# Fundamental and Applied Research and Standards for AI (FARSAI)

Briefing on NIST AI Research Program to VCAT

Chuck Romine

5 June 2018

# 1956 Summer Research at Dartmouth

**A PROPOSAL FOR THE DARTMOUTH SUMMER RESEARCH PROJECT ON ARTIFICIAL INTELLIGENCE**

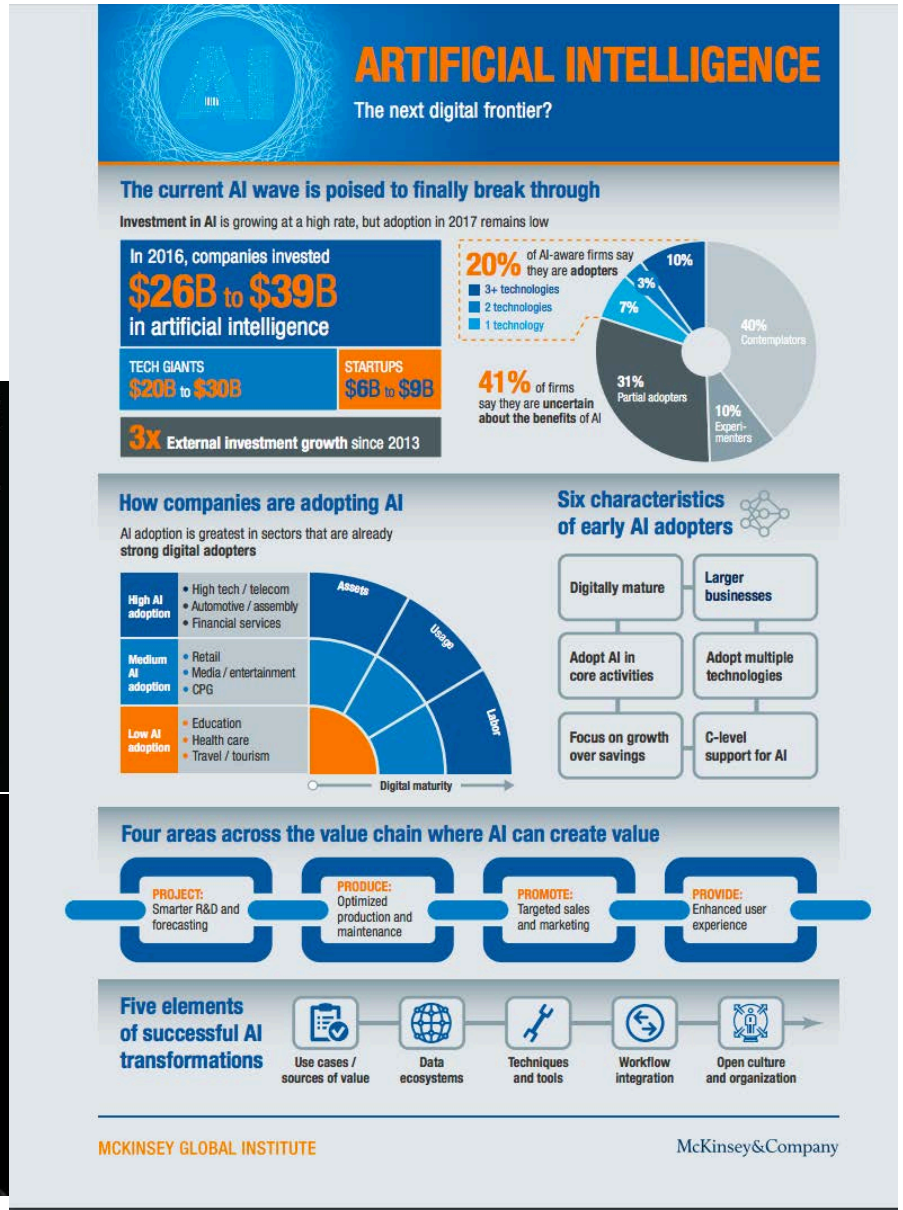
**J. McCarthy, Dartmouth College**
**M. L. Minsky, Harvard University**
**N. Rochester, I.B.M. Corporation**
**C.E. Shannon, Bell Telephone Laboratories**

