

# Overview of NSF investments and administration activities in AI

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*National Science Board Meeting, July 17, 2018*

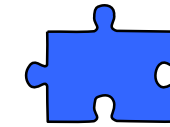
# Artificial Intelligence

- AI is critical to:
  - national economic competitiveness
  - national security
  - national health, welfare
  - global leadership
- investments in fundamental research have positioned the US in a leadership position
  - many countries are increasing their investments in AI R&D
- NSF is the agency that makes largest investment in fundamental AI research
  - what NSF does matters to the country

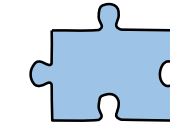


“NSF is where all interesting research gets started...” - Eric Schmidt

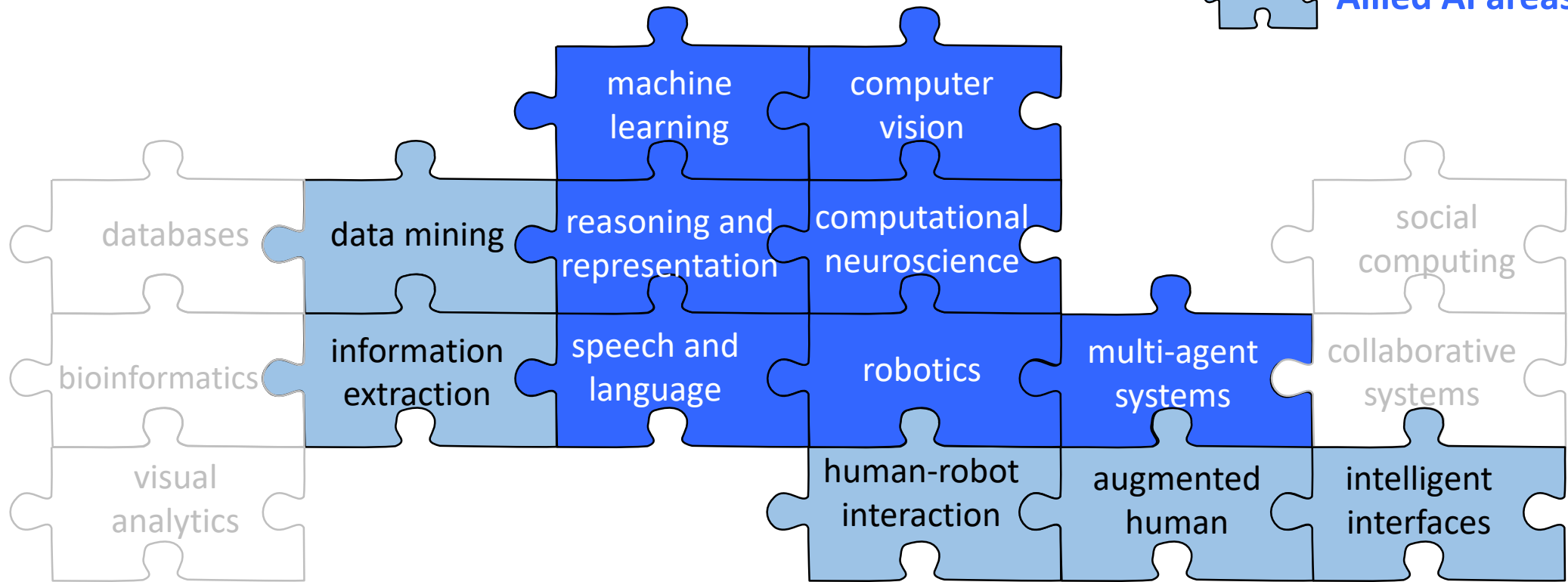
# CISE “core” programs and AI



Core AI areas



Allied AI areas



← NSF/CISE Division of Information and Intelligent Systems →

# NSF Investments in AI Research

## CISE “core” AI



- Robust Intelligence (RI)
- Information Integration and Informatics (III)
- Cyber-Human Systems (CHS)

