

Brains, Minds, and Machines

Tomaso Poggio
MIT



CENTER FOR
Brains
Minds+
Machines

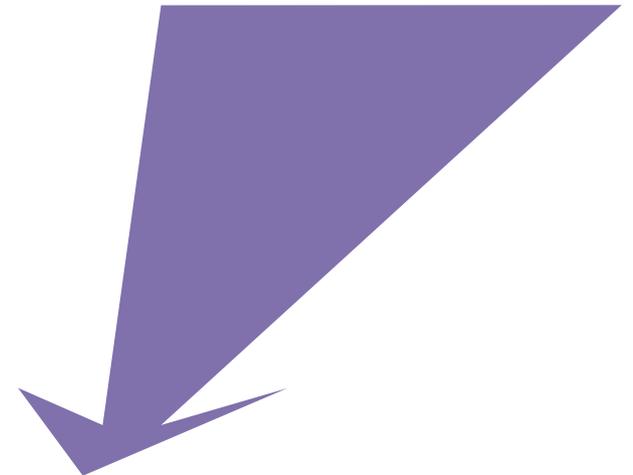
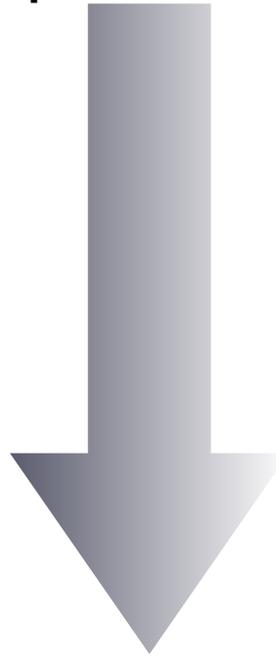
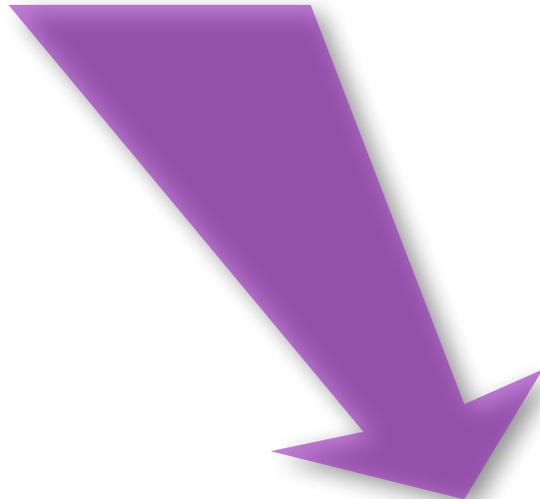
Brains, Minds, and Machines
Summer Course 2015

Why now

Machine Learning
Computer Science

Neuroscience
Computational
Neuroscience

Cognitive Science



Science + Technology
of Intelligence

Center for Brains, Minds, and Machines

MIT

Boyden, Desimone, Kanwisher,
Katz, Poggio, Sassanfar, Saxe,
Schulz, Tenenbaum, Ullman, Wilson,
Rosasco, Winston

