

Romain R. Brault

Curriculum Vitae

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TL; DR: Dynamic and curious, I am a Machine Learning and programming enthusiast looking for a research position, in France or abroad.

Doctoral Research

“Large-Scale Operator-Valued Kernel Regression” [3]

My research examined the scalability of learning algorithms based on Operator-Valued Kernels (OVKs) leveraging regression in Hilbert spaces rather than reals.

We developed a stochastic approximation method called ORFF, extending the already existing random Fourier feature methodology to OVKs [1]. We provided theoretical guarantees on the quality of the approximation. We applied this work to scale-up non-linear autoregressive models [2]. We also proposed a scalable splitting criteria that extend Random Forests to one-class classification [4].

My doctoral studies have been motivated by my desire to apply mathematical knowledge to practical applications. I enjoy providing robust pieces of software along with theoretical guarantees. During this thesis I have been conducting to develop and maintain the open-source library **Operalib** which aims at implementing state of the art operator-valued kernel based algorithms and being fully compatible with **Scikit-Learn**. I also had the opportunity to be a teaching assistant at **UEVE** and **Télécom ParisTech**.

Positions

Current, from December 2018 (FT)
III-V Lab, Thalès
Research Scientist

October 2018, from September 2017 (FT)
Centrale-Supélec
Post-Doctoral Fellow

My research has been directed toward learning function-valued functions. The idea is that some problems such as Quantile Regression, Cost-Sensitive learning or Level-Set estimation are described by an hyperparameter. Rather than solving the problem for a specific value of the hyperparameter, we propose to learn the whole continuum of hyperparameters. Then we can enforce stronger coherence of the learned models (non-crossing quantiles, nested level sets) and sometimes improve the overall quality of the models [5]. We provide a Tensorflow implementation of the proposed method (<https://bitbucket.org/RomainBrault/itl/>). This postdoc is done in collaboration with the **CMAP** laboratory at École Polytechnique.

Education

2013 – 2017 **Doctor of Philosophy**
Machine Learning
UEVE & Télécom ParisTech

2012-2013 **Master of Science**
Computer Science
Imperial College London

2010 – 2013 **Diplôme d'ingénieur**
Computer Science
ENSIIE, Paris-Saclay

2010 – 2011 **Bachelor of Science**
Mathematics
UEVE, Paris-Saclay

Languages

French (native), **English** (Fluent),
German (notions)

Technical Skills

Pandas, Python, Tensorflow, Scikit-Learn,
C/C++, x86 Assembly, Hardware,
OpenMP, MPI, Continuous Integration,
Open-source contribs,
LaTeX, Machine Learning, Statistics,
Functional Analysis

References

Pr. Florence d'Alché-Buc

Position Full Professor
Employer *LTCI, Télécom ParisTech*
Email florence.dalche@enst.fr
Phone +33 (0)1 45 81 79 76 (Work)

Dr. Zoltán Szabó

Position Associate Professor
Employer **CMAP, École Polytechnique**
Email zoltan.szabo@polytechnique.edu
Phone available on request

September 2013, from Mai 2013 (FT)
Department of Computing, Imperial College London
Master Thesis

Worked on Finite Elements Method: modified **Fluidity**'s code to integrate bended elements to the **FEniCS** project.

July 2012, from June 2012 (FT)
CMLA, ENS Cachan
Research Intern

Implementation of a parallel lock-free SGD algorithm using OpenMP and SSE instructions. Also worked on a CUDA GPGPU implementation.

August 2011, from June 2011 (FT)
CEA²
Research Intern

Used Machine Learning techniques to calibrate the hyperparameters of a simulation code for nuclear reactions (**TALYS**).

Publications

Proceedings

- [1] Romain Brault, Markus Heinonen, and Florence d'Alché-Buc. "Random Fourier Features For Operator-Valued Kernels." In: Proceedings of Machine Learning Research 63 (16–18 Nov 2016), pp. 110–125. url: <http://proceedings.mlr.press/v63/Brault39.html>.
- [4] Nicolas Goix et al. "One Class Splitting Criteria for Random Forests." In: Proceedings of Machine Learning Research 77 (15–17 Nov 2017), pp. 343–358. url: <http://proceedings.mlr.press/v77/goix17a.html>.
- [5] Romain Brault et al. "Infinite-Task Learning with Vector-Valued RKHSs." In: *Proceedings of AISTATS* (2019). url: <https://arxiv.org/pdf/1805.08809.pdf>.

Communication

- [2] Romain Brault, Néhémé Lim, and Florence d'Alché-Buc. "Scaling up Vector Autoregressive Models With Operator-Valued Random Fourier Features." In: *AALTD: ECML/PKDD International Workshop on Advanced Analytics and Learning on Temporal Data*. 2016, p. 3. url: <https://aaltd16.irisa.fr/accepted-papers/>.

Thesis

- [3] Romain Brault. "Large-scale operator-valued kernel regression." 2017SACLE024. PhD thesis. 2017. url: <http://www.theses.fr/2017SACLE024/document>.



Distinctions

- 2012 **Best engineering project**
National reward to our team for the **best engineering project** among the French Junior Entreprises.
- 2011 **Top Achiever Award**
Best Individual Project (out of 109)
Implemented a kernel SGD algorithm (**NORMA**) for house market prediction in London.

Hobbys

In my spare time I enjoy practicing photography (see 500px.com/romainbrault) as well as climbing and trekking. I used to practice archery.