**August 31, 1955**

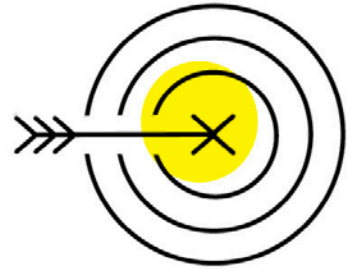
We propose that a 2 month, 10 man study of artificial intelligence be carries out during the summer of 1956 at Dartmouth College in Hanover, New Hampshire. The study is to proceed on the basis of the conjecture that every aspect of learning or any other feature of intelligence can in principle be so precisely describes that a machine can be made to simulate it. An attempt will be made to find how to make machines use language, form abstractions and concepts, solve kind of problems of now reserved for humans, and improve themselves. We think that a significant advance can be made in one or more of these problems if a carefully selected group of scientists work on it together for a summer.

www-formal.stanford.edu/jmc/history/dartmouth/dartmouth.html

# 62 years later …




# Top 10 Strategic Technology Trends for 2018



## Intelligent

- AI Foundations
- Intelligent Apps and Analytics
- Intelligent Things

## Digital

- Digital Twins
- Cloud to the Edge
- Conversational Platform
- Immersive Experience

## Mesh

- Blockchain
- Event-Driven
- Continuous Adaptive Risk and Trust

gartner.com/SmarterWithGartner

Source: Gartner
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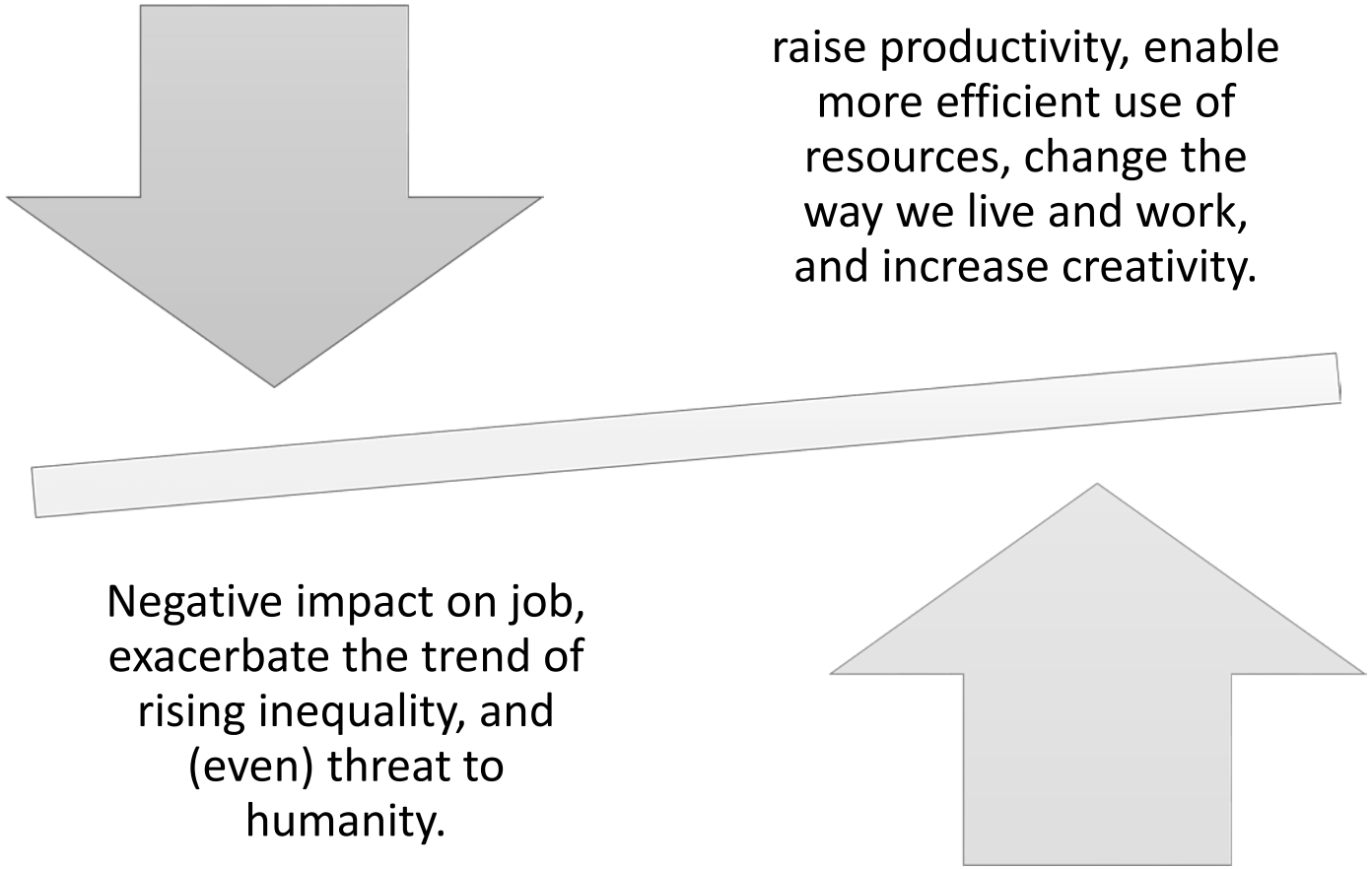
Gartner

