

# Modeling the Intuitive Decision Making of One Agent AND Tree-based Decision Making in Thousands

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Think. Learn. Succeed.



# Intuitive Decision Making

- Making decisions based on knowledge acquired intuitively, *without transformation of the intuitive knowledge into explicit knowledge*

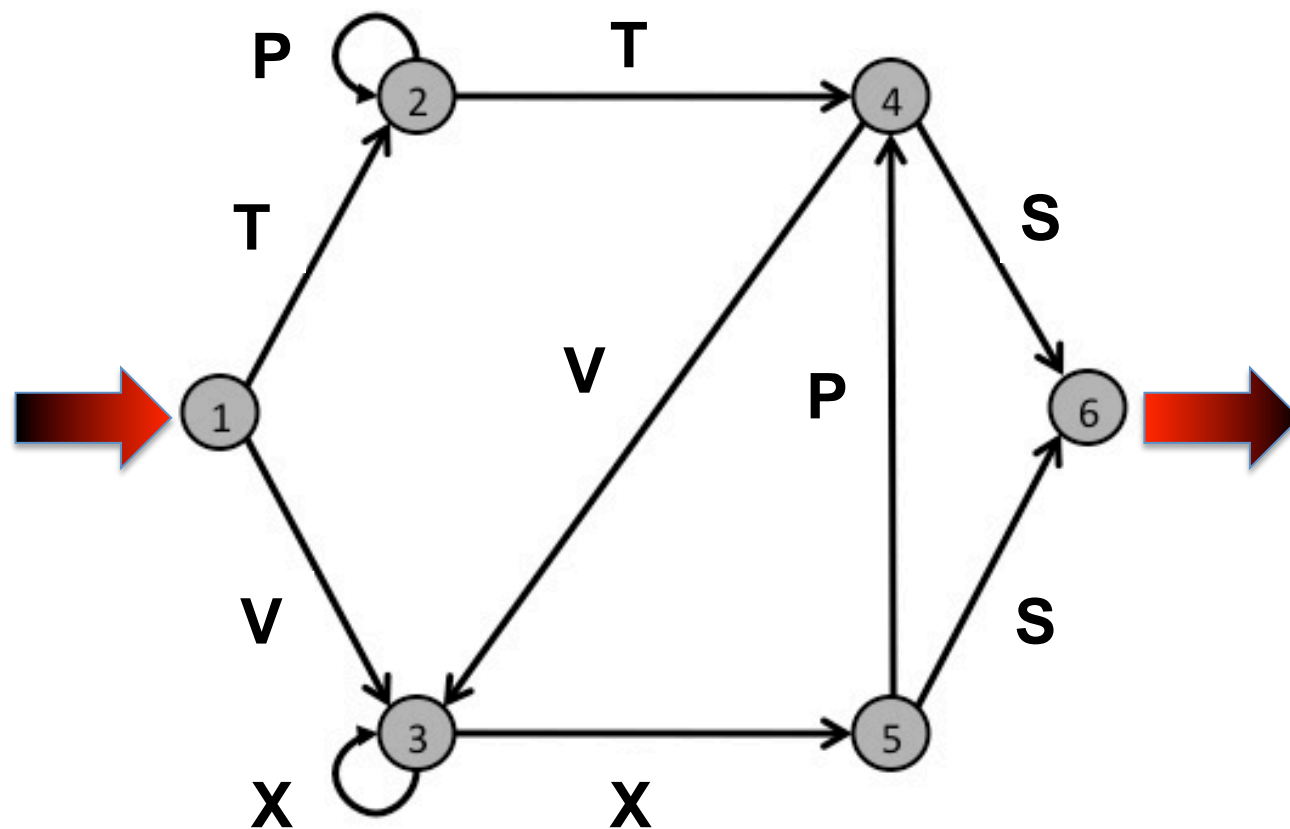
# Patterson's Experiment



# Reber's Artificial Grammar (1967)

- Samples:

