

Information theory as a means to understand language development in infancy: a perspective of a computational modeler

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Spoken languages are governed by statistical regularities at various levels, resulting in intelligible, learnable, and hence commonly shared communication systems. At the same time, an element of unpredictability is necessary for information transmission between interlocutors. Information theory offers useful tools to understand this interplay between regularity and unpredictability, leading to influential theories of how speech might be shaped for optimal information transmission in the presence of lossy channels and various situational and cognitive constraints. However, much of the existing work focuses on adult communication, and implicitly or explicitly assumes that the interlocutors have well-structured representations of the language upon which statistical nature of information then operates. In contrast, young infants arguably do not yet share these well-defined representations but are on their journey to learn them instead. This raises the question of how information theoretic considerations of speech map to early language, and, perhaps even more importantly, how information theory can help us understand the language learning process of infants.

In this talk, I will first discuss key differences in the application of information theory to the study of infant and adult language. I will then highlight certain prominent phenomena in early language, such as infant-directed speech and attentional preference towards familiar or novel speech input, and how they could be linked to information theoretic considerations. Finally, I will provide a few examples of how information theoretic concepts, such as mutual information, can be related to the operation principles of contemporary and increasingly powerful computational models of early language development.