Conclusions and Future Work

7.1 Conclusions

In this book we have investigated the role of enthymemes and topoi in dialogue. These concepts, which are known from Aristotle's work, refer to rhetorical arguments and the warrants of such arguments respectively. A defining feature of an enthymeme is that the conclusion does not necessarily follow from its premises (unlike in a logical argument), and therefore the topoi that underpin enthymemes must be *acceptable* to the audience or interlocutor at which the argument is aimed. Hence, the reasoning based on topoi is sometimes referred to as "common sense" reasoning.

However, enthymematic reasoning goes beyond that. In fact any type of reasoning can be accounted for using enthymemes and topoi, ranging from situations where we do not find a topos acceptable (and which are thus not part of "common sense") but *recognisable*, to instances of strictly logical reasoning where the inference rules have been made explicit (Brandom, 1998).

In Chapter 1 we introduced the concepts of enthymeme and topos and considered how they may present themselves in dialogue, and how enthymematic reasoning is relevant to many of the challenges in interactional linguistics. In Chapter 2 we were interested in how enthymemes and topoi relate to different types of inferences and how they contribute to cohesion and meaning. In Chapter 3 we introduced a dialogue semantic account of how enthymematic reasoning causes updates of dialogue participants' information states, cast in TTR, a type theory with records. In Chapter 4 we looked at how some features of dialogical reasoning such as *why*-questions can be analysed in terms of enthymemes and topoi, and in Chapter 5 we moved on to consider how enthymematic reasoning relates to models of dialogue, context and cognition. In Chapter 6 we looked at how our theory accounts for non-monotonicity, ambiguous meaning in conversation and the acquisition of new topoi. In this final chapter we will sum up the main conclusions drawn in the previous chapters and suggest some directions for future work.

7.1.1 Pragmatic Inference

Few theories in linguistics or philosophy of language deny that some kind of background knowledge or set of beliefs about the world is necessary in order for a language user to draw pragmatic inferences. However, the organisation of

this knowledge and the mechanisms for including it in dialogue models are still far from accounted for in pragmatics.

The anti-inferentialist theory of meaning in context (Recanati, 2004) does pay more attention to the role of world knowledge than theories like Gricean pragmatics and Relevance Theory. But it mainly acknowledges the role of world knowledge in the context of primary pragmatic processes such as disambiguation and enrichment, and less as underpinning pragmatic inferences like conversational implicatures.

In overtly rhetorical discourse such as political speeches the role of background knowledge or assumptions is particularly evident. In this context enthymemes are sometimes very conspicuous since they draw on potentially controversial topoi. This is not least true in the current, increasingly polarised, political climate.

In dialogue, particularly informal conversation, on the other hand, enthymematic arguments tend to be less noticeable, as many of the things that underpin our arguments in everyday conversation are associated with commonly acknowledged topoi. For example, when interpreting pieces of dialogue like “Let’s walk along Walnut Street—it’s shorter” we might not even reflect on the rhetorical structure, since the enthymeme conveyed is based on commonplace and uncontroversial topoi such as the assumptions that if you are going somewhere you want to get there as quickly as possible, if a route is short it is fast, etc.

In the literature on pragmatic inferences it is often suggested that the principles for making such inferences are universal and independent of context. We have shown that while we may draw on general principles to infer more than the truth-conditional content of an utterance, we cannot rely only on a small and closed set of high-level principles like Gricean maxims or relevance assumptions.

7.1.2 *Defining Genres*

In Chapter 5 we discussed some parameters that can be used to distinguish between genres of language use or conversational types. We mentioned *activity*, *communicative project* and *conversational game* as examples of such parameters. We may think of communicative projects as linked to the subgoals of the activity, and of conversational games as related to activities as well as to projects, in the sense that the speech act sequence (or sequence of adjacency pairs) typically employed to carry out a communicative project depends on the nature of the project itself, but also on the kind of activity in association with which the conversation occurs.

Let us imagine, for example, that a group of friends are going camping and they are dividing up the various tasks which are necessary to set up camp. In

this scenario, the activity is “setting up camp”. The communicative project of making decisions about tasks would probably be carried out by means of a different conversational game, or sequence of conversational games, than in a similar situation in the military where hierarchies are very well defined and there is no expectation that decisions should be made jointly.

We suggested that topoi should be added to the set of parameters defining conversational types. In this context, the notion of topoi is to some extent related to activity type, since certain topoi are strongly associated with particular activity types. For example, in a patient-doctor conversation we can expect topoi related to health, body, etc., to be more frequent than topoi regarding the economy or money. However, topoi also contribute to how the activity plays out, since the socio-cultural context in which the activity is embedded may affect *which* topoi of health are introduced in the interaction.

