

Ο Αντίκτυπος της Τεχνητής Νοημοσύνης στα Μελλοντικά Ρομποτικά Συστήματα

Παναγιώτης Τσιότρας
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Georgia Institute of Technology

8 Δεκεμβρίου 2022

The Impact of Artificial Intelligence on Future Robotic Systems

Panagiotis Tsiotras

School of Aerospace Engineering

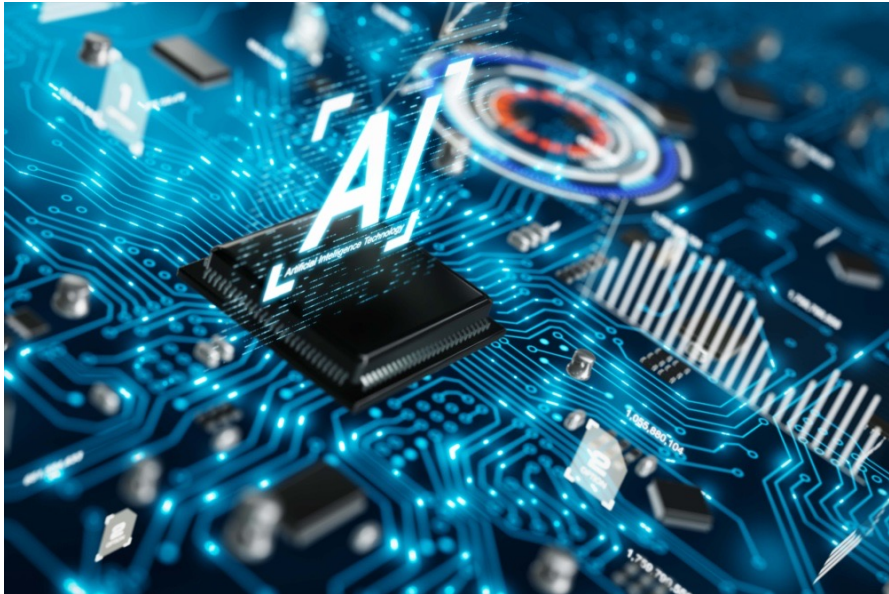
Institute for Robotics and Intelligent Machines

