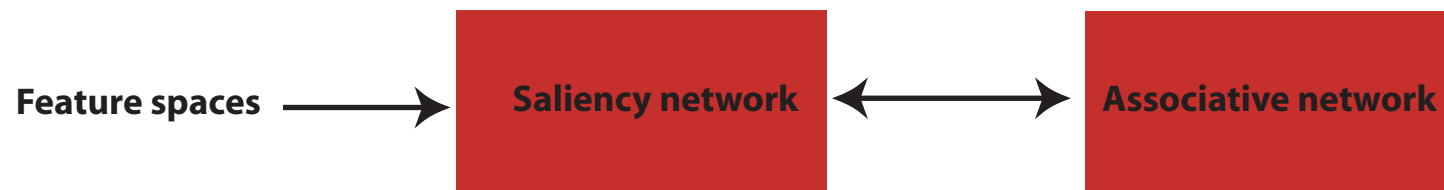


ALAVLSI: attend-to-learn and learn-to-attend with analogue, neuromorphic VLSI

Coordinator: Jochen Braun

- * General architecture for attention and learning
- * Implement with multi-chip analogue VLSI
- * Classification of dynamic perceptual objects (optical flow, speech)

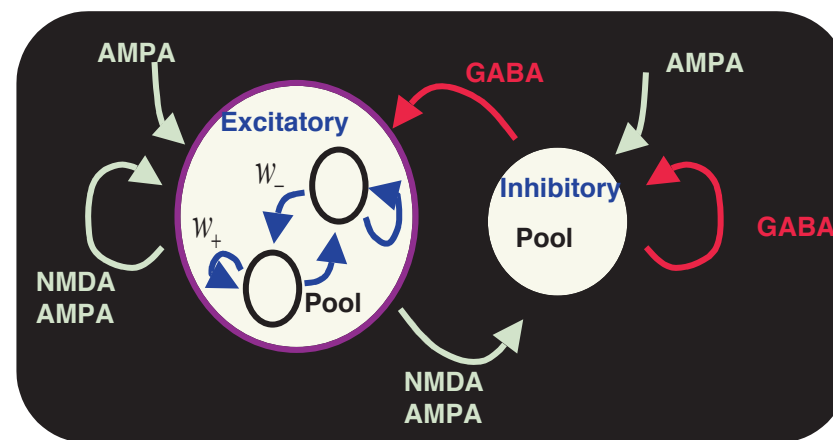
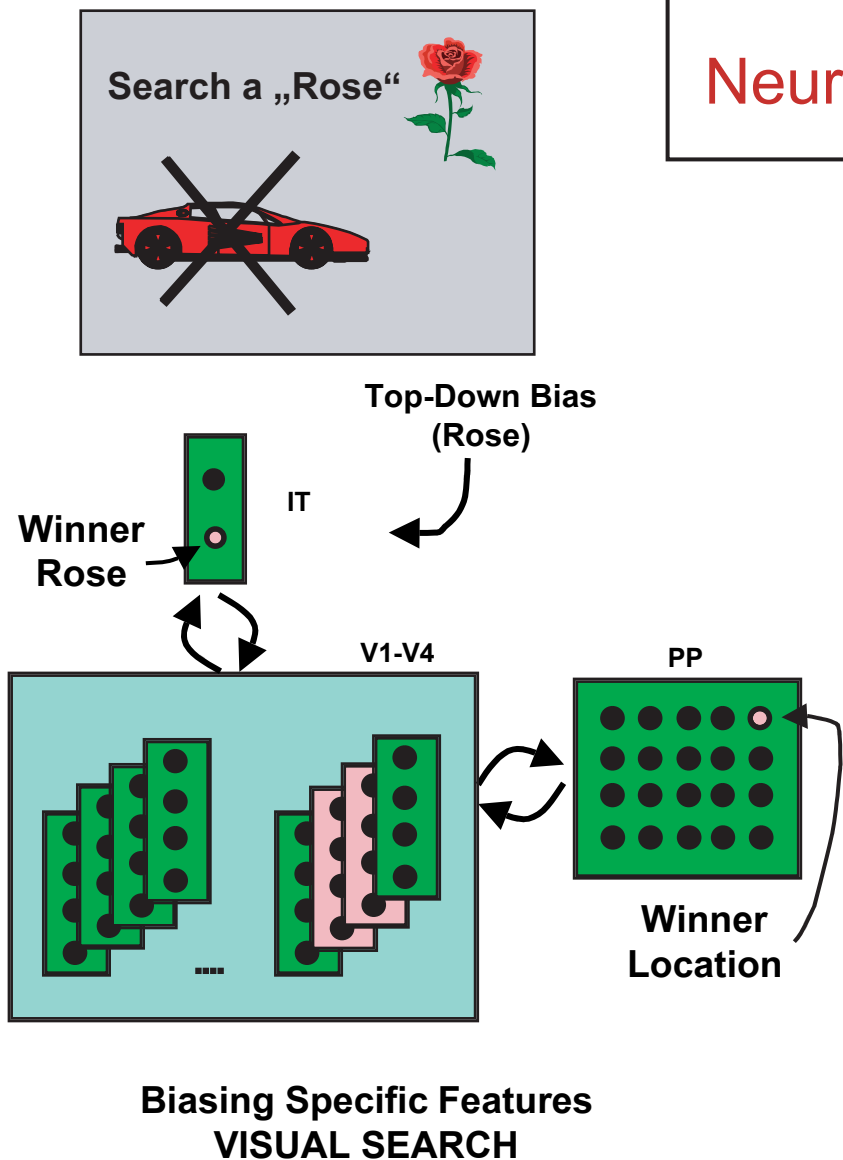


