Mind-Reading vs. Simulation in Epistemically Heterogeneous Social Networks
Gerhard Schaden

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Background: The Nature of Pragmatic Inference

- Pragmatics concerns context-dependent inferences (generally assumed to be linked to rational use of language by situated agents)
- How is this done (beyond and independent of particular algorithms, e.g., Gricean conversational maxims, relevance theory or argumentation theory)?

Mind-Reading
(see, e.g., Sperber and Wilson, 2002)
- Figure out epistemic state of interlocutors
- Determine inferences based on inferred epistemic state of addressee

Simulation Theory
(see, e.g., Carruthers and Smith, 1996, p. 3)
- Assume that interlocutor has same epistemic state as yourself
- Simulate likely inferences

- Difference might matter when agents’ epistemic contexts are not identical, that is, when they do not know and believe the same things (in real life: always)
- Not clear to which degree Mind-Reading is assumed to be psychologically real
- Mind-Reading is slow and error-prone (especially when agents share little common ground)

Epistemically Heterogeneous Social Networks

- Humans are an unusually social and cooperative species (for primates). As a consequence, all language learning (and most of language use) takes place in social networks.

  Linguistic theory is concerned primarily with an ideal speaker-listener, in a completely homogeneous speech community [...] (Chomsky 1965, p. 3)

- This position necessarily ignores everything related to variation
- Variation is a key ingredient in language change
- Two kinds of heterogeneity will be investigated:
  - contact in social networks; and
  - partly differing epistemic contexts.

Reinforcement Learning with Polya Urns

- Polya Urns provide a mathematical model of reinforcement learning.
- Randomly draw a ball from the urn.
- If the ball corresponds to the correct answer, a further ball will be added to the urn.

Learning Internally Differentiated Lexical Items

- I assume internally differentiated lexical representations like Pustejovsky’s qualia structure.

General Pattern: Absence of Mutation vs. Mutation (Regardless of Inference Method)

- With Mind-Reading inference, the lexical distance between agents of different islands is bigger than with Simulation inference
- Because Mind-Readers discard non-shared epistemic states, they leave a smaller foot-print of their epistemic differences
- All things being equal, the less agents take into account other’s epistemic states, the more similar they become

Pragmatics in Production

Mind-Reading Inferences
Agents discard for production parts of their own epistemic state the interlocutor lacks

Simulation Inferences
Agents always take into account their full epistemic state for production

Significant differences (p-values from Kruskal-Wallis test for network of 9 × 10 agents):

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Mind-Reading Increases Lexical Distance

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Acknowledgments & Sample References

All simulations have been performed with Shed Common Lisp, using the graph library by Eva Scheler (https://github.com/evascheler/graph). Networks have been drawn with graphviz (Gansner and North, 2000). Data analysis has been performed with GNU S.