Georgia Institute of Technology

December 8, 2022

AI = Electricity of 21st Century

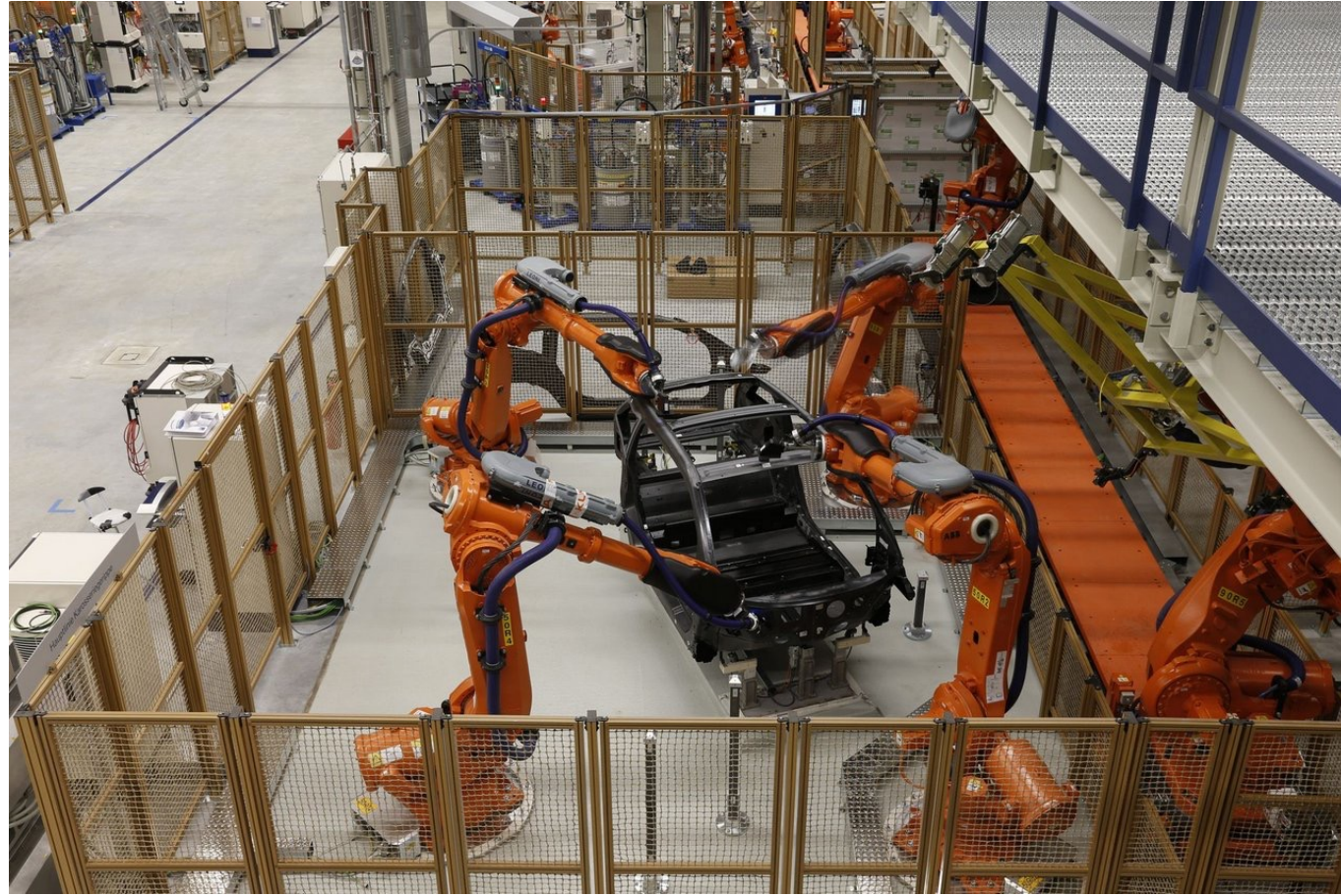
An enabling technology



Andrew Ng, AI/ML pioneer



Robotics 1.0



Robotics 2.0

Autonomous Systems



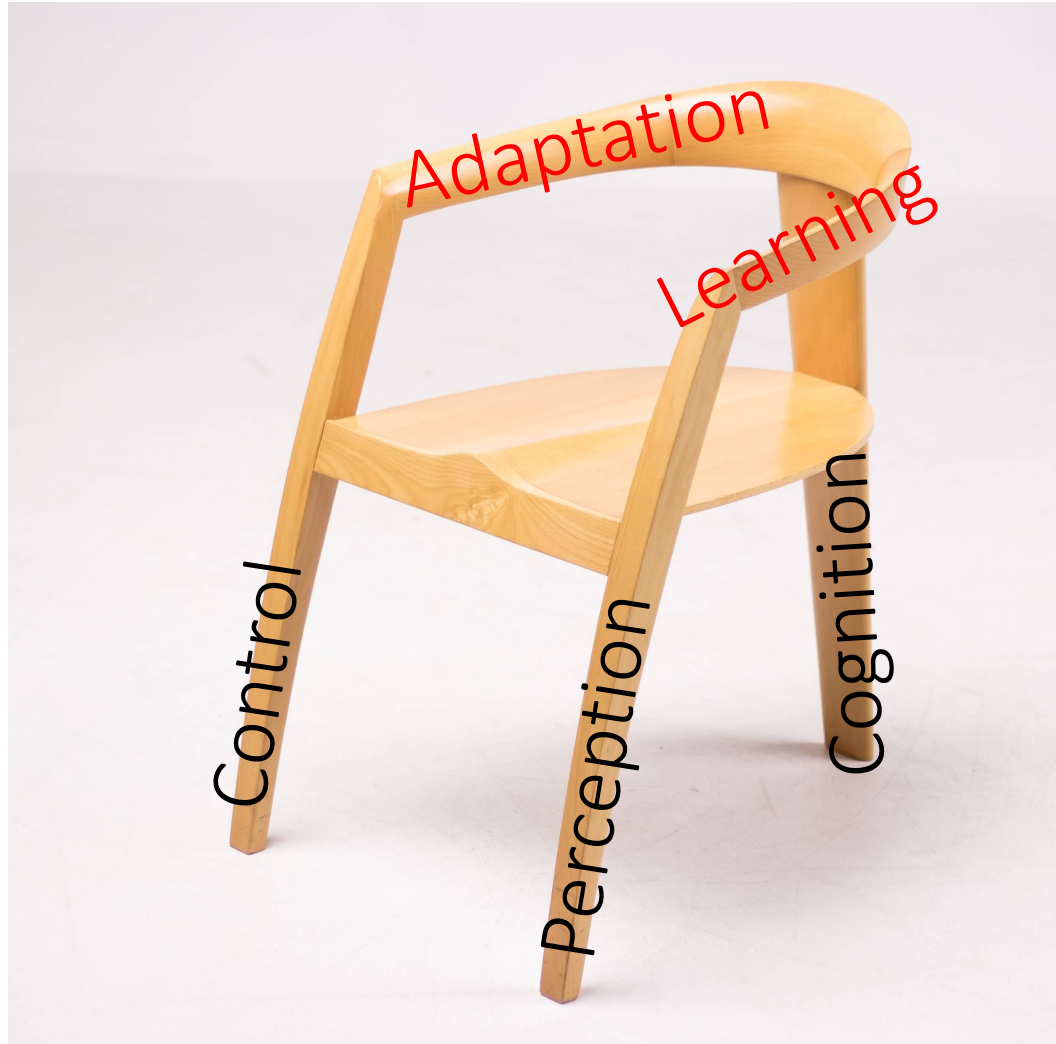
Human Augmentation



Collaborative Robots



From Automation to Autonomy



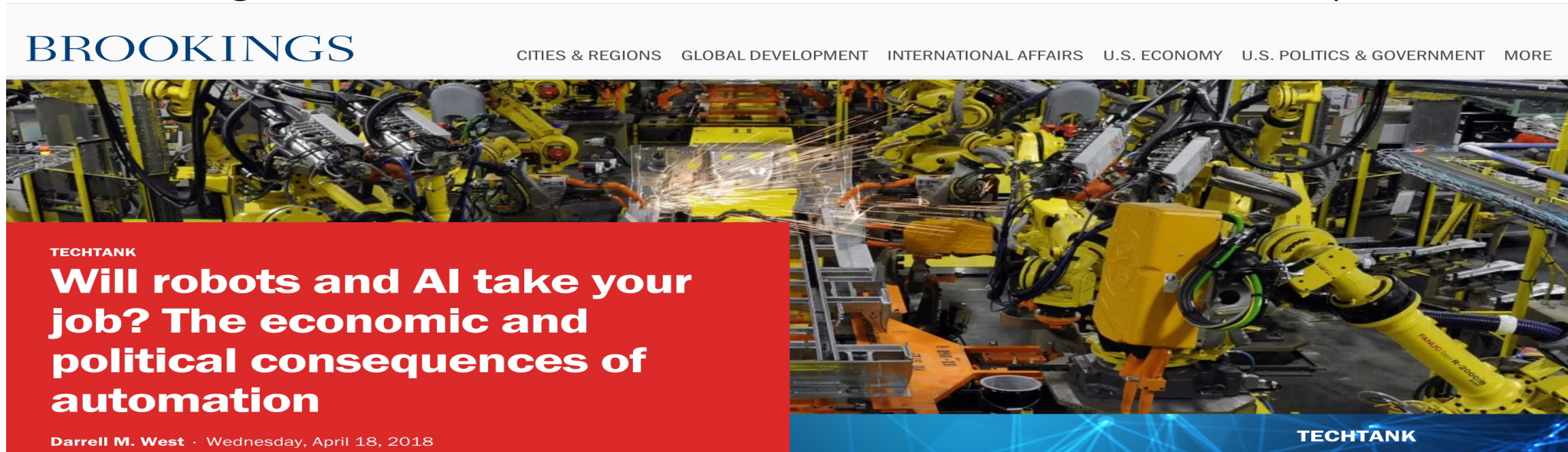
- Operate in non-structured and unpredictable environments
- Interact with humans

Automation \Rightarrow Autonomy

- New challenges on:
 - Design
 - Operation
 - Certification

Economic Impact

- The global market for robotics would reach \$90B over the coming decade
- Robotics & AI is projected to be a trillion-dollar market by 2030. Thereafter robotics and AI is anticipated to become the largest global market *of any industry*.
- Merrill Lynch predicts that by 2025 the “annual creative disruptive impact” of Robotics and AI could amount from \$10 Trillion to \$30 Trillion
- McKinsey forecasts that advanced robotics could have an economic impact on the manufacturing sector of between \$720 billion to \$1.45 trillion annually