# Major advances in artificial intelligence - especially in the subset of machine learning



raise productivity, enable more efficient use of resources, change the way we live and work, and increase creativity.

Negative impact on job, exacerbate the trend of rising inequality, and (even) threat to humanity.

- Investing in skills and training. There is going to be churn in labor markets as a result of AI is widely accepted.
  - require constant monitoring and close cooperation between industry, educators, and policymakers.

- Dealing with data. The uses and misuses of data are going to be among the defining issues of the 21st century.
  - Need for interoperable anonymized data

# Fundamental and Applied Research and Standards for AI (FARSAI)

| Short Term | Long Term |
| --- | --- |
| Strengthening machine learning and artificial intelligence expertise at NIST. | Measure and enhance the security and trustworthiness of AI systems. |

# The now
# Strengthening machine learning and artificial intelligence expertise at NIST

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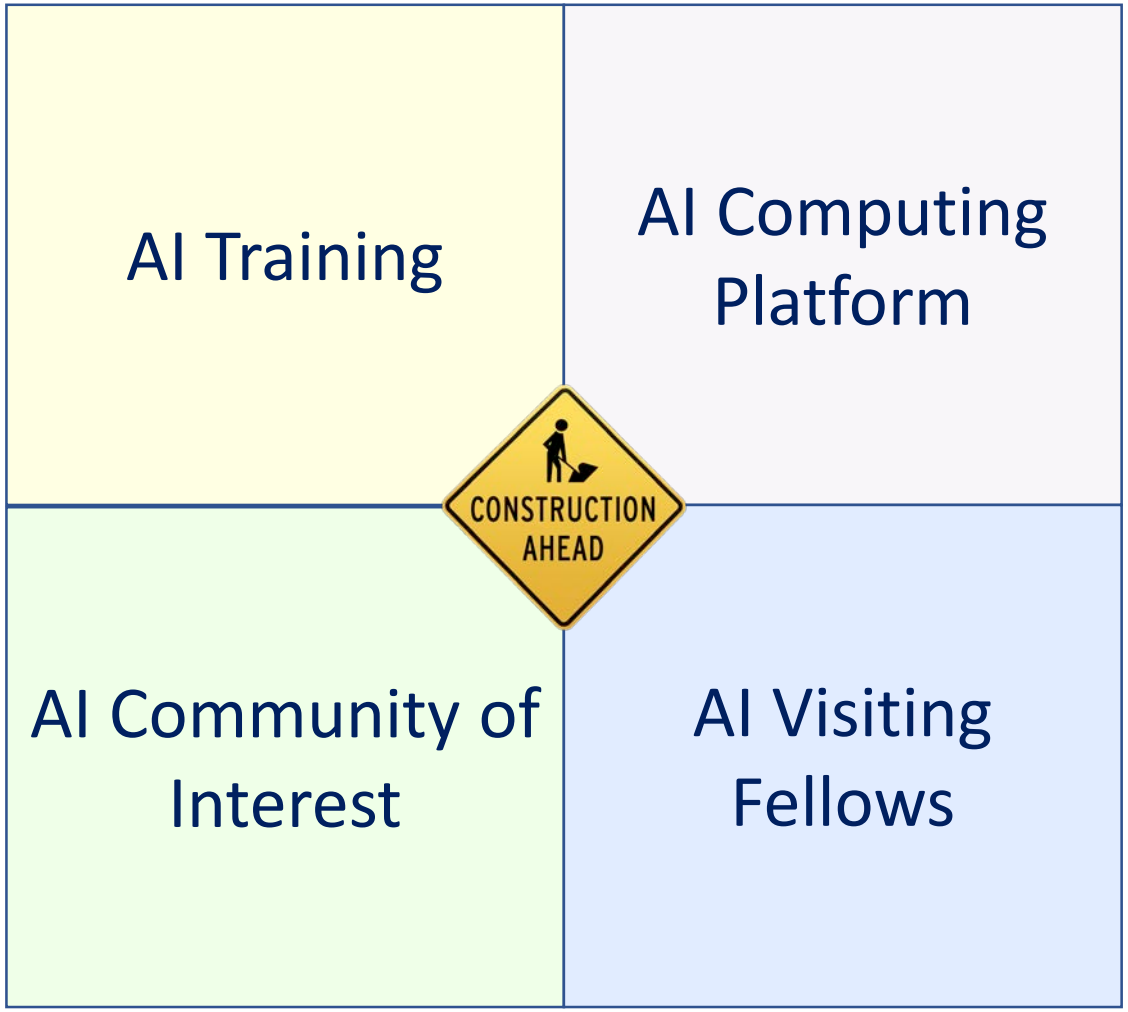


