DANDRITE
Danish Research Institute of Translational Neuroscience
Nordic EMBL Partnership for Molecular Medicine

AARHUS UNIVERSITY

Virtual DANDRITE Lecture

Friday 18 September 2020

16:00 – 17:00

Online via Zoom

Please find Zoom link via the Outlook calendar invitation. If you have not received this, please write an e-mail to Kathrine Hennings: kh@dandrite.au.dk

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Learning orthogonalizes visual cortical population codes

The pattern of cortical population firing rates evoked by a sensory stimulus can be summarized by a vector in a high-dimensional space. The geometry of population responses to a set of stimuli can be summarized by the "kernel function", which reflects the angle between each pair of vectors. Learning theory suggests that the brain should be better able to produce distinct behaviors in response to two stimuli when the vectors are close to orthogonal. We measured the orientation tuning of neuronal populations in V1 before and after training on a visual orientation discrimination task, in which two orientations were informative for the animal's choice. Training sparsened population responses to these informative directions, resulting a more orthogonal population code. We tested a computational model in which the sparsening and orthogonalization of the codes was produced solely by modulation of neuronal FI curves, without requiring changes to input synapses. This model was able to predict neuronal responses post-training as a nonlinear function of pre-training responses, whose convexity was largest for the informative stimuli. We conclude that training orthogonalizes the population codes for informative stimuli, and that this may be achieved by simple network mechanisms such as changes in inhibition, without requiring synaptic plasticity coordinated at a network level.