

SEMINAR ANNOUNCEMENT

DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING
Faculty of Engineering
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Area: Signal Processing & New Media

Host: Dr Zhao Qi

TOPIC	:	The Computational Magic of the Ventral Stream: Sketch of a Theory
SPEAKER	:	Tomaso Poggio CBCL, McGovern Institute, Computer Science and Artificial Intelligence Laboratory, Brain Sciences Department, Massachusetts Institute of Technology, Cambridge, MA, USA
DATE	:	17 December 2013, Tuesday
TIME	:	1:00 pm to 2:00 pm
VENUE	:	E5-03-20, Engineering Block E5, Faculty of Engineering, NUS

ABSTRACT

The talk explores the theoretical consequences of a simple assumption: the computational goal of the feedforward path in the ventral stream in visual cortex – from V1, V2, V4 and to IT – is to discount image transformations, after learning them during development. The initial assumption is that a basic neural operation consists of dot products between input vectors and synaptic weights – which can be modified by learning. Empirical estimates of one-dimensional projections of the distribution induced by a group of transformations are proven to represent a unique and invariant signature associated with an image. The theory shows how a multi-layer hierarchical architecture of dot-product modules can learn in an unsupervised way to be automatically invariant to transformations of a new object, achieving the goal of recognition with one or very few labeled examples. The theory should apply to a varying degree to a range of hierarchical architectures such as HMAX, deep convolutional networks and formally characterize some of their properties.

BIOGRAPHY

Tomaso A. Poggio is one of the founders of computational neuroscience. He pioneered models of the fly's visual system and of human stereovision, introduced regularization theory to computational vision, made key contributions to the biophysics of computation and to learning theory, developed an influential model of recognition in the visual cortex. He received his Doctor in Theoretical Physics from the University of Genoa in 1971 and was a Wissenschaftlicher Assistant, Max Planck Institut für Biologische Kybernetik, Tübingen, Germany from 1972 until 1981 when he became Associate Professor at MIT. He is an honorary member of the Neuroscience Research Program, a member of the American Academy of Arts and Sciences and a Founding Fellow of AAAI. He received several awards such as the Otto-Hahn-Medaille Award of the Max-Planck-Society, the Max Planck Research Award (with M. Fahle), from the Alexander von Humboldt Foundation, the MIT 50K Entrepreneurship Competition Award, the Laurea Honoris Causa from the University of Pavia in 2000, the 2003 Gabor Award, the 2009 Okawa prize and the American Association for the Advancement of Science Fellowship (2009). He is one of the most cited computational neuroscientists (with a h-index greater than 100 – based on Google Scholar). He is somewhat unique in having a significant impact in most areas of sciences, e.g. a h-index = 35 in social sciences and ~20 in business (remarked in the Via-academy list with the note 'most eclectic scientist').