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

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8 *This guide accompanies the following article(s):*

9 *Computational Approaches to the Pragmatics Problem, Language and Linguistics Compass 8/4 (2014) pp. 133-*
10 *143 [DOI: 10.1111/lnc3.12072]*

11

12

13 ***Authors' Introduction***

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

25

26 ***Authors Recommend:***

27

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

30

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

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

37

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

- 42 3. Levinson, Stephen C. (1995). Interactional biases in human thinking. In E. N. Goody
43 (ed.), *Social Intelligence and Interaction*. Cambridge: Cambridge University Press.
44 221-260.

45

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

51

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

57

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

61

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

64

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

69

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

72

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

77

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

81
82 Traum offers a computationally-informed perspective on the question of how
83 dialogue acts, and particularly so-called dialogue act types, might be relevant to the
84 construction of dialogue systems. In doing so he furnishes insight into why the
85 theoretical linguistic and applied computational approaches to dialogue acts diverged
86 to such an extent.

87
88 8. DeVault, David, Sagae, Kenji, & Traum, David (2011). Incremental interpretation
89 and prediction of utterance meaning for interactive dialogue. *Dialogue and Discourse*
90 2: 143-170.

91
92 Among the huge body of work on dialogue systems, this presents some features of
93 particular interest from a linguistic perspective. Dialogue act types are explicitly
94 treated within this model, although they are not used as a basis for classification in
95 the way that linguistics would traditionally propose. Coupled with the incrementality
96 of the proposed model, it's tempting to see this as a hint as to how the theoretical
97 questions could be informed by computational work, even when that computational
98 work is primarily directed towards entirely different practical goals.

99
100 **Note:** We have focused here on what we consider to be the research in this field that is most
101 directly relevant to psycholinguistic questions. However, approaching the field from other
102 perspectives, some other research becomes potentially relevant. In particular, from a
103 theoretical computer science perspective, this notably includes the following.

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

105 Asher, Nicholas, and Lascarides, Alex (2003). *Logics of Conversation*. Cambridge:
106 Cambridge University Press.
107

108 *Sample Syllabus:*

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

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

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

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

127

128 *Focus Questions*

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

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

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

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

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

140

141 *Seminar Activity*

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