Perspective on Vision and Politics

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University of Minnesota, CSci 8715, Spring 2018
1. Vision: Spatial Computing

2. Bias


4. Future: Quantum Technology

5. Synergy
Vision: Spatial Computing
Short-Term Opportunities:

- Augmented reality systems:
  - overlaying spatially aligned media in real time.
- Spatial predictive analytics:
  - Generalize machine-learning techniques
- Moving spatial computing indoors, underwater, and underground
Long-Term Research Needs:

- From fusion to synergetics (data sources)
  - New sources of geographic information (check-ins, tweets, geotags, donated GPS tracks).

- Spatial cognition
  - New ways to understand spatial abilities (navigation)
  - Different groups think about space.

- Geoprivacy
  - Google Street Views been accused by European Union of privacy violations.
  - Balance between utility and privacy.
Bias
Financial Weapons of Math Destructions:

Florida, adults with clean driving records and poor credit scores paid an average of $1552 more than the same drivers with excellent credit and a drunk driving conviction.
Many Weapons of Math Destructsions create feedback loops that perpetuate injustice:

A person who scores as ‘high risk’ is likely to be unemployed and to come from a neighborhood where many of his friends and family have had run-ins with the law. Thanks in part to the resulting high score on the evaluation, he gets a longer sentence, locking him away for more years in a prison where he’s surrounded by fellow criminals—which raises the likelihood that he’ll return to prison. He is finally released into the same poor neighborhood, this time with a criminal record, which makes it that much harder to find a job. If he commits another crime, the recidivism model can claim another success. But in fact the model itself contributes to a toxic cycle and helps to sustain it.
Vision: Science and Engineering Research
National Science Foundation’s long-term research:

- Understanding the Rules of Life
- Navigating the new Arctic
- Harnessing the Data Revolution
- The Quantum leap
- The Future of Work
- Windows on the Universe

Quiz: Which topic is most related to our class?
Future: Quantum Technology
Impact of NSF’s big idea on Quantum Technology[4]

• NSF invests $12 million in quantum technologies for secure communication

  • Use photons in pre-determined quantum states as a way to encrypt data
  • Currently, such a communication system may be demonstrated in laboratories, but only at cryogenic – very low – temperatures, and with bulky, energy-intensive equipment.
Synergy
To solve grand challenges: energy, water, climate, food, health

"Scientists must work together to save the world."

Harder: to fund, do, review and publish.

Governments, funders, journals, universities and academics must do to make interdisciplinary work a joy rather than a curse
How can scientists successfully pursue research outside their comfort zone?

- Forge a shared mission
- ‘T-shaped’ researchers: able to cultivate both their own discipline and to loop beyond it.
- *Nurture constructive dialogue*: involved commitments: to interact in plain English; to foster empathy and respect for different disciplinary norms; and to reflect on what is working in collaborative interactions.
- *Give institutional support*
- Bridge research, policy and practice


NSF’s 10 Big Ideas - Special Report | NSF - National Science Foundation.
NSF invests $12 million in quantum technologies for secure communication | NSF - National Science Foundation.