## Cross cutting AI



# NSF Investments in AI Research

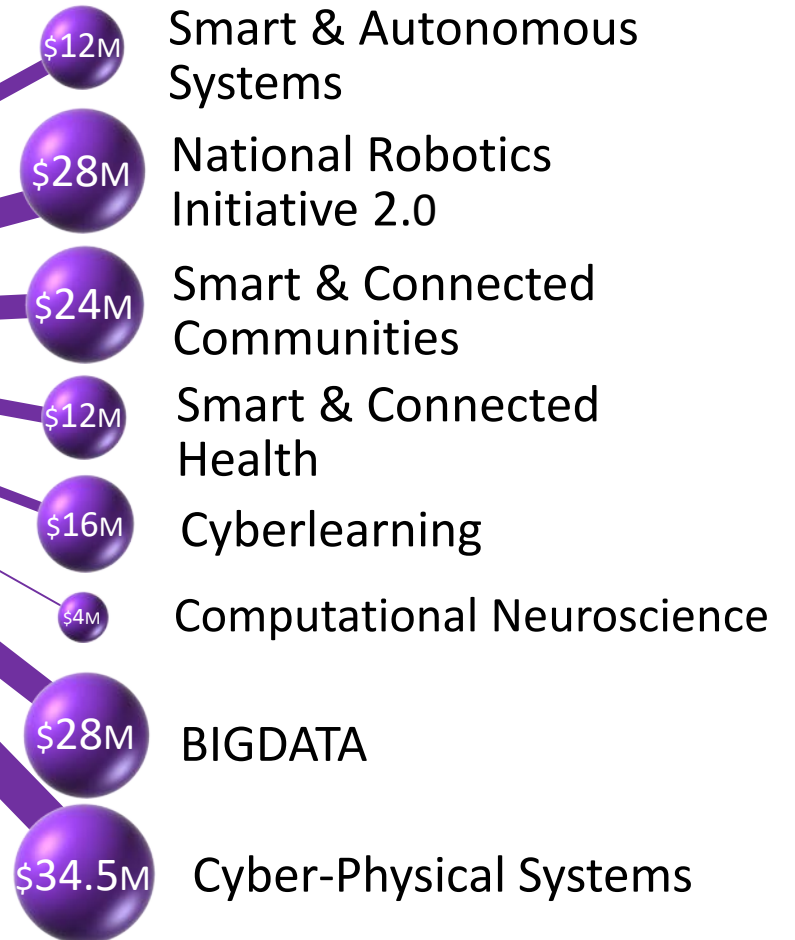
## CISE “core” AI



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CISE

## Cross cutting AI



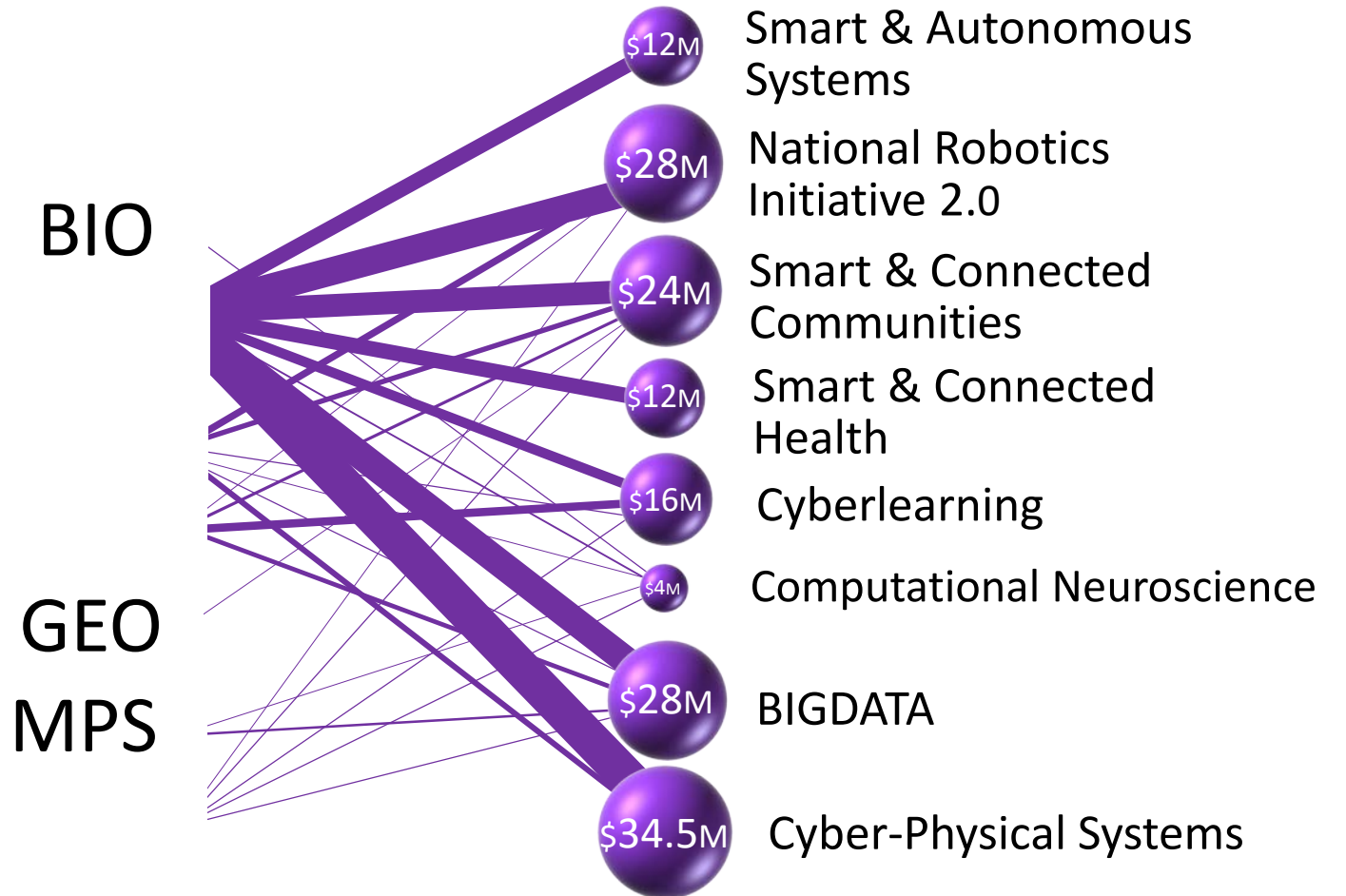
# NSF Investments in AI Research

## CISE “core” AI



- Robust Intelligence (RI)
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## Cross cutting AI



# NSF Investments in AI Research

## CISE “core” AI



- Robust Intelligence (RI)
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## Partners

USDA, DOE, DARPA,  
AFOSR, ONR

NIH (9 Institutes)

ANR, BMBF, BSF,  
NICT, NIH

Amazon, Google,  
Microsoft, IBM

DHS, DOT, NASA,  
NIH, USDA

## Cross cutting AI



Smart & Autonomous  
Systems



National Robotics  
Initiative 2.0



Smart & Connected  
Communities



Smart & Connected  
Health



Cyberlearning



Computational Neuroscience



BIGDATA



Cyber-Physical Systems

# NSF's 10 Big Ideas for Future Investment

## RESEARCH IDEAS

 <p><b>Harnessing Data for 21<sup>st</sup> Century Science and Engineering</b></p>	<p><b>Work at the Human-Technology Frontier: Shaping the Future</b></p>  	<p><b>Windows on the Universe: Multi-messenger Astrophysics</b></p>  	<p><b>Quantum Leap: Leading the Next Quantum Revolution</b></p>  <p><b>Understanding the Rules of Life: Predicting Phenotype</b></p> 
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## PROCESS IDEAS

<p><b>Mid-scale Research Infrastructure</b></p> 	<p><b>NSF 2026</b></p> 
<p><b>Growing Convergence Research at NSF</b></p> 	<p><b>NSF INCLUDES: Enhancing STEM through Diversity and Inclusion</b></p> 

“ ... bold questions that will drive NSF's long-term research agenda -- questions that will ensure future generations continue to reap the benefits of fundamental S&E research. ”



“AI is the universal connector that interweaves all of our Big Ideas; data science is changing the very nature of scientific inquiry, and AI's use of data has the potential to revolutionize everything we do in science.”