TTS, TP...PTS,  
VXS, VX...XXS,  
TTVX...XPS, ...  
TTVXPVXS



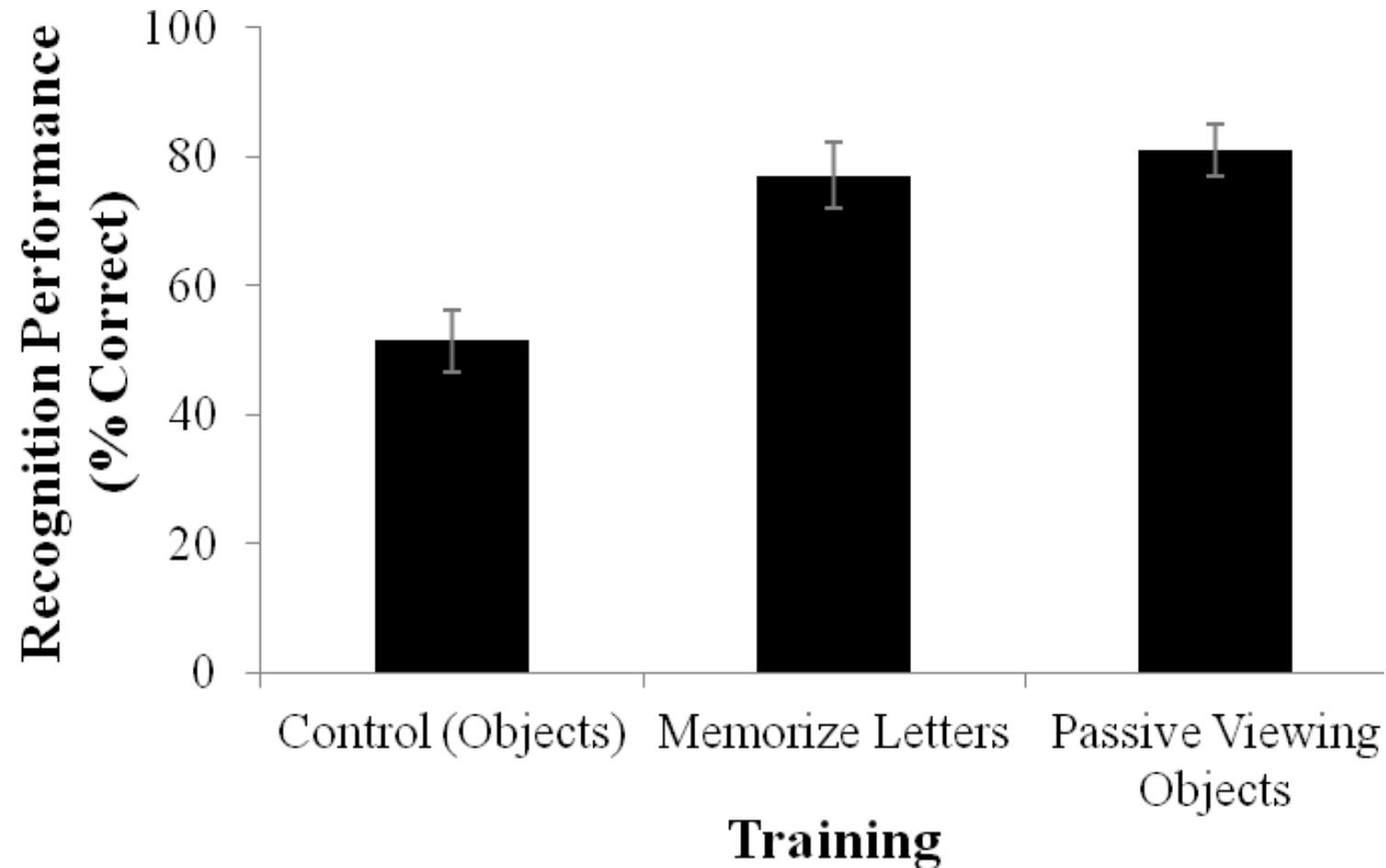
- Protocols:

**Train:** on 18 unique strings of length  $\leq 8$

Shown randomly in 6 blocks of 3 each 16 times, for 5 sec. with 0.6 sec. between

**Testing:** 22 valid and 22 foils (same letters, random order), each assessed twice

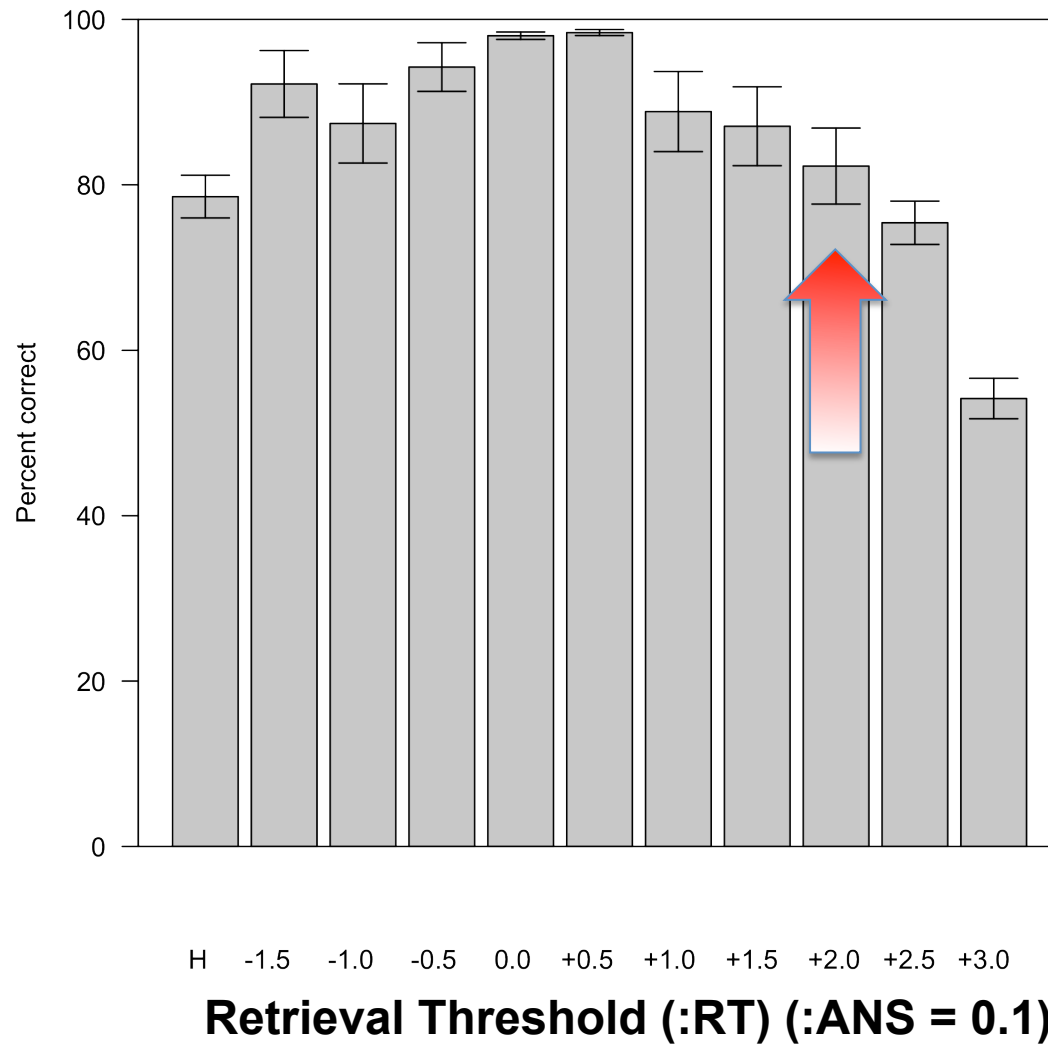
# Patterson's Experiment



# Newest Experiment: ACT-R Model

- Standard ACT-R can do the Reber experiment
- Theory implemented:
  - Read strings L->R, over and over, while available
  - Build chunks of sequential pairs of letters (bigrams)
  - To evaluate test string, read L->R & attempt to retrieve bigram chunks. If all recalled, recognized; otherwise not.
  - Two free parameters: retrieval threshold & noise

