MIT Quest for Intelligence

The Quest for Intelligence

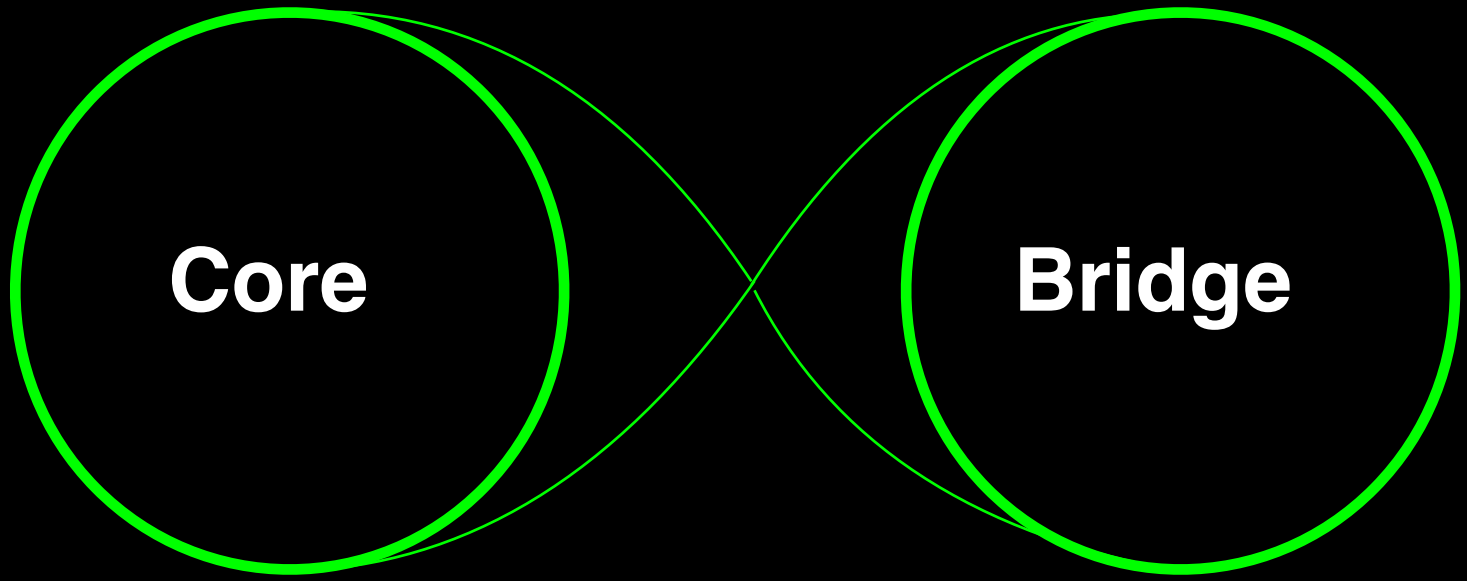
Aude Oliva | Executive Director, MIT Quest for Intelligence

What is the MIT Quest for Intelligence?

- The Quest aims to advance two fundamental intelligence challenges:

- Can we reverse engineer intelligence?
- How can we deploy our current and expanding understanding of intelligence to the benefit of society?

