Teaching and learning guide for

Teaching & Learning Guide for: Computational Approaches to the Pragmatics Problem

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Authors' Introduction

The pragmatics of natural language poses a challenge both at a theoretical and at a practical level, in part because of the absence of simple one-one mappings between form and meaning. This is exemplified by the recognition of speech act or dialogue act types. The linguistic tradition of research in this area has been primarily taxonomic in its focus, and has had relatively little to say about the processes underpinning speech act recognition in real time. Similarly, the rich body of applied computational research on dialogue has chiefly addressed the practical considerations of how to build working artificial systems that can handle natural language. Nevertheless, both strands of research have the potential to offer useful psycholinguistic insights, which have only recently begun to be explored. This course presents some of the relevant background and discusses the relevance of computational and theoretical dialogue work to active research questions in linguistics.

Authors Recommend:

1. Jurafsky, Dan (2008). Pragmatics and computational linguistics. In Gregory Ward & Laurence R. Horn (eds.), *Handbook of Pragmatics*. Oxford: Blackwell. 578-604.

   An excellent general introduction to the idea of "computational pragmatics" with particular focus on the topic of speech act recognition. Explains the nature of the problem and demarcates the major approaches that have been adopted in order to address it.

2. Levinson, Stephen C. (1983). *Pragmatics* (esp. chapter 5, Speech Acts, and chapter 6, Conversational structure). Cambridge: Cambridge University Press.

   Chapter 5 of Levinson's influential textbook discusses the difficulties associated with different theoretical proposals as to how speech acts can be identified. Chapter 6 provides an overview of the importance of conversation in pragmatics, and contrasts the major research traditions hitherto examining the topic.

3. Levinson, Stephen C. (1995). Interactional biases in human thinking. In E. N. Goody (ed.), *Social Intelligence and Interaction*. Cambridge: Cambridge University Press. 221-260.

   Provides useful theoretical background on the problems inherent to the process of extracting pragmatic meaning from an underspecified linguistic signal. Taken together with work on the immediacy of turn-taking (see below), this indicates the extent of the challenge facing language users as they attempt to interpret and respond to utterances in real time.

4. Stivers, Tanya, Enfield, Nick J., Brown, Penelope, Englert, Christina, Hayashi, Makoto, Heinemann, Trine, Hoymann, Gertie, Rossano, Federico, De Ruiter, Jan P., Yoon, Kyung-Eun, & Levinson, Stephen C. (2009). Universals and cultural variation in turn-taking in conversation. *Proceedings of the National Academy of Sciences of the United States of America*, 106: 10587-10592.

A short paper that demonstrates the rapidity of turn-taking across a typological diverse sample of languages, and touches upon the issue of how this interacts with dialogue act type.

5. Searle, John R. (1975). Indirect speech acts. In Peter Cole & Jerry L. Morgan (eds.), *Syntax and Semantics, Vol. 3: Speech Acts*. New York: Academic Press. 59-82.

Presents an influential view of how indirect speech acts can be identified through a process of reasoning, which constitutes an important part of the context for plan-based accounts as well as a position that alternative computational approaches can be seen to be reacting against.

6. Perrault, C. Raymond, & Allen, James F. (1980). A plan-based analysis of indirect speech acts. *Computational Linguistics*, 6: 167-182.

An early attempt to systematise the recognition of speech acts within a plan-based system, this paper sketches a sophisticated model for the computational treatment of speech acts that draws upon the reasoning-based approach of Searle and others and presages a great deal of subsequent work in this tradition.

7. Traum, David R. (1999). Speech acts for dialogue agents. In M. Wooldridge & A. Rao (eds.), *Foundations of Rational Agency*. Dordrecht: Kluwer Academic Publishers. 169-201.

   Traum offers a computationally-informed perspective on the question of how dialogue acts, and particularly so-called dialogue act types, might be relevant to the construction of dialogue systems. In doing so he furnishes insight into why the theoretical linguistic and applied computational approaches to dialogue acts diverged to such an extent.

8. DeVault, David, Sagae, Kenji, & Traum, David (2011). Incremental interpretation and prediction of utterance meaning for interactive dialogue. *Dialogue and Discourse* 2: 143-170.

   Among the huge body of work on dialogue systems, this presents some features of particular interest from a linguistic perspective. Dialogue act types are explicitly treated within this model, although they are not used as a basis for classification in the way that linguistics would traditionally propose. Coupled with the incrementality of the proposed model, it's tempting to see this as a hint as to how the theoretical questions could be informed by computational work, even when that computational work is primarily directed towards entirely different practical goals.

Note: We have focused here on what we consider to be the research in this field that is most directly relevant to psycholinguistic questions. However, approaching the field from other perspectives, some other research becomes potentially relevant. In particular, from a theoretical computer science perspective, this notably includes the following.

Bunt, Harry, et al. (2010). Towards an ISO standard for dialogue act annotation. *LREC 2010*.

Asher, Nicholas, and Lascarides, Alex (2003). *Logics of Conversation*. Cambridge: Cambridge University Press.

Sample Syllabus:

Week 1: Framing the pragmatics problem. Why intention recognition involves many-to-many mappings (and more generally, the limitations of the Shannon-Weaver model of communication as applied to human-human interactions). Evidence that people are able to identify dialogue acts rapidly on-line: turn-taking, backchannel responses and so on. The difficulty of treating this within low-level computational models.

Week 2: Inferential computational models of intention recognition. The tradition of planning models, and their relation to the existing linguistic literature (Searle and colleagues). Their connections to traditional AI approaches. Possible limitations of this line of attack: notably, problems with the assumption that utterances have an underlying literal meaning.

Week 3: Probabilistic models of intention recognition. The probabilistic approach and its relations to the ideas of microgrammar, conversational games and scripts. What factors can usefully contribute to the identification of dialogue acts, and how might computational work help us to understand this? Determining the appropriate "tagsets" for dialogue acts. Using N-gram grammars.

Week 4: Overview and outlook. The advantages and disadvantages of the competing approaches. How might we proceed towards an integrative account of dialogue act recognition, and what might this tell us about the way humans solve this problem? State-of-the-art in computational modelling of intention recognition.

Focus Questions

1. What is the relationship between what we actually say, and what we want to accomplish with our utterance socially? To what degree is that relationship influenced by the social and discourse context?

2. Which cues can we use to guess the identity of a speech act?

3. Is every utterance "in the wild" associated with a unique, idiosyncratic speech act, or are there a limited number of possible speech acts? And if so, how could we determine which ones they are?

4. How does the core semantics of an utterance relate to the speech act that it is used to perform?

5. Does the speech act of an utterance influence its semantic and/or syntactic interpretation? Can knowledge of the speech act facilitate the disambiguation of an utterance?

Seminar Activity

For a simple “chatterbot”, it’s easy to cause the conversation to break down, for instance by directing the conversation outside the machine’s knowledge base. Consequently, it’s easy to tell that such a system is artificial, and it would fail the Turing Test (a criterion for AI that requires a dialogue system to pass as a human). More sophisticated systems have better coping strategies, however. Suppose that your goal was to test a system like that and prove that it was artificial. How would you achieve that? In particular, at a dialogue level, what would be your expectations about how the machine would interact, and how could you try to fool it into giving a non-human-like response?