Jean-Yves Franceschi

Curriculum Vitae

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Research

September 2018 – August 2021

PhD, *Sorbonne Université, Laboratoire d'Informatique de Paris 6, team MLIA*, Paris, France, under the supervision of Patrick Gallinari and Sylvain Lamprier.

I am working on machine learning for spatio-temporal data. In particular, my work is focused on how to leverage differential equations and their links with neural networks in order to create performant prediction models for complex data, such as videos.

Inspired by such connections, I designed with colleagues a novel temporal model based on residual connections instead of recurrent neural networks, and that lead to state-of-the-art results for stochastic video prediction [1].

Additionally, I am a teacher assistant at Sorbonne Université in Computer Science, and participate in organizing a reading group on the topic of spatio-temporal machine learning.

March 2017 – July 2018

Research Internship, *Ecole Polytechnique Fédérale de Lausanne, Machine Learning and Optimization Laboratory*, Lausanne, Switzerland, 19 weeks, under the supervision of Martin Jaggi.

I worked on unsupervised scalable representation learning for time series. We designed a method combining an encoder based on causal dilated convolutions with a novel triplet loss employing time-based negative sampling, obtaining general-purpose representations for variable-length and multivariate time series in a scalable manner. This work is published and was presented at NeurIPS 2019 [2].

September 2017 – February 2018

Research Internship, *Ecole Normale Supérieure de Lyon, Laboratoire de l'Informatique et du Parallélisme, team MC2*, Lyon, France, 25 weeks, under the supervision of Omar Fawzi.

I worked on theoretical aspects of machine learning, such as adversarial examples and convex optimization.

We bounded the ratio between the amplitude of adversarial perturbations (imperceptible perturbations altering the classification of an image) and classifiers robustness to random perturbations for linear classifiers, extended the result to more general classifiers, and experimentally verified it on state-of-the-art neural networks. This work resulted in a publication at AISTATS 2018 [3].

Our work on convex optimization consisted in studying the precise query complexity of convex optimization problems (existing algorithms and lower bounds) and formalizing query complexity for convex optimization in the quantum setting.

February – June 2017

Research Internship, *Inria Antenne Lyon - La Doua, team Privatics*, Lyon, France, 20 weeks, under the supervision of Daniel Le Métayer.

I worked on the emerging field of accountability of decision algorithms, more particularly on decision explanation (why did a classifier output a given result?) and fairness (how to detect and design fair classifiers?), with an emphasis on learning procedures. We produced a first attempt of a state-of-the-art review of the field, destined to be submitted as a Systematization of Knowledge.

May – July 2016	**Research Internship**, *University of Konstanz, Computer Graphics and Media Informatics working group*, Konstanz, Germany, 11 weeks, under the supervision of Abdalla Gaafar Ahmed and Oliver Deussen. I worked on blue-noise sampling in computer graphics. After a review of the topic and of the standard and state-of-the-art techniques, I worked on an in-development sampling method, studied it and proposed a variant that improves its blue-noise properties. A paper related to this topic was published in IEEE TVCG [4].
June & July 2015	**Research Internship**, *Inria Sophia Antipolis, team Marelle*, Valbonne, France, 6 weeks, under the supervision of Yves Bertot. I worked on the integration of the "differential dynamic logic" – a logical system aiming to prove properties about physical systems – in the higher order proof system Coq. We managed to implement its basis and start a reflexion about how to modify this logic in order for a possible implementation to be convenient to write and use.

References

[1] **J.-Y. Franceschi***, E. Delasalles*, M. Chen, et al. "Stochastic Latent Residual Video Prediction". Preprint. 2020. URL: https://hal.archives-ouvertes.fr/hal-02484182.

[2] **J.-Y. Franceschi**, A. Dieuleveut, and M. Jaggi. "Unsupervised Scalable Representation Learning for Multivariate Time Series". In: *Advances in Neural Information Processing Systems 32*. Curran Associates, Inc., 2019, pp. 4650–4661.

[3] **J.-Y. Franceschi**, A. Fawzi, and O. Fawzi. "Robustness of classifiers to uniform ℓ_p and Gaussian noise". In: *Proceedings of the Twenty-First International Conference on Artificial Intelligence and Statistics (AISTATS)*. Vol. 84. Proceedings of Machine Learning Research. Playa Blanca, Lanzarote, Canary Islands: PMLR, Apr. 2018, pp. 1280–1288.

