Thursday March 24th, 12pm (noon) ET
Presentation in Zoom, accessible via the C-STAR website:
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Reverse-Engineering the Cortical Architecture for Controlled Semantic Cognition

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Controlled semantic cognition is challenging as the brain must achieve two seemingly contradictory functions: abstracting context-invariant conceptual representations across time and modalities, while producing specific context-sensitive behaviours appropriate for the immediate task. Adopting a reverse-engineering approach allowed us to illuminate the neurocomputational building blocks that combine to support controlled semantic cognition: the storage and context-appropriate use of conceptual knowledge. By systematically varying the structure of a computational model and assessing the functional consequences, we identified the architectural properties that best promote some core functions of the semantic system. These functions were best achieved in models with particular building blocks; a single, deep multimodal hub with sparse connections from modality-specific regions, and control systems acting on peripheral rather than deep network layers. Evidence is provided for the presence of these same building blocks in the cortical semantic system, providing an explanation of how the organisation of the brain supports controlled semantic cognition. The reverse-engineered model provides a unifying account of core findings in the cognitive neuroscience of controlled semantic cognition, including evidence from anatomy, neuropsychology and functional brain imaging.

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