



The State of AI

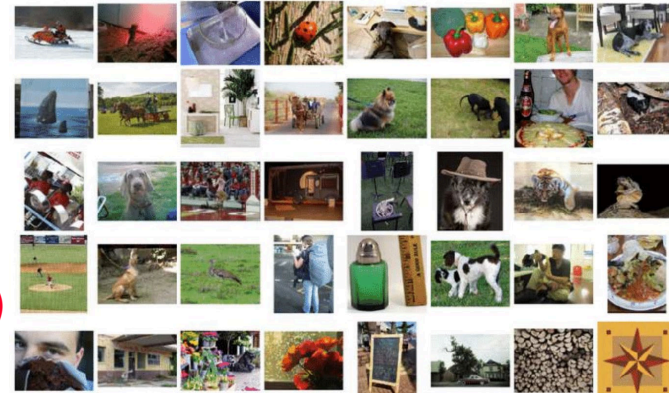
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AI: The Deep Learning Transformation

The “deep learning revolution” has transformed core areas of AI, starting around 2012.

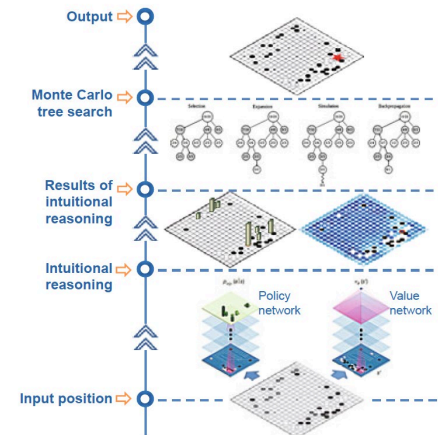
- (1) Computer vision (CNN architecture)
- (2) Machine Translation
- (3) Decision making (AlphaGo, AlphaZero)
- (4) Natural Language (LLMs, ChatGPT, GPT-4)



We’re seeing an incredible acceleration of progress. Major AI conferences (e.g., NeurIPS, AAI) receive over 10,000+ full submissions! (up from around 1,000 a decade ago)



Large Language Models (LLMs) provide a
“telescope for the human mind.”



The Societal Impact of AI

AI Research Roadmap



Boost Health and Quality of Life: Prevention of illness in aging population. Mental/behavioral health. Reducing cost (25+% feasible) while improving care. Remote patient care.



Lifelong Education and Training: Personalized, scalable education. On demand technical training. Retrain workforce. Educate the next generation of AI specialists, data scientists, and software engineers.



Reinvent Business Innovation and Competitiveness: Evidence-driven companies, which would increase productivity and value and open new sectors/products.



Accelerate Scientific Discovery and Technological Innovation: Transform capabilities in all areas of research: biomedical, environmental, new materials, personalized services, robotics, etc.



Social Justice and Policy: Engaging and empowering disadvantaged communities. Improving civic and political discourse online.



Transform Cyber Defense and Security: AI driven systems can compensate for a relatively small cyber defense workforce, adversarial reasoning.

[Link](#)

August 2019

Roadmap Co-Chairs:

Yolanda Gil, University of Southern California, AAI past-President

Bart Selman, Cornell University, AAI President

Based on input from 100+ leading AI researchers



Outstanding AI research challenges



AI-driven capabilities:

- Behavioral health coaches
- High payoff experiments
- Opportunistic education
- Resolve supply chain delays
- At-home robot caregivers/helpers
- Effective natural disaster response
- Novel business processes
- Address food and water insecurity
- Resilient cyber-physical systems

1) Integrated Intelligence

- Science of integrated intelligence
- Contextualized AI
- Open knowledge repositories
- Understanding human intelligence



2) Meaningful Interaction

- Collaboration
- Trust and responsibility
- Diversity of interaction channels
- Improving online interaction



3) Self-Aware Learning

- Learning expressive representations
- Trustworthy learning
- Durable machine learning systems
- Learning in integrated AI/Robotic systems



- **Infuse AI research programs with particular attention to AI ethics and interpretability, and human-compatibility**

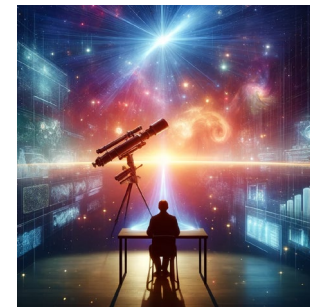
Great opportunities but also unique challenges for academic and non-profit R&D

- There is clear evidence that the larger the deep neural nets are with more high-quality data, the better they perform.
- Current best foundation models (eg GPT-4) are commercially developed and held.
- ***Academia needs access to shared top-level AI resources to truly boost AI for science, engineering, and health --- and develop robust, reliable, fair, and safe AI.***

The challenge is providing such resources (e.g. “ScienceGPT” & “EngineeringGPT”) at a national level.

Public-private partnerships?

Other countries will certainly boost their R&D in this way.



We're at the cusp of a scientific and technological transformation driven by AI.

This is a unique nationwide opportunity to accelerate science and engineering assuming the proper policies and R&D investments.