Joined Colloquium of SFB 1287 and SFB 1294

on the **27.11.2020** at **3 pm**

"Cognitive computational neuroscience of vision"

by Prof. Nikolaus Kriegeskorte, PhD

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Online via Zoom - we will send out an invitation via our email lists. If you are not on a mailing list, please send an email up front to Liv.Heinecke[at]uni-potsdam.de to receive the link.

Abstract: To learn how cognition is implemented in the brain, we must build computational models that can perform cognitive tasks, and test such models with brain and behavioral experiments [1]. Modern technologies enable us to measure and manipulate brain activity in unprecedentedly rich ways in animals and humans. However, experiments will yield theoretical insight only when employed to test brain-computational models. Recent advances in neural network modelling have enabled major strides in computer vision and other artificial intelligence applications. This brain-inspired technology provides the basis for tomorrow's computational neuroscience [1, 2]. Deep convolutional neural nets trained for visual object recognition have internal representational spaces remarkably similar to those of the human and monkey ventral visual pathway [3]. Functional imaging and invasive neuronal recording provide rich brain-activity measurements in humans and animals, but a challenge is to leverage such data to gain insight into the brain's computational mechanisms [4, 5]. We build neural network models of primate vision, inspired by biology and guided by engineering considerations [2, 6]. We also develop statistical inference techniques that enable us to adjudicate between complex brain-computational models on the basis of brain and behavioral data [4, 5]. I will discuss recent work extending deep convolutional feedforward vision models by adding recurrent signal flow and stochasticity. These characteristics of biological neural networks may improve inferential performance and enable neural networks to more accurately represent their own uncertainty.

[1] **Cognitive computational neuroscience.** Kriegeskorte, N., & Douglas, P. K. (2018). *Nature neuroscience*
[2] **Deep neural networks: A new framework for modeling biological vision and brain information processing** Kriegeskorte N (2015) Annu. Rev. Vis. Sci.
[3] **Deep Supervised, but Not Unsupervised, Models May Explain IT Cortical Representation** Khaligh-Razavi SM, N Kriegeskorte (2014) PLoS Computational Biology
[4] **Representational models: A common framework for understanding encoding, pattern-component, and representational-similarity analysis** Diedrichsen J, Kriegeskorte N (2017) PLoS Computational Biology
[5] **Inferring brain-computational mechanisms with models of activity measurements** Kriegeskorte N, Diedrichsen J (2016) Philosophical Transactions of the Royal Society B
[6] **Recurrent Convolutional Neural Networks: A Better Model of Biological Object Recognition** Spoerer CJ, McClure P, Kriegeskorte N (2017) Frontiers in Psychology

An **introductory seminar** to the topic of the colloquia will be given beforehand by Alma Lindborg online from **2 to 2:45 pm** for all junior scientist.

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