web technologies, including Node, Backbone, Coffeescript, Bootstrap, Git, and Github.

Prerequisites: Basic computer science as per CS106B. Recommended: some familiarity with HTML, CSS, and Javascript.

Schedule: June 17 - Aug 25, 2013

Week	Week of	Released	Due (by 11:59pm PT)
1	June 17	HW1	
2	June 24	HW2	HW1
3	July 1	HW3	HW2
4	July 8	HW4	HW3
5	July 15	HW5	HW4
6	July 22	HW6	HW5
7	July 29	HW7 (short homework)	HW6
8	Aug 5	Final Project Leaderboard live	HW7
9	Aug 12		
10	Aug 19		FP winners declared on August 25, 2013 at 11:59pm Pacific Time

Syllabus: Technical

Week	Technical Topics	Assignment
1	*Start:* Sign up for webservices, get server up, node/npm, basic JS	HW1
2	*Dev Environment:* Unix CLI, git, emacs, REPL, dotfiles, edit HTML	HW2
3	*Product/Design:* Market research, wireframing, design, CSS	HW3
4	*Mobile:* HTTP, user agents, responsive design, Bootstrap	HW4
5	*Frontend JS:* social and payment integration, frontend testing	HW5
6	*Backend JS:* command line UI, DB, ORM, backend testing	HW6
7	*Full Stack JS I:* Set up REST JSON API, client-side templating	HW7
8	*Full Stack JS II:* Consume APIs, widget as API client, data pipeline	Final Project
9	*Marketing:* Video Editing, Analytics, CAC/LTV/Funnel	Final Project
10	Summary and Recap	Final Project

Syllabus: Philosophical

Week	Philosophical Topics	Related to...
1	Introduction: a startup is a business built to grow rapidly.	Product
2	Your market: The most important choice in a startup.	Product/Copy
3	Some basic principles of market research, design, and PR.	Design
4	Why do VCs love mobile/local/social? And what will they love next?	Product
5	Regulation, disruption, and the technologies of 2013.	Product
6	How to disrupt everything, including the government.	Product
7	Founding, conception, composition, and capitalization.	Business
8	Dev scaling: engineers vs. CPUs. DRY, docs, tests, code review.	Business
9	Business scaling: sales, marketing, the funnel, finance, accounting.	Business
10	Summary and recap.	

Assignments

- Homeworks (HWs): graded
  - HW out/due on Wednesdays (HW1 out on June 19, 2013)
  - Weekly multiple choice quizzes and simple programming assignments (node.js, client-side JS)
  - Objective answers, auto-grading
- Final Project: *partially* graded
  - Final project: Bitcoin Selfstarter with your idea
  - You will build this up in steps over each week of the course
  - What is graded
    - grade.js takes your URL, return JSON w/ boolean flags to evaluate technical details; see further slides for details
  - What is not graded
    - Qualitative content or video (i.e. product) is not graded
    - Instead, ranked on basis of # BTC and other metrics

Assignments: Due on Wednesdays

All HW assignments will be auto-graded with objective answers
- Some multiple choice, some programming exercises
- Also grade technical aspects of final project (details)

HW	Release Date	Due Date	Notes
HW1	June 19	June 26 at 11:59pm Pacific Time	Easy to allow late start
HW2	June 26	July 3 at 11:59pm Pacific Time	
HW3	July 3	July 10 at 11:59pm Pacific Time	
HW4	July 10	July 17 at 11:59pm Pacific Time	
HW5	July 17	July 24 at 11:59pm Pacific Time	
HW6	July 24	July 31 at 11:59pm Pacific Time	
HW7	July 31	Aug 7 at 11:59pm Pacific Time	Short to allow project focus

