# Research on Intelligence in the Center for Brains, Minds & Machines

The Center for Brains, Minds & Machines
&
The National Science Foundation

We are a multi-disciplinary research center creating brain-inspired intelligent systems

*cbmm.mit.edu*

## Our Goals & Products

Sustained and proactive collaborative relationships, making Artificial Intelligence and Neuroscience better together

New methods and questions for evaluating next-gen machine learning algorithms, going beyond the Turing test, the **Turing++ challenge**: To answer questions and generate narrative explanations similar to those a human would produce, in response to photo and video stimuli


Open datasets of stimuli and responses from people and algorithms.

Open-source research platforms allowing the use of CBMM-developed algorithms and data by anyone

New research into how human brains solve the problems that we hope to solve with smart machines

Novel algorithmic solutions, derived from our research findings, to the Turing++ chalenge, systems that make the same types of correct judgments and mistakes that humas make, and build the same types of internal mental models

## Our Research

### Thrust 1: Development of Intelligence

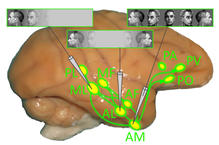
How do infants and toddlers learn to recognize objects, actions, intention, logic, and social structure?

How does human developmental learning (involving just a few trials) differ from curent machine learning alrogithms (which requires many training samples)?

### Thrust 2: Circuits for Intelligence

Can we find signatures of high-level computation in the animal brain?

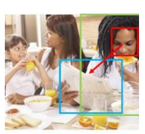
How does neural computation resemble current machine learning algorithms? How can next-gen algorithms compute in a more neural way?




### Thrust 3: Visual Intelligence

How do humans solve the recognition problem? Where do we look to recognize objects and people? What are the limits of our visual memory?

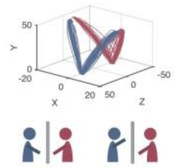
How can machine vision move from the restricted domain of labeling single images with single categories, to open-ended problems humans solve in unconstrained environments?



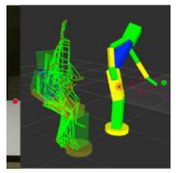

### Thrust 4: Social Intelligence

How do we infer others' mental states?

How do we anticipate others' motor goals? What are the minimal visual cues we need to preempt them?




How do infants and toddlers learn to recognize objects, actions, intention, logic, and social structure?

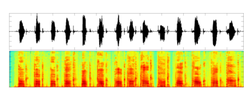


What cues let us tell a friend from an aggressor?

What brain areas are involved in theory-of-mind, and the asignment of blame or forgiveness?

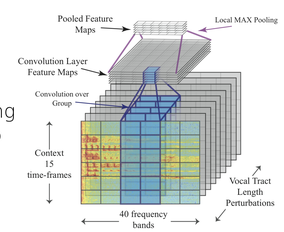
### Thrust 5: Theories for Intelligence

How can we constrain machine learning algorithms to reach more consistent accuracy under noise? What designs will result in them making more muman-like patterns of mistakes?



How can we port the success of visual classifiers to other senses?

How can we move  from the current training regime of thousands of example stimuli, to one-shot learning?




What I can not **create** I do not **understand** - Richard Feynman