The Core and the Bridge



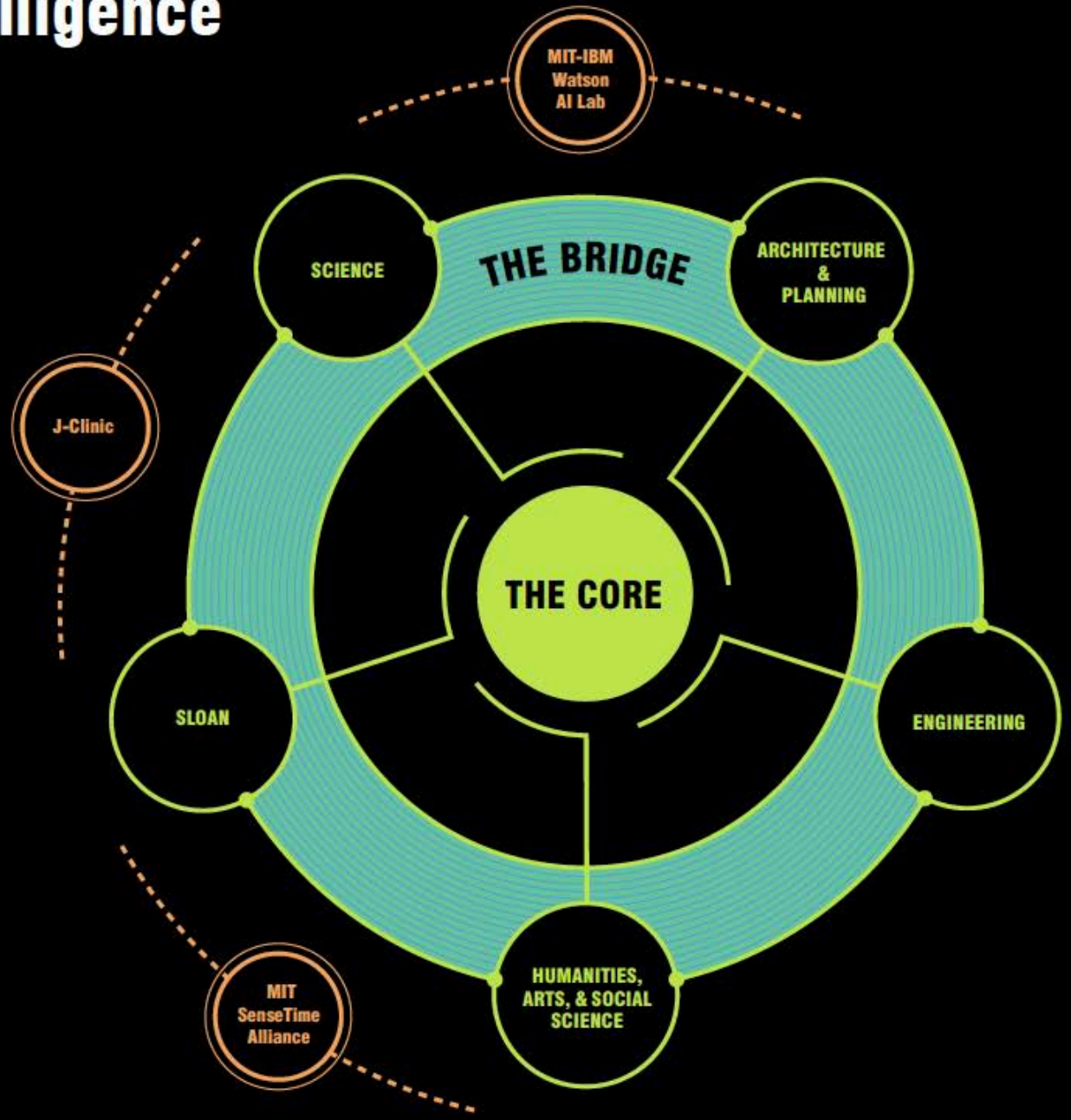
The Core: Advance the science and engineering of intelligence

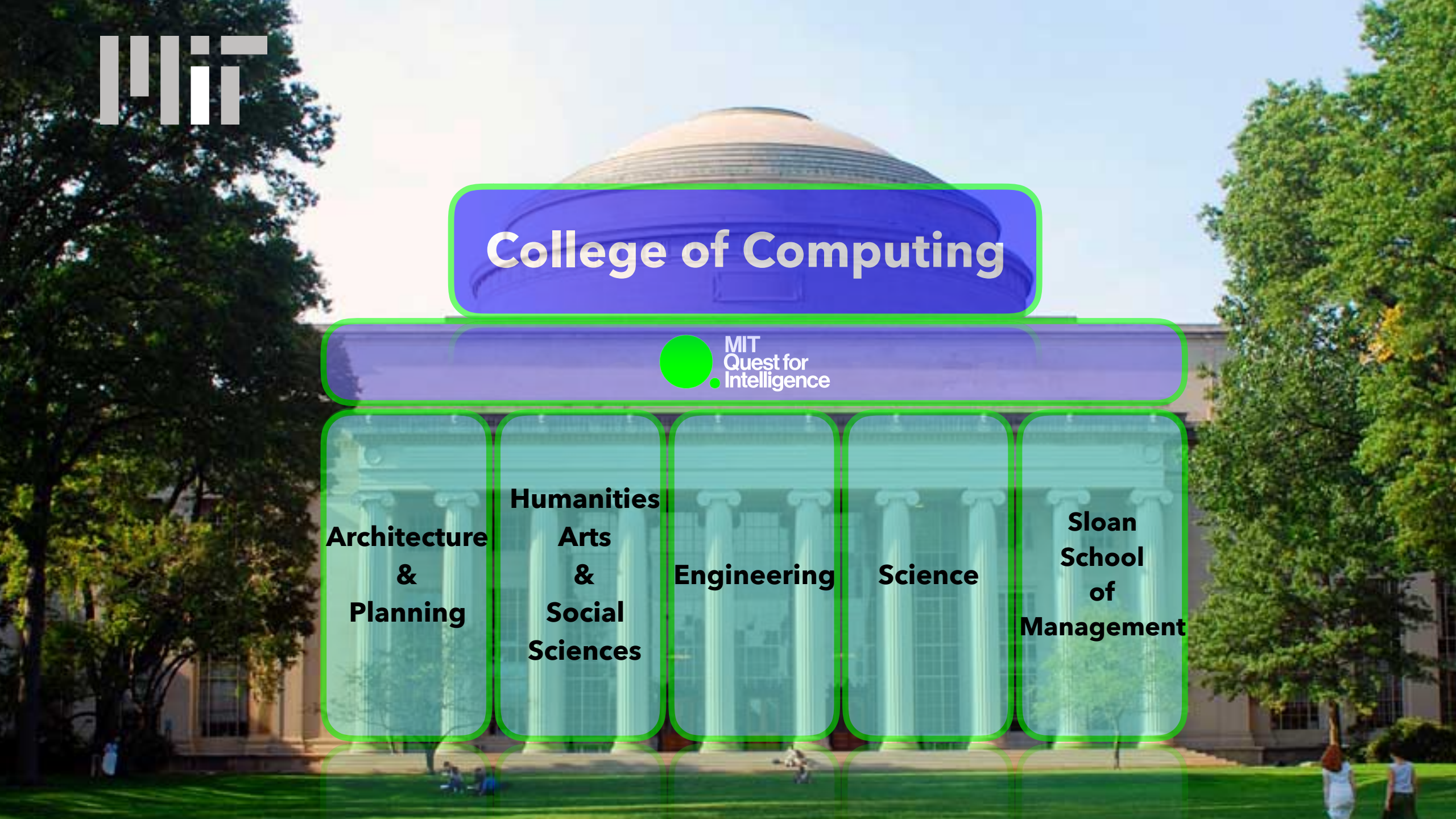
-> cognitive science, biology, physics based machine-learning algorithms and insights

