

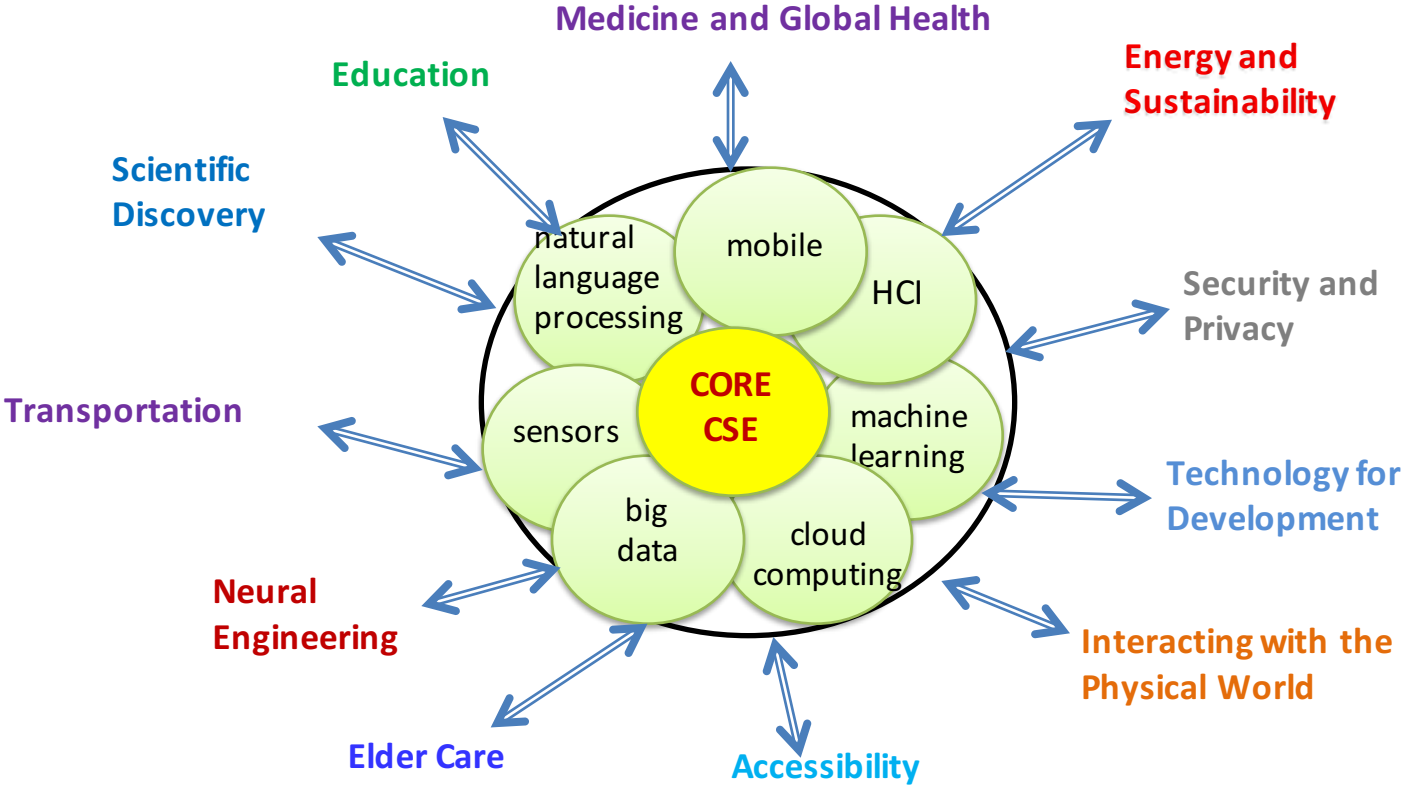


Programming Languages in a Time of Technical Disruption

Ben Zorn

**Principal Researcher and Research Manager
Research in Software Engineering (RISE) Group
Microsoft Research, Redmond**

The Rapidly Expanding World of Computing



Implications of CS + X...

Questions to Consider:

- How much does your life depend on software being correct?
- What's the trend?
- Do governments have the understanding and/or ability to regulate this trend?
- When do you start worrying?



