Victorian Section
IEEE SMC Victorian Chapter

Title: Neuromorphic Approaches to Computing Acoustic Information by Associate Professor Neil McLachlan

12.00 noon – 1.00 pm, Monday, 9 February 2015
Room NA 1.418, GTP building (ground Floor), Centre for Intelligent Systems Research, Deakin University, Waurn Ponds, Geelong, Australia

RSVP – http://www.deakin.edu.au/research/cisr/workshops/ieee-smc-vic.php
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Neuromorphic Approaches to Computing Acoustic Information

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Abstract
During the 1890's Ivan Pavlov observed that dogs could be conditioned to salivate at the sound of a bell. The association of conditioned stimuli to behaviours has been studied in a wide range of animals for over a century, however practically no research has been undertaken on how animals learn to recognize sounds in the first place. This is important because sound recognition likely occurs early in auditory processing, and underpins most other auditory functions. Previous research has shown that conditioned reflexive responses to sound involve ponto-cerebellar pathways, and so these pathways likely underpin sound recognition more generally. High level computational models of these pathways have been used to recognize human speech, music, environmental sounds and animal calls, and to act as adaptive filters for integrating pitch and loudness information. This paper will outline a new neurocognitive account of the auditory pathways and provide examples of computational algorithms based on this model. More broadly, it will discuss the possibility that neuro-cognition based on memory processes may provide the operating systems for future generations neuromorphic computers based on memsistors. These computers will learn and adapt to natural environments just like animals, but can "inherit" (or share) their sense memories from other computers at any time.

Biography:
Dr McLachlan is an Associate Professor in Psychological Sciences at The University of Melbourne and has broad professional experience in music, acoustic design, engineering, and auditory neuroscience. In 2000 he designed the World's first harmonic bells, and more recently has designed a new harmonic percussion ensemble for use in educational and a range of community contexts. To establish better design criteria for musical instrument design he has developed the first end-end neurobiological model of auditory processing. He has computationally implemented aspects of this model leading to the development of new sound segregation and recognition algorithms for hearing prosthetics and automated sensing systems.