The Bridge: Implement the newest intelligence techniques

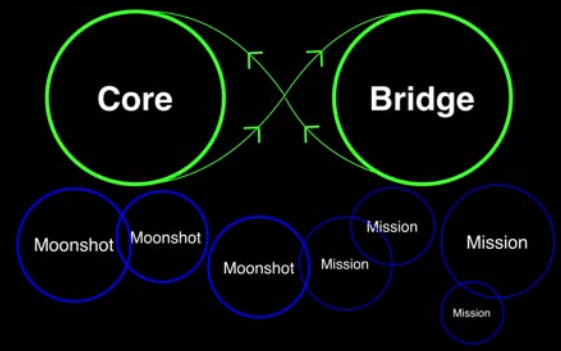
-> Provide people inside and outside MIT with intelligence technologies, tools, platforms, and infrastructure (data sets, technical support, specialized software and hardware)

MIT Quest for Intelligence




College of Computing
MIT Quest for Intelligence
Architecture & Planning
Humanities Arts & Social Sciences
Engineering
Science
Sloan School of Management

Quest Moonshots & Missions



- Team-driven bet on a large, unsolved problem in intelligence
- Projects go above and beyond business as usual
- Projects that MIT is well positioned to lead

The Development of AI

Narrow AI

Big data
Pattern analysis
Single task
Offline decision

Emerging AI

Multi-tasks
Online prediction
Intelligence at the edge
Reinforcement learning
Transferability
Replicability
Parallelism

Human-level AI

Cognitive Flexibility
Continuous learning
Common sense
Intuition
Ethical overlay
Adaptability
Collaboration
Theory of Mind

