21st Annual Meeting of the Cognitive Neuroscience Society. Symposium organized by Gina Kuperberg titled, "Prediction, Adaptation and Plasticity of Language Processing in the Adult Brain." Boston, MA. April 7, 2014.

EFFICIENT LANGUAGE UNDERSTANDING IN A VARIABLE WORLD: PREDICTION AND ADAPTATION

T . Florian Jaeger, Dave F . Kleinschmidt

University of Rochester

Whether reading, listening, or viewing sign language, the linguistic signal comprehenders receive is perturbed by noise. This makes language understanding a problem of inference over noisy input. The ideal solution to this problem is to take advantage of prior (top-down) knowledge in predicting the signal, thereby facilitating efficient inference of the intended message. In line with such ideal observer models, prediction is an essential part of language processing. However, producers differ in their realizations of linguistic sounds as well as lexical and syntactic preferences. As a consequence the statistics required for efficient prediction actually differ (i.e., are subjectively non-stationary) between environments (e.g., between speakers/writers). How then is efficient prediction even possible? We propose that the brain achieves this by a) recognizing previously encountered environments (e.g., a familiar speaker or experimental testing room), b) generalizing across environments based on similarity to previous experience, and c) implicitly learning the statistics of novel environments (e.g., a new speaker). That is, not only do we continuously learn, but we do so while imputing and updating structure over linguistic environments (e.g., groups of speakers that share an accent or dialect). We discuss existing evidence that supports this view and present a computational framework that guides future work on how the brain integrates prediction errors by learning at multiple levels of representation. Language is an ideal domain to pursue the question of how we navigate a variable world, because of its comparatively well-understood rich structure.