Offer #2025-08903

PhD Position F/M 3-year PhD position in Computational Models of Semantic Memory

Contract type : Fixed-term contract

Level of qualifications required : Graduate degree or equivalent

Fonction : PhD Position

About the research centre or Inria department

The Inria Lille - Nord Europe Research Centre was founded in 2008 and employs a staff of 360, including 300 scientists working in sixteen research teams. Recognised for its outstanding contribution to the socio-economic development of the Hauts-De-France région, the Inria Lille - Nord Europe Research Centre undertakes research in the field of computer science in collaboration with a range of academic, institutional and industrial partners.

The strategy of the Centre is to develop an internationally renowned centre of excellence with a significant impact on the City of Lille and its surrounding area. It works to achieve this by pursuing a range of ambitious research projects in such fields of computer science as the intelligence of data and adaptive software systems. Building on the synergies between research and industry, Inria is a major contributor to skills and technology transfer in the field of computer science.

Context

The PhD position will be hosted within the MAGNET team at Inria Lille [1], in partnership with with the SCALAB group at University of Lille [2] in an effort to strenghten collaborations between these two research teams, and specifically to foster cross-fertilizations

between Natural Language Processing (NLP) and psycholinguistics. The MAGNET is actually evolving into a new interdisciplinary research group focusing on cognitively-grounded computational, neural-based models of language and reasoning.

Assignment

This PhD project investigates semantic memory through complementary contrastive and integrative approaches, at the intersection of
cognitive psychology and natural language processing. The overarching goal is to better understand the semantic capacities of large language models (LLMs) by comparing them to human cognition, and to improve these models using cognitively inspired learning biases.

Main activities

The first research axis focuses on contrastive evaluation: we will design robust probing and prompting techniques to analyze how
different families of LLMs (e.g., auto-regressive vs. masked models) encode and organize semantic knowledge. Models will be evaluated on datasets from experimental psychology, such as typicality norms (e.g., Rosch) and semantic feature norms (e.g., McRae, Buchanan), possibly including new data collection. The goal is to assess whether and how these models exhibit well-known features of human semantic memory such as taxonomic and prototypical organization, semantic feature sharing and inheritance, and polysemy —building upon preliminary work carried out in the team [3, 4, 5]. In addition, we intend to explore the structure of representations in vision-language models to investigate how multi-modal grounding shapes semantic memory, in light of findings from blind populations and developmental theories that challenge the necessity of visual input for acquiring rich word meanings.

The second axis focuses on integrative modeling, aiming to develop LLMs with inductive biases inspired by human cognitive development. Drawing from developmental psycholinguistics and findings in semantic memory acquisition, we will explore how representations evolve in humans and model this process in artificial learners. We will experiment with training regimes that control input volume, syntactic complexity, and curriculum structure. Longitudinal corpora and multimodal input (e.g., visual and symbolic data) will be used to simulate developmental conditions. This approach is directly inspired by recent initiatives such as the BabyLM benchmark campaigns, which promote the design of smaller, more data-efficient language models grounded in child language learning. Our goal is to integrate such developmental constraints into the architecture and training of LLMs in order to foster interpretability, efficiency, and cognitive plausibility. In both axes, both English and French data will be considered.

[3] https://aclanthology.org/2023.eacl-main.167.pdf
[4] https://aclanthology.org/2023.findings-emnlp.615.pdf
[5] https://aclanthology.org/2024.emnlp-main.156.pdf

Benefits package

- Subsidized meals
- Partial reimbursement of public transport costs
- Leave: 7 weeks of annual leave + 10 extra days off due to RTT (statutory reduction in working hours) + possibility of exceptional leave (sick children, moving home, etc.)
- Possibility of teleworking and flexible organization of working hours
- Professional equipment available (videoconferencing, loan of computer equipment, etc.)
- Social, cultural and sports events and activities
- Access to vocational training
- Social security coverage

Remuneration

2 200€ Gross monthly salary (before taxes)

General Information

- **Theme/Domain :** Data and Knowledge Representation and Processing Statistics (Big data) (BAP E)
- **Town/city :** Villeneuve d'Ascq
- **Inria Center :** Centre Inria de l'Université de Lille
- **Starting date :** 2025-10-01
- **Duration of contract :** 3 years
- **Deadline to apply :** 2025-06-30

Contacts

- **Inria Team :** MAGNET
- **PhD Supervisor :**
  Denis Pascal / Pascal.Denis@inria.fr

About Inria

Inria is the French national research institute dedicated to digital science and technology. It employs 2,600 people. Its 200 agile project teams, generally run jointly with academic partners, include more than 3,500 scientists and engineers working to meet the challenges of digital technology, often at the interface with other disciplines. The Institute also employs numerous talents in over forty different professions. 900 research support staff contribute to the preparation and development of scientific and entrepreneurial projects that have a worldwide impact.

The keys to success

Applicants should hold a Master's degree (or equivalent) in one or more of the following fields: Computational Linguistics, Natural
Language Processing, Artificial Intelligence, Machine Learning, Cognitive Science. Strong programming skills (Python preferred), a solid foundation in empirical research methods, and an interest in interdisciplinary work combining formal, computational, and experimental approaches are highly desirable.

Warning : you must enter your e-mail address in order to save your application to Inria. Applications must be submitted online on the Inria website. Processing of applications sent from other channels is not guaranteed.

Instruction to apply

Applications will be considered until the position is filled.
However, you are encouraged to apply early as we shall start processing the applications as and when they are received.

Applications, written in English, should be submitted online and should include:
* Curriculum Vitae (including your contact address, work experience, publications)
* Cover letter indicating your research interests and your motivation
* Contact information for at least 2 referees

Applications should be sent to: Pascal Denis (pascal.denis@inria.fr) et Angèle Brunellière (angele.brunelliere@univ-lille.fr).

Defence Security :
This position is likely to be situated in a restricted area (ZRR), as defined in Decree No. 2011-1425 relating to the protection of national scientific and technical

potential (PPST).Authorisation to enter an area is granted by the director of the unit, following a favourable Ministerial decision, as defined in the decree of 3 July 2012 relating to the PPST. An unfavourable Ministerial decision in respect of a position situated in a ZRR would result in the cancellation of the appointment.

Recruitment Policy :
As part of its diversity policy, all Inria positions are accessible to people with disabilities.