*F. Córdoba , Director, NSF, Sept. 2017*



# Artificial Intelligence: an Administration Priority



MEMORANDUM FOR THE HEADS OF EXECUTIVE DEPARTMENTS AND AGENCIES

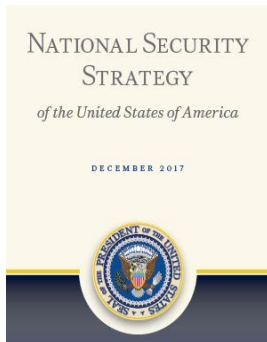
FROM: MICK MULVANEY  
DIRECTOR, OFFICE OF MANAGEMENT AND BUDGET

MICHAEL KRATSIOS  
DEPUTY ASSISTANT TO THE PRESIDENT  
OFFICE OF SCIENCE AND TECHNOLOGY POLICY

SUBJECT: FY 2019 Administration Research and Development Budget Priorities

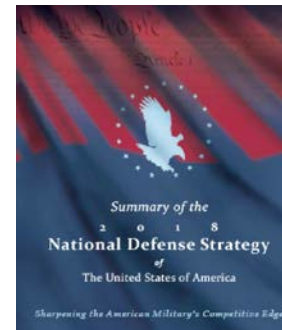
## FY 2019 R&D Budget Priorities memo

“autonomous systems, ... machine learning, and quantum computing ..... coordinated interagency initiatives, ... STEM education, including computer science education ”



## National Security Strategy

“prioritize emerging technologies critical to economic growth and security, such as data science, encryption, autonomous technologies,... advanced computing technologies, and artificial intelligence. “



## National Defense Strategy

“.. invest broadly in military application of autonomy, artificial intelligence, and machine learning, including rapid application of commercial breakthroughs.”

“Artificial intelligence holds tremendous potential as a tool to empower the American worker, drive growth in American industry, and improve the lives of the American people. Our free market approach to scientific discovery harnesses the combined strengths of government, industry, and academia, and uniquely positions us to leverage this technology for the betterment of our great nation.”

- Michael Kratsios, Deputy Assistant to the President for Technology Policy

# Artificial Intelligence for the American People

- **Prioritizing funding for AI R&D** including, machine learning, autonomous systems, research cyberinfrastructure
- **Ensuring an AI-ready future American workforce:** K-12, re-training/Re-skilling, undergraduate, R&D workforce
- **Barriers to AI Innovation:** removing regulatory barriers to deployment of AI-powered technologies
- **Achieving strategic military advantage:** recognizing need to lead in AI, with DoD investing accordingly
- **Leveraging AI for government services:** applying AI to improve the provision of government services
- **Leading international AI negotiations:** OSTP-led US delegations to 2017 & 2018 G7 Innovation and Technology Ministerials, working with allies to recognize potential benefits of AI, promote AI R&D

