University of Victoria | Graduate Studies

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

of

CHRISTOPHER FOSTER

BCS (Thompson Rivers University, 2012)

"Using EEG to Decode Semantics During an Artificial Language Learning Task"

Department of Computer Science

Friday, November 23, 2018
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. Clay Holroyd, Department of Psychology, University of Victoria

Chair of Oral Examination:
Dr. Andrea McKenzie, Department of History, UVic

Dr. David Capson, Dean, Faculty of Graduate Studies

Abstract

The study of semantics in the brain explores how the brain represents, processes, and learns the meaning of language. In this paper we show both that semantic representations can be decoded from electroencephalography data, and that we can detect the emergence of semantic representations as participants learn an artificial language mapping. We collected electroencephalography data while participants performed a reinforcement learning task that simulates learning an artificial language, and then developed a machine learning semantic representation model to predict semantics as a word-to-symbol mapping was learned. Our results show that 1) we can detect a reward positivity when participants correctly identify a symbol's meaning; 2) the reward positivity diminishes for subsequent correct trials; 3) we can detect neural correlates of the semantic mapping as it is formed; and 4) the localization of the neural representations is heavily distributed. Our work shows that language learning can be monitored using EEG, and that the semantics of even newly-learned word mappings can be detected using EEG.