- * Performance on natural stimuli (visual & auditory) comparable to human observers
- * Spiking networks for saliency and for associative memory
- * Software and hardware implementations of SN and AN (analogue VLSI with AER communication)
- * Feature space optimized for efficient and sparse representation of natural stimuli
- * Natural and synthetic stimuli of low dimensionality but rich perceptual content

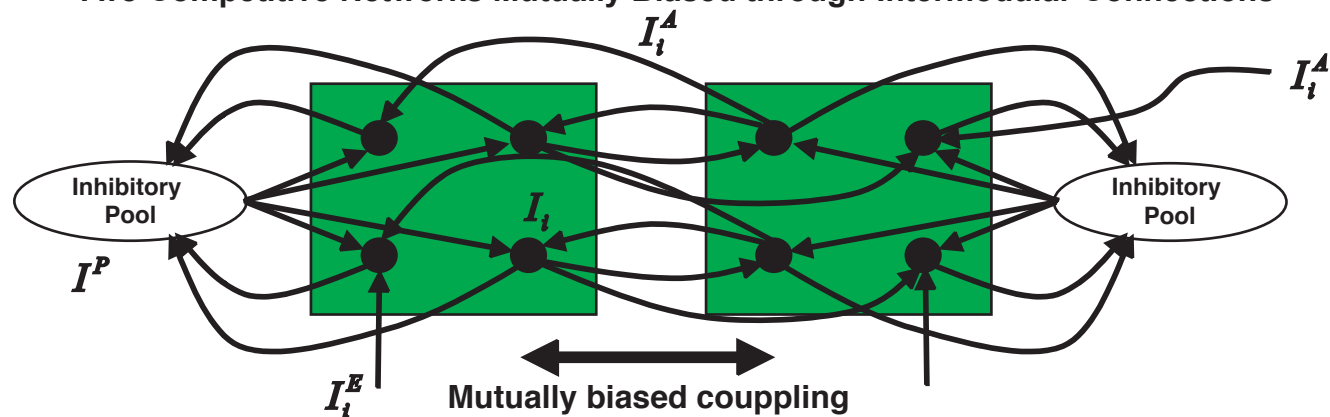


Gustavo Deco, Siemens, Munich

Neurodynamic modelling of attention and control

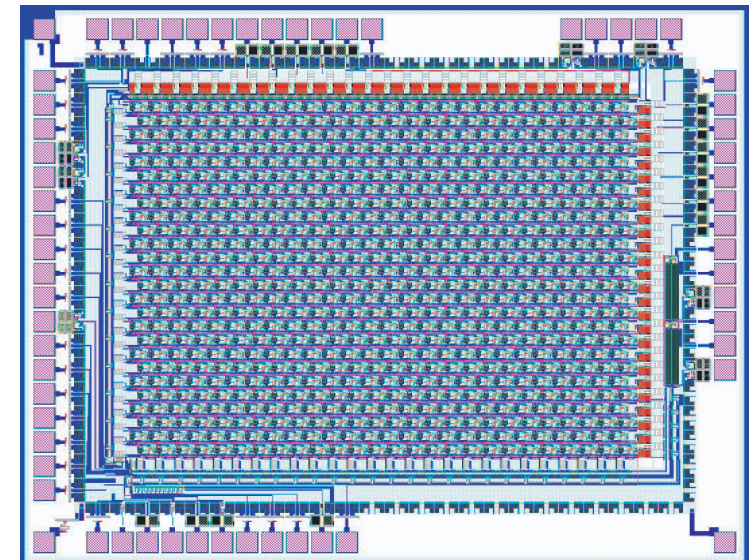
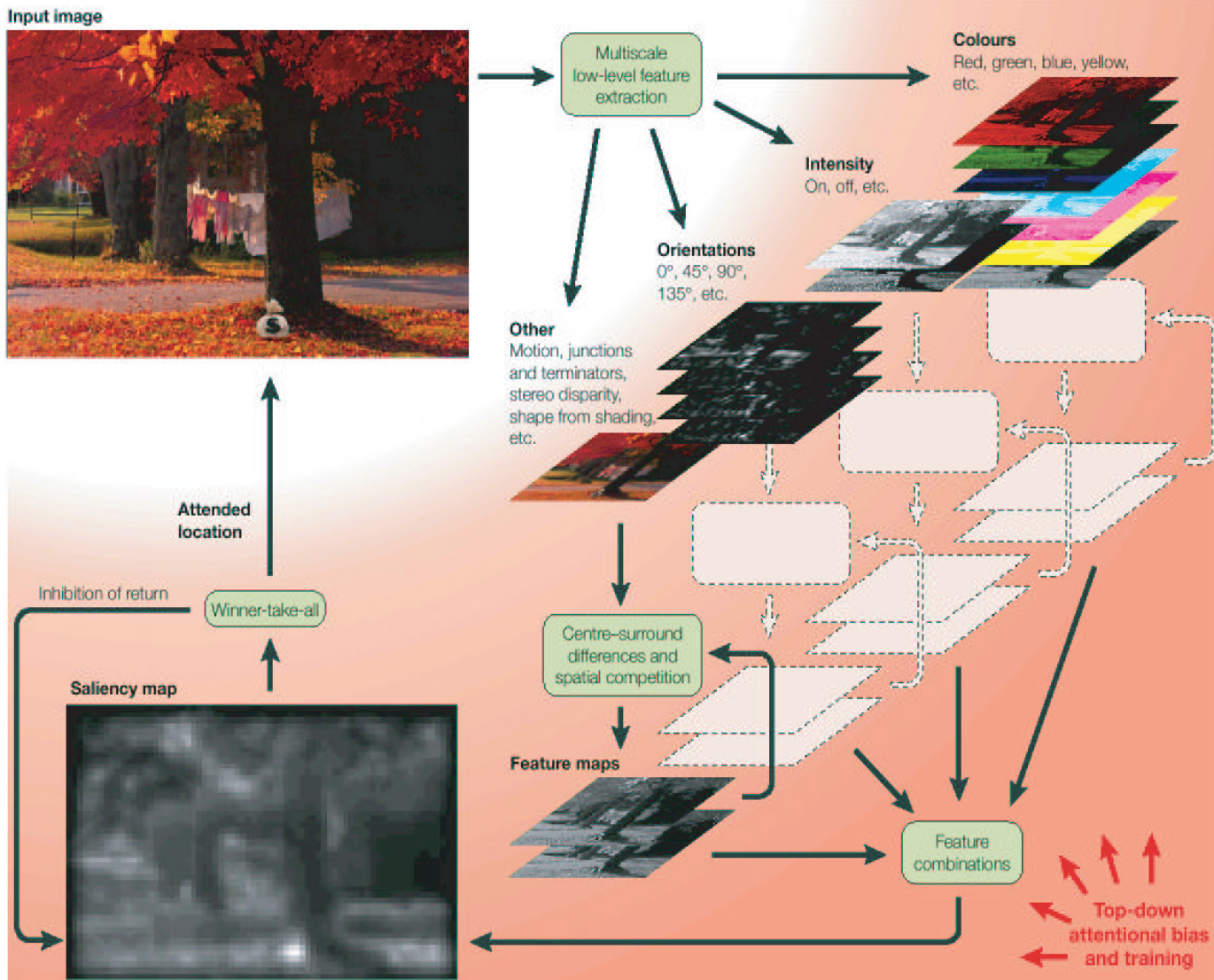


