Neuroeconomics and Eyetracking

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Neuroeconomics

- An Interdisciplinary field
  - Economics, Neuroscience, and Psychology
- Use Neuroscience methods to investigate Economic (Cognitive) questions
  - fMRI, PET (Good spatial resolution)
  - TMS, Lesion patients (Causal!)
  - EEG, MEG (Good temporal resolution)
  - Single Neuron Measurements (Monkeys only)
  - Psychophysical Measures (PDR, GSR, etc.)
  - Eyetracking (Information search + PDR)

Neuroeconomics

- Why should we care about this?
  - Gul and Pesendorfer (2005), "A Case for Mindless Economics"
- More Tools (good!)
  - Theory of the Firm with/without Game Theory
- Can make better predictions
  - This is what empirical studies are all about!
- Neuroscience people are doing it!
  - Economics have much to offer "them"

Neuroeconomics

- Holy Grail 1 (from Neuroscience side)
- How does neural tissue sustain itself and process information efficiently?
  - Unlike computers who don't worry about heat
- This is "Neuroeconomics 1"
  - Read Montague (2007), "Neuroeconomics: a view from neuroscience"

Neuroeconomics

- Holy Grail 2 (from Economics side)
- Can we find a "Theory of the Brain" that explains more human behavior?
  - Like "Theory of the Firm" in IO
- For example:
- Fudenberg and Levine (2006) "A Dual Self Model of Impulse Control," *American Economic Review* 96, 1449-1476.

Neuroeconomics: Where We Stand?

- Bits and pieces are coming together
- fMRI has great spatial resolution (areas of the brain), but
  - Temporal resolution is still 2 second per scan
  - "Activation" is indirect, not causal (only trace hemodynamic blood flow into brain regions)
- However, combining several tools gives a much clearer picture

Neuroeconomics

- Economics can guide experimental design
  - And can benefit from opening the black box
- SPM2 – Matlab Toolbox for imaging data (GLM!)
- Student Presentation
- Hsu, Bhatt, Adolphs, Tranel and Camerer (2005), "Neural Systems Responding to Degrees of Uncertainty In Human Decision Making," Science, 310, 9 December 2005, 1624-1625.

Neuroeconomics

- Another wild idea: What is "curiosity"?
- Kang, Hsu, Krajbich, Loewenstein, McClure, Wang, and Camerer (2007), "The Hunger for Knowledge: Neural Correlates of Curiosity," working paper.
- fMRI implications verified in follow-up study (behaviorally and eyetracking)

Neuroeconomics

- Can you think of a wild study to do?
- Remember, since Imaging data are noisy:
  - Need 90+ trials per subject (to aggregate)
  - Need very clean design (treatment vs. control)
  - Interaction is difficult (typically only 1 scanner)
- Chen-Ying Huang (NTU) is the expert!

Eyetracking

- Self presentation:
- Wang, Spezio, and Camerer (2008)
- **Pinocchio's Pupil:**
  - **Using Eyetracking and Pupil Dilation To Understand Truth-telling and Deception in Sender-Receiver Games**
- Under revision…

On-going Eyetracking Studies

- Chen, Huang, and Wang (2008)
  - A Window of Cognition: Eyetracking the Decision-Making Process in Graphical Beauty Contest Games
- Work-in-Progress:
  - Collective Responsibility
  - Eyetracking Learning