8 worries for sleepless nights

(and what we can do about them)

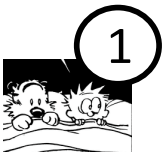
+ 2 reasons for a good night sleep

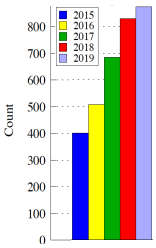
Jim Kurose

Distinguished University Professor
University of Massachusetts
College of Information and Computer Sciences

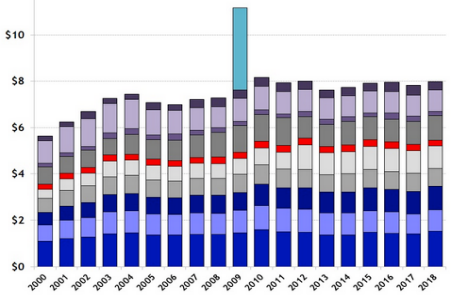
1

Relatively Flat Funding, Exploding opportunity

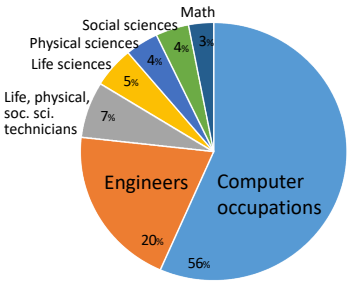




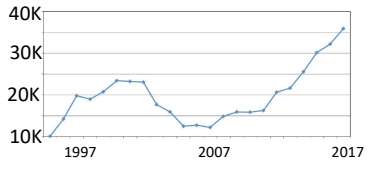
Advertised tenure track positions in CS (Wills, 2018)



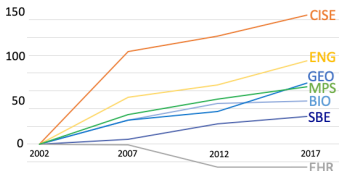
NSF Budget (AAAS, constant 2019 $)



Job Openings 2016 – 2026:
National growth and replacement
(US Bureau of Labor Statistics)



Newly Declared Undergraduate CS, CE, I Majors (CRA)



Increase in number of PhDs awarded by STEM Discipline (2002-2017). NSF 19-03

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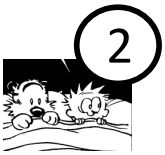
By some measures CISE has done well, but …



There was an NSF internally-generated graph of per-directorate % funding increases since 2000, made from publicly available data

… and high quality proposed research goes unfunded across all directorates

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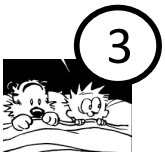
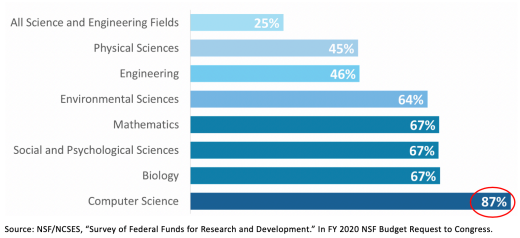
87%

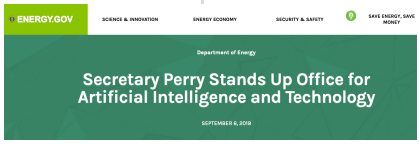


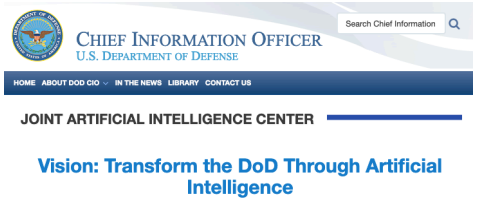
NSF support as a % of total Federal support for basic academic research



Source: NSF/NCSES, "Survey of Federal Funds for Research and Development." In FY 2020 NSF Budget Request to Congress.

NSF funds a very large proportion of Federal basic CS research. Mission agencies are expanding AI activities in their application domains. What portions of that goes to CISE academic research is TBD.





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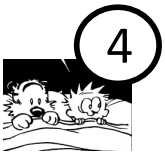
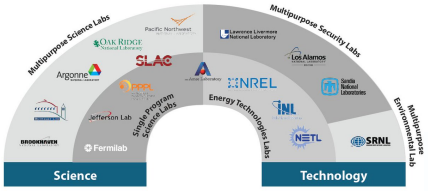
Funding Agencies: NSF and other agencies



Many Federal agencies have "lifers" leading the agency. They have deep experience, many contacts, and know how to "work the system". By comparison, NSFer leadership are "short-termers"

- But NSF DADs, DDDs are invaluable, generally long-term, Federal employees

Other Federal agencies have organizations that promote their good work within the Beltway.



RESEARCH AMERICA 30 YEARS 1989-2019

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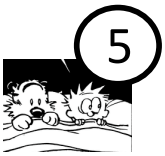
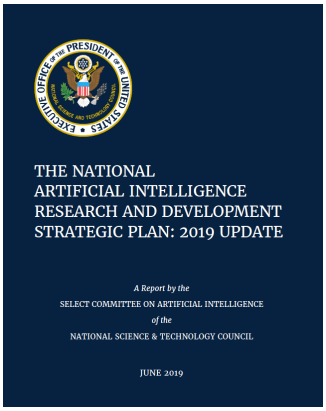
Academic versus industry research: the public (and others) don't quite get it



- Well-known that industry R&D vastly outspends Federal CS investments (Amazon, Google, Microsoft: $22B, $16.2B, $14.7B)
  - Heard in the corridors of NSF (not CISE) : "with so much money being invested in CS research by industry, how can NSF hope to make a difference?"
- Need to continue to make case for the value proposition for academic CS research that's funded by the Federal Government, or jointly with industry
  - But not a top 3 priority for any lobbying organizations (university, or industry)