1980 2012

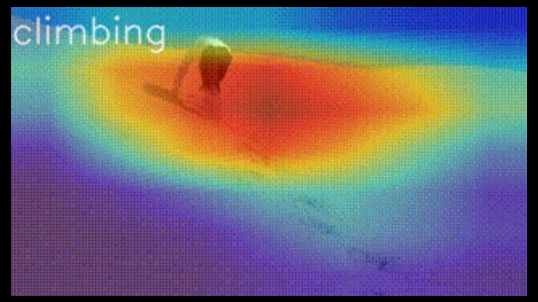
We are entering Emerging AI


handwriting

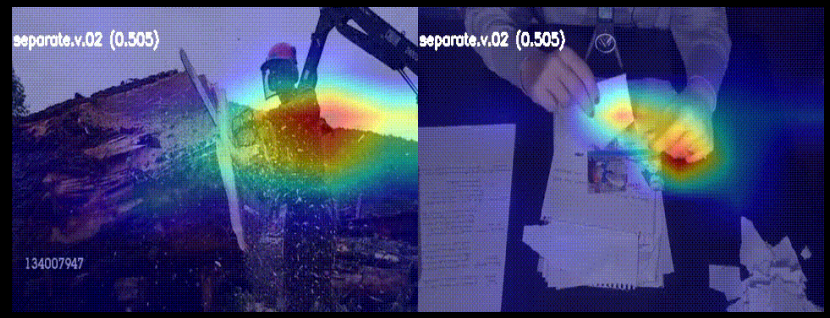
Visual Intelligence: Milestones

Visual systems with common sense reasoning

54 % Classification

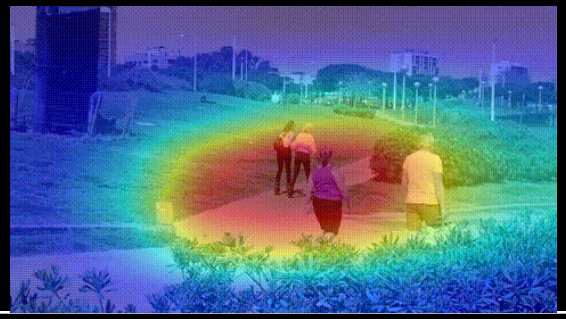


Abstraction: “separate”