Harvard

Blum, Kreiman, Mahadevan,
Nakayama, Sompolinsky,
Spelke, Valiant

Rockefeller

Freiwald

Allen Institute

Koch

UCLA

Yuille

Stanford

Goodman

Hunter/Queens

Epstein, Chodorow,
Sakas, Brumberg

Wellesley

Hildreth, Conway,
Wiest

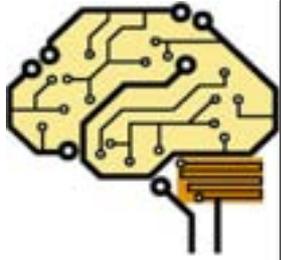
Puerto Rico

Bykhovaskaia, Ordonez
Arce Nazario

Howard

Manaye, Chouikha,
Rwebangira





The Center for Brains, Minds and Machines

A little bit of history
and
background

Why now: recent progress in AI



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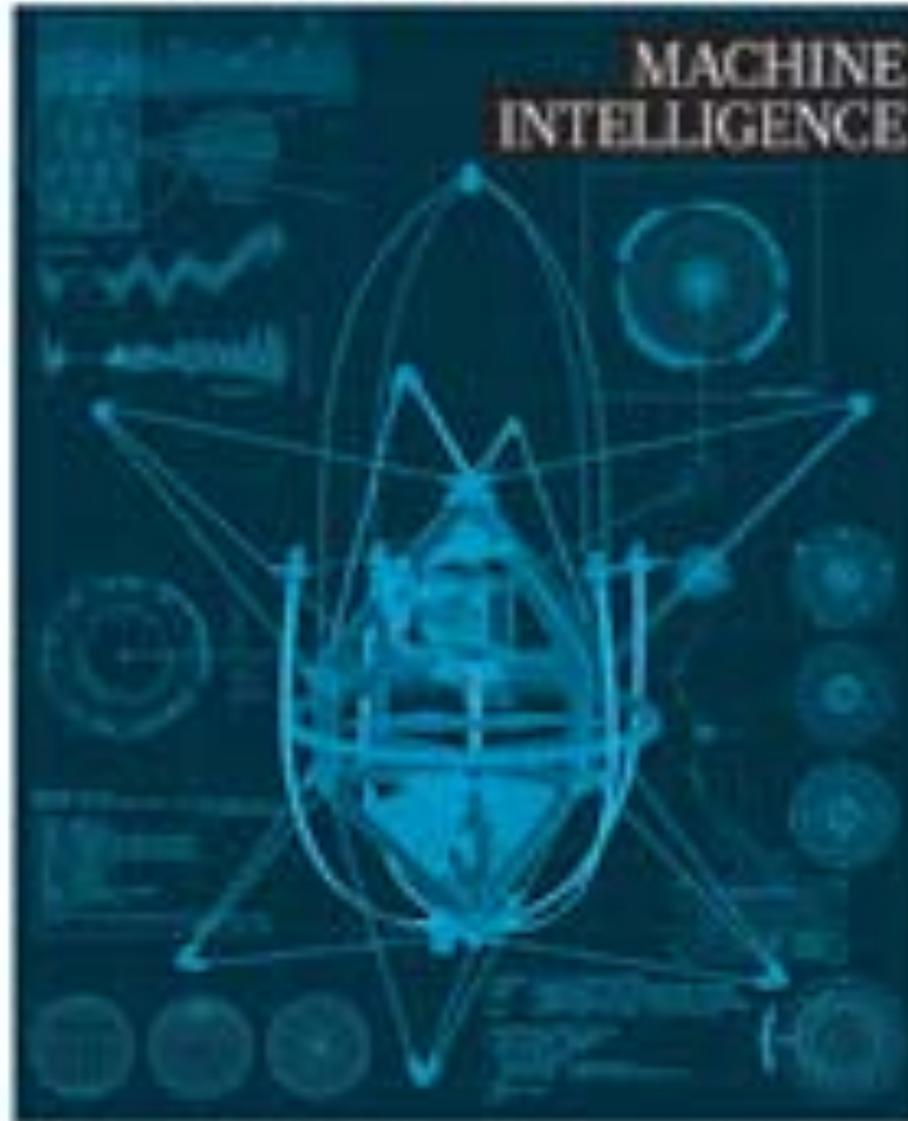
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Why now: very recent progress in AI



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Pedestrian accidents occur every day
in our increasingly intensive traffic environment.



Center for Brains,
Minds & Machines

Thus we see great advances
in AI based on machine
learning research of 20 years
ago ...

but we are still very far from
understanding human
intelligence and the brain

What is this?

What is Hueihan doing?

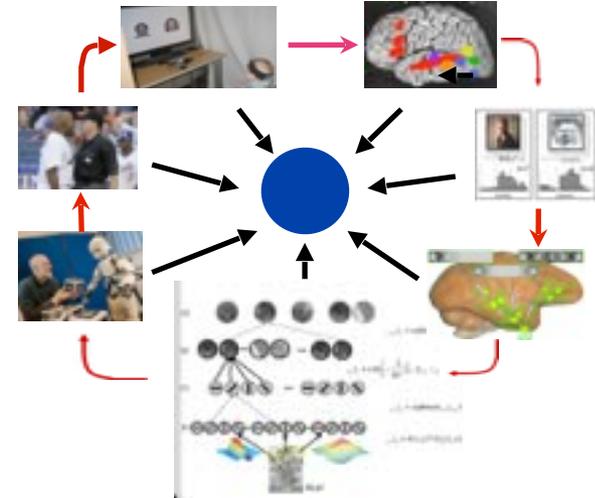
What does Hueihan think about Joel's thoughts about her?



