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📅 Date of birth: 27 April 1987



Senior Researcher, Criteo AI Lab

Research statement

Context.

In recent times, machine learning / AI systems have demonstrated human-level ability across a broad range of domains previously thought to be out-of-reach. Just to name a few, let us mention: computer vision, natural language processing, generative modeling, recommender systems, fault prediction, fraud detection, detection of harmful content and fake-news in social networks, medical diagnosis, solving complex games like Go, etc. However, much of the underlying principles governing machine learning / AI in regards to real-world applications are still to be discovered. For example, explaining the decisions of such systems, and the failure modes –which can have life-changing consequences– is an active research subject. Adversarial examples in deep (and shallow) models remain a mystery. Finally, if care is not taken, ML / AI powered-systems can amplify problems linked to fairness and privacy. Thus, *Explainability*, *Robustness*, *Fairness*, and *Privacy*, have been identified by researchers and practitioners alike, as being some of the biggest foundational problems in machine learning and AI.

My research agenda, now, and the future.

My research focuses on the following subjects:

- *Adversarial robustness* (theoretical limits, detection)
- *Robust optimization* (robustness to uncertainty like distributional shift)
- *Structured prediction* (specifically, determinant point processes)
- *Understanding deep-learning* (optimization, generalization)

The above subjects all have tight links with explainability, robustness, fairness, and privacy in machine learning / AI discussed above. I have made significant contributions to these subjects (see selected publications below). My long-term goal is to bring about original technical / scientific contributions that help our understanding of these problems. These contributions will come by way of theoretical and conceptual insights, algorithms, and software.

Education

- Oct 2014 – Sep 2017 **Doctor of Philosophy (PhD.), Computer Science, Université Paris-Saclay.**
Title: Enhancement of functional brain connectome analysis by the use of deformable models in the estimation of spatial decompositions of the brain images.
Supervisors: Bertrand THIRION, PhD; Gael VAROQUAUX, PhD.
- 2010 – 2011 **MSc. Cryptology and Information Security, University of Bordeaux 1.**
- 2009 – 2010 **Maîtrise ès Mathématiques, University of Bordeaux 1.**
- 2005 – 2008 **BSc. Mathematics and Computer Science, University of Buea.**

Professional experience

- March 2018 – Present **Senior researcher, Criteo AI Lab, Paris, France.**
- Mostly working on: adversarial examples, deep-learning theory, robust optimization, structured prediction, reinforcement-learning
 - Co-supervising Masters' and PhD students (CIFRE)
- Oct 2017 – Dec 2017 **Post-doctoral researcher, Parietal Team – INRIA / CEA, Neurospin, Neurospin, Université Paris-Saclay, France.**
Machine learning and neuroscience

- Oct 2014 – Sep 2017 **Part-time research engineer**, *Parietal Team – INRIA / CEA, Neurospin, Neurospin, Université Paris-Saclay, France.*
While preparing my PhD, a 6th of my time is spent programming and consulting.
- Oct 2012 – Oct 2014 **Research engineer**, *Parietal Team – INRIA / CEA, Neurospin, Neurospin, Université Paris-Saclay, France.*
Software engineering / python-programming; implementation of machine learning algorithms for brain decoding (on functional MRI data); preprocessing and statistical analysis of fMRI data; implementation of registration algorithms. See <http://nilearn.github.io/search.html?q=dohmatob> and <https://github.com/neurospin/pypprocess>.
- Mar 2011 – Aug 2011 **Cryptology and Security intern**, *P1 Security, Paris, France.*
Implementation of an event-driven pentesting framework for telecom protocols

Selected scientific publications

Summary from Google scholar: Total citations ≥ 555 ; h index ≥ 10 ; 110 index ≥ 13 .

Full information available at: <https://scholar.google.fr/citations?user=FDWgJY8AAAAJ&hl=fr>.

- 2020
- *On the Convergence of Smooth Regularized Approximate Value Iteration Schemes.* Neural Information Processing Systems (NeurIPS).
 - *Learning disconnected manifolds: a no GAN's land.* International Conference in Machine Learning (ICML). <https://arxiv.org/pdf/2006.04596.pdf>
 - *Distributionally Robust Counterfactual Risk Minimization.* Conference on Artificial Intelligence (AAAI). <https://arxiv.org/abs/1906.06211>
 - *Dark control: The default mode network as a reinforcement learning agent.* Human Brain Mapping (HBM). <https://onlinelibrary.wiley.com/doi/full/10.1002/hbm.25019>
- 2019
- *Generalized No Free Lunch Theorem for Adversarial Robustness.* International Conference in Machine Learning (ICML). <https://arxiv.org/pdf/1810.04065.pdf>
 - *Learning Nonsymmetric Determinantal Point Processes.* Advanced Neural Information Processing Systems – NeurIPS conference (NeurIPS). <https://arxiv.org/pdf/1905.12962.pdf>

Scientific reviewing

- 2016 – present NeurIPS – Neural Information Processing Systems
- 2018 – present ICML – International Conference in Machine Learning
- 2019 – present COLT – Conference on Learning Theory
- 2019 – present ICLR – International Conference on Learning Representation
- 2019 – present IJCAI – International Joint Conference on Artificial Intelligence

Supervision of students

- Jan. 2019 – July 2019 Morgan Goibert, Masters' internship
- Nov. 2019 – present Morgan Goibert, PhD candidate (co-supervised with Stéphan Clémanson)

Languages

- Bilingual English (fluent), French (fluent)

Contributions to open-source software projects

- Data science & AI scikit-learn <http://scikit-learn.org/stable/>
- Complete list See complete list on my github profile at <https://github.com/dohmatob>

IT and computing skills

See my github profile at <https://github.com/dohmatob>

Programming Languages Python, bash, Latex

Data science software scikit-learn, pandas, pytorch, keras

Software Engineering OOP, TDD, version control (git, github), continuous integration (travis, circle-ci), parallel computing (xargs, joblib)

Operating Systems GNU/Linux

Scholarships

2009 - 2011 Erasmus Mundus, ALGANT (*Algebra, Geometry, and Number Theory*), Université de Bordeaux 1

Interests

Research adversarial examples, deep-learning theory, robust optimization, privacy / fairness

Hobbies programming, dancing, ping-pong, arcade games