BROOKINGS CITIES & REGIONS GLOBAL DEVELOPMENT INTERNATIONAL AFFAIRS U.S. ECONOMY U.S. POLITICS & GOVERNMENT MORE

TECHTANK
Will robots and AI take your job? The economic and political consequences of automation
Darrell M. West · Wednesday, April 18, 2018

TECHTANK

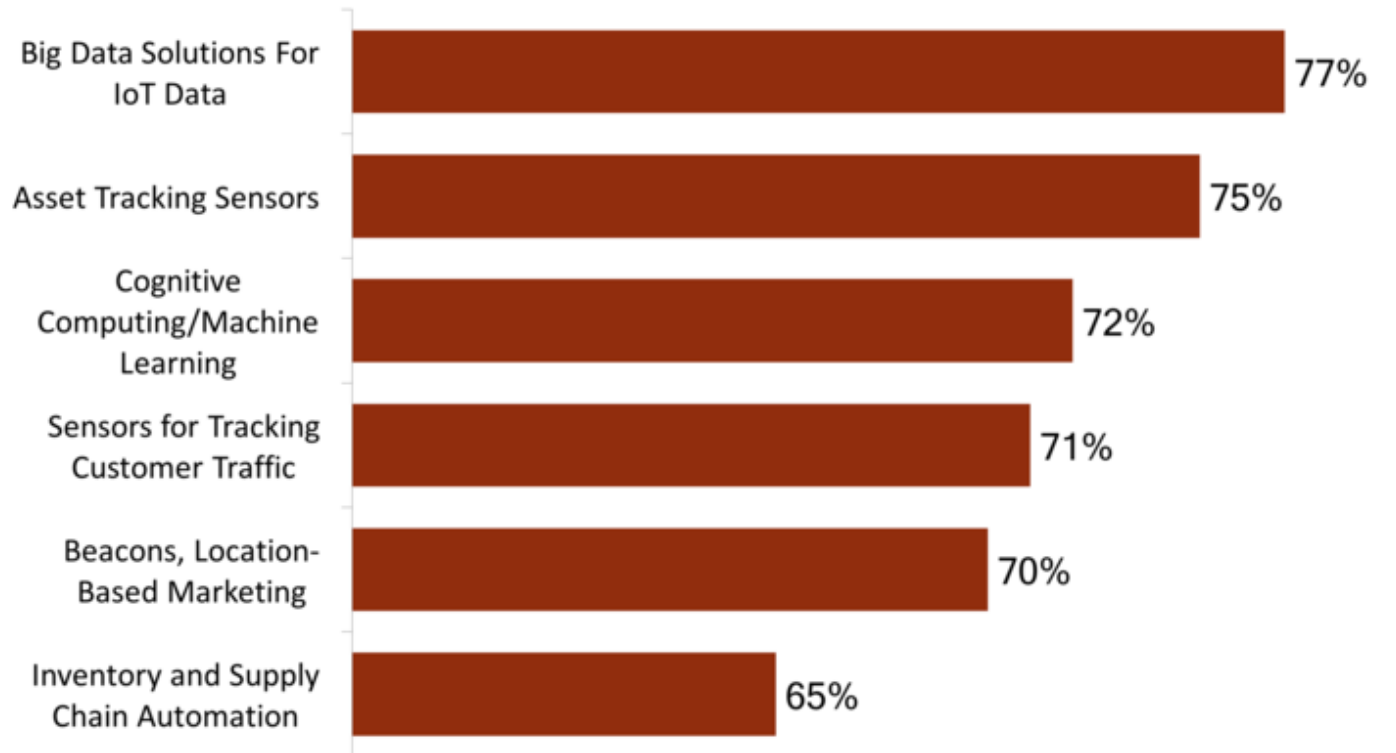
Just the Tip of The Iceberg



- Medical robots
- Transportation
- The insurance industry
- The retail sector
- Many more