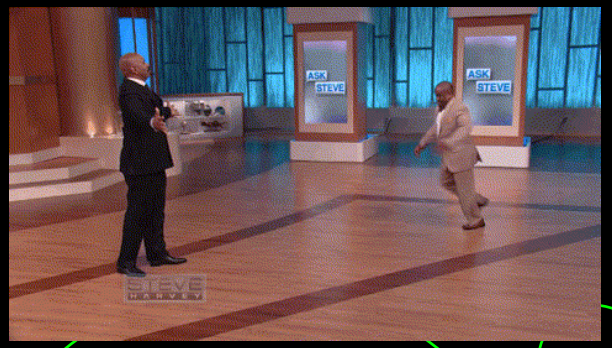


Common sense

1 year → 2 years → 5 years → 10 years



Recognition

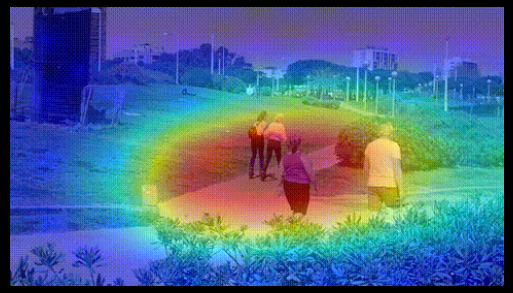


Intention & Causality

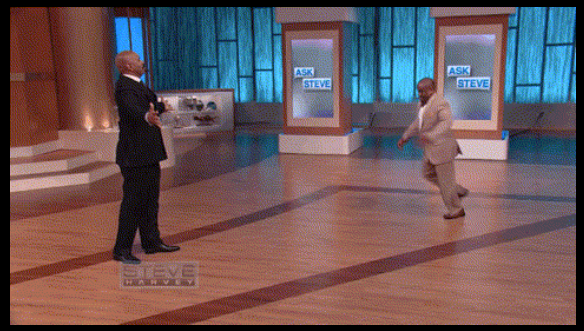
Visual Intelligence

Visual systems with common sense reasoning

71 % Recognition



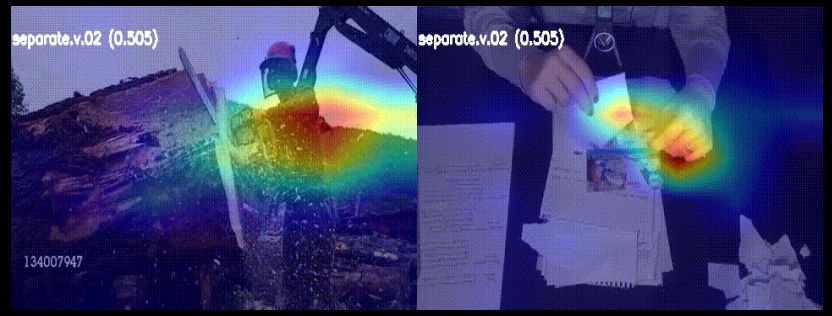
Intention & Causality



Common sense

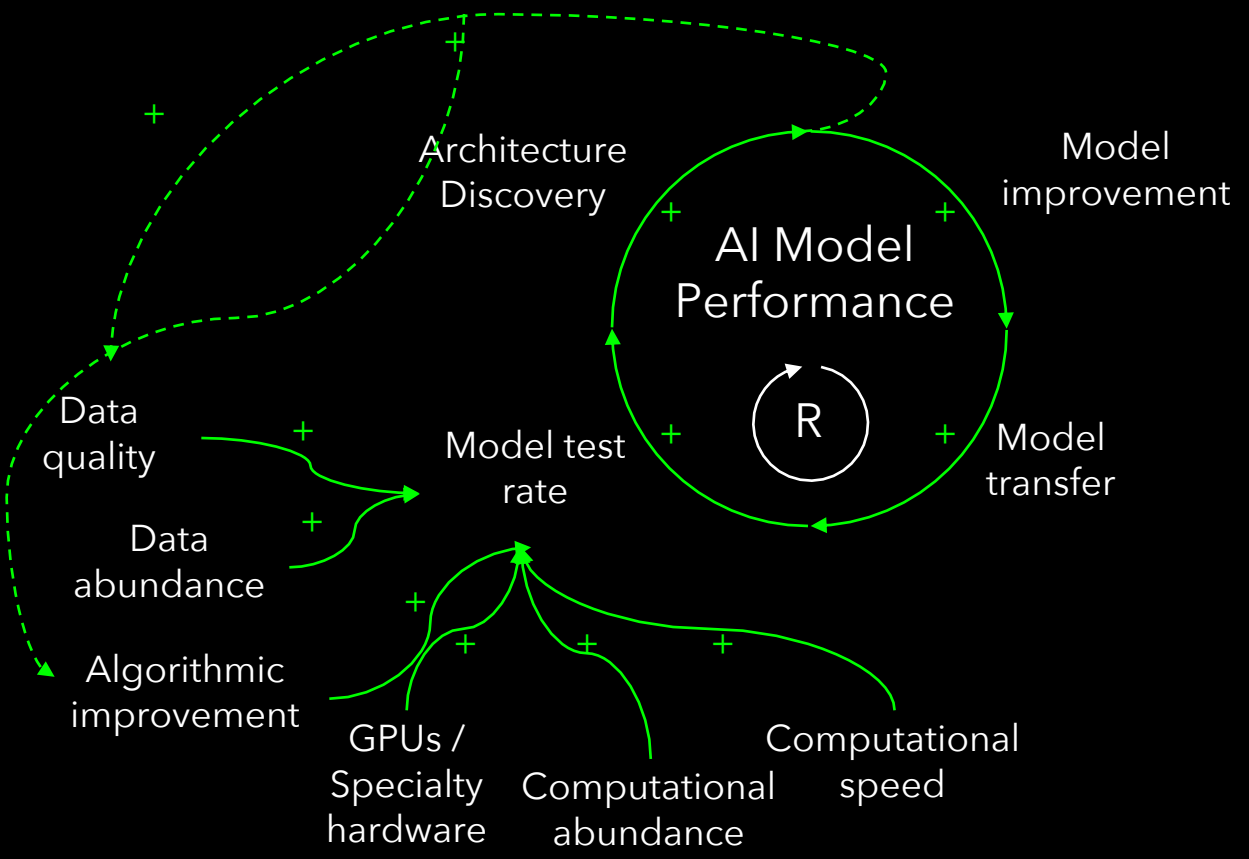
Theory of Mind

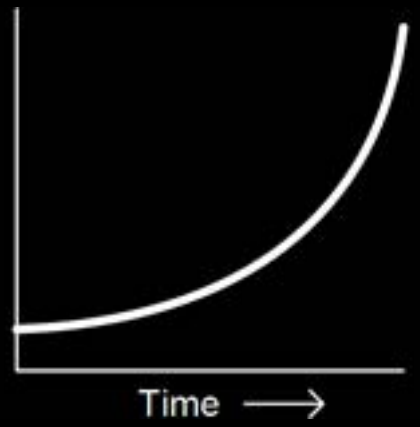
1 year → 2 years → 5 years → 10 years



Abstraction: “separate”

