Learning on the fly. Computational modelling of an unsupervised online-learning effect

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Abstract: Humans rapidly learn complex structures in many domains. Some findings of above-chance performance of untrained control groups in artificial grammar learning (AGL) studies raise the question to which extent learning can occur in an untrained, unsupervised testing situation with partially correct and incorrect structures. Computational modelling simulations explore whether an unsupervised online learning effect is theoretically plausible in AGL. Symbolic n-gram models and simple recurrent network models were evaluated using a large free parameter space and applying a novel evaluation framework, which models the human experimental situation through alternating evaluation (in terms of forced binary grammaticality judgments) and subsequent learning of the same stimulus. Results indicate a strong online learning effect for n-gram models and a weaker effect for SRN models. Model performance improves slightly once the window of accessible past responses for the grammaticality decision process is limited. Results suggest that online learning is possible when ungrammatical structures share grammatical chunks to a large extent. Associative chunk strength for grammatical and ungrammatical sequences is found to predict both, chance and above-chance performance for human and computational data.