Computational Cognitive Neuroscience (CCN): Course Description Update

Peggy Seriès, pseries@inf.ed.ac.uk

Summary
In this course, we study how computations carried out by the nervous system leads to cognition, in particular perception, memory, learning, and decision-making. We learn to develop and simulate computational models that incorporate data from neurobiology and/or can be used to model aspects of cognition such as measured during behavioural experiments. Such models can be used to understand individual differences and mental disorders (e.g., autism, schizophrenia, addiction, and depression): a domain of application that is emphasised in the second half of the course is the emerging field of computational psychiatry.

Course description
* Overview of computational neuroscience basics (models of neurons and networks)
* Reinforcement learning models for computational neuroscience
* Bayesian models for computational neuroscience (The Bayesian Brain)
* Computational modelling of behavioural data
* Models of decision-making
* Application to individual differences (e.g., autism) and mental disorders (e.g., schizophrenia, addiction, and depression): introduction to Computational Psychiatry

Learning outcomes
By the end of this course, you will be able to:

- describe current computational theories of the brain and mental illness.
- read, understand, and have a critical opinion on scientific articles related to computational cognitive neuroscience and computational psychiatry.
- write and analyse simple computational models related to brain function in Python or MATLAB.
- write scientific reports on topics related to computational cognitive neuroscience

Prerequisites
No prior biology/neuroscience knowledge is required. The course was developed assuming a background in computer science or related quantitative field. We use a small subset of not very advanced math and machine learning in the lectures (Keywords: linear differential equations, Bayesian inference models, model fitting and model comparison). Basics of Python or MATLAB is required.
Having taken the course “Computational Neuroscience” (CNS) (or equivalent) is highly recommended.