

Minds, Mechanisms and Interaction in the Evolution of Language

Poster Abstracts

Poster 1

Convexity and expressivity in the simplicity–informativeness tradeoff

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Language is shaped by competing pressures from learning and communication: The pressure from learning favours simplicity, while the pressure from communication favours informativeness. This leads to the simplicity–informativeness tradeoff, which has been demonstrated in typological (e.g., Kemp & Regier, 2012) and empirical (e.g., Kirby, Tamariz, Cornish, & Smith, 2015) studies. However, a recent experiment by Carstensen, Xu, Smith, and Regier (2015) has suggested that iterated learning alone can give rise to informative languages.

One explanation for this result lies in how the pressures for simplicity and informativeness affect two key properties of semantic categorization systems: expressivity (the number of categories a space is partitioned into) and convexity (approximately, how effectively the space is organized; Gärdenfors, 2000). In the case of expressivity, the two pressures work against each other: Learning prefers few categories; communication prefers many. While in the case of convexity, the two pressures are aligned: Learning and communication both prefer convexity. This leads to a situation in which expressivity is subject to the tradeoff, while convexity is not and can only increase.

We first demonstrate this in a Bayesian model of the tradeoff. The language user has a prior bias for simplicity, but once the language user derives sufficient experience from communicative interaction, the prior bias may be overpowered by a preference for informative languages. We support this with an iterated category learning experiment, in which chains converge on inexpressive but convex systems.

A measure of informativeness that is sensitive to convexity may reveal that languages become increasingly informative over time, but it cannot reveal the causal mechanism if an explanation from simplicity is also possible. We suggest that future experiments should be careful to control for these two semantic properties in ascertaining the mechanisms involved in the cultural evolution of language.

References

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