# Results (part 1)



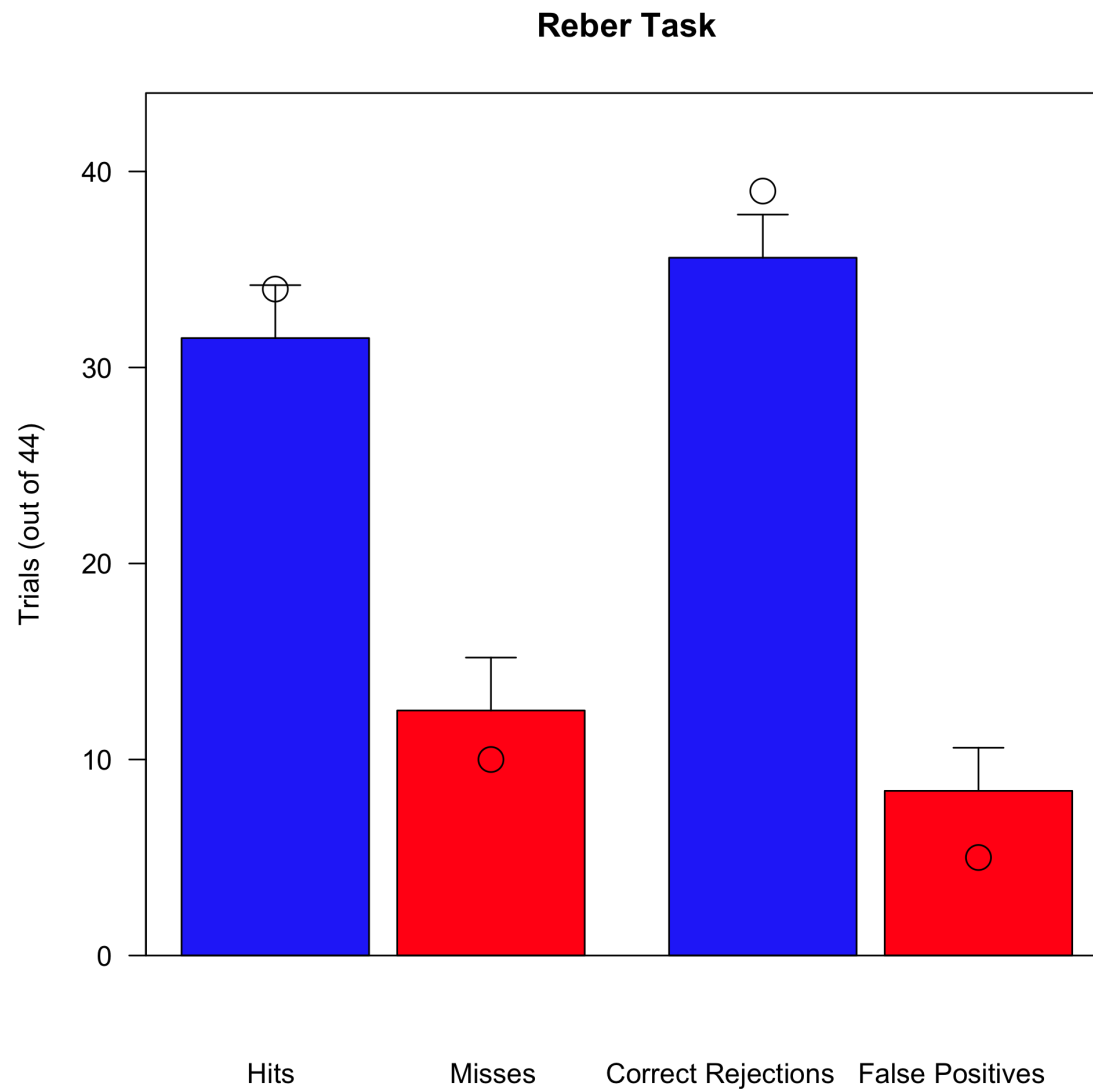
# Results (part 2)

Test: 22 valid & 22 invalid strings shown twice

	<u>Human</u>	<u>Model</u>
Hits	31.5(2.7)	34/44
Misses	12.5(2.7)	10/44
Correct Rejections	35.6(2.2)	39/44
False Alarms	8.4(2.2)	5/44



# Results (part 2)



# Other Possible Theories

- Trigrams rather than bigrams?
- Voting rather than all bigrams recalled?
- Explicit representations?
- Primacy/recency?

This is your invitation...