Two Competitive Networks Mutually Biased through Intermodular Connections



Giacomo Indiveri, ETH Zurich

Saliency with analogue, neuromorphic VLSI



Paolo Del Giudice, ISS Rome, Stefano Fusi, Uni Berne

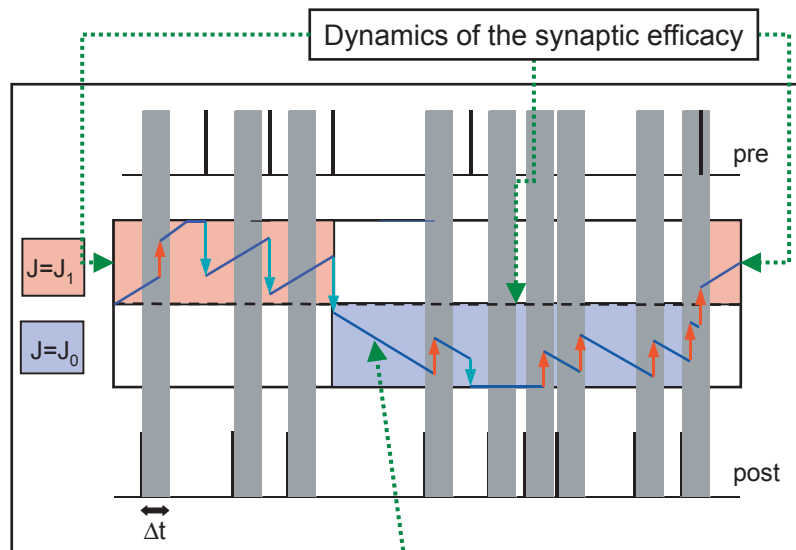
Working memory with Hebbian, spike-driven synapses

$$\text{Max number of patterns} \quad p \mu \frac{n_0 \log(N \sqrt{n_s})}{\Lambda_{\min}}$$

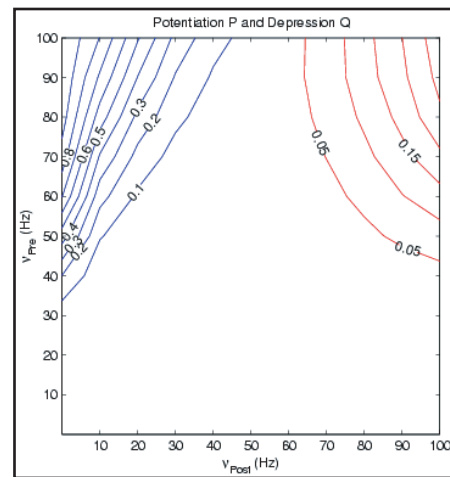
deterministic

$$p \mu N^2$$

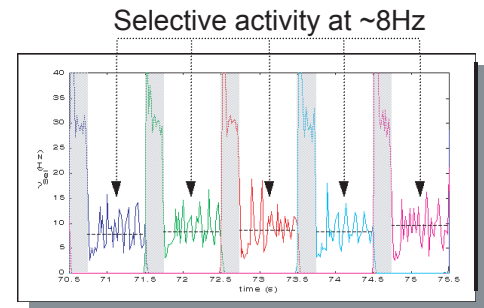
stochastic



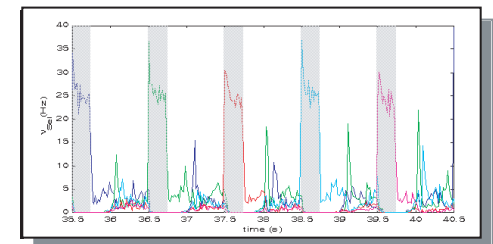
Synaptic transition probability vs (v_{pre} , v_{post})



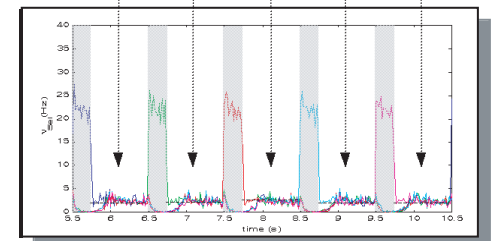
Dynamics of the (hidden) internal synaptic variable



