

Michaël Defferrard

"I make machines learn; better by exploiting structure."

Education

- 2015 – now **PhD candidate**, *École Polytechnique Fédérale de Lausanne (EPFL)*.
Advised by Prof. Pierre Vandergheynst.
- 2012 – 2015 **MSc Electrical Engineering**, *EPFL*, *GPA 96%*.
Minor in Computational Neuroscience.
- 2009 – 2012 **BASc Electrical Engineering**, *École d'Ingénieurs de Fribourg (EIA-FR)*, *GPA 98%*.
- 2010 – 2011 **Exchange student (ERASMUS)**, *Fachhochschule München*.

Experience

- 2014 – now **Research Assistant**, *École Polytechnique Fédérale de Lausanne (EPFL)*.
Doctoral assistant (and previously project student) at the LTS2 laboratory led by Prof. Pierre Vandergheynst. I researched on machine learning and data structured by graphs and manifolds. I published papers in top-tier venues, supervised students, gave talks, taught courses, developed software.
- 2011 – 2015 **Software Engineer**, *Infoteam*, Givisiez CH.
Part-time job in the Energy R&D team. I ported a core product of the company, a control-command tool for energy distribution and production, to embedded systems. My work enabled the company to close its largest contract to date.
- May – Aug 2012 **Research Intern**, *Lawrence Berkeley National Laboratory (LBNL)*.
I characterized the performance of a new particle detector for the ATLAS experiment at the CERN's Large Hadron Collider (LHC).
- 2005 – 2011 **Electronics Specialist**, *Meggitt*, Fribourg CH.
Apprenticeship and part-time job. Production, test, quality assurance, repair, certification and development of sensing systems for the aerospace and energy markets.

Publications

scholar.google.com/citations?user=Ztj2-gUAAAAJ

- [1] [M. Defferrard](#), [M. Milani](#), [F. Gusset](#), [N. Perraudin](#). "DeepSphere: a graph-based spherical CNN". *International Conference on Learning Representations (ICLR)*. 2020. arXiv: 2012.15000.
- [2] [S. Ebli](#), [M. Defferrard](#), [G. Spreemann](#). "Simplicial Neural Networks". *Topological Data Analysis and Beyond workshop at NeurIPS*. 2020. arXiv: 2010.03633.
- [3] [K. Glomb](#), [J. Rué Queralt](#), [D. Pascucci](#), [M. Defferrard](#), [S. Tourbier](#), [M. Carboni](#), [M. Rubega](#), [S. Vulliémoz](#), [G. Plomp](#), [P. Hagmann](#). "Connectome spectral analysis to track EEG

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1/3

task dynamics on a subsecond scale”. *NeuroImage* 221 (2020). bioRxiv: 2020.06.22.164111, p. 117137.

- [4] M. Defferrard, N. Perraudin, T. Kacprzak, R. Sgier. “DeepSphere: towards an equivariant graph-based spherical CNN”. *ICLR Workshop on Representation Learning on Graphs and Manifolds*. 2019. arXiv: 1904.05146.
- [5] N. Perraudin, M. Defferrard, T. Kacprzak, R. Sgier. “DeepSphere: Efficient spherical Convolutional Neural Network with HEALPix sampling for cosmological applications”. *Astronomy and Computing* 27 (Apr. 2019), pp. 130–146. arXiv: 1810.12186.
- [6] M. Defferrard, S. P. Mohanty, S. F. Carroll, M. Salathé. “Learning to Recognize Musical Genre from Audio. Challenge Overview”. *The 2018 Web Conference Companion*. ACM Press, 2018. arXiv: 1803.05337.
- [7] M. Defferrard, K. Benzi, P. Vandergheynst, X. Bresson. “FMA: A Dataset for Music Analysis”. *18th International Society for Music Information Retrieval Conference (ISMIR)*. 2017. arXiv: 1612.01840.
- [8] Y. Seo, M. Defferrard, P. Vandergheynst, X. Bresson. “Structured Sequence Modeling with Graph Convolutional Recurrent Networks”. *International Conference on Neural Information Processing (ICONIP)*. 2017. arXiv: 1612.07659.
- [9] M. Defferrard, X. Bresson, P. Vandergheynst. “Convolutional Neural Networks on Graphs with Fast Localized Spectral Filtering”. *Advances in Neural Information Processing Systems (NIPS)*. 2016. arXiv: 1606.09375.

Software

github.com/mdeff

- [1] M. Defferrard, L. Martin, R. Pena, N. Perraudin. *PyGSP: Graph Signal Processing in Python*. URL: <https://github.com/epfl-lts2/pygsp/>.
- [2] M. Defferrard, R. Pena, N. Perraudin. *PyUNLocBoX: Optimization by Proximal Splitting*. URL: <https://github.com/epfl-lts2/pyunlocbox/>.
- [3] F. Gusset, L. Vancauwenberghe, M. Allemann, J. Fluri, N. Perraudin, M. Defferrard. *DeepSphere: learning on the sphere*. URL: <https://github.com/deepsphere/>.

More open-source contributions (e.g., paper implementations, teaching materials, contributions to the python scientific stack and jupyter) at github.com/mdeff.

Awards

- 2020 ICLR spotlight talk for [1].
- 2016, 2017 Google PhD Fellowship Nominee.
- 2014 Silicon Valley Startup Camp (selected and funded).
- 2012 Award for excellence (BASc thesis), Phonak Communications.
- 2009 Award for excellence (highest GPA), Union Patronale du Canton de Fribourg.

Miscellaneous

Talks I gave 20+ talks. List with slides (and some videos) at deff.ch.

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- Teaching I co-taught 8 courses around Machine Learning, Networks, and Data Science, in various roles (TAing, lecturing, teaching team & student management, curriculum design) and forms (university class, workshop, summer school). List with roles and resources at deff.ch.
- Supervision I supervised 20+ students (MSc theses, semester projects, internships). List of students with project title, co-supervisors, and outputs at deff.ch.
- Collaborations I enjoy to solve real problems by collaborating with domain experts. So far in Neuroscience, Cosmology, Protein Design & Imaging, Weather & Climate Sciences.
- Organization
 - Machine Learning for Earth, Seminar, 2019 – now.
 - Musical Genre Recognition Challenge, The Web Conference (WWW), 2018.
 - Open Science in Practice, Summer School, EPFL, 2017.
 - Deep Learning on Irregular Domains, Workshop, BMVC, 2017.
- Reviewing IEEE Transactions on Medical Imaging (TMI), IEEE Transactions on Image Processing (TIP), IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI), IEEE Transactions on Neural Networks and Learning Systems (TNNLS), IEEE Global Conference on Signal and Information Processing (GlobalSIP), IEEE Journal of Selected Topics in Signal Processing (J-STSP).
- Open Open science, open source, open data, and reproducibility are values I advocate for and adhere to in my research.
- Extra Brass band musician, militia firefighter officer, computing enthusiast.