# Future Directions

- Comparing errors by participants and model
- Cognitive process of converting implicit knowledge (perception chunks) into an explicit representation

# Modeling Trust Experiments

- Ewart de Visser (new PhD): human-aid trust
- Frank Krueger: Neural Correlates of Trust  
conditional/unconditional trust

# Ewart's Human-Aid Trust

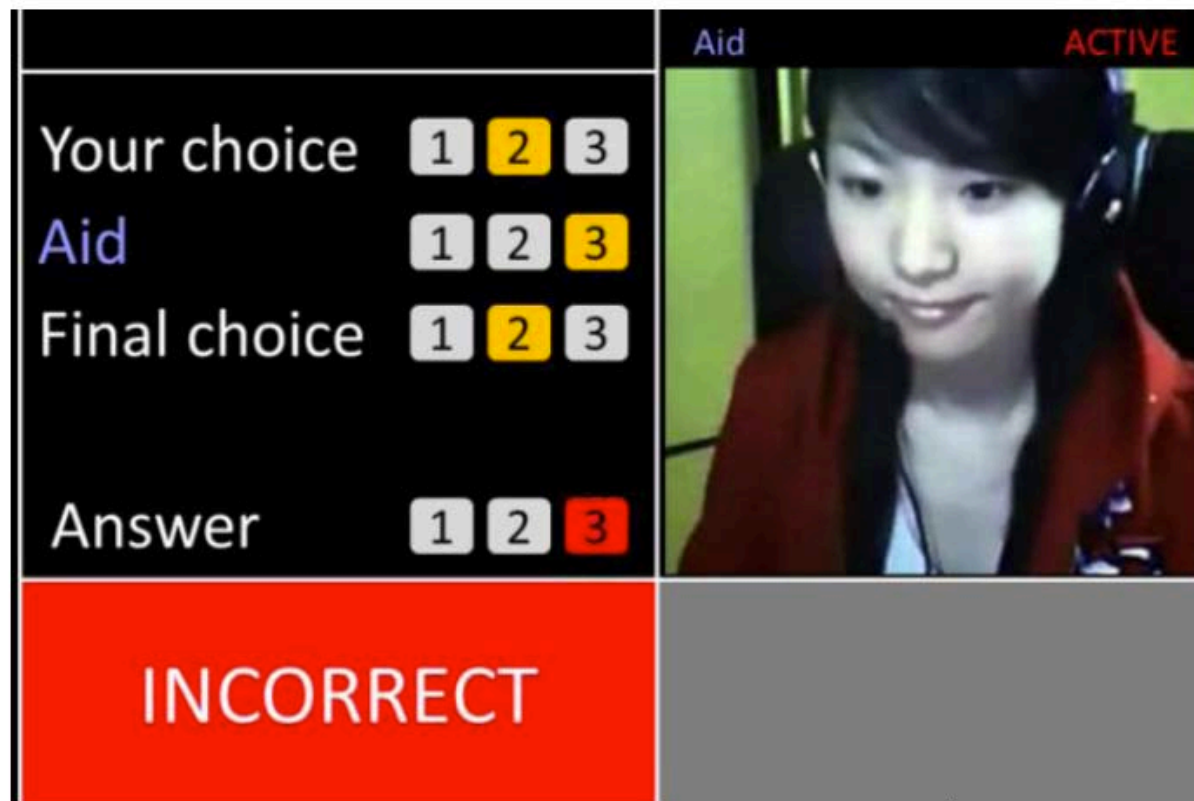
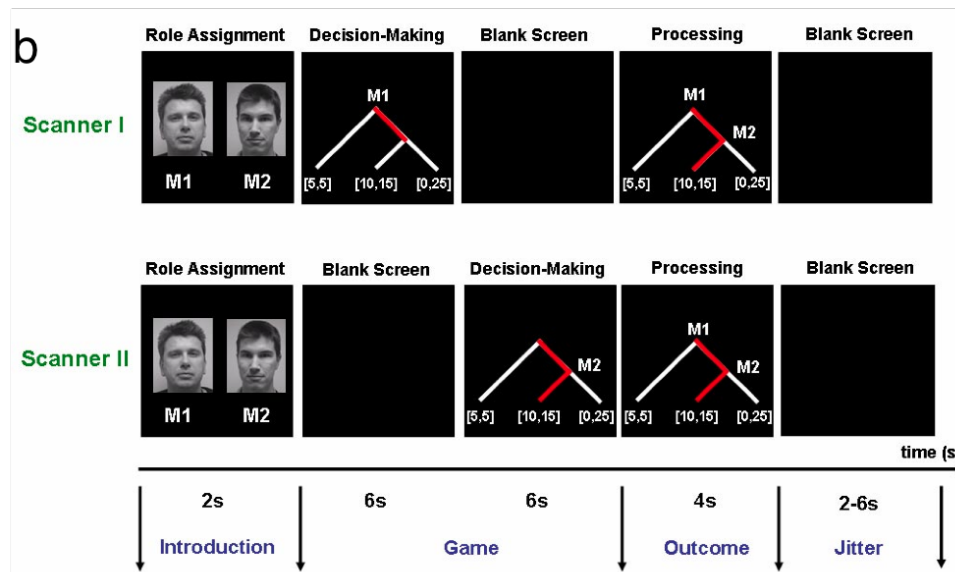
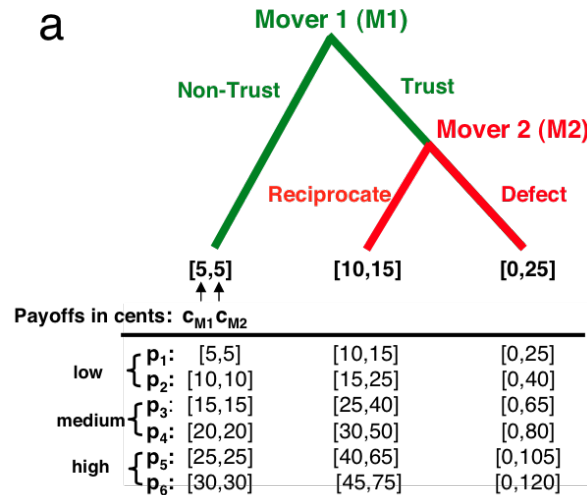