Working memory

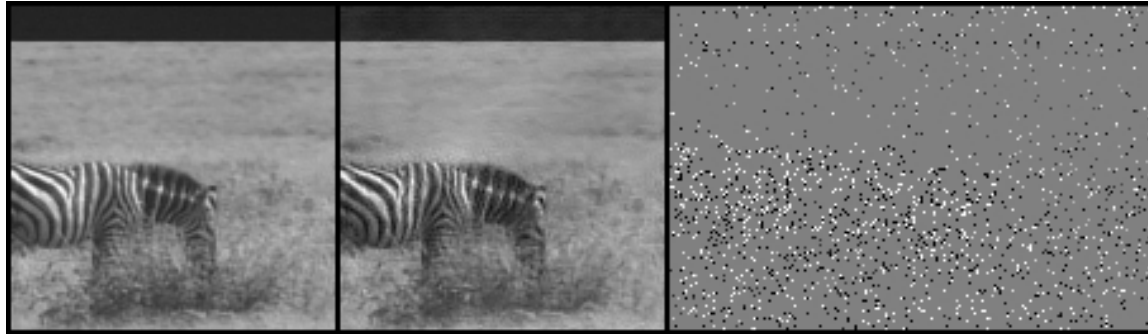


Spontaneous activity at ~2Hz

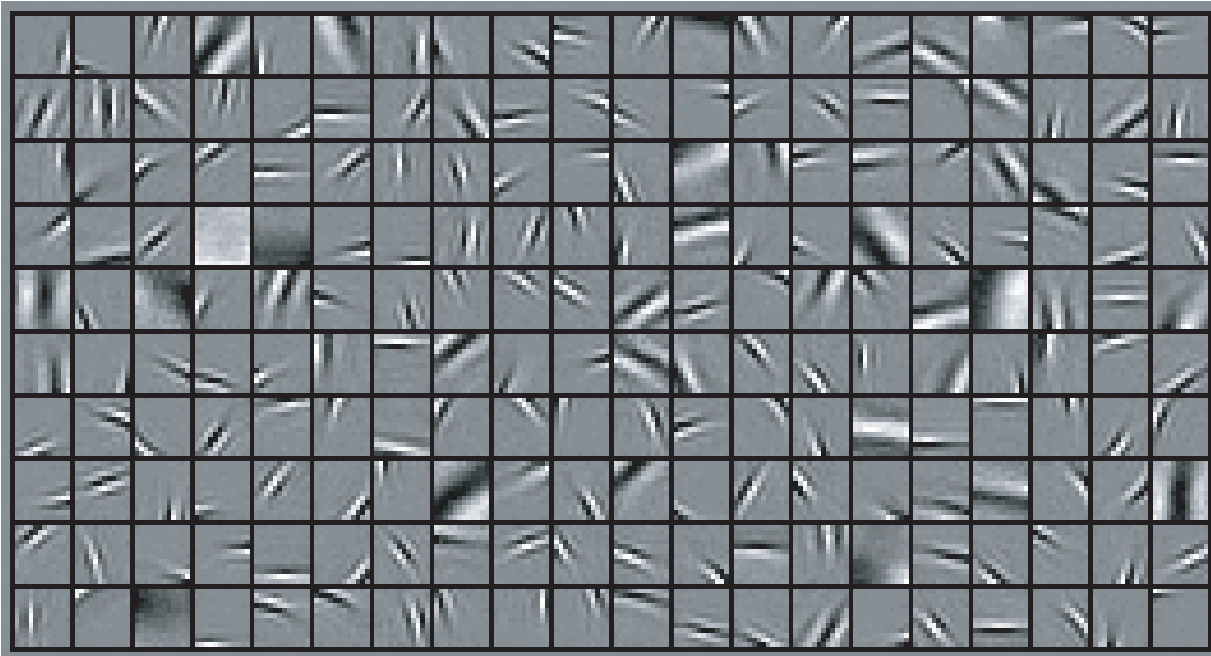


Bruno Olshausen, UC Davis

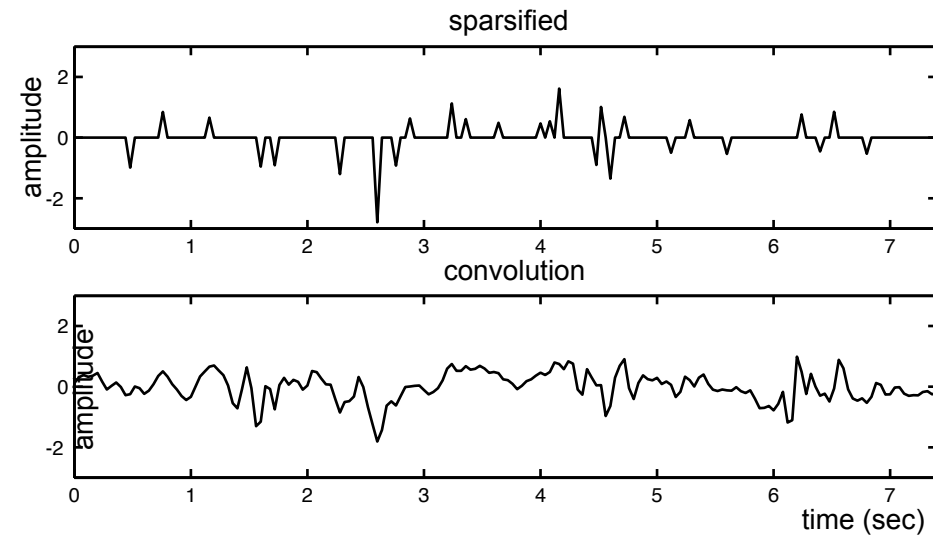
□ □ □ □ □ □ □ □ Sparse coding of natural stimuli



Learned space-time-basis functions (200, $12 \times 12 \times 7$)
Training set: nature documentary