# NIST AI Training

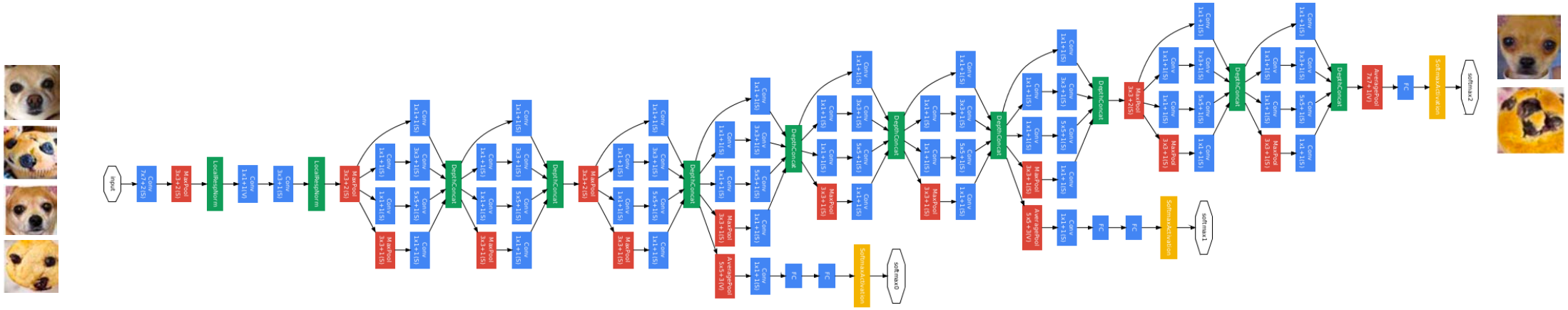
coursera

**Speaker Series**

# NIST AI Community of Interest

Catalyzing the use of machine learning and AI within NIST scientific program

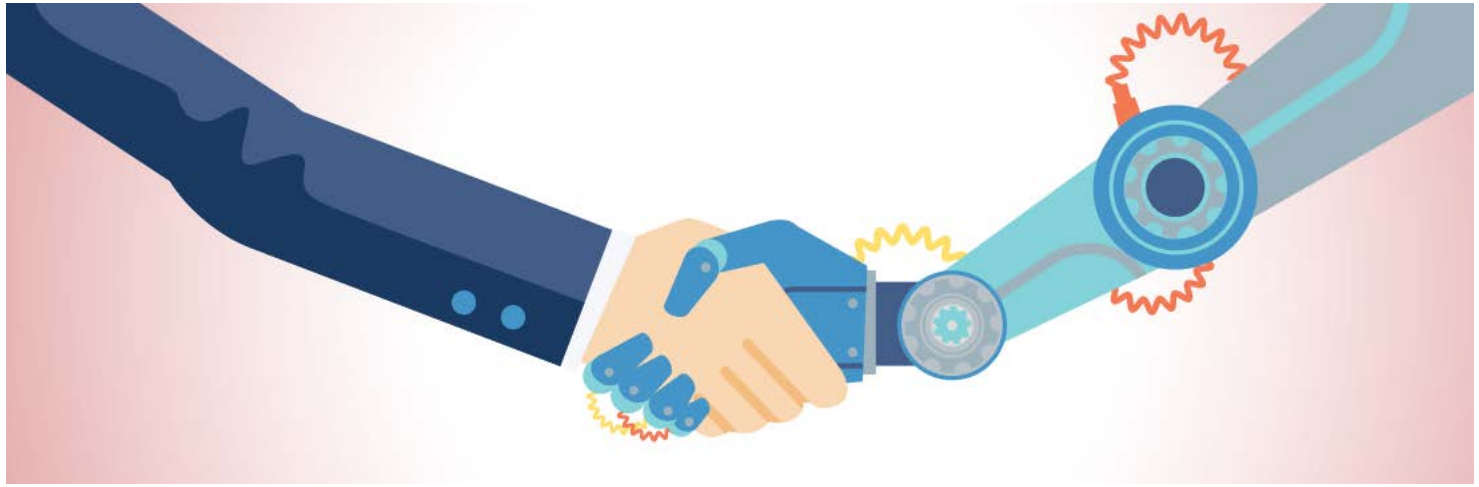
# NIST AI Computing Platform



GoogLeNet, 2014

Many of deep learning architectures require GPU or special hardware support.
We are building an AI lab to address this need.