7.1.3 *Enthymemes in Conversational AI*

Related to the question of defining genres of conversation is the question of how to model context. When modelling artificial agents, world knowledge may be organised for example as schemas or frames. These can be seen as groups or clusters of connected concepts for things, people and events, usually related to a particular domain or activity such as dining in a restaurant. While we do not want to rule out the use of frames and schemas for modelling context, we suggest that modelling some world knowledge as topoi could be advantageous. Many topoi would be included in several schemas and it might sometimes be hard for an agent to identify a given situation as belonging to a particular schema or frame, whereas it may be easier to recognise an enthymematic argument as evoking a particular topos. With a set of topoi at its disposal rather than only a set of domain specific schemas, an artificial agent has a higher degree of flexibility and is free to draw on any topos in any domain, specify it, generalise it and combine it with other topoi just as people do. It seems to us that this approach is valuable if we want to build creative agents who can adjust to new situations.

In the context of dialogue systems we pointed out a connection between enthymemes and informationally redundant utterances (IRUs). IRUs have been shown to contribute to decreasing the cognitive load of dialogue participants. We argued that IRUs and their antecedents evoke enthymemes drawing on situation relevant topoi. The fact that suggestions, proposals or claims are presented with a supporting premise decreases cognitive load, since the addressee has to do less work to find the appropriate topos or topoi.

7.1.4 *Accommodation*

In the context of pragmatic inferences we extended the notion of accommodation to cover enthymemes and topoi. We discussed several different cases of topos accommodation, that is, when a topos is added to the discourse model because it is perceived as a necessary warrant of an enthymeme under discussion. In the modelling of a dialogue, accommodation of a topos results in integrating the topos on the shared DGB.¹ We distinguished different cases of topos accommodation based on the resources available to the language user and the salience of the topos in a given context.

The first case is when a dialogue participant anticipates the accommodation of a topos, that is, the topos is already salient and part of the discourse model for a dialogue participant. The accommodation in this case consists of the integration of already acknowledged and relevant topoi into the shared discourse model. In our model, this corresponds to the topoi being moved from the private to the shared DGB. This kind of topos accommodation was described in Section 4.2.1.

Secondly, we have the case where a topos is evoked that is available in the long term memory of a dialogue participant. In this case, the topos is recognisable to the dialogue participant, but it is not salient in the sense that it is already present in his or her mind in the discourse context. An example where this kind of accommodation occurs is the excerpt about “rollers” in (4.36).

Note that we do not make strong claims regarding the precise architecture of the private game board and other resources accessible to a dialogue participant. We could think of the rhetorical resources of an agent as part of that agent’s private game board, or external to it. The point is that we sometimes need to differentiate between easily accessible topoi (ones that are salient and relevant for a particular speaker engaged in dialogue in a particular context) and less accessible topoi.

Another case of accommodation is when a dialogue participant cannot identify a topos that would warrant the enthymeme currently under discussion, but is still able to reconstruct and tentatively accommodate a topos that warrants the enthymeme. This means that we can accommodate topoi we did not previously recognise. We suggest that this kind of accommodation contributes to acquisition of new topoi, in that an agent may add new, tentatively

1 Since topoi are usually not made explicit, they are not straightforwardly integrated in the way that explicit dialogue moves are. For example, an answer to a question raised in the previous turn is automatically integrated as the latest move made in the dialogue. Topoi, on the other hand, are typically integrated through accommodation.

accommodated topoi to his resources, where they might over time become more prominent as the language user encounters more instances of these topoi in interaction with other language users. An example of this kind of accommodation can be found in Section 6.3.

In addition to the different types of topos accommodation, we also introduced a rule for accommodation of enthymemes based on topoi. The type of situation we are interested in here is when an agent infers an enthymematic structure between two utterances or parts of an utterance based on topoi that are easily associated with the discourse. This kind of accommodation contributes to cohesion in dialogue by warranting an enthymematic relation between two discourse units. An example of this kind of accommodation is the “Walnut Street” example in (5.4).

7.1.5 *Formalisation*

We have suggested a way of formalising enthymematic reasoning in TTR, drawing on previous work by Cooper and Ginzburg, thus extending the kinds of linguistic phenomena previously accounted for in the literature on TTR to also include enthymemes and topoi. Developing the formal analysis has contributed to many of the conclusions discussed above. One insight in particular regards the nature of enthymemes and topoi and the relation between them. Topoi tend not to be *instantiated*, viz. they usually apply to more than one individual of a certain type, while enthymemes are specific arguments used in particular dialogues and situations. In our formalisation we treat enthymemes and topoi as the same type of formal object—a function from a situation of a particular type to another type of situation.

It is possible that instantiated principles of reasoning become part of our rhetorical resources, if they concern individuals and events that are central enough to motivate this. That topoi and enthymemes are modelled as the same type of formal object means that we have a way of moving seamlessly between enthymemes and related topoi. This is necessary to account for how we expand our resources by integrating topoi based on enthymematic inferences from discourse. Such mechanisms may also explain how we can obtain new topoi by combining, generalising and restricting topoi which are already established in our resources. In our account of these operations we draw on the subtype-supertype relation that exists between parts of enthymemes and the topoi that underpin them.