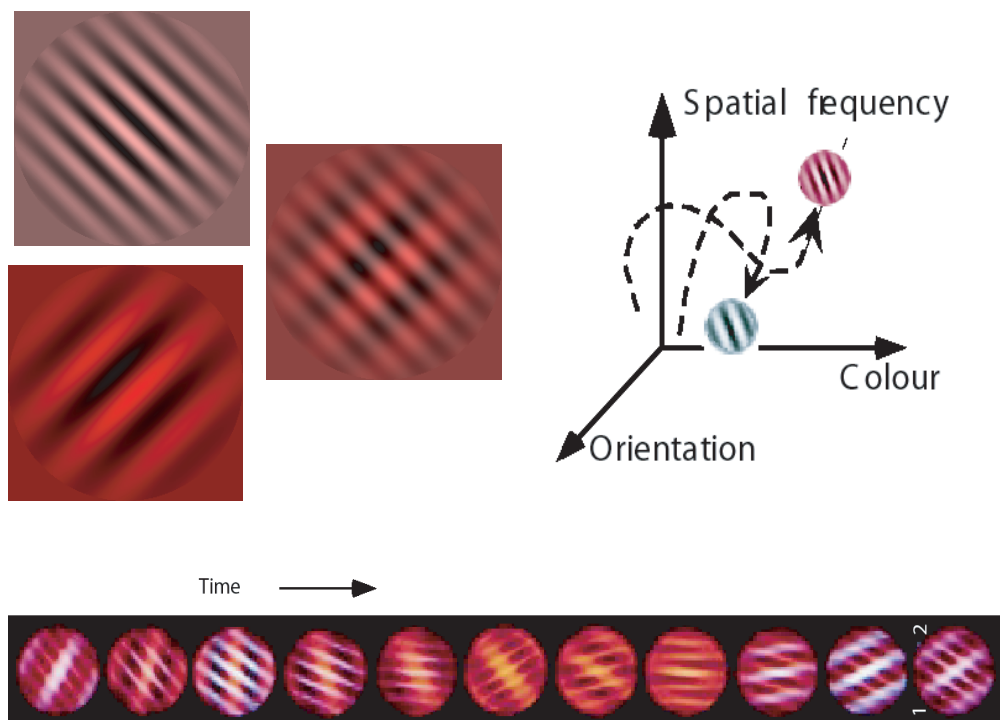
Competitive interaction between
basis functions



Jochen Braun, Sue Denham, U Plymouth

Natural and synthetic stimuli, task-specific feature spaces

Vision: transparent superposition of continuously changing visual objects



Audition: superposition of human speech, animal vocalisations, etc

