

Adrien Vandenbroucq

DOCTORAL ASSISTANT

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Summary

I have a strong interest in Probability Theory, Information Theory, Combinatorial Optimization and Algorithms. Currently, my focus is on statistical estimation and the analysis of Markov processes.

Education

Swiss Federal Institute of Technology (EPFL)

Lausanne, Switzerland

DOCTORAL ASSISTANT IN THE LABORATORY FOR INFORMATION IN NETWORKED SYSTEMS (LINX)

2023 - Present

- Co-advised by Prof Michael Gastpar (EPFL) and Prof. Amedeo Esposito (OIST)
- Research on Information Theory, Probability Theory and Statistics

Swiss Federal Institute of Technology (EPFL)

Lausanne, Switzerland

MSC IN DATA SCIENCE

2018 - 2021

- GPA: 5.69/6.00
- Completed two semester projects with titles *On Quantum Algorithms to Solve Linear Systems of Equations* and *Reinforcement Learning & Games*
- Completed Masters thesis with the title: *A Dive into Cluster Monte-Carlo Algorithms: A Quantum-Inspired Approach*

University of Illinois at Urbana-Champaign

Champaign, IL, USA

EXCHANGE PROGRAM IN COMPUTER SCIENCE

2017 - 2018

- GPA: 3.96/4.00
- Research project on Streaming Algorithms with Prof. Chandra Chekuri during Summer 2018

Swiss Federal Institute of Technology (EPFL)

Lausanne, Switzerland

BSC IN COMMUNICATION SYSTEMS

2015 - 2018

- GPA: 5.46/6.00

Work Experience

Entropica Labs

Singapore, Singapore

ALGORITHMS RESEARCHER

2021 - 2023

- Research on cluster Monte-Carlo algorithms, resulting in the scientific article *The Houdayer Algorithm: Review, Extension, and Applications*.
- Development of the "ReduCon" method to improve the use of our generalization of the Houdayer algorithm, patent filing.
- Research on the qubit routing problem using reinforcement learning, applied to the quantum approximate optimization algorithm (QAOA).
- Contributor to *OpenQAOA*, an open-source multi-backend SDK for quantum optimization.
- Supervised the internship of an EPFL student.

SGInnovate

Singapore, Singapore

SUMMATION PROGRAMME APPRENTICE

2021

- Apprentice at Entropica Labs for the 6th run of the *SGInnovate Summation Programme*.
- Received mentorship from the programme and participated in specialised training workshops, along with exclusive invites to a multitude of Deep Tech industry and community events.

Entropica Labs

Singapore, Singapore

RESEARCH SCIENTIST INTERN

2021

- Provided a comparison of performance between classical and quantum algorithms in the context of mathematical optimization.
- Generalized an existing type of cluster Monte-Carlo algorithm and implemented an associated Python package to use and visualize it.

Dalytica (Vandenbroucq)

Morges, Switzerland

FREELANCE DATA SCIENTIST

2020 - 2021

- Completed multiple projects to gain experience and entrepreneurial skills. Clients include the *End Demand Switzerland (EDS)* association.
- Various tasks included: organization and planning, data extraction and processing, and data visualization.

Swiss Federal Institute of Technology (EPFL)

Lausanne, Switzerland

TEACHING & RESEARCH ASSISTANT

2020 - 2021

- TA in the classes: *EE-205 Signals and Systems* (undergraduate level), *COM-516 Markov Chains and Algorithmic Applications* (graduate level) and *COM-406 Foundations of Data Science* (graduate level).
- Research assistant at the Laboratory for Information in Networked Systems (LINX). Worked on information theory and distributed estimation, leading to two publications at the IEEE International Symposium on Information Theory (ISIT).

Dathena Science

Singapore, Singapore

DATA SCIENTIST INTERN

2019

- Implemented a system to efficiently detect and recognize personal identifiable information (PII) in chatbot messages.
- Improved the company's autolabeling system to automatically label samples from datasets.

EPFL Science Outreach Department

Lausanne, Switzerland

TEACHER

2017 - 2019

- Taught the course *Coding club for girls*, introducing how to use Internet and also how to make your own website to 11-16 year old girls.
- Designed and improved workshops to teach programming (Python and Scratch) to teenagers, and lead multiple of them.