Figure 3. The TNO Trust Task (T<sup>3</sup>).

# Conditional/Unconditional Trust Development and Maintenance



# From Modeling 1 to Thousands

- Primary work in modeling cognition for social simulations, i.e., thousands of agents
- Why not ACT-R, Soar, or other? the time scales
  - Simulating decisions made on daily basis
  - And thousands (millions?) of agent decisions per day of simulation
  - Our model runs are over years to decades of simulated time

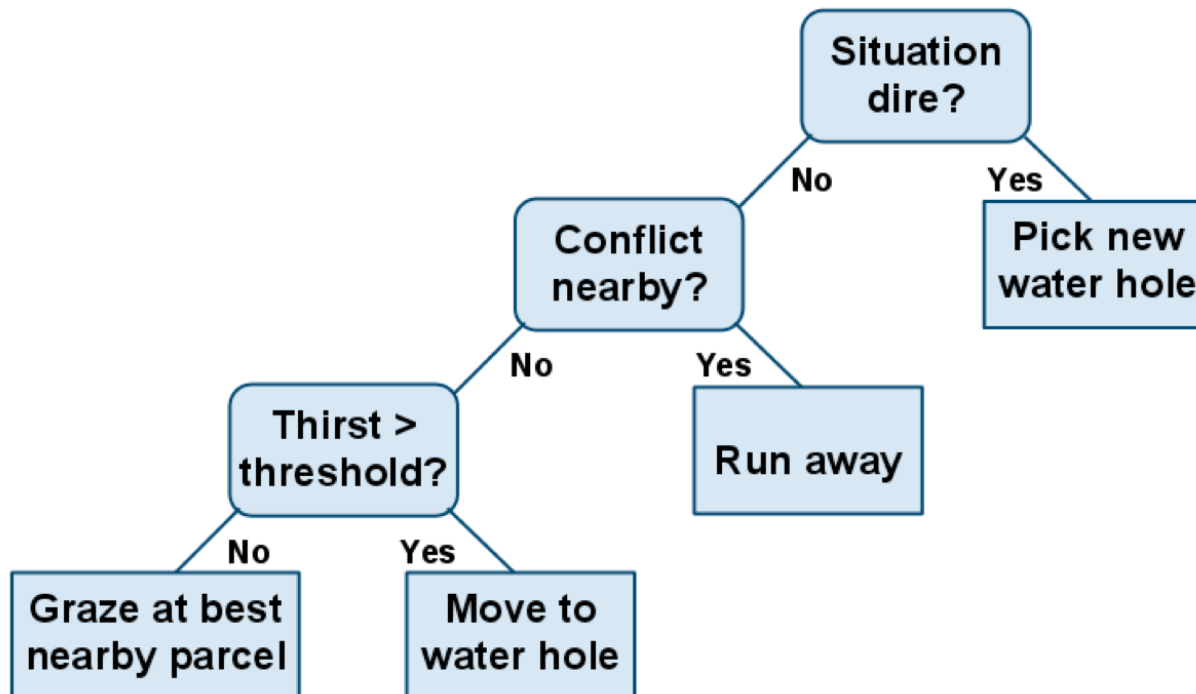
# Light Weight Cognition

- Gigerenzer's "fast and frugal" decision trees
  - + Matches end result of cognition (not process)