# NIST AI Visiting Fellows

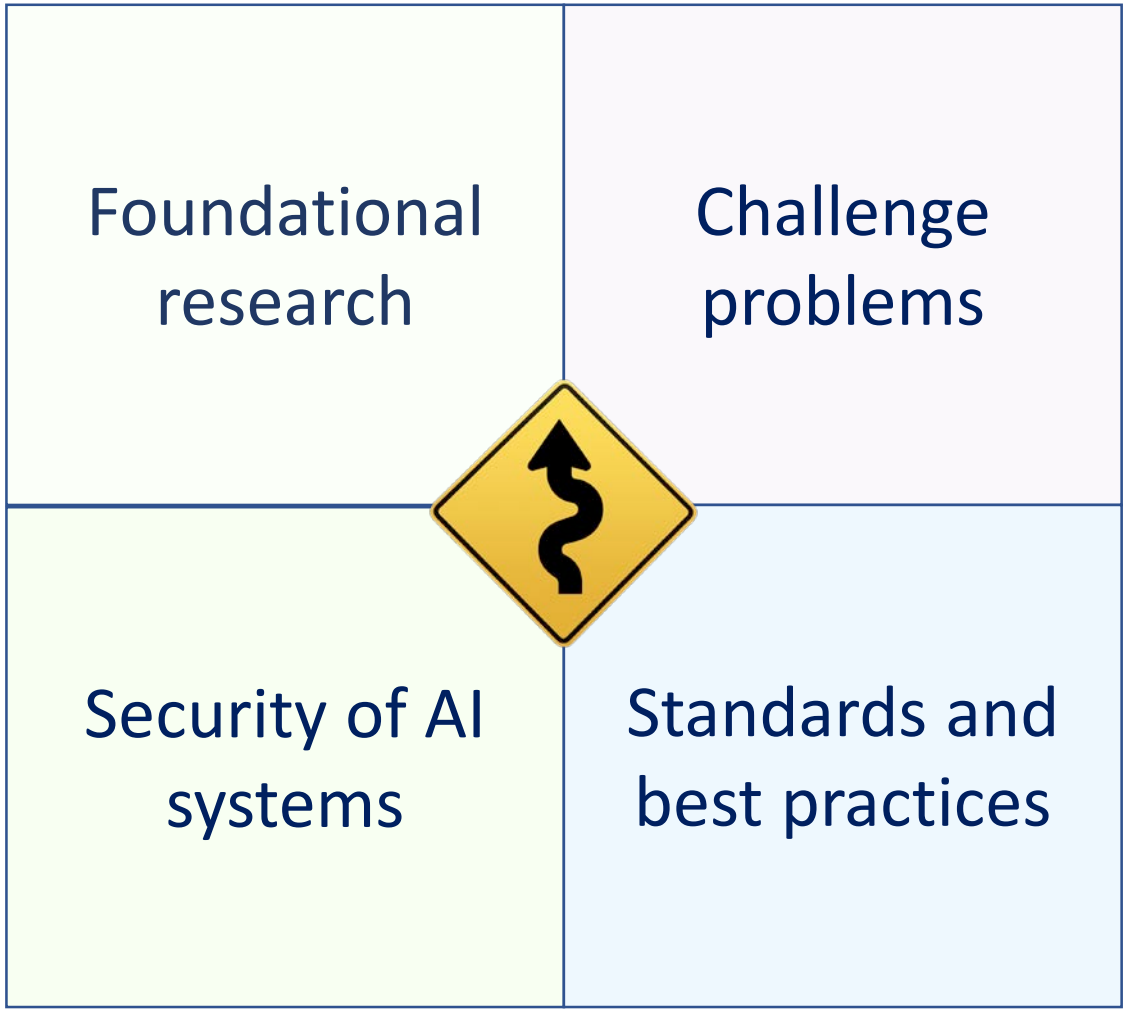


NIST AI visiting fellows will provide technical support in ML/AI methods, and contribute through participation in workshops, meetings, and assist with development activities for NIST AI research projects.

The Future - Coming soon

