

## Final Program

### Invited Talks

- [John K. Tsotsos](#)  
Director of Center for Vision Research  
Department of Computer Science  
York University, Toronto, Canada
- [Gustavo Deco](#)  
Computational Neuroscience  
Department of Technology  
Universitat Pompeu Fabra, Barcelona, Spain

### Technical Program

#### Opening

8:50

#### Invited Talk 1

- 9:00      Distributed Saliency Computations Solve the Feature Binding Problem  
*John K. Tsotsos*  
*Department of Computer Science and Centre for Vision Research*  
*York University, Toronto, Canada*

Computational vision has a long history of proposing methods for decomposing a visual signal into its components. For example, many good strategies have appeared for decomposing visual motion signals. What has been far more elusive is how to recombine those components into a whole. This problem has even merited its own name - the binding problem. To date no realizable process has appeared to solve the binding problem, even in part, although several proposals are being studied. This presentation will focus on a new strategy utilizing a novel distributed saliency computation mechanism that solves at least one aspect of the binding problem, namely the binding of features from separate representations into a whole. Several examples will be drawn from a new, biologically realistic, motion analysis system, one that attends to complex motion patterns. An example of how this approach even yields Treisman-style illusory conjunctions is included. The entire process is implemented

and operates on real image sequences. The implications for the neurobiology of visual attention will round out the presentation.

### Session 1: Attention in Object and Scene Recognition

9:45 Object Based Visual Attention: Searching for Objects Defined by Size  
*Ola Ramstrom and Henrik I. Christensen*  
*Royal Institute of Technology, Sweden*

Inherent Limitations of Visual Search and the Role of Inner-Scene Similarity  
*Tamar Avraham and Michael Lindenbaum*  
*Technion Haifa, Israel*

10:45 coffee break

### Session 2: Architectures for Sequential Attention

11:00 Selective Attention for Identification Model (SAIM): Simulating Different Types of Visual Neglect  
*Dietmar Heinke and Glyn W. Humphreys*  
*University of Birmingham, UK*

A Model of Object-Based Attention That Guides Active Visual Search to Behaviourally Relevant Locations  
*Linda J. Lanyon and Susan L Denham*  
*University of Plymouth, UK*

Learning of Position and Attention-Shift Invariant Recognition across Attention Shifts  
*Muhua Li and James J. Clark*  
*McGill University, Canada*

12:15 lunch

### Invited Talk 2

13:45 The Computational Neuroscience of Visual Cognition: Attention, Memory and Reward  
*Gustavo Deco*  
*Institucio Catalana de Recerca i Estudis Avancats (ICREA)*  
*Universitat Pompeu Fabra, Barcelona, Spain*

Cognitive behaviour requires complex context-dependent processing of information that emerges from the links between attentional perceptual processes, working memory and reward-based evaluation of the performed actions. We describe a computational neuroscience theoretical

framework which shows how an attentional state held in a short term memory in the prefrontal cortex can by top-down processing influence ventral and dorsal stream cortical areas using biased competition to account for many aspects of visual attention. We also show how within the prefrontal cortex an attentional bias can influence the mapping of sensory inputs to motor outputs, and thus play an important role in decision making. We also show how the absence of expected rewards can switch the attentional bias signal, and thus rapidly and flexibly alter cognitive performance. This theoretical framework incorporates spiking and synaptic dynamics which enable single neuron responses, fMRI activations, psychophysical results, the effects of pharmacological agents, and the effects of damage to parts of the system, to be explicitly simulated and predicted. This computational neuroscience framework provides an approach for integrating different levels of investigation of brain function, and for understanding the relations between them. The models also directly address how bottom-up and top-down processes interact in visual cognition, and show how some apparently serial processes reflect the operation of interacting parallel distributed systems.

### **Session 3: Biologically Plausible Models for Attention**

14:30 Modeling Attention: From Computational Neuroscience to Computer Vision

*Fred H. Hamker*

*Westfälische Wilhelms-Universität, Germany*

Towards a Biologically Plausible Active Visual Search Model

*Andrei Zaharescu, Albert L. Rothenstein and John K.*

*Tsotsos*

*York University, Canada*

15:20 coffee break

### **Session 4: Applications of Attentive Vision**

15:50 Visual Attention for Object Recognition in Spatial 3D Data

*Simone Frintrop, Andreas Nüchter, and Hartmut Surmann*

*Fraunhofer AIS Institute, Germany*

AttentiRobot: A Visual Attention-based Landmark Selection Approach for Mobile Robot Navigation

*Nabil Ouerhani and Heinz Hügli*

*University of Neuchatel, Switzerland*

Detection of Frequent Change in Focus of Human Attention  
from Videos

*Nan Hu, Weimin Huang, Surendra Ranganath  
Institute for Infocomm Research, Singapore*

### Poster Session

- 17:05 On the Usefulness of Attention for Object Recognition  
*Dirk Walther, Ueli Rutishauser, Christof Koch, and Pietro Perona  
California Institute of Technology, CA*
- Combining Conspicuity Maps for hROIs Prediction  
*Claudio M. Privitera, Orazio Gallo, Giorgio Grimoldi, Toyomi Fujita, Lawrence W. Stark  
University of California, Berkeley, CA*
- A General Purpose Neural Network Simulator for Visual  
Attention Modeling  
*Albert L. Rothenstein, Andrei Zaharescu, and John K. Tsotsos  
York University, Canada*
- Biologically Motivated Selective Attention for Face  
Localization  
*Minho Lee and Sang-Woo Ban  
Kyungpook National University, South Korea*
- Accumulative Computation Method for Motion Features  
Extraction in Dynamic Selective Visual Attention  
*Antonio Fernandez-Caballero, María T. López, Miguel A. Fernández, José Mira, Ana E. Delgado and José M. López-Valles  
Universidad de Castilla-La Mancha, Spain*
- Attentive Object Detection Using an Information Theoretic  
Saliency Measure  
*Gerald Fritz, Christin Seifert, Lucas Paletta, and Horst Bischof  
JOANNEUM RESEARCH, Austria*
- 18:05 finish