Intelligence and Turing⁺⁺ Questions

- Intelligence —> Human Intelligence
- (Human) Intelligence: one word, many problems
- A CBMM mission: define and “answer” these *Turing⁺⁺ Questions*

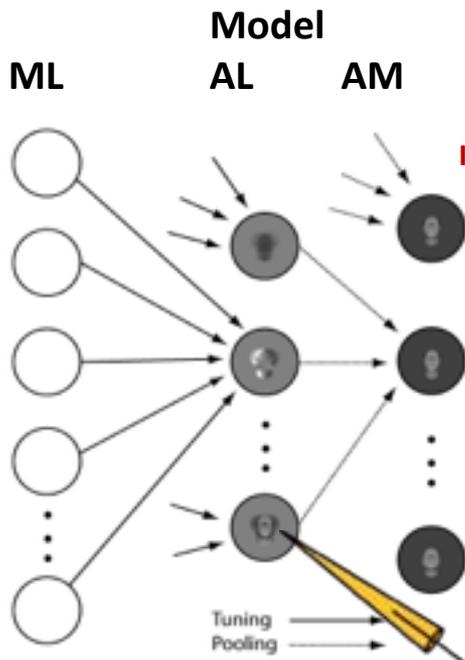
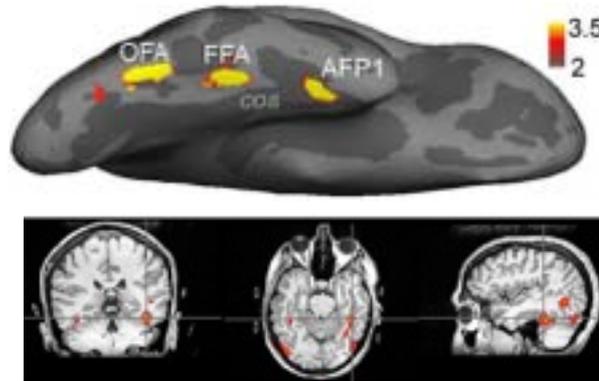
Turing++ Questions



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The challenge is to develop computational models that answer questions about images and videos such as *what is there / who is there / what is the person doing* and eventually more difficult questions such as *who is doing what to whom? what happens next?* at the computational, psychophysical and neural levels

The who question: face recognition from experiments to theory



Theory of Intelligence

Social Intelligence

Development of Intelligence

Neural Circuits of Intelligence

Visual Intelligence

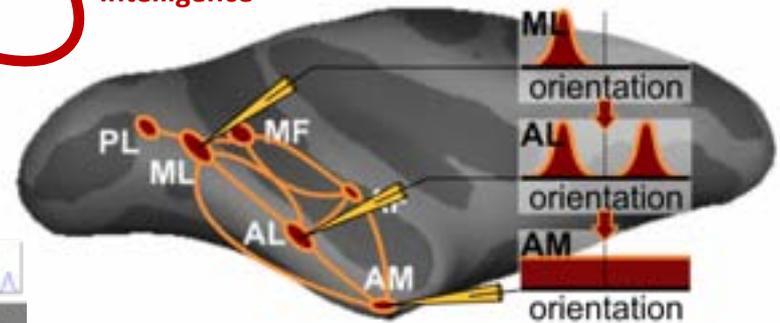
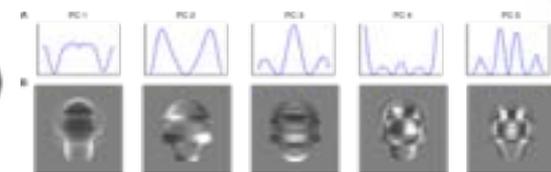


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A summary

To understand (human) intelligence, we must:

- Understand what we compute
- How what we compute develops
- How amplified by social interaction
- How implemented in neural tissues

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Resource: Brains, Minds and Machines Summer Course

Tomaso Poggio and Gabriel Kreiman

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