ANC Seminar - Dimitra Maoutsa

Tuesday, 7th May 2024

Learning latent low-dimensional dynamics from neural population responses: a stochastic control approach

Abstract: A fundamental challenge in systems neuroscience is understanding how cognitive and behaviourally relevant latent processes are reflected in neuronal population responses. While latent low-dimensional deterministic mechanisms have been instrumental in explaining collective neural activity, they are often unfit to describe the inherent randomness of cognitive processes such as decision-making. In my talk, I will present a method for identifying latent stochastic dynamics in neural population responses based on stochastic control. To begin, I will outline the key components of this framework: an interacting particle system that allows for efficient sampling of marginal probability densities of stochastic systems, and a non-iterative stochastic control method that employs the interacting particle dynamics to compute the optimal controls. I will demonstrate how the constraints of the stochastic control framework naturally translate to a likelihood function used in statistical inference problems. I will apply this approach for inference of latent stochastic dynamical systems observed indirectly through neural population activity to demonstrate how the optimal control perspective offers an ad-hoc regularisation for inference.

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Location: G.03

Speaker(s): Dimitra Maoutsa

Chair/Host: Angus Chadwick

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