Arthur Pesah

PhD Student in Quantum Computing

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Education

2020–2024 **University College of London**, *PhD*, Quantum Computing.
PhD student at the Center for Doctoral Training (CDT) in Delivering Quantum Technologies. Fully-funded four-year program including one year of MRes and three years of thesis work

2017–2019 **KTH Royal Institute of Technology**, *Master of Science*, Theoretical Physics.
Double-degree with my engineering's school. I took courses in particle physics, statistical physics, general relativity, quantum computing, dynamical systems, and algebraic topology.
Thesis: *Learning quantum state properties with quantum and classical neural networks*

2015–2017 **ENSTA Paris**, *Engineering's degree*, Applied Mathematics.
One of the top French "Grandes Écoles". I took courses in applied mathematics (statistics, optimization, numerical methods, functional analysis) and physics (quantum physics, relativity, statistical physics, fluid/solid mechanics, plasma).

2013–2015 **Lycée Henri IV**, *Preparatory Class*, Mathematics and Physics.
A French specific two years' undergraduate program leading to a nation-wide competitive examination into a "Grande École", one of the top French engineers school system. Henri IV: Top 3 preparatory classes.

Research Experience

June-Sept. 2020 **Summer Student**, *Los Alamos National Laboratory*, Los Alamos, New Mexico, US.
Advisors: Marco Cerezo and Patrick Coles
Student and researcher at the Quantum Computing Summer School organized by LANL. Resulted in a paper: *Absence of Barren Plateau in Quantum Convolutional Neural Networks*

March-May. 2020 **Research Assistant**, *DTU*, Copenhagen, Denmark.
Advisor: Lars Kai Hansen
I worked on two projects in the computer science department of DTU: federated learning for EEG data and thermal state preparation with noisy quantum circuits

June-Dec. 2019 **Machine Learning Scientist**, *1QBit*, Vancouver and Waterloo, Canada.
Advisor: Pooya Ronagh
Member of the Hardware Innovation Lab, a research team that explores how future quantum devices can be leveraged to solve practical industrial problems. I designed reinforcement learning algorithms to control nonstoquastic quantum annealers. Summer in Vancouver and Fall in Waterloo.

Oct. 2018 - May 2019 **Visiting Graduate Student**, *University of Toronto*, Toronto, Canada.
Advisors: Peter Wittek (University of Toronto) and Nathan Killoran (Xanadu).
Internship in the context of my master's thesis, I worked on learning quantum state properties with quantum neural networks (for both continuous and discrete states)

July-Sept. 2018 **Research Engineer**, *University of Liège*, Liège, Belgium.
Advisor: Gilles Louppe.
I worked for the summer on deep learning and meta-learning methods for likelihood-free inference. Resulted in a publication at the *NeurIPS 2018 Workshop on Meta-Learning*.

Sept. 2017 - June 2018 **Research Assistant**, *KTH Royal Institute of Technology*, Stockholm, Sweden.
Advisor: Hossein Azizpour
Research assistantship in *Robotics, Perception and Learning (RPL)* lab. I worked on benchmarking adversarial domain adaptation methods.

June - Aug. 2017 **Summer Student**, *CERN*, Geneva, Switzerland.
Advisors: Benoît Salvant and Nicolo Biancacci
Member of the CERN Summer Student Program, I contributed to the development of a new model of instability inside particle accelerators.

Sept. 2015 - June 2017 **Research Assistant**, *Université Paris-Saclay*, Orsay, France.
Advisor: Isabelle Guyon
I worked on domain adaptation with High Energy physics datasets. I developed a software that enables to test and visualize domain adaptation algorithms on toy datasets.

Teaching

Jan. 2020 **PSI Winter School**, *Perimeter Institute*.
Supervised a project on the loss landscape of variational circuits with three master students and two post-docs, at a Winter School organized by the Perimeter Institute.

Oct. 2018 - May 2019 **Quantum Machine Learning MOOC**, *University of Toronto*.
Teaching Assistant for the QML MOOC (available on EdX) made by Peter Wittek. I wrote some of the lecture notebooks and helped answering questions on the forum.