Promoters to AI success





Trustworthy and Robust AI

Systems which decisions are transparent, interpretable and explainable

Model Response: washing dishes

Correct label: brushing

Unit 1679
Bathroom

Unit 867
Kitchen

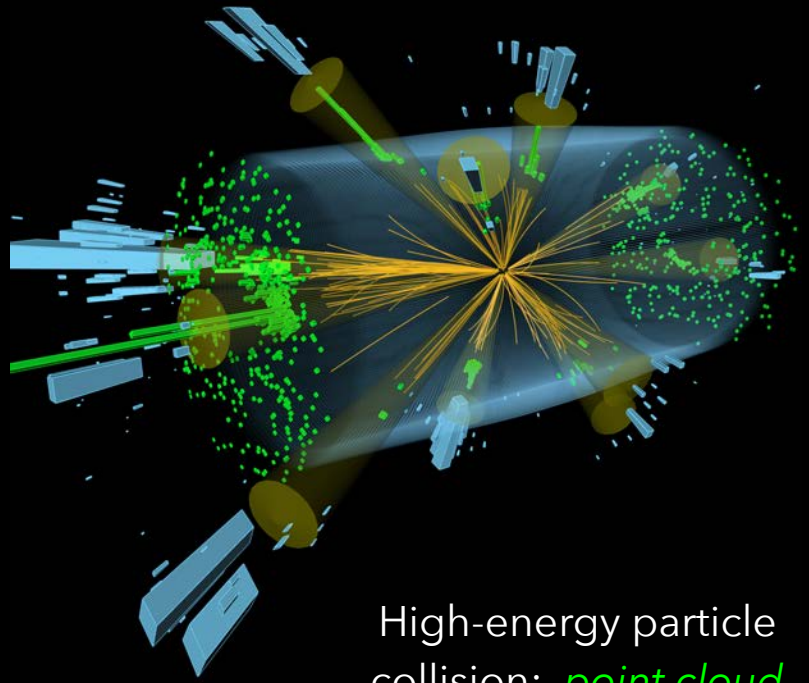
Unit 1749
House

Unit 795
Bathroom

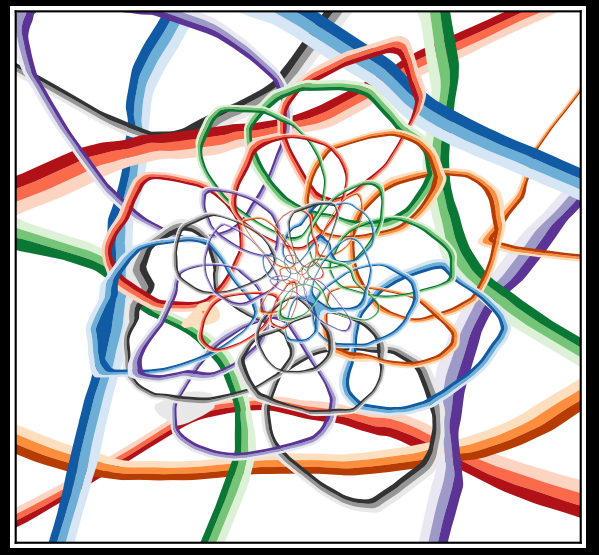
Unit 1978
Person

Artificial Mind: Reasoning like a Physicist

Teach a machine to think like a *physicist* by *factorizing* complex problems into *verifiable* pieces



High-energy particle collision: *point cloud*



Energy flow network with *visualizable* internal structure

Profs. Phil Harris, Markus Klute, Jesse Thaler & Mike Williams

Multi-sensory AI: Wireless signals as sensors

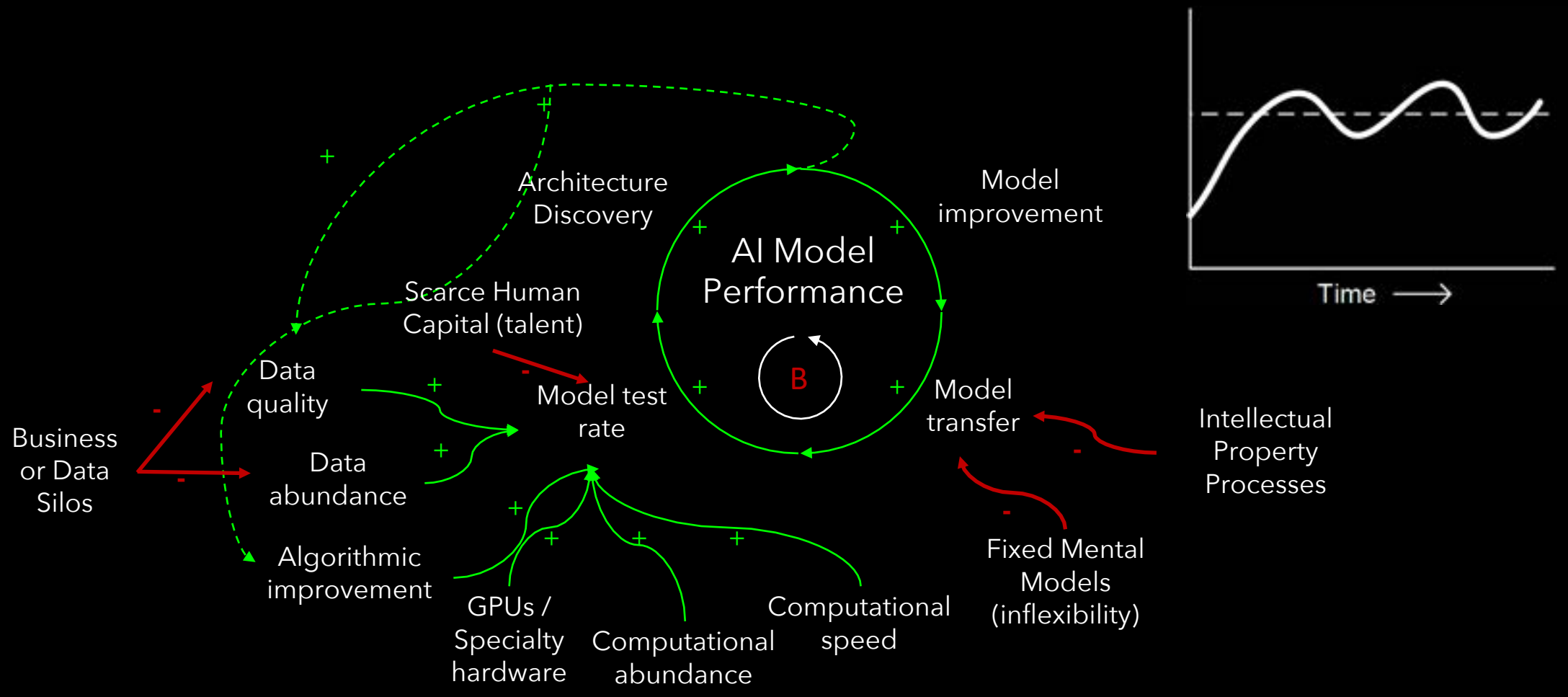
Katabi & Torralba. http://rfpose.csail.mit.edu/