Percentage Of Retailers Planning To Invest In AI And IoT Technologies By 2021

Global

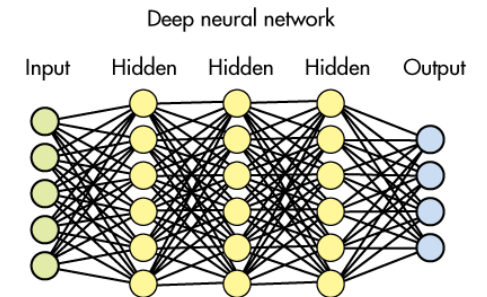
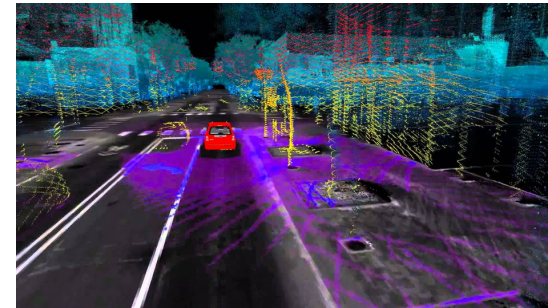
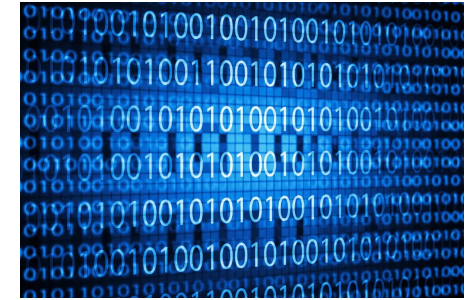
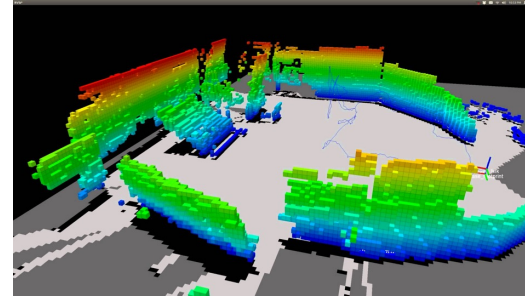


n=1,700
Source: Zebra Technologies, 2017

BI INTELLIGENCE

Why Now?

- **Computer vision & perception algorithms**
Robots to “leave” the labs and start interacting with humans and other robots
- **Hardware (GPUs)**
Ability to perform the computations necessary to implement these algorithms in realistic time schedules
- **Data**
Train ML algorithms
- **Protocols (ROS)**
Has lowered significantly the “upstart cost” – no need to worry on the low-level implementation and communication architecture



