Business Process Management Research Group
Faculty of Science and Technology
Queensland University of Technology

BPM Seminar Series

Biologically Inspired Pattern Recognition
Connectionist and Belief Network approaches

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Abstract: The automatic detection of faults and defects in software and hardware applications is an important research area. In this context, a number of pattern recognition techniques have been successfully applied to detect anomalous streams of data in various application domains. As it is always the case, however, a (typically large) number of parameters need to be carefully tweaked in order to prevent the anomaly detectors from underfitting or overfitting. Furthermore, the observed data often needs to be appropriately represented in order to reduce dimensionality and noise. Selecting good data representations is considered one of the most important and most difficult tasks in anomaly detection and pattern recognition in general.

By contrast, the human brain is capable of making sense of the enormous amount of data coming from the external world, effortlessly, identifying interesting patterns in space and time and effectively separating them from noise. The brain is also able to generalize experiences by isolating aspects that may recur in other contexts. Large amounts of experimental data have become available over years of brain research. From these observations, several models of cortical computation have been proposed in order to explain and imitate the brain's pattern recognition capabilities. Among them, a Hierarchical Temporal Memory (HTM) framework has been recently proposed. HTM is grounded on the hypothesis that the mammalian brain uses common mechanisms to achieve different cognitive tasks. Accordingly, hearing, vision, touch, movement, language and planning come about through very similar neural "algorithms".

This talk will present a novel connectionist approach to pattern recognition in Computer Graphics which has been applied to visual bug detection in computer games. The limitations of this study will be outlined and a method to overcome these will be presented, based on the principles of the HTM framework.

Speaker: Alfredo Nantes received his Master's degree (Laurea) in Computer Engineering from Politecnico di Torino (Italy). He is a final year PhD student at the Queensland University of Technology. His main research interest has been the development of machine learning approaches to virtual environments testing. The core framework of his research was presented at a conference on AI and Interactive Digital Entertainment (AIIDE), at Stanford University (CA). Alfredo participated in the 2007 Blue Box Discovery Competition, where he was awarded the runner-up prize. During his PhD, he also worked on a sensor network project for the observation and assessment of environment and ecological systems. While exploring the area of machine learning, he developed a strong interest in neuroscience, and wishes to explore further the connection between neuroscience and computer science.