# Dynamic Causal Modeling (DCM) - Cognitive Network Modelling Education Series

The Cognitive Network Modelling team, at the Krembil Centre for Neuroinformatics, led by **Dr Andreea Diaconescu,** presents a multi-day educational series on Dynamic causal modelling (DCM) as a class of models for examining effective connectivity in the brain.

See attached for details into the syllabus.

**Topics include:**

- Classical Models of Effective Connectivity and Introduction to DCM
- DCM for FMRI
- Regression DCM for FMRI
- Physiological DCM for FMRI
- DCM for Electrophysiological Data
- DCM for steady-state responses & conductance-based DCMs

**Learning Objectives:** Understand the theory behind DCM and how it can be robustly applied to address questions related to neural mechanisms and effective connectivity from noninvasive recordings such as EEG and fMRI

If you have any questions, please reach out to Krembil.centre@camh.ca

**Learn more about the CogNeMo team here.**

## REGISTER HERE.

| Date | Instructor | Topic | Description | Talk Recording | Slide Deck |
|---|---|---|---|---|---|
| Feb 1, 2022 @ 3pm EST | Dr. Andreea Diaconescu | Introduction to the Course | | | |
| Feb 15, 2022 @ 3pm EST | Dr. Andreea Diaconescu | Classical Models of Effective Connectivity and Introduction to DCM | **Literature**: (Penny et al., 2004; Stephan et al., 2010; McIntosh and Miši, 2013)<br><br>**Topics:**<br>• General Systems Theory: foundations, main ideas, general equations<br>• Discuss pros/cons of PPIs, SEM, and show how in which way they represent a specific system model<br>• Show how the general concept/equation of GST is mirrored by the DCM state equation | Recording Link<br><br>Access Passcode: G.w?2Nk*J2 | Feb 15 slide deck |
| Mar 1, 2022 @ 3pm EST | Dr. Povilas Karvelis | DCM for FMRI | **Literature:** (Friston et al., 2003; Stephan et al., 2005, 2007a)<br><br>**Topics:**<br>• The general idea of DCM: Bayesian inference on hidden parameters of a dynamic neuronal model that is linked to observed data by a forward model<br>• The bilinear state equation | Recording Link<br><br>Access Passcode: dcm fmri2022! | Mar 1 slide deck |
| Mar 15, 2022 @ 3pm EST | Peter Bedford | Regression DCM for FMRI | **Literature**: (Frässle et al., 2017, 2018, 2021; Frässle and Stephan, 2021)<br><br>**Topics:**<br>• the general idea of regression DCM<br>• the bilinear state equation<br>• example | Recording Link<br><br>Access Passcode: regDCM2022! | Mar 15 slide deck |
| Mar 29, 2022 @ 3pm EST | Dr. Kamil Uludag, UHN | Physiological DCM for FMRI | **Literature:** (Stephan et al., 2007b; Havlicek et al., 2015)<br><br>**Topics:**<br>• bilinear equation<br>• forward model<br>• applications | Recording Link<br><br>Access Passcode: physDCM2022! | Mar 29 slide deck |

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| Apr 12, 2022 @ 3pm EST | Dr. Zheng Wang | DCM for Electrophysiological Data | **Literature:** (Jansen and Rit, 1995; David et al., 2006; Kiebel et al., 2006; Garrido et al., 2008)<br><br>**Topics:**<br><br>• DCM for ERPs:<br>  ◦ the basic neural mass model (Jansen & Rit)<br>  ◦ forward, backward, lateral connections<br>• DCM for induced responses<br>  ◦ the phenomenological model<br>  ◦ linear (within-frequency) vs. nonlinear (across-frequency) coupling | Recording Link<br><br>Access Passcode:<br><br>#2j4$J+uEH | April 12 slide deck |
| Apr 26, 2022 @ 3pm EST | Milad Soltanzadeh | DCM for steady-state responses & conductance-based DCMs | **Literature:** (Moran et al., 2008, 2009, 2011b, 2011a; Symmonds et al., 2018; Pereira et al., 2021)<br><br>**Topics:**<br><br>• conductance-based DCMs<br>• validation studies | Recording Link<br><br>Access Passcode:<br><br>ghx#6?y#gQ | April 26 slide deck |