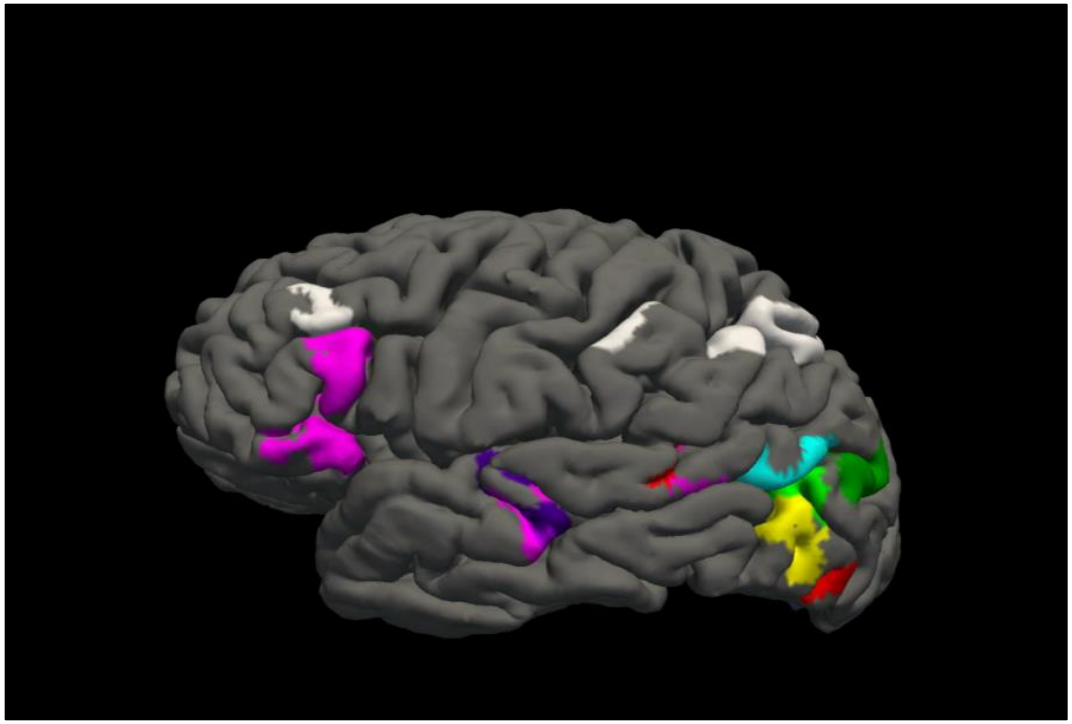
Nancy Kanwisher, MIT

http://nancysbraintalks.mit.edu



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my part of CBMM

My Interests:
What is the architecture of the human mind (fundamental components?)
How does this structure arise over development and over evolution?
What are the computations and representations in each region?
How do these parts work together to make us smart?
What is “special” about the human brain that enables uniquely human cognition?

Thrust 4: Social Intelligence

Goal: To understand the cognitive, computational, and neural basis of social perception.

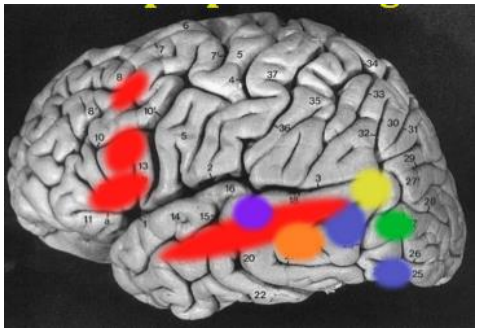
PIs: Kanwisher, Nakayama, Tenenbaum, Saxe, Spelke

Why social intelligence?

Grad Students & Postdocs:

Images removed due to copyright restrictions. Please see the video.

Why Social Intelligence?



- Social cognition is the crux of human intelligence
  - The *source* of much of human intelligence
  - A major driver of evolution of the brain
  - A large *percen*t of human cognition (in minutes & cortical area)

-- Greatest feats of the human intellect are products of groups of people working together

Thrust four: social perception.
What is that?

Turing++ Questions for Social Perception

-- **Who is this?**

– **What are they attending to?**

– **What are they doing?**

– **What will happen next?**

– **What are they feeling?**

– **What is their character?**

– **Are they interacting with someone else?**

– **What is the nature of the interaction?**

Brain Specializations for Social Perception

Infants

Adults

Thrust 4 Approach

Study these abilities in the system that does them best: the human mind and brain.

Roadmap:

1. Psychophysics

Characterize and quantify each ability:

how good are we?

what cues?

characterize the input

2. Computational modeling

3. Discover brain basis with

fMRI

ECOG

NIRs

some specific projects…..

