CHAPTER ONE

INTRODUCTION

The aim of this book is to give an account of production and interpretation of natural language utterances that would be linguistically, psychologically, and computationally plausible.

The central goal will be to explain the fact that human speakers trust they will reach coordination with their hearer on the intentions that motivated them to speak. This trust is compatible only with success rates for coordination in standard conversation well over 0.9: failure should be the exception—while being quite possible.

In this chapter, an argument will be presented for a theory of production and interpretation where the role of competence grammar is restricted to one aspect of production, the linguistic rules that constrain the mapping from a speaker intention to its verbal expression. Interpretation is understood as analogous to interpretation in computer vision, a mapping from the utterance to the interpretation that maximises the product of its prior probability in the context and the probability that it will be produced given the interpretation, a probability defined by the competence grammar. By Bayes' theorem, that interpretation is the most probable interpretation of the utterance. If, as speakers seem to assume and as is a necessary assumption for the evolutionary emergence of natural languages, coordination between speaker and hearer is standardly achieved, it is not sufficient that the hearer follows a strategy of probability maximisation in the face of the massive underdetermination of meaning by form in natural languages.[1] It follows that for coordination, one needs to assume that speakers have adapted to the hearer strategy and design their utterances so that their most probable interpretation is in fact the interpretation the speaker intends.

The arguments against an account of interpretation based on symbolic Aristotelian Competence Grammars as defined in section 1.1 are that they cannot help in explaining coordination on meaning (section 1.1.1), that the

[1] This property sets them apart from the formal languages in logic and computer science that have been designed in such a way that the form completely determines the meaning in terms of model theory or the process that should be executed.

parsing algorithms to which they give rise do not have the linear time complexity that seems characteristic of human performance (section 1.1.2) and that they would predict that whatever a speaker can understand, she could also produce, a prediction in conflict with the production-comprehension gap found in empirical studies (section 1.1.3).

In favour of the Bayesian account of interpretation, three arguments are given. The first are the arguments for an architecture of a grammar in which the grammar maps meanings to forms: linguistic generalisations are better captured when the grammar tries to map meanings on forms and can employ the Elsewhere Principle to explain blocking (section 1.2.1). Bayesian interpretation can immediately use such a grammar and does not need a similar rule-based interpretation grammar. Further, there is considerable evidence for simulated production in human language interpretation processes (section 1.4.1). Mirror neurons can also be interpreted as achieving a simulation of motor movements as a component of Bayesian interpretation processes and thus as embodying a successful perceptual strategy that would also be employed in human language understanding (section 1.4.2). Bayesian interpretation can also be read into Grice's concept of non-natural meaning and in Liberman's motor theory of speech perception. In fact, the intuition behind these theories is very much the appeal of Bayesian interpretation. The connection with Grice also makes it clear that Bayesian interpretation is closely connected with pragmatics. We will in fact argue with Hobbs et al. (1990) that pragmatic interpretation is a side effect of interpretation as finding the best explanation of the utterance as in Hobbs' interpretation by abduction or in Bayesian interpretation.

1.1. Aristotelian Competence Grammars

The dominant view in linguistics is that an account of a given language should be given as an Aristotelian Competence Grammar (ACG) of that language. A competence grammar would be an account of linguistic competence only, i.e., its aim would be to explain the linguistic knowledge a competent speaker of a language applies in producing and interpreting utterances and it would not concern itself with processes involved in language use. An Aristotelian grammar for a particular language is a grammar which characterises the language as a relation between the expressions of the language and their meanings.[2]

[2] Calling this kind of grammar Aristotelian can be based on a brief discussion in chap-