Final Project

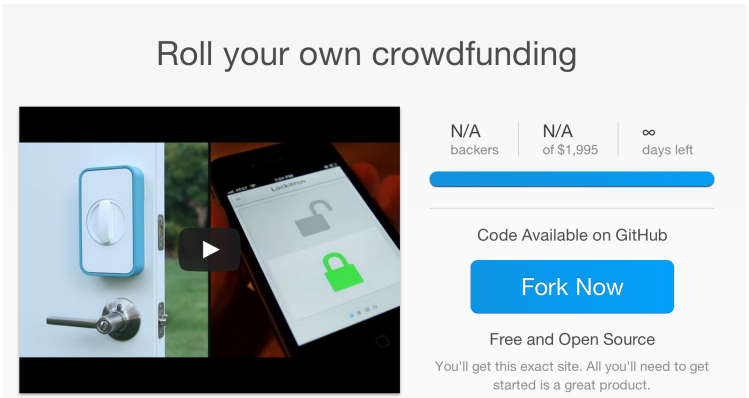
You will build your own simple Bitcoin-powered crowdfunding site, featuring your own product.

Final Project: Bitcoin Selfstarter

- 100,000+ final projects present unique problems
  - Rank/score automatically, yet allow creativity
  - Enrich beginners, but challenge advanced students
  - Complete within relatively short course period, but simulate as much of startup founding process as possible
- After much deliberation...
  - Selfstarter is an open-source Kickstarter clone (1, 2, 3, 4)
  - Allows non-dilutive crowdfunding via pre-orders of product, as opposed to dilutive crowdfunding via equity sale
  - Bitcoin is an open-source digital currency (1, 2, 3, 4)
  - Allows anyone to set up a merchant account and accept payments from anywhere in the world
  - Final project = your node.js version of Selfstarter + sharing + Bitcoin + [your product]

Final Project: Your Bitcoin Selfstarter

The official selfstarter.us



Over the course of the class, we will walk you through the steps required to take the selfstarter concept...

Your personal selfstarter

...and write your own simple selfstarter clone in node.js, set up social sharing, accept Bitcoin payments, and thereby host your own custom crowdfunder.

Final Project: Grading

Week	Graded Aspects of Final Project (Technical)	Ungraded (Qualitative)
1	*Start:* Hello world site successfully up at URL	Name of your custom domain
2	*Dev Environment:* Specified HTML tags present	Quality of text and body copy
3	*Product/Design:* Specified CSS rules present, different product tiers listed	Quality of design or product tiers
4	*Mobile:* Site set up for mobile user agents (via responsive design w/ Bootstrap)	Visual artifacts on different mobile clients
5	*Frontend JS:* Social & payment buttons function	Look and feel of integrations
6	*Backend JS:* Code writes orders/shares to DB	Quality of DB/ORM code
7	*Full Stack JS I:* REST API returns proper JSON	Quality of template code
8	*Full Stack JS II:* Check client-side API calls	Visual appearance of widgets
9	(no homework)	Quality of video and pitch
10	(no homework)	# of shares, # of BTC raised

Final Project: Grading

- Now you get it
  - We can auto-grade the technical parts (e.g. via phantomjs)
  - But your creativity shines through in the qualitative portions
  - That is, you choose the product, the text, the video, design, and all the qualitative aspects in the selfstarter
  - Crowdfunder success: idea + execution + design + sales
- You're playing for bragging rights
  - The final projects with the most social media shares and the most Bitcoin raised via crowdfunding will get attention
  - Bitcoin is particularly good for this because the pattern of transfers to a given public address is *world-readable*
  - For example, this open-source project accepts donations at `15qSxP1SQcUX3o4nhkfdbgyoWEFMomJ4rZ`
  - And we can see how much was transferred, and when!

Final Project: Why Bitcoin?

Example: see how much was transferred & when to 15qSxP1SQcUX3o4nhkfdbgyoWEFMomJ4rZ

Final Project: Leaderboard

As the class progresses, we'll set up a final project leaderboard.
- If you decide to list your project, you can rank it vs. others
- Ranking will be done within each category, and also overall

Rank	URL	Category	Bitcoin address	# BTC raised	# Tweets	# FB shares
1	example.com	genomics	15qSxP1SQcUX3o4nhkfdbgyoWEFMomJ4rW	1000.0	4000	300
2	example2.com	law	16GS6V8F4UUysQT8nhbGr1qFtUUSqEUry8	970.3	5000	350
...	...		...	...	...	...

