

Network control theory: recent advances, current limitations, and future directions

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Symposium

See above

Objective

- To distinguish between different applications of NCT, understand their underlying models, and their interpretation
- Understand the relative strengths and weaknesses of different NCT approaches

Target Audience

Any researchers interested in applying NCT to their data.

Presentations

Introduction to Control Theory and its Application to Clinical Neuroimaging

Daniela Zöllner, Ecole polytechnique fédérale de Lausanne, Lausanne, Switzerland and University of Geneva, Geneva, Switzerland daniela.zoller@epfl.ch Daniela Zöllner will give a brief general introduction to control theory before presenting how the altered structure-function relationship of resting-state brain dynamics in a prominent gene-deletion syndrome 22.q11DS can be investigated using NCT.

Presenter

Daniela Zöllner, Ecole Polytechnique Fédérale de Lausanne (EPFL) and University of Geneva Geneva Switzerland

Dimensional Psychopathology Phenotypes Track Deviations from the Normative Neurodevelopmental Pattern of Structural Control Metrics

Linden Parkes, University of Pennsylvania, Philadelphia, USA lindenmp@seas.upenn.edu; Alumnus of Monash University, Australia Linden Parkes will present the utility of applying simple structural control metrics for identifying novel brain-psychopathology relationships during development, discussing the value of network control theory metrics compared to cortical thickness in delineating deviations from normative development.

Presenter

Linden Parkes, University of Pennsylvania Philadelphia, PA
United States

Multimodal Data Integration using Network Control Theory

Braun, Central Institute of Mental Health, Mannheim, Germany urs.braun@zi-mannheim.de Urs Braun will demonstrate how network control theory can be used to probe brain dynamics during working memory. He integrates structural, functional, and pharmacological-MRI with genetic data to investigate how brain-wide transitions of activity patterns can be explained by structural properties of the underlying connectome and multiple levels of dopamine function. Particular focus is given to discussing the suitability of task fMRI for defining brain states and choosing optimal parameters for task related NCT analyses.

Presenter

Urs Braun, Central Institute of Mental Health Mannheim, Baden-Wuerttemberg
Germany

Target Control Principles and their Applications to C. elegans and Other Connectomes

Petra Vertes, University of Cambridge, Cambridge, UK pv226@cam.ac.uk Petra Vertes will describe how NCT has been used to predict the functional role of individual neurons in C. elegans behaviour. She will discuss the main limitations of the approach used and what these mean for the translation of NCT results to higher-level organisms and more complex behaviours.

Presenter

Petra Vertes, University of Cambridge Cambridge, UK
United Kingdom
