Quantum artificial intelligence with neutral-atom arrays (postdoc)

Record number : OPR-1040

Overview

RESEARCH DIRECTION

Stefanos Kourtis, Professeur - Department of Physics

INFORMATION

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ADMINISTRATIVE UNIT(S)

Faculté des sciences
Département de physique
Institut quantique

LEVEL(S)

Stage postdoctoral

LOCATION(S)

Institut Quantique Sherbrooke

Project Description

Context

To harness the potential of quantum computation in the near-term, new algorithmic blocks are necessary to extract the maximum possible benefit out of limited quantum resources. One of the most promising platforms for near-term quantum computing is based on trapped ultracold atom arrays.
This research project aims to design, implement, and deploy quantum algorithms and quantum simulation protocols for artificial intelligence applications through a partnership between the research group of Prof. Stefanos Kourtis and PASQAL, a world leader in quantum computing with neutral atoms.

Project

The research goals of this project are to
a)   develop quantum simulation protocols for the study of complex collective dynamical phenomena,
b)   design quantum machine learning protocols based on complex quantum dynamics,
c)   invent and apply new quantum algorithms for the solution of high-complexity combinatorial problems in artificial intelligence,
d)   standardize quantum advantage certification through high-performance classical computing.
By achieving these goals, it is expected that the team will enable demonstrations of utility of neutral-atom quantum computing.

Partner

PASQAL is a world-leading manufacturer of quantum processors built out of trapped atom arrays. Based in France, PASQAL has a strong presence in the Quantum Innovation Zone in Sherbrooke, with an assembly line already established in the city's Espace Quantique 1.

Team & environment

The selected postdoctoral researcher will be joining a dynamic team of 15 students, postdocs, and researchers, led by Prof. Stefanos

Kourtis. The team's research activities enjoy generous financial support from a Research Chair in Quantum Computing awarded by the Ministère de l'Économie, de l'Innovation et de l'Énergie du Québec and funding agencies (NSERC, Mitacs).

Our research team is embedded in the Faculty of Science at Université de Sherbrooke, a vibrant and diverse body of students, educators, and scientists. We are part of the dynamic research environ-ment of the Institut quantique, a research institute comprised of more than 30 research groups from the Faculty of Science, the Faculty of Engineering, the Faculty of Humanities and the School of Management, 25 technical and professional staff members, and over 200 students and postdocs.

Role available

One postdoctoral researcher role is open. The role will be remunerated competitively.

The position is based at the Université de Sherbrooke campus, with flexibility for remote work.

Candidates who identify as women, members of gender, sexual, visible or ethnic minorities, Indigenous people, and people with disabilities are encouraged to apply. Accommodations for maternity / paternity are available. A mentoring and professional development plan will be established for all team members.

Main tasks:

• Perform fundamental research on neutral-atom quantum computing and simulation
• Manage research activities to meet or revise project roadmap
• Co-supervise graduate students
• Coordinate actions between team and PASQAL collaborators

Qualifications:

• PhD in quantum information theory, theoretical physics, or theoretical computer science
• Strong capabilities in independent preparation of research manuscripts
• Capacity to work with a high degree of autonomy
• Capability to supervise students
• Familiarity with at least one of the following: ultracold atom physics, quantum algorithms, combinatorial optimization, tensor networks
• Coding capabilities (Python and / or C preferred)
• Desire to support a dynamic and diverse research team

Application

Interested applicants should provide the following:
• Letter of motivation; where possible, provide concrete examples of qualifications and strong suits
• CV including (i) publication list and (ii) names and contact information of 2 references; where possible, provide concrete examples of qualifications and strong suits
• Sample of independently authored research manuscript or code repository

Application material should be sent to :

quantum.ai@usherbrooke.ca

Discipline(s) by sector

Sciences naturelles et génie

Informatique, Physique

Partner(s)

Pasqal

The last update was on 6 May 2024. The University reserves the right to modify its projects without notice.