Measure and enhance the security and trustworthiness of AI systems

# Measure and enhance the security and trustworthiness of AI systems



# Open and public data

NIST Special Database 19 NIST Handprinted Forms and Characters Database

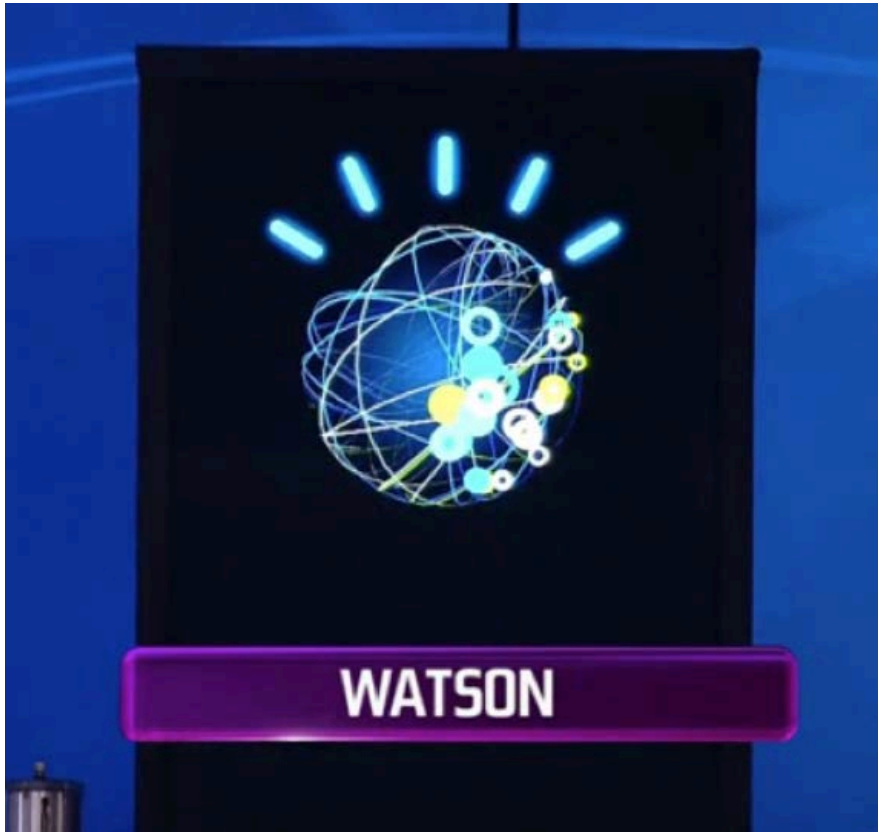
www.nist.gov/srd/nist-special-database-19