Turing++ Questions for Social Perception

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Peterson: Face Recognition in Real-World Viewing

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Brain Specializations of Social Perception

Infants Lindsey Powell (+T1, Saxe)

Adults

Turing++ Questions for Social Perception

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Peterson: Face Recognition in Real-World

– **What are they attending to?**

Daniel Harari, Tao Gao (+T1, Tenenbaum)

– **What are they doing?**

Tao Gao, Harari (+T1, Tenenbaum)

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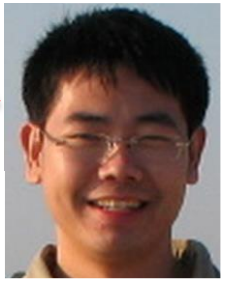
Gaze perception and the acuity of joint attention



Psychophysics and Modeling of reach target discrimination.

Brain Specializations for Social Perception

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Maryam Vaziri-Pashkam & Nakayama

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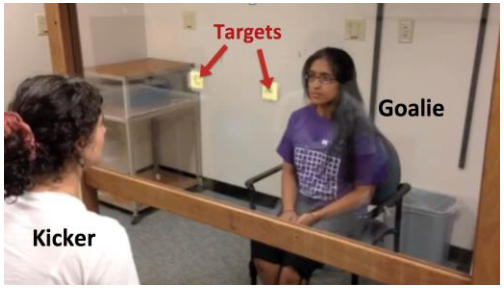
Maryam Vaziri-Pashkam



Ultrafast Blocking movements
(150ms, faster than choice RT)
Predictive information exists
prior to finger movement
Information distributed over body
Humans can extract this information
without learning
probably implicitly
Shows stunning action prediction
Next: machine learning on stimuli
to discover cues

Brain Specializations of Social Perception

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– **What are they feeling?**
McKone & Dawel

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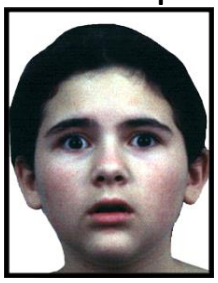
Elinor McKone: Virtually entire literature on perc of facial emotion uses *posed* expressions!



Source: Dawel, A. et al. "Perceived emotion genuineness: normative ratings for popular facial expression stimuli and the development of perceived-as-genuine and perceived-as-fake sets." *Behavior Research Methods* (2016): 1-24. DOI 10.3758/s13428-016-0813-2.

Brain Specializations of Social Perception
- Infants
- Adults

Psychophysics
fMRI (&MEG?) decoding of:
- real versus posed
- real E1 vs real E2
- static vs dynamic

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Isik, Kreiman, Kanwisher neural decoding

– **Are they interacting with someone else?**

Isik, Kreiman, Kanwisher neural decoding

– **What is the nature of the interaction?**

Isik, Kreiman, Kanwisher neural decoding

Leyla Isik

Decoding neural data (ECOG, fMRI, and MEG) of people watching movies:
identity
(face/voice/body)
actions
good guy/bad guy
interactions (pos/neg)
etc.

Brain Specializations of Social Perception

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Brain Specializations of Social Perception

Infants Lindsey Powell (Saxe)

Adults

Poster: Using fNIRS to Map Functional Specificity in the Infant Brain

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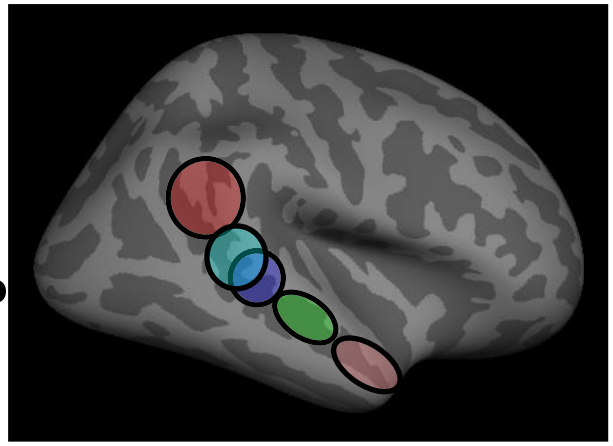
Isik, Kanwisher, Kreiman neural decoding

Theory of mind
Biological motion
Faces + Voices
Voice perception
Language + ToM



Brain Specializations of Social Perception

Infants Lindsey Powell (Saxe)

Adults Ben Deen, Rebecca Saxe →

The human STS comprises multiple functionally specific subregions for different aspects of social cognition.

Resource: Brains, Minds and Machines Summer Course

Tomaso Poggio and Gabriel Kreiman