MIT Quest for Intelligence

Current Issues and Challenges in AI

- Lack of accessibility
- Lack of resources
- Lack of expertise in tools
- Lack of reproducibility

Promoters and Barriers to AI success



The Bridge

AI Platforms - Tools - Services

Software

Open repository
Standardized
Reproducible
Deployable
- AI workflows
- AI pipelines

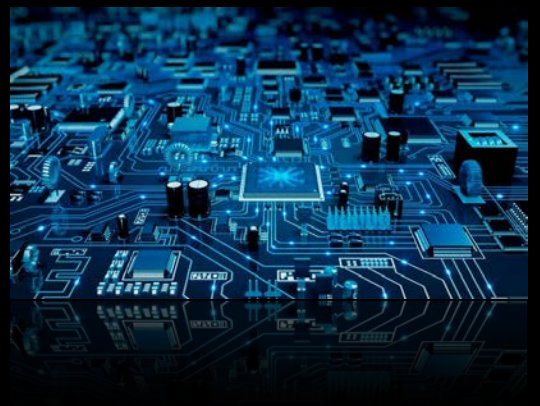
People

Consulting Team
& Ethical Team
- Academic
- Industry
- Developers
- Users

Data

Curation
Hosting
Archiving
- Benchmarks
- Research datasets

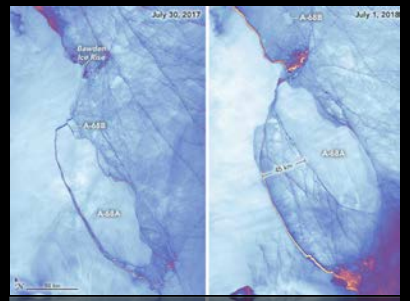
Hardware



Seamless
AI development
- Industry clouds
- Local clusters
New Hardware

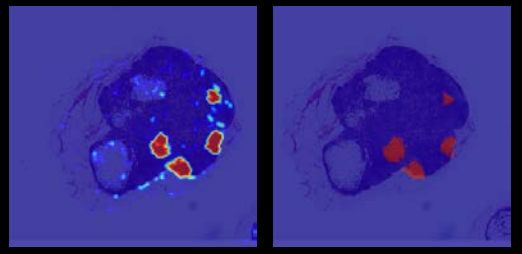
The Bridge AI Workflow: Documentation, Executable, Ethical Use

Classification



Iceberg states from satellites to monitor environment

Localization



AI Human

Localization of Lesions

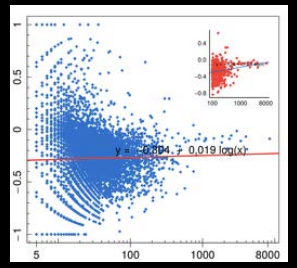
Detection

Detection of outliers, anomalies (cyber threat detection)