7.1.6 *Non-monotonic Reasoning*

In Chapter 6 we suggest using topoi as resources for non-monotonic reasoning. Using a collection of topoi integrated in one DGB we can account not only

for situations where topoi are hierarchical, but also for situations where several topoi apply, but taken together are inconsistent or lead to conclusions that are inconsistent. The reason for this is that a system of topoi is not a monolithic logical system. Allowing for mutually inconsistent topoi enables, for example, modelling of internal deliberation or a discussion where arguments are used which are potentially acceptable by themselves, but lead to an inconsistent system, such as the “Nixon Diamond” example discussed in Section 6.1.2.

7.2 Future Work

7.2.1 *Experimental and Corpus Studies*

The work presented in this book is mostly neither experimental nor quantitative, and a natural progression would be to test some of the hypotheses and models experimentally. For example, the connection between enthymemes and *Why*-questions could be systematically tested to see how people respond to such questions at different points in dialogue, and how this is related to the incremental update of their rhetorical resources.

It could also be fruitful to use experimental techniques to investigate the enthymemes people use in a dialogue, and to see what factors influence which argument people choose when more than one topos is available. It seems possible that how people respond to *Why*-questions is influenced by both the current turn, and the enthymematic arguments they have shared previously in the dialogue, with later turns leading to more explicit descriptions of topoi as participants incrementally refine and recognise their own arguments through the process of dialogue.

The hypotheses that enthymemes are somehow related to cognitive load could also be tested, for example in an in-vehicle environment (see for example Villing, 2009). Drivers would be given instructions in the form of valid enthymematic arguments (that is, enthymemes underpinned by a relevant topos), in the form of enthymematic arguments that do not have obvious connections to relevant topoi, or in the form of instructions without a supporting premise, leaving the question of the underpinning topos open. The subject's cognitive load would be measured continuously. An experiment like this would not only test the connection between cognitive load and acceptable enthymemes, but potentially also provide some information about which topoi are considered relevant in particular situations.

Quantitative corpus studies of enthymemes are problematic since enthymemes are not easy to find automatically, and manual searches that would produce enough data for quantitative studies are not feasible. One option

that might be worth pursuing in this context is enthymeme mining (Razuvayevskaya and Teufel, 2017; Maraev et al., 2020).

Implementing our model in a conversational AI system would be a way of testing the predictions made by our theory as well as the effects of using enthymemes on interactions between humans and artificial agents.

7.2.2 *Enthymematic Reasoning and Probabilistic Inference*

A consequence of the gradual nature of topoi is that the acceptability of an enthymeme is based on the non-binary acceptability in a particular context of the warranting topos. When we model a dialogue based on already existing data, we know which enthymemes are conveyed in the discourse and we may construe topoi which would result in the observed dialogue behaviour. However, if we were to model artificial agents capable of interpreting, producing and reacting to new dialogue contributions, other issues arise.

One such issue is how an agent is to choose between available topoi based on the degree of acceptability of these topoi in the context. In recent work in this direction Maguire (2019) encodes enthymemes and topoi as Bayesian networks implemented in TTR. Combining techniques from Maguire (2019) and other probabilistic approaches to dialogue modelling, such as Cooper et al. (2014), with insights from the experimental studies sketched above would provide data for testing such a model.

7.2.3 *Theoretical Development*

The formal account presented in this book provides a way of formally accounting for phenomena discussed in the literature on reasoning going back to antiquity, even in cases when the theories of reasoning presented cannot be cast in a traditional logical framework. Being able to formally account for some aspects of theories like Aristotelian dialectic, which has been shown to be fundamentally pragmatic in nature (Mora-Márquez, 2017), would elucidate our understanding of some of these theories.

A precise theory of enthymemes and topoi also enables us to relate (non-formal) accounts of rhetoric and argumentation to formal and computational models in linguistics and language technology. One area where this is relevant is within “third wave” sociolinguistics (Eckert, 2012), where topoi could be used to characterise personae, particularly in argumentative contexts, using similar techniques to those used by Burnett (2019) (see for example Breitholtz and Cooper, 2018; Noble et al., 2020).

A micro-rhetorical perspective on discourse and dialogue combines different strands of linguistic research which each contribute important perspectives on linguistic interaction. Including enthymemes and topoi in an analysis of dialogue has the potential of capturing notions of individual- and socio-

cultural identity, as well as point of view. One example of a field of study where it is necessary to take socio-cultural aspects into account is humour and laughter, see for example Ginzburg et al. (2015) and Breitholtz and Maraev (2019).

7.3 Summary

In this book we have shown that by including enthymematic reasoning based on topoi in an account of dialogue, we can capture in a precise way how background assumptions and knowledge is integrated into the common ground of a dialogue. We have also sketched a way of formally accounting for phenomena at the semantics-pragmatics interface which opens up a wide range of opportunities for applied, experimental and theoretical future work.