

Abstract of Presentation

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| Research interest: computational neuroscience & machine learning: perception and visual processing, reward-based learning, learning on structured representations, analysis of neural data | |
| Abstract : <p>In my talk I will first present results from a map model of primary visual cortex, where we analyzed how much evidence recent single unit recordings from cat area 17 provide for a particular cortical "operating point". Using a Bayesian analysis we find, that the experimental data most strongly support a regime where the local cortical network provides dominant excitatory and inhibitory recurrent inputs (compared to the feedforward drive). Most interestingly, the data supports an operating regime which is close to the border to instability. Hence it is conceivable, that modulatory effects like visual attention may briefly shift the operating point into these regimes, leading to an increased sensitivity of cortical responses to visual inputs.</p> <p>Secondly, I will discuss results of developmental perturbations imposed on the visual system of adolescent cats through retinal lesions. Using a computational model of visual cortical responses, I will show that the lesion induced changes of neuronal response properties are consistent with spike timing-dependent plasticity (STDP) learning rules. STDP causes visual cortical receptive fields to converge by creating a competition between neurons for the control of spike timing within the network. The spatial scale of this competition appears to depend on the balance of excitation and inhibition and can in principle be controlled by synaptic scaling type mechanisms. This reveals a novel way by which the capacity of cortical learning rules to transfer response properties between neurons can be effectively switched on and off.</p> | |