March - May 2018 **Deep Learning in Data Science (DD2424)**, *KTH Royal Institute of Technology*.
Teaching Assistant for the deep learning master's course at KTH. I helped students with their projects and homework and was in charge of setting up Google Cloud Platform for the course.

July - Aug. 2015 **AutoML Hackathons**, *ChaLearn*.
Teaching assistant for the non-profit organization ChaLearn during two hackathons on automatic machine learning (AutoML). One was in Saint-Petersburg, at the *Machine Learning and Intelligence School* and the other in Stanford at the *INNS Conference on Big Data*. I wrote the starting kit for the challenge and helped the participants during the hackathons

Papers

2020 **A. Pesah**, M. Cerezo, S. Wang, T. Volkoff, A.T. Sornborger, P.J. Coles, *Absence of Barren Plateaus in Quantum Convolutional Neural Networks*, arXiv preprint arXiv:2011.02966

2020 W. Guan, G. Perdue, **A. Pesah**, M. Schuld, K. Terashi, S. Vallecorsa, J. Vlimant, *Quantum Machine Learning in High Energy Physics*, Machine Learning: Science and Technology

2018 **A. Pesah**, A. Wehenkel, G. Louppe, *Recurrent Machines for Likelihood-free Inference*, NeurIPS 2018 Workshop on Meta-Learning

Articles

2018 A. Pesah and A. Wehenkel, *Improve your scientific models with meta-learning and likelihood-free inference*, Towards Data Science

2018 A. Pesah, *Recent Advances for a Better Understanding of Deep Learning*, Towards Data Science

2018 A. Pesah, *A Little Review of Domain Adaptation in 2017*, Personal Website

Talks

2020 A. Pesah, *Quantum Machine Learning Beyond the Hype*. Talk given in different research seminars: IRISA (CNRS), France and DTU Compute, Denmark. Slides on my website

2019 A. Pesah, *A Gradient-based Method for Controlling Adiabatic Trajectories*. IQC Student Seminar, University of Waterloo, Canada

2018 A. Pesah and A. Wehenkel, *Recurrent Machines for Likelihood-free Inference*, Contributed talk at the NeurIPS 2018 Workshop on Meta-Learning. Slides on my website

2018 M. Sebag and A. Pesah, *Representation Learning, Domain Adaptation and Generative Models with Deep Learning*, 2nd International Summer School on Deep Learning 2018. I gave the last part of the course, on adversarial domain adaptation.

2018 A. Pesah, *Introduction to domain adaptation*. Talk given during a Stockholm AI meetup and the AI week organized in the city. Slides on my website.

Grants and Awards

2019 **Mitacs Globalink Research Award**, *6,000 CAD*.
Canadian grant received for my master's thesis internship at the University of Toronto

2017 **ENSTA Best Research Project Award**, *2nd position*, 1,000€.
Award received for my research internship at CERN during the Summer 2017. Competition organized by ENSTA ParisTech to gratify the best research summer internships. Students are judged by a dozen researchers of the school on a 50-pages report, the comments of the supervisor and a 3 minutes presentation. 16 students are selected in the first phase (among the whole cohort consisting in 150 students) and 3 prizes are awarded at the end.

Community service

2020 **Reviewer**, *Journal of Physics Communications*, IOP Publishing.
Reviewed a paper for the Journal of Physics Communication

2019 **Reviewer**, *Machine Learning and the Physical Sciences 2019 workshop*, NeurIPS 2019.
Reviewed two papers for the workshop

Other activities

2016 **Science outreach**, *Bouge la Science*, Supelec, Gif-sur-Yvettes.
Popularized scientific experiments to junior high school students during a scientific festival in the engineering school Supelec.

2016 **Science outreach**, *Palais de la Decouverte*, Paris.
Volunteered to present some physics experiments to a general public at a science museum in Paris

2015 **French selection for the International Physicists Tournament (IPT)**, *3rd place*.
Member of the ENSTA team, I participated to the national selection of the IPT. We worked on open physics problems during 4 months and presented models and experiments in front of a jury.

Skills

Langages	Python, C/C++, JavaScript, Julia, R, Matlab
ML Libraries	Tensorflow, PyTorch, Keras, Scikit-Learn
Quantum Libraries	Qiskit, PyQuil, PennyLane, Strawberry Fields, Yao
Web Framework	D3.js, Three.js