Honors & Awards

2023 **EDIC Fellowship for Doctoral Studies**, EPFL

Lausanne,
Switzerland

2017 **Scholarship for US Exchange Program**, Vahabzadeh Foundation

Lausanne,
Switzerland

2017 **Scholarship for Bachelor's Exchange Year**, EPFL

Lausanne,
Switzerland

2015 **Semi-Finalist**, 29th Championship of Mathematical and Logical Games (National Semi-Finals)

Lausanne,
Switzerland

2014 **Semi-Finalist**, 28th Championship of Mathematical and Logical Games (National Semi-Finals)

Lausanne,
Switzerland

2013 **Finalist**, 27th Championship of Mathematical and Logical Games (National Finals)

Lausanne,
Switzerland

Service

International Symposium on Information Theory (ISIT)

Taipei, Taiwan

REVIEWER

2023

Information Theory Workshop (ITW)

Mumbai, India

REVIEWER

2022

Presentations

The Conference on Uncertainty in Artificial Intelligence (UAI)

Universitat Pompeu Fabra,
Barcelona, Spain

ANALYSIS OF BOOTSTRAP AND SUBSAMPLING IN HIGH-DIMENSIONAL REGULARIZED REGRESSION

Jul. 2024

International Symposium on Information Theory (ISIT)

Aalto University, Espoo, Finland

LOWER BOUNDS ON THE BAYESIAN RISK IN ESTIMATION PROCEDURES VIA f -DIVERGENCES

Jun. 2022

Workshop in Computational Scientific Research

Universidad Mayor, Santiago, Chile
(Online)

CLUSTER MONTE-CARLO ALGORITHMS: A TOOL FOR SOLVING DISCRETE OPTIMIZATION PROBLEMS

Jan. 2022

Publications

Lower Bounds on the Bayesian Risk via Information Measures

JMLR

WITH AMEDEO ROBERTO ESPOSITO AND MICHAEL GASTPAR

Nov. 2024

The problem of parameter estimation in a Bayesian setting is considered and a new approach for lower-bounding the Bayesian risk using a variety of information measures is proposed.

Analysis of Bootstrap and Subsampling in High-Dimensional Regularized Regression

UAI

WITH LUCAS CLARTÉ, GUILLAUME DALLE, BRUNO LOUREIRO, FLORENT KRZAKALA AND LENKA ZDEBOROVÁ

Jun. 2024

The performance of resampling methods (subsampling, bootstrap, jackknife) is investigated for uncertainty estimation in high-dimensional supervised regression tasks.

The Houdayer Algorithm: Review, Extensions, and Applications

ArXiv

WITH EZEQUIEL IGNACIO RODRÍGUEZ CHIACCIO AND EWAN MUNRO

Nov. 2022

A generalization of the Houdayer cluster Monte-Carlo algorithm is developed and applied to the study of generic Ising spin systems.

Lower Bounds on the Bayesian Risk in Estimation Procedures via f -Divergences

IEEE ISIT

WITH AMEDEO ROBERTO ESPOSITO AND MICHAEL GASTPAR

Aug. 2022

The problem of parameter estimation in a Bayesian setting is considered and a general lower-bound on the Bayesian risk using f -Divergences is proposed.

On Sibson's α -Mutual Information

IEEE ISIT

WITH AMEDEO ROBERTO ESPOSITO AND MICHAEL GASTPAR

Aug. 2022

A family of information measures that stems from Rényi's α -Divergences with $\alpha < 0$ is explored. In particular, the definition of Sibson's α -Mutual Information is extended and several of its properties are shown.

Patents

Methods And Systems For Optimization Problem Transformation For Facilitated Resolution

Singapore

LISTED AS INVENTOR, OWNED BY ENTROPICA LABS

Apr. 2023

Filed under the Patent Cooperation Treaty

Extracurricular Activity

EPFL Erasmus Student Network (ESN)

Lausanne, Switzerland

MEMBER FOR THE BUDDY PROGRAM

2021 - 2021

- Point of contact for exchange student coming to EPFL.
- Help exchange student feel at home by meeting regularly and discovering Switzerland together through various activities.

EPFL Quantum Computing Association (QCA)

Lausanne, Switzerland

COMMITTEE MEMBER & EVENT MANAGER

2019 - 2021

- In charge of creating and leading a workshop for an introduction to quantum computing.
- Responsible to organize events and promote the association on campus.

Global Leaders Orange and Blue (GLOBE)

Champaign, IL, USA

MEMBER

2017 - 2018

- Gave talks at the association's *iCU* events about the experience of studying in the United States and Switzerland.
- Received a certificate of recognition for being a great member and leader.

International Tech-Do Nunchaku Association (ITNA)

Morges, Switzerland

MEMBER, STUDENT & TEACHER

2006 - Present

- Received Black Belt 1st Dan in 2016 and gave lessons to students of all ages and levels since then.
- Participated in a number of international competitions throughout the years (Switzerland, France and Netherlands).

Tian Long Guan - Wing Chun Kung Fu

Morges, Switzerland

STUDENT & ASSISTANT

2012 - Present

- Gave lessons since 2016 and was assistant in most classes.
- Received two gold medals for Tuishou and Southern Chinese Forms at the 2014 Unified World Championship in Carrara, Italy.

Miscellaneous

Programming Python, Julia, Matlab, Java, Scala, C, Bash, Latex

Front-end React, HTML5

Languages French (Native), English (IELTS Band Score 8.0/9.0), German (CEFR B2 Level)