Ruben Ohana

Second year PhD candidate in Machine Learning at Ecole Normale Supérieure, INRIA & LightOn

https://rubenohana.github.io/ rubenohana oharub

Education

PhD candidate in Machine Learning - Ecole Normale Supérieure, INRIA & LightOn — *Paris, France*

Supervisors: Florent Krzakala, Alessandro Rudi, Laurent Daudet — *Dec. 2019 - Nov. 2022*

Axis of Research:

- (Optical) Random features and kernel methods
- Machine learning for chaotic time-series
- Improving Adversarial Robustness of Neural Networks
- Differential Privacy
- High-dimensional machine learning and their statistical analysis
- Alternative methods to backpropagation (mainly Direct Feedback Alignment)
- Quantum Information and Quantum Machine learning

MSc (Master 2) in Mathematics (Statistics & Machine Learning) — *Paris, France*

Sorbonne Université — *2018 - 2019*

MSc (Master 2) in Physics (Condensed Matter & Quantum Physics) — *Paris, France*

Ecole Normale Supérieure & Sorbonne Université — *2017 - 2018*

***Diplôme d'ingénieur* (major: Physics, minors: Biology & Chemistry)** — *Paris, France*

Ecole Supérieure de Physique et de Chimie Industrielles (ESPCI ParisTech) — *2014 - 2018*

Internships

LPENS, Ecole Normale Supérieure — *Paris, France*

Approximations of Kernels at the speed of light using the OPU of LightOn (PI: Florent Krzakala) — *May 2019 - Nov. 2019*

- **Corresponding Publication: [6]**

LIP6, Sorbonne Université — *Paris, France*

Contextuality for quantum information networks (PI: Damian Markham) — *April 2018 - June 2018*

- **Corresponding Publication: [7]**

MIT LIGO laboratory, Massachusetts Institute of Technology (MIT) — *Cambridge, USA*

Noise characterization of the ytterbium-doped fiber laser for ligo (PI: Peter Fritschel) — *May 2017 - July 2017*

- Implementation of the whole optical set-up for noise characterization of the laser.
- Characterization of the frequency noise, relative intensity noise, polarization noise of the laser - data analysis.

Quantum Solid State Physics Group, NTT Basic Research Laboratories — *Atsugi, Japan*

Quantum Spin Hall Effect in InAs/(In)GaSb double quantum wells (PI: Hiroshi Irie) — *July 2016 - December 2016*

- **Corresponding Publication: [8]**

Publications

[1] *Photonic Differential Privacy with Direct Feedback Alignment.* **R. Ohana***, H. Ruiz*, J. Launay*, A. Cappelli, I. Poli, L. Ralaivola, A. Rakotomamonjy, ArXiv

[2] *Photonic co-processors in HPC: using LightOn OPUs for Randomized Numerical Linear Algebra.* D. Hesslow, A. Cappelli, I. Carron, L. Daudet, R. Lafargue, K. Müller, **R. Ohana,** G. Pariente, I. Poli, ArXiv

[3] *Adversarial Robustness by Design through Analog Computing and Synthetic Gradients.* **R. Ohana*,** A. Cappelli*, J. Launay, L. Meunier, I. Poli, F. Krzakala, ArXiv

[4] *The dynamics of learning with feedback alignment.* M. Refinetti, S. d'Ascoli, **R. Ohana**, S. Goldt, ArXiv, **(ICML 2021)**

[5] *Reservoir Computing meets Recurrent Kernels and Structured Transforms.* **R. Ohana***, J. Dong*, M. Rafayelyan, F. Krzakala, ArXiv, **(Oral Presentation at NeurIPS 2020)**

[6] *Kernel computations from large-scale random features obtained by Optical Processing Units.* **R. Ohana**., J. Wacker, J. Dong, S. Marmin, F. Krzakala, M. Filippone, L. Daudet, ArXiv, **(ICASSP 2020)**

[7] *Experimental Approach to Demonstrating Contextuality for Qudits.* A. Sohbi, **R. Ohana**, I. Zaquine, E. Diamanti, D. Markham, ArXiv, **(Physical Review A)**

[8] *Impact of epitaxial strain on the topological-nontopological phase diagram and semimetallic behavior of InAs/GaSb composite quantum wells.* H. Irie, T. Akiho, F. Couedo, **R. Ohana**, K. Suzuki, K. Onomitsu, K. Muraki, ArXiv, **(Physical Review B)**

Reviewer in International conferences: ALT2020, NeurIPS2021

Academic Projects

ENGIE Challenge Data (rank: 33/185) Predict wind power production from wind turbine operational data (supervised learning). Data preprocessing, feature engineering and model selection.

Scientific Team Project (ESPCI, 18 months) Assembly of an electrospray and study of the nano-drops on a liquid (water or oil) collector, as well as the different modes of the spray. Video of the project available here.

Languages/Computer Science

English Fluent - Degrees: BULATS (level C1, June 2013), TOEIC (965/990, March 2017).
French Mother tongue.
Computer skills **Python, Pytorch**, beginner in Jax and Matlab.

Extracurricular Activity

Association President of the Langevinium (1 year), the laboratory for students of the ESPCI: implementation of a superconductive train self-propelled by liquid nitrogen, showing of many scientific experiments at the *Collège de France* and the *Grand Palais*.

Music Harp (11 years of practice, *Diplôme de fin d'études du Conservatoire de Rueil-Malmaison*, 1st Medal), music theory.

Teaching Private tutoring (mathematics, quantum physics, chemistry, music theory) to students from various levels.