  - + Implemented directly in simulation's code
- Major competition: calculation-based decisions
- Major advantage: changed discussion to concepts and reasoning rather than weights



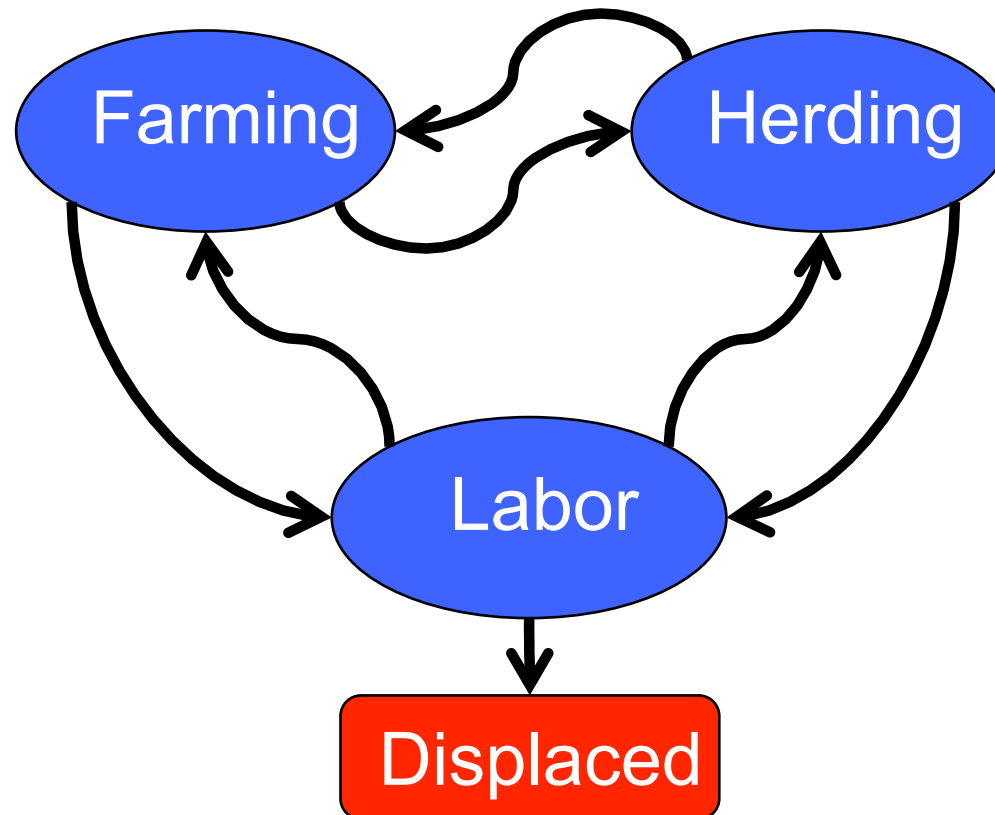
# Herder's Daily Decision

- Where to move herd?



# Household Management Decisions

- Where to apply household resources for household survival/welfare?



# System 1/System 2 Balancing Act

Heart in  
Individual cognition  
(10-20%)



Stomach drives  
social simulation  
(90-80%)

Thank you.

# Acknowledgements

- Intuitive Decision Making & trust modeling:  
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