

A Framework for Decoding Event-Related Potentials from Text

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Background

- Event-related potentials (ERPs) used to probe rapid, online language processing Kuperberg, 2016
- Growing interest in language processing with natural stimuli Frank et al., 2015; Broderick et al., 2018
- Novel analyses are required that...
 - enable broadly applicable quantitative comparison of online language processing
 - abstract over aspects of ERP signals not relevant to language processing

Proposal

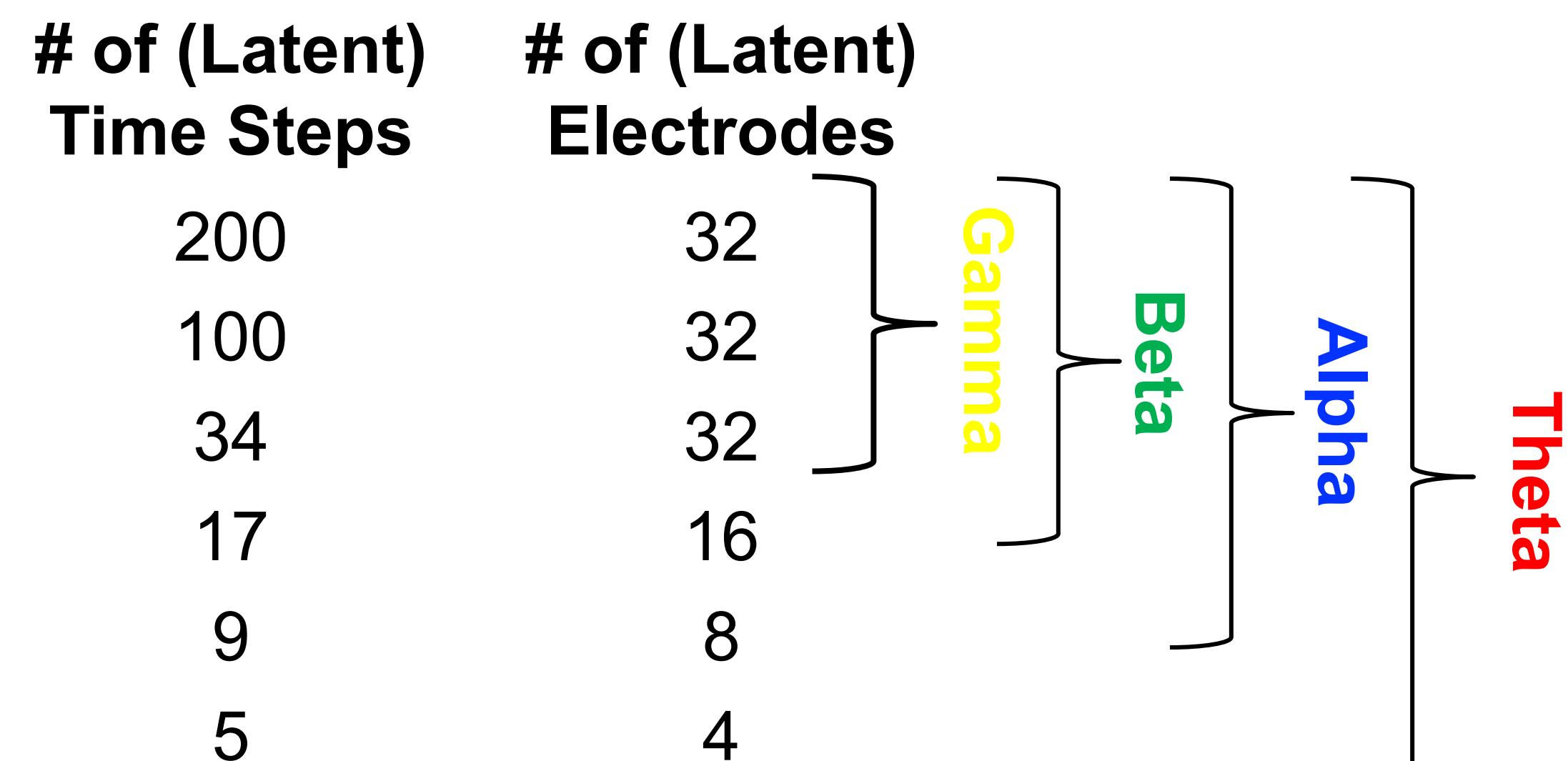
- Pre-train autoencoder to compress ERP data
- Fix decoder parameters and replace encoder with language model

Take-home Message

- ERPs well reconstructed by autoencoders
- Word embeddings...
 - do not improve semantic processing over surprisal and semantic distance.
 - show biggest contribution for perceptual/morphological processing

Autoencoder

- Different levels of compression based on EEG frequency bands



Models

- Baseline variables
Frequency, Surprisal, Semantic Distance
- Word embeddings
Static: GloVe Pennington et al., 2014
Contextual: ELMo Peters et al., 2018