"Yet another advice: don't get fooled by people who claim to have a solution to Artificial General Intelligence. Ask them what error rate they get on MNIST or ImageNet."

Yann LeCun, 2014.
Vice President, Chief AI Scientist at Facebook and prof. at NYU

www.reddit.com/r/MachineLearning/comments/25lnbt/ama_yann_lecun/

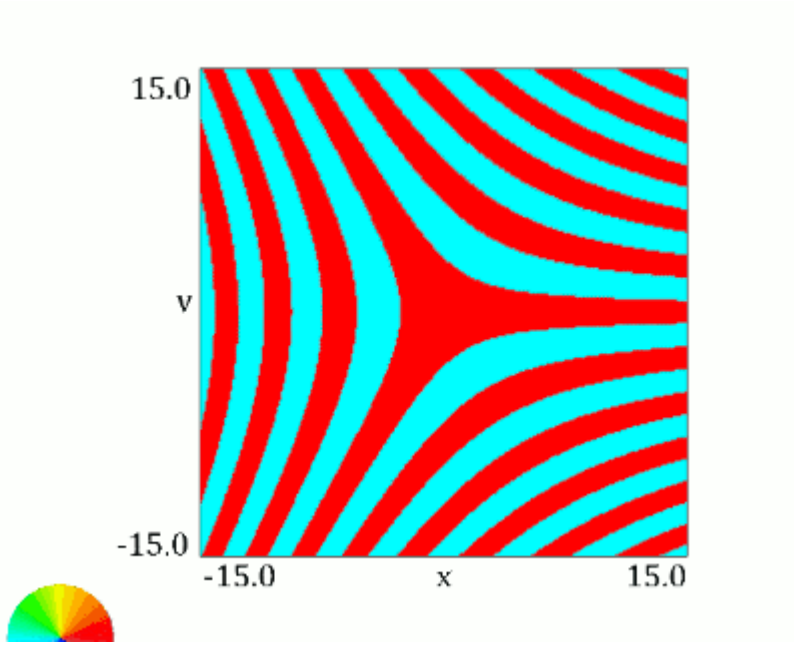
# Advance scientific disciplines via evaluations




"Our prior QA work took shape in the form of a QA system called PIQUANT. PIQUANT development started in 1999, predating our work in UIMA, and was funded by government research grants and tested against NIST evaluation data in the Text REtrieval Conference (TREC) QA track between 1999 and 2005."

*Introduction to "This is Watson". IBM Journal of Research and Development (Volume: 56, Issue: 3.4, May-June 2012)*

# Mathematics of metrology for foundational validity and reliability



# Trusted convener to lead the development of standards and best practices

(Photo: Fabrice Coffrini—AFP/Getty Images)

- Opportunity for voluntary standards to help with development, evaluation and adoption of AI applications.
- Working with ISO, we provide technical support to development of international standards for artificial intelligence.

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