Tesla Model S



Amazon Echo

MS Band



Ring.com



Nest

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Every object is a computer

Toyota Hires All-Star Team for Robotics and Artificial Intelligence Research

by [Jason Siu](#) | Ja

Towards the social media enabled jet engine

September 26, 2012

Posted by Paul Wallbank at 10:02 am

Add comments



"What if my jet engine could talk to me and what would it say?" Asked Beth

Mother Jones

POLITICS

ENVIRONMENT

CULTURE

PHOTO ESSAYS

Must Reads: [\\$15 an Hour Isn't the Answer](#) | [Why You Shouldn't Bet on Fossil Fuels](#) | [Look Who's Running Burma](#)

ENVIRONMENT

→ [Climate Change](#), [Climate Desk](#), [Corporations](#), [Food and Ag](#), [Tech](#), [Top Stories](#)

Monsanto Is Using Big Data to Take Over the World

The GMO giant wants to help you beat climate change...with your phone.

—By [Tim McDonnell](#) | Wed Nov. 19, 2014 6:00 AM EST

Every company is a software company

POLITICS DEC 1 2014, 7:15 PM ET

Obama Requests \$263 Million for Police Body Cameras, Training

Apple opposes judge's order to hack San Bernardino shooter's iPhone



By [Evan Perez](#) and [Tim Hume](#), CNN
🕒 Updated 5:24 AM ET, Thu February

The screenshot shows a navigation bar with a White House icon and links for 'BRIEFING ROOM', 'ISSUES', and 'THE ADMINISTRATION'. Below the navigation bar is a 'HOME - BLOG' section. The main content area features the title 'Big Data and the Future of Privacy' in a large serif font, with the date and author 'JANUARY 23, 2014 AT 3:30 PM ET BY JOHN PODESTA' in a smaller font below it.

Everything you do is recorded



Isn't this a
Programming Languages Workshop?!

Programming languages have impact

- Financial modeling: Spreadsheets
- Mini computers/PCs: C / Unix
- Web: Java / WWW
- Web 2.0: HTML + JavaScript + CSS
- Statistics: S, R, ...

However...

- How many companies showing interest in PLDI?
- Why is industry attendance at SPLASH/OOPSLA reduced?

How will programming languages take us forward?

- Understanding verticals better
 - Cyber-physical systems
 - Health, energy, transportation, ...
- How would **you** prevent Stuxnet?
 - Computer Scientist: “Reduce attack surface in software...”
 - Mechanical engineer: “Put a limit switch in the centrifuges!”
- Go where the problems are...



Public health is important...

What does this...



Four Zika virus cases reported in Bay Area

By Tracy Seipel, tseipel@mercurynews

...have to do with this?



Micro
Research

Zorn, PNEPLSE 2016

Safe Cyber Physical Systems Expedition



Safe and **complex** autonomy



interacting with the physical world



at scale and without failures.

Ranveer Chandra
Alex Ching
Ethan K. Jackson
Chris Hawblitzel
Ashish Kapoor

Mobility and Networking Research
Hardware lab
Research in Software Engineering
Systems Research Group
Adaptive Systems and Interaction Group

Mike Chieh-Jan Liang
Shaz Qadeer
Patrick Therien
Feng Zhao
Benjamin Zorn

Mobile and Sensing Systems Group
Research in Software Engineering
Hardware lab
Mobile and Sensing Systems Group
Research in Software Engineering
Slide courtesy of Jeannette Wing

Call to Action

- **Smart objects** will replace dumb objects
- The software embedded in this objects **will be written in the next 5 years, but will have implications for the next 50 years**
- **Our lives will depend on** these objects...
 - [“I BOUGHT SOME AWFUL LIGHT BULBS SO YOU DON'T HAVE TO”](#)
 - By Matthew Garrett, <https://mjpg59.dreamwidth.org/40397.html>
 - (via Jonathan Protzenko)
- We need languages, tools, and processes to make these objects safe

The Cathedral and the Skyscraper



Heroic effort, amazing engineering,
one of a kind...

Microsoft
Research



Stronger materials, reusable
components, mathematical analysis...

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114TH CONGRESS
2^D SESSION

S. 2607

To ensure appropriate spectrum planning and interagency coordination to support the Internet of Things.

IN THE SENATE OF THE UNITED STATES

MARCH 1, 2016

Mrs. FISCHER (for herself, Ms. AYOTTE, Mr. BOOKER, and Mr. SCHATZ) introduced the following bill; which was read twice and referred to the Committee on Commerce, Science, and Transportation