



University
of Victoria

Graduate Studies

Notice of the Final Oral Examination
for the Degree of Master of Science

of

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BSc (Shiraz University, 2016)

**“Decoding Semantic Representations during Production of Minimal
Adjective-Noun Phrases”**

Department of Computer Science

Monday, March 18, 2019

9:00 A.M

Clearihue Building

Room B007

Supervisory Committee:

Dr. Alona Fyshe, Department of Computer Science, University of Victoria (Supervisor)

Dr. George Tzanetakis, Department of Computer Science, UVic (Member)

External Examiner:

Dr. Leila Wehbe, Machine Learning Department, Carnegie Mellon University

Chair of Oral Examination:

Dr. Francis Nano, Department of Biochemistry and Microbiology, UVic

Dr. David Capson, Dean, Faculty of Graduate Studies

Abstract

Through linguistic abilities, our brain can comprehend and produce an infinite number of new sentences constructed from a finite set of words. Although recent research has uncovered the neural representation of semantics during comprehension of isolated words or adjective-noun phrases, the neural representation of the words during utterance planning is less understood. We apply existing machine learning methods to Magnetoencephalography (MEG) data recorded during a picture naming experiment, and predict the semantic properties of uttered words before they are said. We explore the representation of concepts over time, under controlled tasks, with varying compositional requirements. Our results imply that there is enough information in brain activity recorded by MEG to decode the semantic properties of the words during utterance planning. Also, we observe a gradual improvement in the semantic decoding of the first uttered word, as the participant is about to say it. Finally, we show that, compared to non-compositional tasks, planning to compose an adjective-noun phrase is associated with an enhanced and sustained representation of the noun. Our results on the neural mechanisms of basic compositional structures are a small step towards the theory of language in the brain.

Keywords: Semantic composition; language production; brain decoding