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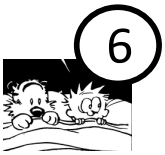
Eating our Seedcorn



The New York Times

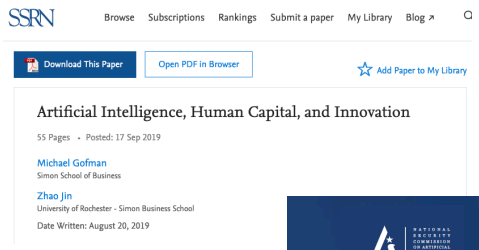
Tech Giants Are Paying Huge Salaries for Scarce A.I. Talent

Nearly all big tech companies have an artificial intelligence project, and they are willing to pay experts millions of dollars to help get it done.

05.09.18 | MIND AND MACHINE

Facebook Says It's Not Destroying Academia With An AI Brain Drain

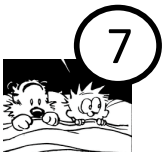
Late last week, Facebook announced the opening of new AI labs in Pittsburgh and Seattle. But the company says most of its researchers maintain academic affiliations, and help train their successors.



Limited availability of federal funding contributes to an accelerating brain drain from academia to industry.[66] This trend damages our ability to train the next generation and influences the direction of research toward more commercially-applied problems. The government must help redirect this trend soon.

7

Science and Security

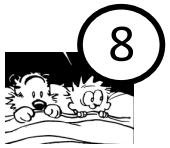


- Take seriously the concern that foreign governments may be targeting US research to gain advantage over US interests
- Articulate how US has benefited immeasurably from its open research system (share findings, attract top students and researchers)
- Important to have people (with clearances) who know academia and Federal research agencies "in the room"
- US law, policy must strike right balance between openness, protection
  - Restrictions must be well targeted, not undermine fundamental strengths of US system
  - US must invest sufficiently in our own R&D, make it easier and more desirable for those we educate to remain in US

https://www.youtube.com/watch?v=lqO0-8vN-2M
(46:45 onwards)

8

Federal (NSF) grants and promotion



"Securing competitive research is a critical requirement for tenure and promotion at X." *From: A CS Department chair's 3-year "mid-term" review case analysis*

Heard (in person) from many early career faculty that getting a CAREER grant is seen as "bar" for getting tenure

- Funding seen as "an end" not a "means" ($) towards an end (great research)
- Funding decisions based in part on many factors (including portfolio balance) not an absolute measure of research quality.
- Funding is getting harder (and harder) to get

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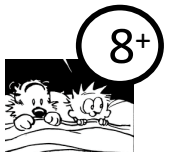
And there are other worries ….



- Always a worry about getting good people to come to DC (even for a short stay, much less a long stay)
- Coherence, support needed for scaling CS undergraduate education
- 5-year STEM Ed plan: focus on training (not undergrad or graduate)

But there is great cause for optimism! ….

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Our message is great, and being heard many places

- National economic competitiveness, national security, national defense … there are today's calling cards: computing is at the center of this; this is recognized on all sides

MEMORANDUM FOR THE HEADS OF EXECUTIVE DEPARTMENTS AND AGENCIES

FROM: RUSSELL T. VOUGHT
ACTING DIRECTOR, OFFICE OF MANAGEMENT AND BUDGET

DR. KELVIN K. DROEGEMEIER
DIRECTOR, OFFICE OF SCIENCE AND TECHNOLOGY POLICY

SUBJECT: Fiscal Year 2021 Administration Research and Development Budget Priorities

Artificial Intelligence, Quantum Information Science, and Computing: .. prioritize basic and applied research investments that are consistent with the 2019 Executive Order on Maintaining American Leadership in Artificial Intelligence … prioritize R&D advancing fundamental QIS, building and strengthening the workforce, engaging industry, … work together to explore new applications in and support R&D for high performance future computing paradigms, fabrication, devices, and architectures alongside sustainable and interoperable software; data maintenance and curation; and appropriate security. Support the development and deployment of advanced communications networks by prioritizing R&D

United States should make a massive investment in AI, top Senate Democrat says

Science

Nat. Security Commission on AI

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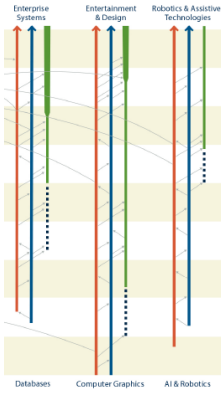
Our message is great, and being heard many places

CRA
Computing Research Association

The National Academies of
SCIENCES • ENGINEERING • MEDICINE

CISE Advisory Committee
Advisory Committee for Cyberinfrastructure
Committee(s) of Visitors
NSF-wide: CEOSE, ERE



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We have a growing group of politically-savvy CS researchers in DC

Need to *retain p*olitically-savvy and CS-research savvy people in DC over longer terms

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CS Community action

- Increased interactions with Congress (staff, NSC AI)
  - "push," into addition to responding to "pull"
- *Retaining p*olitically- and CS-research-savvy people in DC longer
- NSF and 87%: engaging other Federal agencies in CS research
- Making research funding *someone's* top-3 priority
- Honing our narrative: updating tiretracks
  - also: contributions to national security, defense, health
- Helping academic CS:
  - Funding and tenure, eating our seed corn, scaling undergraduate programs

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More thanks at http://jimkurose.wordpress.com

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