Google I/O 2015

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https://events.google.com/io2015/videos

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- a yearly 5,000+ conference for developers and tech enthusiasts
- watching parties available globally
- keynote and many other sessions posted online
Key trends (I extracted) from the keynote

- the next billion users
- the internet of things
- context-aware apps
Thinking about the next billion users

- cheaper phones (AndroidOne)
- optimized apps, search, and loading
- offline support
- new use cases

- already over a billion users for Chrome, Android, and YouTube, almost a billion users for Gmail
- 2.8 billion people online (out of 7 billion)
- now tackling developing markets, spotty connectivity, small budgets
- just six countries, including China, Mexico, and Brazil, will be responsible for 1.2 billion smartphone sales by 2016, but many of them lack pervasive Internet access
- $100 AndroidOne phones
- project Loon providing mobile broadband (balloons stay up for 400 days)
4000+ apps for wearables already available

want impact? start thinking about converting your research into mobile and wearable apps
- connected devices, seamless manipulation
- control, adjust, monitor all your devices using similar (mobile) interfaces
Internet of Things

- streamlining for the developer
- just released: specially-designed OS (Brillo) and communication platform (Weave)
looking into the future of smart devices...

in billions!
looking into the future of smart devices...

how’d they estimate 26? who knows (but then again, it’s Google, so they probably know better than you exactly how many devices you will buy and how much your neighbor will buy)
looking into the future of tech innovation...

- actually a slide from GoogleX presentation (moonshots)
looking into the future of tech innovation...

50% of solutions will be from startups < 3 years old

- what are you doing?
trending: ubiquitous computing

- developers need to start thinking now about developing for the future (the internet of things)
Context-aware apps: Now on Tap

- proactively bringing you answers
- relevant data for your current location and activity
- using machine learning that knows which activities take place in which locations
Context-aware apps: Now on Tap

- knows the context of your physical location AND the context of your current app(s), messages, etc. – can use this information to narrow search
Popular use-case for tech: photos

- as part of Google photos
- Google first to cross “race to zero” finish line
- other companies may follow suit to remain competitive in terms of user base –> may see competition in the form of more developments in terms of organization, sharing, and displaying of photo collections
Image understanding of your photo collections

- with the amount of photos taken by each individual on a daily basis, need a personal search engine to navigate photo collections
- the power of Google image understanding applied to all your photos
- other utilities: image processing (photo enhancement, filters), panorama stitching, gif creation, automatic slideshows and videos (with automatic soundtracks)
Automatically self-organizing photo collections

- automatic clustering by people, places, and timepoints
- clustering by person is also done over time, so as a person changes/grows/transforms, identity is still preserved across photos (all automatically)
Investments into machine learning are panning out
Deep nets are why image search has improved

- for search and for organizing photo collections
- at the backbone of Google Photos
Deep nets are why image search has improved

what more is there to say?
Sebastian Thrun on democratizing education

- because physical colleges and steep tuitions are becoming outdated
- “Education will be a toothbrush phenomena, to be used twice a day for 5 minutes”
Future of education: nanodegrees

- suite of courses designed to make you a fully competent developer in some area with a portfolio that industry will appreciate
- e.g. Google’s nanodegree on “android development”: https://www.udacity.com/course/android-developer-nanodegree--nd801
- incentive for finishing: $200/month regular, $100/month rebate for completing degree
How to grade thousands of students?
crowdsource the TA-ing as well!

- for nanodegrees to result in portfolios, students have to complete customized, complex coding project → automatic grading becomes infeasible
How to grade thousands of students?

- starting 2/3 months ago, began building a global code reviewing network to grade class projects
- now have hundreds of worldwide graders with a project grading turn-around of one day, or in most cases even one hour (unheard of in classical college education settings!)
How to grade thousands of students?

- student posts project on Github
- reviewers accept grading jobs
- return back to student
- student rates reviewer on grading quality
- reviewer is compensated
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- all material on Udacity free but students who need feedback and certification (thus requiring grading, etc.) are charged $200/month for their nanodegrees but get returns later if successfully complete (motivation to complete)
How to grade thousands of students?

Monthly Income

- Part time Instructor (US): $1,950
- Top Udacity Mentor: $11,300

nice incentive!
Guide to surviving in the future

- based on the last few slides...
- make some money as a code reviewer → get an online tech nanodegree → start a tech startup → succeed and be acquired by Google or raise more money by starting over

if research fails...
Guide to surviving in the future

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Google.org: Google’s philanthropy

- panel with social innovators
- start-ups in the context of social change
- Panelists: Code for America (data-driven approach to services for better governments), Nexleaf Analytics (smart fridge sensors to monitor expiration of vaccines), Charity Water (sensors in wells to automatically monitor well quality), HandUp (direct giving to the homeless)
- Tackling hard problems, innovating technological solutions (e.g. how to make a battery in sensors last for many years and remain durable in different climates, etc. to make it usable in rural areas for automatic monitoring?)
Google’s philanthropy: some general stats

100M each year to nonprofits and schools around the world
100K Googler volunteer hours
100B free products to nonprofits
20M current open call for technology for the disabled
50M to increase visibility of women and underrepresented groups
Google ATAP: start-up-like innovation
The future of controls
The future of controls: RF sensors

ATAP organization within Google works at short timescales on innovative deliverables
The future of controls:
RF sensors

- raw radar signal converted to features including specular reflections, electromagnetic phenomena
- a demo of the processing: https://youtu.be/mpbWQbkl8_g?t=1010
The future of devices: interactive textiles

- Capacitive touch sensor
- Jacquard touch sensing textile
The future of devices: interactive textiles

- required innovations to make yarns 100x more conductive, to make them withstand manufacturing process (heat, moisture, tension, etc.), and to make them diverse enough to be used for different textiles
- interactive garments at scale
- video about project Jacquard begins here: https://youtu.be/mpbWQbkl8_g?t=1391
The future of devices: interactive textiles

- for plugging in electronics
The future of authentication: multi-modal verification
The future of authentication: multi-modal verification

small demo of project abacus: https://youtu.be/mpbWQbkI8_g?t=2781
The future of storytelling:
360° of interactive

- high resolution, fast moving action, in 360 (viewer can look around to decide which part of the scene to view)
- efficient streaming, decoding, and rendering; dynamic spatial tiling system
- more about this: https://youtu.be/mpbWQbkIg?t=3744
The future of storytelling: 360° of interactive developments in efficient streaming, rendering, compression, stitching, etc.

- rig: 4 red epic dragon cameras with 8 mm fisheye lenses from canon capturing at 6K res each
Links and suggestions

• about ATAP and frontline technological innovations
  https://youtu.be/mpbWQbkl8_g

• some projections about ubiquitous computing
  https://youtu.be/9YFGN8vCYm4

• developing for virtual reality
  https://youtu.be/Qwh1LBzz3AU

• project Tango: 3D reconstruction and navigation
  https://youtu.be/iP9m9a2KEN4

• about philanthropy at Google (4 social innovators discuss their start-up experiences)
  https://youtu.be/DcezrMhwaSs

• Sebastian Thrun on online education, Udacity, and nanodegrees
  https://youtu.be/898S7o9UnPA

• https://events.google.com/io2015/videos