Research

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[Seminar Series](#) ▾

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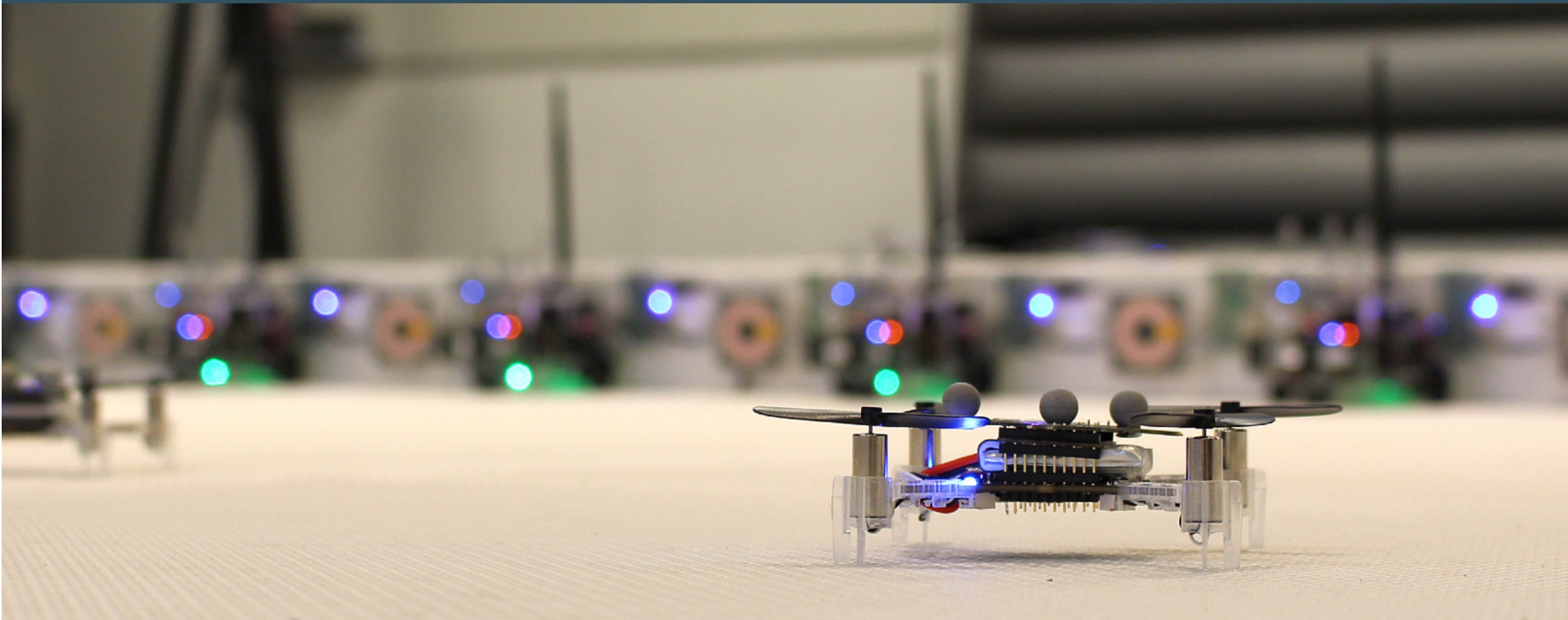
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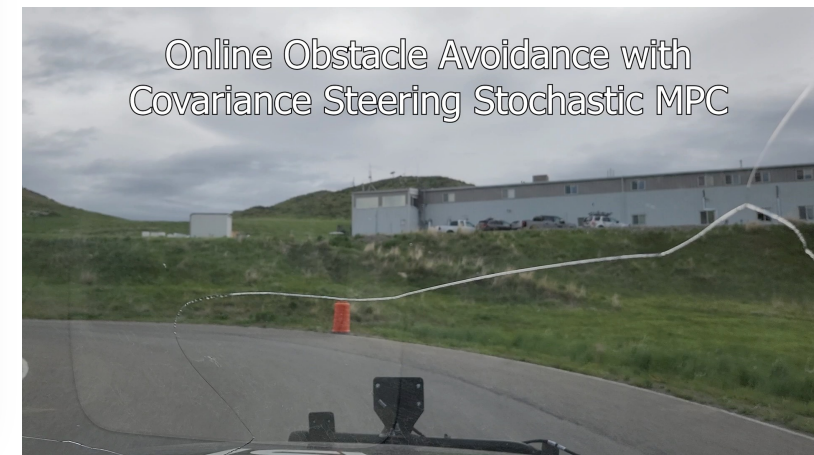
