Sékou-Oumar Kaba

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Machine learning Ph.D. student with a physics background and data science industry experience. My interests include **AI for science**, **Geometric Deep Learning**, **Graph Representation Learning**.

Education

Doctor of Philosophy in Computer Science   **Montréal**
McGill University   *Since 2020*
GPA : 3.9 / 4.0
Supervisor: Prof. Siamak Ravanbakhsh
○ Designing deep learning models that leverage symmetry in crystals for prediction and generation.

Master of Science in Physics   **Sherbrooke**
Université de Sherbrooke   *2016 - 2018*
GPA : 4.1 / 4.3
Supervisor: Prof. David Sénéchal
○ Conducted numerical simulations on quantum lattice models to study unconventional superconductivity.

Bachelor of Science in Physics   **Québec**
Université Laval   *2013 - 2016*

Research experience

Research Intern in Artificial Intelligence   **Montréal**
Mila - Quebec Artificial Intelligence Institute   *2019 - 2020*
Supervisor: Prof. Yoshua Bengio
○ Implemented deep learning models for material property prediction. Performed predictions on a database of existing materials to identify promising candidates for magnetic refrigeration.

Research Intern in Neuroscience   **Québec**
CERVO Brain Research Center (Formerly CRIUSMQ)   *2015*
Supervisor: Prof. Robert Bonin
○ Designed and performed optogenetics and behavioural experiments on mice to study the MrgprB4 expressing neurons suspected to play a role in chronic pain.

Industry experience

Scientific Developer   **Montréal**
OODA Technologies   *2018 - 2019*
○ Full-stack work on data collection, analysis, and visualization programs, with applications in geolocation and computer vision. Tested, debugged, and documented software products.

Data Scientist   **Montréal**
The Brane   *2018 - 2019*
○ Scraped and processed data from various scientific databases to populate knowledge graphs. Engineered ontologies for the extracted data.

Publications

Conference papers:

S.-O. Kaba, S. Ravabakhsh. *Equivariant Networks for Crystal Structures.* In Thirty-Sixth Conference on Neural Information Processing Systems, 2022.

(Spotlight presentation) S.-O. Kaba, A. K. Mondal, Y. Zhang, Y. Bengio, S. Ravanbakhsh. *Equivariance with Learned Canonicalization Functions.* NeurIPS 2022 Workshop on Symmetry and Geometry in Neural Representations, 2022.

M. Pezeshki, S.-O. Kaba, Y. Bengio, A. Courville, D. Precup, and G. Lajoie. *Gradient starvation: A learning proclivity in neural networks.* In Thirty-Fifth Conference on Neural Information Processing Systems, 2021.

Journal articles:

(Under review at Physical Review Materials) S.-O. Kaba, B. Groleau-Paré, M.-A. Gauthier, A.-M. Tremblay, S. Verret, and C. Gauvin-Ndiaye. *Prediction of large magnetic moment materials with graph neural networks and random forests*, 2022.

S.-O. Kaba and D. Sénéchal. *Group-theoretical classification of superconducting states of strontium ruthenate.* Phys. Rev. B, 100:214507, 2019.

Presentations:

Equivariant Networks for Crystal Structures. Learning on Graphs Conference, Montréal, Canada, 2022.

Zoom sur la recherche en physique de la matière condensée. SAPHARI Symposium, Montréal, Canada, 2019.

Superconductivity in strontium ruthenate with quantum cluster methods. Canadian Graduate Quantum Conference, Vancouver, Canada, 2018.

Invited talks and panels:

IVADO, Canada, 2022.

Awards and achievements

Scholarships:

DeepMind PhD Scholarship (13 600$)	*2021 - 2024*
IVADO PhD Excellence Scholarship (25 000$)	*2021 - 2024*
DeepMind Masters Scholarship (12 000$)	*2020 - 2021*

Awards:

Best presentation award, Canadian Graduate Quantum Conference	*2018*
Laureate of the Acfas science popularization contest	*2018*

Grants

○ Samsung SAIT Call for Projects, PIs : Siamak Ravanbakhsh and Yoshua Bengio (60 000$)	*2022*

Technical skills

Programming: Python, Java, JavaScript   **Environnment**: Mac OS, Linux, Windows

Technologies: Pytorch, Git, LaTeX, Docker, MongoDB, ArangoDB, React, Spring, Flask

Other experience

Academic

Reviewer
NeurIPS workshop on AI for Accelerated Materials Design 2022

Teaching

Teaching Assistant **Sherbrooke**
Université de Sherbrooke *2017*
Course: Statistical Mechanics I
○ Prepared and taught weekly tutorial sessions using an active learning approach

Science Instructor **Québec**
Cégep de Sainte-Foy *2013 - 2015*

Outreach

Science Communication Consultant **Montréal**
Acfas *Since 2019*

Radio Host **Montréal**
CISM (Montréal) and CFAK (Sherbrooke) *2018*
○ Co-hosted the weekly radio show *Aujourd'hui, c'est déjà demain*, aired on two radio stations.

Science Popularizer **Québec**
Boîte à science *2014*

Community service

Laboratory Representative **Montréal**
Mila - Quebec Artificial Intelligence Institute *Since 2020*

Student Mentor **Montréal**
Projet SEUR *2019 - 2021*

Vice President External **Sherbrooke**
Regroupement étudiant des chercheurs en sciences de l'Université de Sherbrooke *2017 - 2018*

Head of Communication **Sherbrooke**
Women in Physics Canada Conference *2018*

Vice President Academic **Québec**
Association des étudiants de physique de l'Université Laval *2015 - 2016*