[4] A. G. M. Ahmed, J. Guo, D. M. Yan, et al. "A Simple Push-Pull Algorithm for Blue-Noise Sampling". In: *IEEE Transactions on Visualization and Computer Graphics* 23.12 (Dec. 2017), pp. 2496–2508.

Teaching

September 2018 –
August 2021
	Teaching Assistant, *Computer Science*, Sorbonne Université, Paris, France.
	○ 2020:
	  - **Algorithmique I** (38.5h), 2nd year of Bachelor: tutorials covering algorithmics foundations (halting, correctness, complexity, trees, and graphs).
	  - **Projet (application)** (38.5h), 2nd year of Bachelor: supervising around 15 group projects to build an artificial intelligence for two-player games (Awele, Othello) in Python.
	○ 2019:
	  - **Introduction à la programmation Objet** (19.25h), 2nd year of Bachelor: object-oriented programming and Java practical works.
	  - **Projet (application)** (38.5h), 2nd year of Bachelor: supervising around 15 group projects to build an artificial intelligence for two-player games (Awele, Othello) in Python.
	○ 2018:
	  - **Introduction à la programmation Objet** (19.25h), 2nd year of Bachelor: object-oriented programming and Java practical works.

Education

2018	**Ecole Normale Supérieure de Lyon Diploma**, *Ecole Normale Supérieure de Lyon*, Lyon, France.
2017	**Master of Science, Foundations of Computer Science**, *Ecole Normale Supérieure de Lyon*, Lyon, France, *GPA : 4.00*. Obtained with highest honors.[1]
2015	**Bachelor of Science, Foundations of Computer Science**, *Ecole Normale Supérieure de Lyon*, Lyon, France, *GPA : 4.00*. Main and mandatory bachelor, obtained with highest honors.[1]
2015	**Bachelor of Science, Mathematics and Applications**, *Université Claude Bernard Lyon I*, Villeurbanne, France, *GPA : 3.50*. Bachelor followed under the scope of a double degree, obtained with highest honors.[1]
2014	**Admission to the Ecole Normale Supérieure de Lyon over a competitive exam**. The Ecole Normale Supérieure de Lyon is a French "Grande Ecole", *i.e.* a leading institution of higher education entrance to which is based on a competitive examination. It provides a four-year training designed for future researchers and scientists.
2012–2014	**Scientific Classes préparatoires MPSI/MP**, *Centre International de Valbonne*, Valbonne, France. "Classes préparatoires" are a two-year intensive course preparing for the competitive entrance examinations to French "Grandes Ecoles". They provide a high-level scientific formation based on Mathematics (14 hours a week), Physics (10 hours a week), Computer Science (5 hours a week), English (3 hours a week) and Philosophy (2 hours a week), and require a consequent investment and a lot of personal work.
2012	**Baccalauréat scientifique**, Ajaccio, France. High-school diploma with a scientific major, obtained with highest honors.

Accomplishments

2015	Ranked 10th as a member of the ENSL1 team (Simon Mauras, Timothée Pécatte and myself) at the Southwestern Europe Regional Contest (SWERC) 2015 of the ACM-ICPC contest.
2017	Ranked 12th as a member of the ENSL2 team (Simon Mauras, Raphaël Monat and myself) at the Southwestern Europe Regional Contest (SWERC) 2017 of the ACM-ICPC contest.

Languages

French	Mother tongue	
English	Proficient	*(B2 level)*[1]
German	Intermediate	*(B1 level)*[1]

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[1] GPA computed thanks to the following conversion tool: `https://www.scholaro.com/gpa-calculator`.
[1] See `https://en.wikipedia.org/wiki/Common_European_Framework_of_Reference_for_Languages`.

Computer Skills

Programming Languages

Intermediate	Java
Proficient	C, C++, Python, OCaml

Miscellaneous

Basic	SageMath, Maple, Mathematica, SQL
Intermediate	MPI, Qt, Coq Proof Assistant, Tensorflow
Proficient	LaTeX, PyTorch