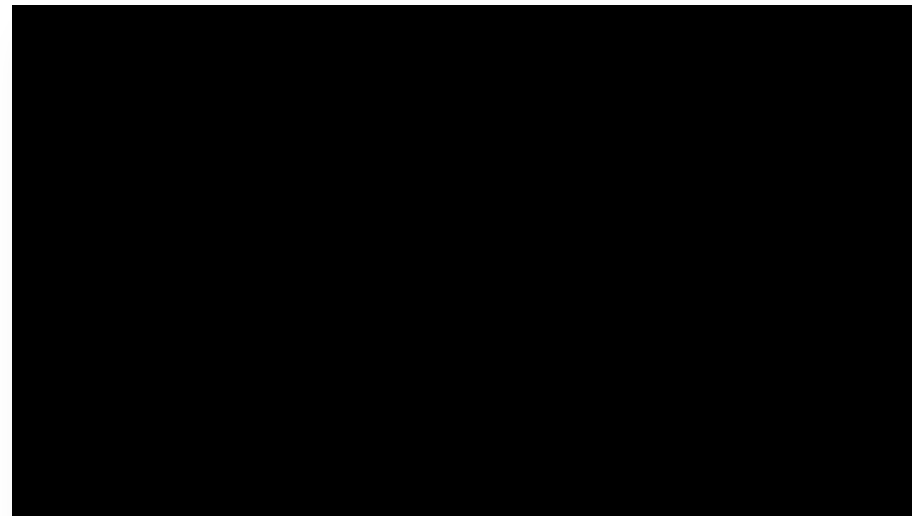
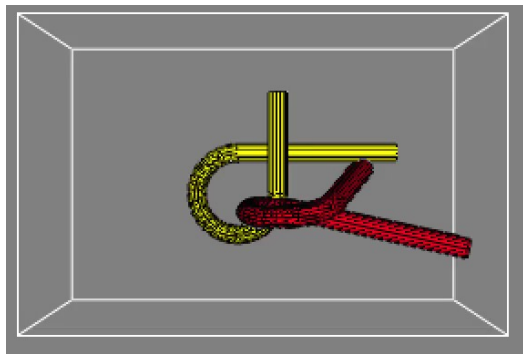
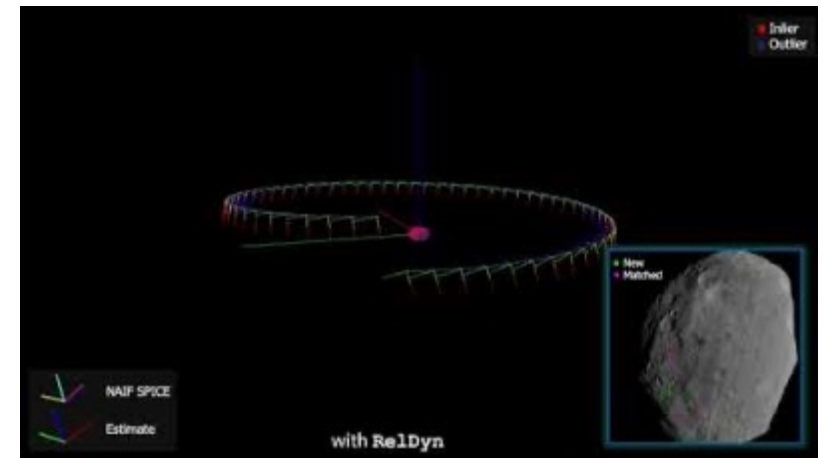
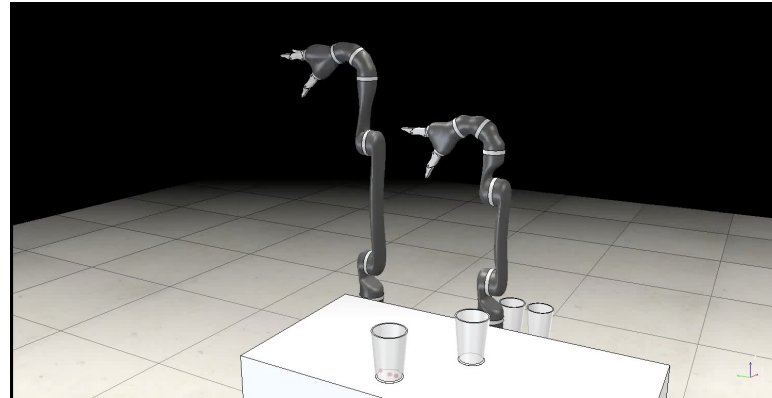
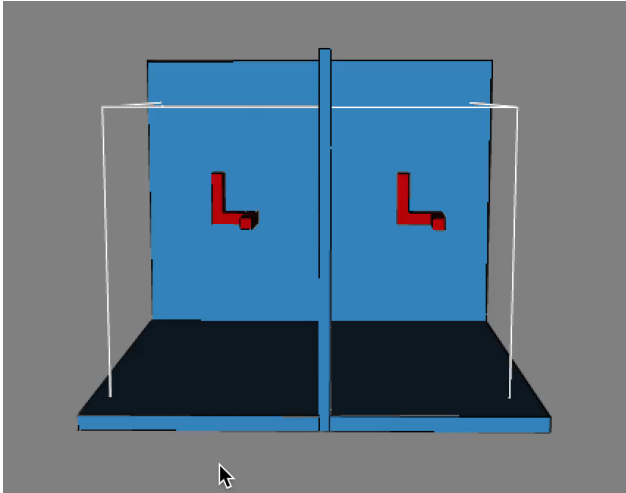
80+ faculty/researchers, 150+ PhD students, 100+ MS students
\$35M/yr sponsored research