Forecasting

Forecasting financial risks, demands

Regression



Sentiment quantification from news to evaluate polarization

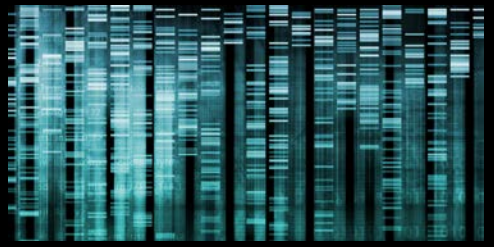
Recommendation

Recommendation engines

Reinforcement Learning

Control optimization for facilities

Ranking

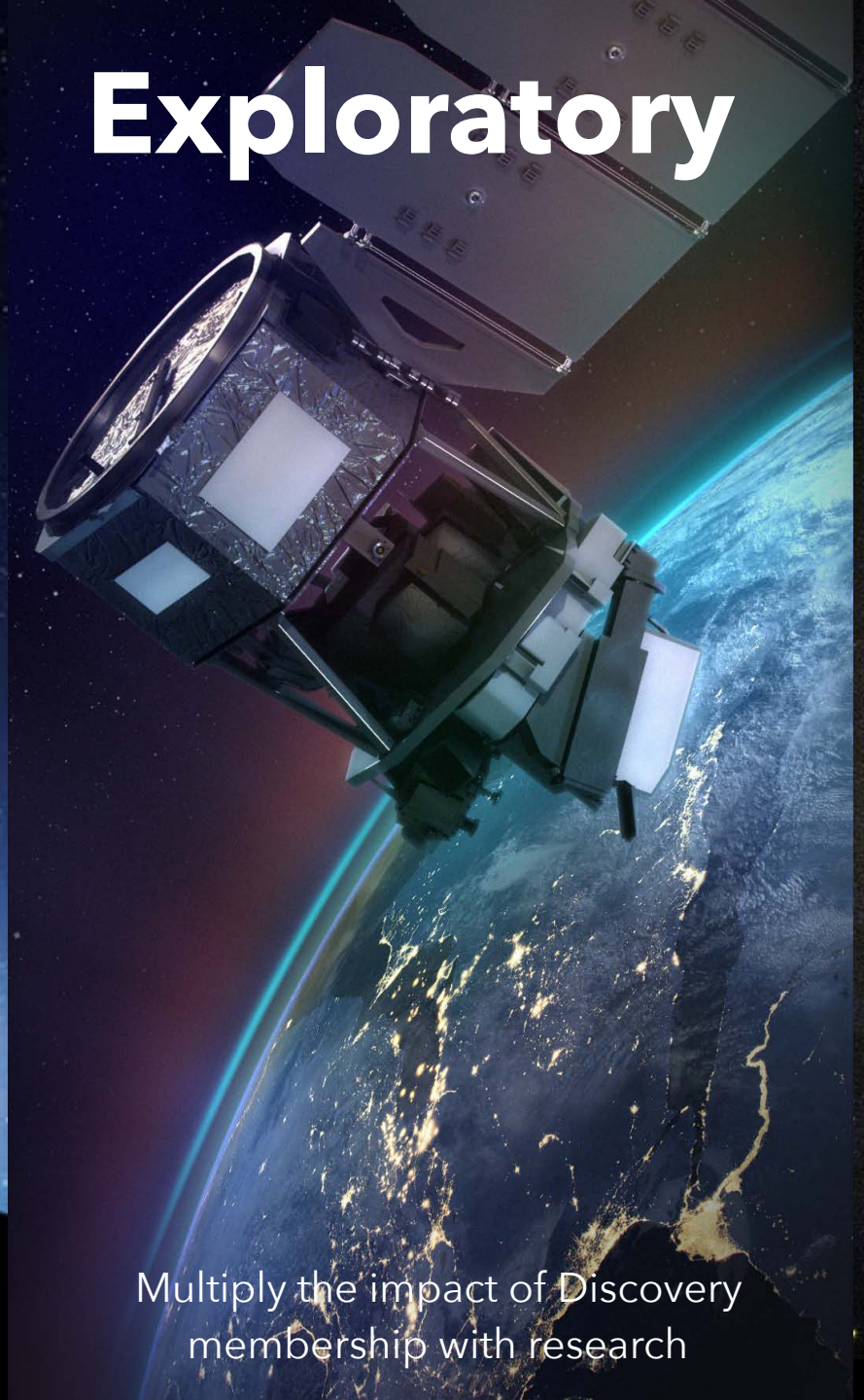


Identifying disease genes from gene expression data

Discovery

Exposure to emerging trends, technologies and talent in intelligence

Exploratory



Multiply the impact of Discovery membership with research

Visionary

Exponentially expand Exploratory membership with a long-term research vision

Quest Leadership Team

- quest.mit.edu

Antonio Torralba
Director, Quest

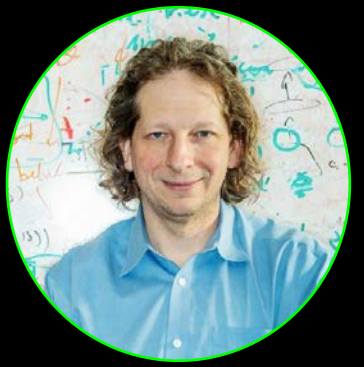
Erik Vogan
Director of Corporate engagement

Aude Oliva
Executive Director Quest

Daniela Rus
Associate Director Core

Cynthia Breazeal
Associate Director Bridge

Leslie Kaelbling
Scientific Director



Josh Tenenbaum
Scientific Director

James DiCarlo
Director, Quest Core

Ignacio Fuentes
Managing Director
Chief Operations Officer

Nick Roy
Director, Quest Bridge

Josh Joseph
Chief Intelligence Architect

Tomaso Poggio
Scientific Advisor