

Interdisciplinary subjects in Computer science, linguistics and psychology for Master/ARPE internships and PhDs

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Supervisors

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Key words

Computer science, linguistics and psychology, computational psychotherapy, psychiatry, systematic AI assistance for psychotherapy,

Location

The Master and the PhD will be supervised by Alain Finkel at the Ecole Normale Supérieure Paris-Saclay. The internships, visits and PhD could probably be made in co-tutelle with colleagues at Montréal. A one-year stay in Montreal with co-supervision by colleagues in Montreal is strongly considered.

Qualifications and Connections

This internship and the PhD are opened to strongly motivated and excellent Master students who like both computer science *and* linguistics. Knowledges in cognitive-behavioural psychology and philosophy will be a plus.

Ideally, the candidate holds a Master degree in Computer Science (or Applied Mathematics) equivalently is graduated from a Computer Science (or Applied Mathematics) Engineering School. Ideally, the candidate has

strong knowledge both in computer science (formal methods, IA, ML, neural nets, LLM,...) or applied mathematics (probability, statistics, ML,...) *and* in computational linguistics; knowledges in cognitive psychology and philosophy will also be appreciated. The internship is an ideal opportunity for starting a PhD thesis (that could be made in collaboration with University of Montréal).

1 FORMAPSY : Formalizing Psychological Theories

Keywords

Formalization, psychological theories, memory, Global Neuronal Workspace (GNW).

Introduction

I aim to continue formalizing, refining, and implementing various psychological theories, such as the one initiated with Gaspard Fougere and Stéphane Leroux concerning Lazarus' stress theory, which we modeled using synchronized communicating finite automata. I plan to explore other formalizations, such as a theory of emotions, properties of memory systems, and consciousness modeled by the Global Neuronal Workspace (GNW) theory (where conscious access occurs when incoming information is made globally available to multiple brain systems via a network of neurons with long-range axons), etc.

Research Program

- Formalize a theory of emotions using the notion of territories [4].
- Model certain spatial and temporal properties of different memory systems [?].
- Formalize elements of the GNW theory [2, 3, 1], for example, using the broadcast protocol model.
- Organize a state-of-the-art review of existing models for consciousness (including probabilistic models like Friston's [5] and Blum's conscious Turing machine model [1]) and then develop a formal model for consciousness.

Applications

- Formally compare the formalized theories.
- Automatically verify potential contradictions, incompleteness, and ambiguities within a theory and between multiple theories.
- Construct an "algebra" of psychological theories that are modular, composable, formally refinable, and verifiable.
- Provide tools to the community for formal modeling.

Recruitment Needs

- 1 ENS M2/ARPE intern.

- 1 PhD student ENS in co-supervision with Udm, UQAM, Concordia. Skills/interests in computability, theoretical computer science, modeling, AI, NLP, LLM, and psychology.
- 1 post-doc at Udm, Concordia, UQAM. Skills/interests in computability, theoretical computer science, modeling, AI, NLP, LLM, and psychology.

Références

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- [5] Karl J. Friston. The free-energy principle : a unified brain theory? *Nature Reviews Neuroscience*, 11(2) :127–138, 2010.
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