Language acquisition as sparse foraging: mapping path-dependence in word acquisition

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Abstract: How does the acquisition of a new word affect the successive acquired ones? We model language acquisition in terms of foraging in an unprecedentedly fine-grained 1-child corpus (0-3y, RoyEtAl2015). We assess whether successive words are learned in close semantic clusters or not (exploitation vs. exploration) and the structure of these clusters. Words are defined in terms of topic distribution in the parental input (Latent Dirichlet Allocation). Distance between successively learned words is measured as cosine distance between their topic distribution.

Word acquisition can be accurately described as foraging in a sparse resource environment with very local path dependence (power law distribution: alpha=3.9$\pm$0.2; detrended fluctuation analysis: alpha=0.6). Words are acquired in semantically close clusters of 2-4 successive words (Recurrence Quantification Analysis: L=2, LMAX=4, V=2, VMAX=4). The effects remain when controlling for shuffled baselines and temporal distance between word acquisition.