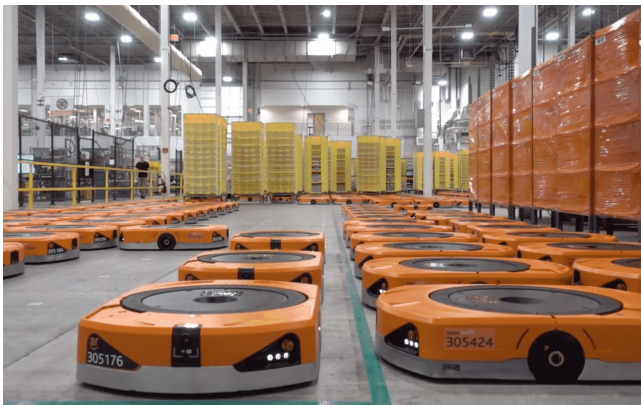
Control Theory

Robotics

Examples



MAPF



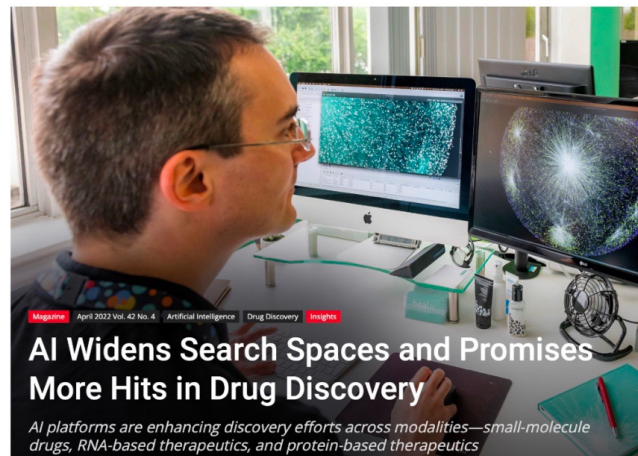
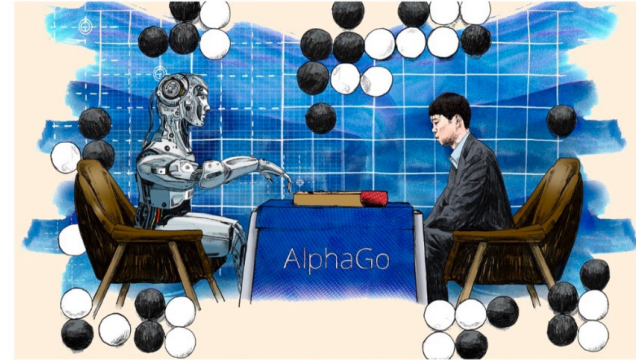
Need to solve P2P
collision-free paths
fast for >1000 robots
at the same time

Current Trends

- Deep Neural Networks
- Thirst for more data
- Certification/Validation
- Integration of hardware and software/algorithms
- Many applications
 - defense
 - transportation
 - services
 - health-care
 -

How DeepMind's AlphaGo Became the World's Top Go Player

The revolutionary power of reinforcement learning



Automation and Robotics, Machine Learning

How AI Is Making Autonomous Vehicles Safer

AI is used to simulate real-world conditions to safety-test autonomous vehicles. Stanford researchers surveyed the algorithms and say they are good, but work remains.

Mar 7, 2022 | Andrew Myers



DeepMind's protein-folding AI cracks biology's biggest problem

Artificial intelligence firm DeepMind has transformed biology by predicting the structure of nearly all proteins known to science in just 18 months, a breakthrough that will speed drug development and revolutionise basic science

TECHNOLOGY 28 July 2022

By Matthew Sparkes



Predicting the structure of proteins is one of the grand challenges of biology

AI test could predict best cancer therapies for patients

Opportunities & Challenges for Greece

Challenges

- Scientific excellence in Greece does not translate to a significant impact on the nation's economy or safety
- Limited technology transfer out of universities and research centers
- Limited high-end job opportunities accelerating brain drain
- Geography, demographics, risk-averse culture

Strengths, Opportunities

- Excellent reputation of basic research, Greek diaspora
- Geography, climate
- Educated, English-speaking youth, EU
- Maritime, tourism, logistics, agri-food
- Low barrier to entry (e.g., service & unmanned vehicles)