Final Project: Comments

- Some further comments...
  - We'll review Bitcoin and how to obtain some later in the class, but you can start with Bitcoin wiki and Local Bitcoins.
  - Note: buying Bitcoin is not needed to pass the course!
  - The final project is meant to be hard to game; after all, "gaming" the process of getting a lot of money to your Bitcoin address is a lot like running a profitable company.
  - For those who don't want to do a real money crowdfunder, you can maximize the number of FB/Twitter social shares.
  - We'll do some basic anti-gaming checks, but ultimately you're mostly playing for bragging rights.
  - That said, the very top projects will attract attention from the Valley, including prizes sponsored by startups.

Final Project: Prizes

- Prize Categories
  - We will have prizes in at least four categories: genomics, law, transportation, and Bitcoin - sponsored respectively by Counsyl, Judicata, Leap Transit, and Coinbase.
  - Depending on which startup categories are popular in Survey 1: Background and Interests we will likely add more
  - You choose your category when you enter the leaderboard, which will go live later in the class
- Bragging rights only
  - In this first offering of the class we will not be awarding any real money (there are strange rules around prizes in many jurisdictions).
  - However, first place in any competition always confers bragging rights!

Final Project: Prizes

- Rank-ordering
  - In each category, projects are ordered by two metrics
    - total BTC crowdfunded
    - total # of public social media shares on Twitter.
  - Twitter is better than FB for this purpose as tweets are default public and more checkable.
  - Founders and engineers from the sponsoring startups will take a close look at the top entries in their category, but ranking/judging will be wholly programmatic as above
- Leaderboard
  - To be counted as a "winner" you need to put your information into the public leaderboard (like the URL of your internet-accessible project, your public Bitcoin address, and so on). Leaderboard will be accessible mid-class.

Final Project: Prizes

- Winning
  - On the last day (Aug. 25, 2013 at 11:59pm PT), the leaderboard will be frozen and winners will be announced.
  - In each category the top 10 projects by # of BTC crowdfunded and by # of tweets will be emailed out.
  - There will also be a grand prize winner with the most BTC crowdfunded, and another with the most Twitter shares.
  - Note again: you do not need to participate in the public leaderboard competition to get a 100% grade in the class! You can keep your final project private and simply learn web programming.
  - You also do not need to use Bitcoin to compete in the public competition. You can instead compete solely on the basis of the # of social media shares for your crowdfunder.

Final Project: Teams

- What about teams?
  - Please submit the graded portions of each final project as *individuals*
  - That is, even if three people are working on the same product as a team, submit three individual URLs for grading (this will be obvious as you do the homeworks) with independent implementations
  - Then when it comes time to promote the project, focus on promoting only one of those URLs
  - For all non-final project individual assignments (multiple choice quizzes and programming), it goes without saying - submit your answers as individuals.
  - Teams are the most experimental part of the class. We'll see how well this goes.

Community and Collaboration

Guest Lecturers, Forums/Meetups/Hackathons, and Collaboration Policy

Guest Lecturers

Our guests include many of the top startups & big companies in Silicon Valley. We'll upload lectures as the course progresses!

Forum, Meetups, and Hackathons

- Forums
  - Please use the discussion forums if you have questions
  - There are ~100,000 students, so email doesn't scale
  - We'll monitor them closely
- Meetups and Hackathons
  - Read this forum thread to find class meetups in your city.
  - Create a thread with your city if it doesn't exist; for example here is the New York forum thread and meetup.
  - If you live in a very remote area, use this thread and set up Google Hangouts with fellow classmates
  - Take pictures of meetups and link them from the forum!
  - Organize meetups to go over course material.
  - Organize hackathons to code on the final project (or whatever you want)

Summary

Let's review.

Summary

- What the class covers
  - Everything we wish we'd known when starting a co/lab
  - Lots of JS and web programming
  - Final project: build your own Bitcoin-powered crowdfunder over the quarter, then use it to market your own product.
- Here's what to do next
  - Bookmark the class website and forum
  - Do the background reading and look at crowdfunding, selfstarter, and Bitcoin
  - Share the signup page on FB/Twitter/G+ if you have friends who might be interested
  - Then go here to continue with Week 1 lectures
  - Homework 1 will be out on Wed. June 19, due on June 26