# 2018 White House Summit on AI for American Industry

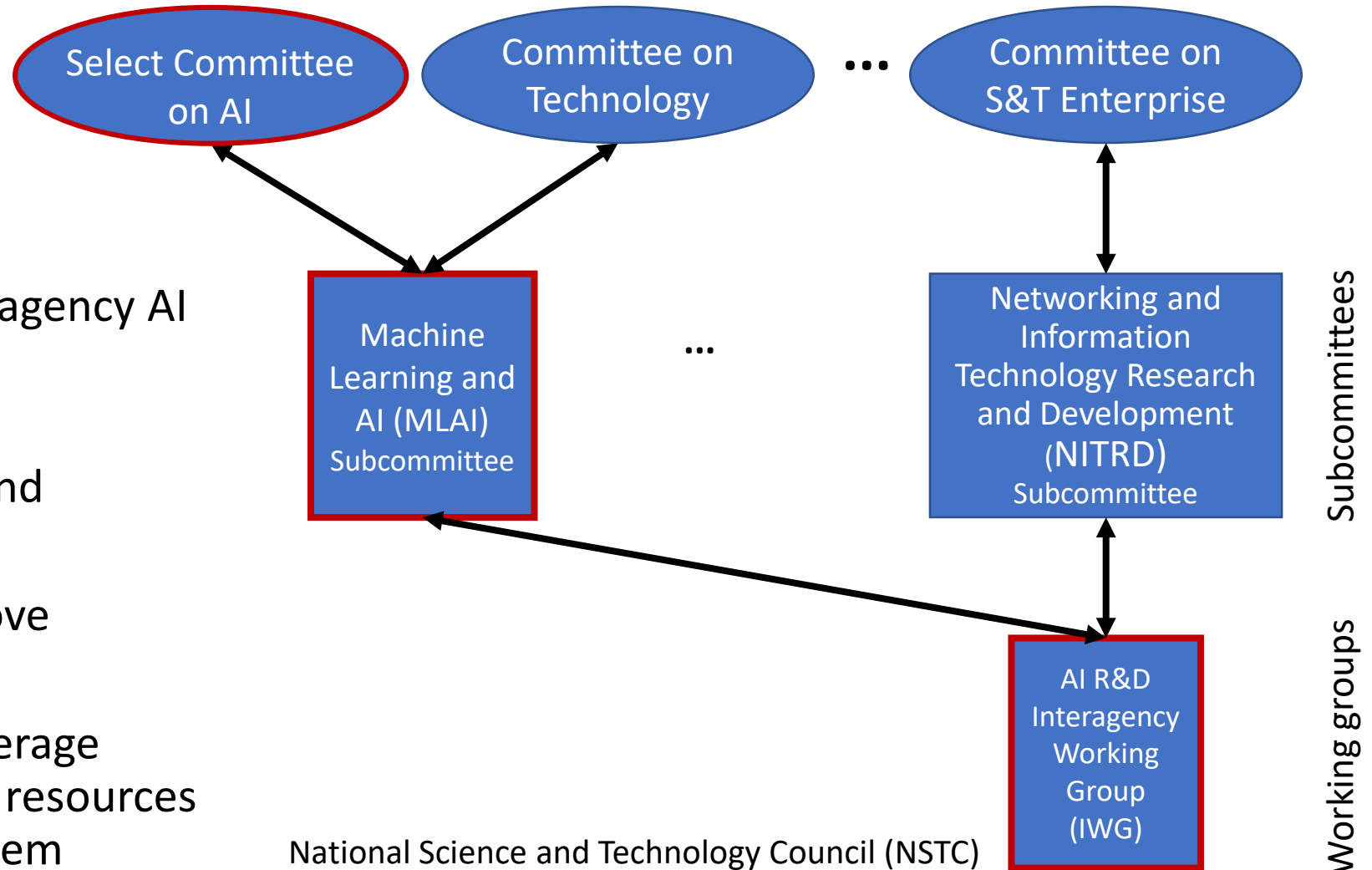
- May 10, 2018
- 100+ participants: senior government officials, top AI academics, heads of industrial research labs, American business leaders
- two sets of breakout sessions:
  - *cross-cutting issues*: AI R&D, workforce development, regulatory barriers to AI innovation
  - *sector-specific applications*: food and agriculture, energy and manufacturing, financial services, healthcare, and transportation and logistics



# NSTC Select Committee on AI

*Membership:* most senior Federal R&D officials (co-chairs: F. Córdoba (NSF), M. Kratsios (OSTP), S. Walker (DARPA))

- advise White House on interagency AI R&D priorities;
- consider creation of Federal partnerships with industry and academia;
- establish structures to improve coordination of AI R&D; and
- identify opportunities to leverage Federal data, computational resources in support of AI R&D ecosystem



# Looking forward: what's needed

- *robust AI research ecosystem:*
  - foundational research, AI in application domains, systems architecture, research cyberinfrastructure
- *workforce:*
  - K-12 STEM workforce, computational thinking
  - lifelong learning, retraining, reskilling
  - R&D workforce
- *partnerships:* leverage unique US research ecosystem of academia (driven by federal R&D investment), industry, federal government



**Prescription 3:**  
Establishing a More Robust National Government-University-Industry Research Partnership