Jonathan Crabbé

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Born 13 February 1996

EDUCATION

2020 – Now

PhD Candidate in Explainable Artificial Intelligence

Department of Applied Mathematics, University of Cambridge

- Supervisor: Prof. Mihaela van der Schaar
- Purpose: Develop new interpretability methods for Machine Learning models. The notion of interpretability has become central in Machine Learning since the large-scale deployment of Machine Learning models requires trust, which relies heavily on the ability of human beings to understand the predictions of such models.

2018 – 2019

Master's degree in Advanced studies in Applied Mathematics (Part III)

Department of Applied Mathematics, University of Cambridge

- Grade: *Distinction*
- Overall average: 79/100

2017 – 2018

Master's degree (M1) from the ICFP (International Centre for Fundamental Physics and its interfaces)

Department of physics, Ecole Normale Superieure of Paris

- Grade: *Mention Bien* (Mention Good)
- Overall average: 14.26/20

2014 – 2017

Bachelor degree in engineering

Ecole Polytechnique de Bruxelles, Universite Libre de Bruxelles

- Grade: *La plus grande Distinction* (The greatest Distinction)
- First year average: 18.12/20 with the highest honors, rank: first (456 students)
- Second year average: 17.63/20 with the highest honors, rank: first
- Third year average: 17.42/20 with the highest honors, rank: first
- Overall average: 17.72/20, rank: first

WORK EXPERIENCE

February 2020 – October 2020

Research in machine learning interpretability

University of Cambridge

- Supervisor: Pr. Mihaela van der Schaar
- Subject: Machine Learning Interpretability
- Purpose: build robust and interpretable models for machine learning black-box models. This is a central problem for the large-scale deployment of machine learning algorithms in a medical context.
- Results: 1 NeurIPS paper: "Learning outside the black-box: at the pursuit of a faithful model".

October 2019 – February 2020

Research in theoretical physics

Université Libre de Bruxelles

- Supervisor: Pr. Glenn Barnich
- Subject: Black-Hole entropy from mode expansion of physical observables
- Purpose: develop a canonical interpretation of the black hole entropy.

February 2018 – July 2018

Internship in theoretical physics

Imperial College London

- Supervisor: Dr. Claudia de Rham and Dr. Andrew Tolley
- Subject: simulation of a perfect caustic formation for a k-essence field and its UV completion
- Purpose: study the dynamic of a scalar field that might describe the acceleration of the universe expansion. A UV completion of this model is built to solve some singularities (caustics), the efficiency of this method is proved formally and with a numerical simulation.

2017 – 2020

Volunteering for the pedagogical project Clipedia

Universite Libre de Bruxelles

- Supervisor: Pr. Marc Haelterman, Dr. Olivier Decroly
- Purpose: create a free online pedagogical platform with videos on various scientific subjects allowing students to learn by themselves and thus breaking the verticality of teaching.
- Statistics: More than 54,000 subscribers for more than 5,000,000 views
- Tasks: realise and act in videos.
- Website: https://clipedia.be/

2016 – 2017

Student assistantship

Universite Libre de Bruxelles

- Purpose: helping students through remedial courses or interactive exercise classes for the following fields : linear algebra, geometry, calculus, probability theory, statistics, general physics, quantum mechanics, electricity, classical mechanics, continuum mechanics

AWARDS

2019

Wolfson College's Jennings Price (£300)

Jennings Prizes are awarded each year to Wolfson students who have achieved a First Class or Distinction in University examinations.

2017 – 2018

LabEx ENS-ICFP scholarship (800€/month for a scholar year)

Academic scholarship based on academic merit.

SKILLS

Languages

- French – native language
- English – IELTS band 8 score (7.5 writing, 8 listening, 8.5 reading, 7 speaking)
- Dutch – moderate level
- Hebrew – weak level

Computer Skills

- Great acquaintance with the following languages: Pyhton (inlucding Pytorch, Tensorflow, Numpy, Pandas, Scikit-Learn), Matlab, C++, Java, Mathematica, Html, CSS
- Relevant courses: Object-oriented programming (18/20), Numerical Analysis (19/20), Signals and systems (19/20), Complements of mathematics and of numerical computing (19/20)

Pedagogy

- Talk given at the CMS of Cambridge on the topology and the geometry of the universe in a FLRW metric
- Volunteer for the teaching project Clipedia
- Experience in student assistantship
- Private teaching experience since 2014
- Responsible of a stand consisting in the presentation of a galvanometric Laser show at the fair *Printemps des Sciences* in Brussels

Academic

- International Selection competition of the *Ecole Normale Superieure* of Paris: 13th scientist and 4th physicist ($\sim$ 350 students)
- Entrance examination at the *Ecole Polytechniques de Bruxelles*: first ($\sim$ 400 students) with 20/20 in Trigonometry, Geometry, Calculus and 18/20 in Algebra

Research
- Main interests: Applied Mathematics, Artificial Intelligence, Numerical analysis, General Relativity, Cosmology, Differential Geometry, Algebraic Topology.

SELECTED PUBLICATIONS

NeurIPS 2020

Crabbe, J., Zame, W. R., Zhang, Y., & van der Schaar, M. (2020). Learning outside the black-box: the pursuit of interpretable models. In H. Larochelle, M. Ranzato, R. Hadsell, M. F. Balcan, & H. Lin (Eds.), Advances in Neural Information Processing Systems (pp. 17838–17849). Curran Associates, Inc.

ADDITIONAL INFORMATION

Interests
- Sports: hiking, swimming, diving
- Culture: modern french literature, history of science, musicology