



Michaël Defferrard (mdeff)
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born 29 September 1989
Swiss
single

Machine Learning researcher interested in Data Science and Artificial Intelligence.

EDUCATION

- PhD Candidate in Electrical Engineering**, EPFL, Switzerland 09/2015 – present
– Advisor: Prof. Pierre Vanderghenst, LTS2 laboratory
– Topic: Deep Learning on Unstructured Data with Graph Signal Processing
- Master of Science MSc in Electrical and Electronic Engineering**, EPFL 2012 – 2015
– Focus in Information Technologies
– Minor in Computational Neurosciences
– UAS pathway (2012 – 2013)
– GPA: 5.7 / 6.0
- Bachelor of Science HES-SO in Electrical Engineering**, EIA-FR 2009 – 2012
– Major in Electronics
– French and German bilingual studies
– ERASMUS (2nd year) at University of Applied Sciences Munich, Germany
– Bachelor thesis at the Physics Division of the Lawrence Berkeley National Laboratory
– Phonak Communications award for excellence
– GPA: 5.8 / 6.0
- Federal Certificate of Capacity as an Electronics Specialist**, EPAI 2005 – 2009
– Professional Technical Maturity Certificate
– Award for excellence from UPCF (Union Patronale du Canton de Fribourg)
– GPA: 5.7 / 6.0

PROFESSIONAL EXPERIENCE

- Research Assistant** (part-time, internship, project & PhD student), LTS2, EPFL 2014 – present
Research assistant at the LTS2 signal processing laboratory led by Prof. Pierre Vanderghenst. Research topics: signal processing on graphs and networks, machine learning, complex & high-dimensional data processing, sparse representations, compressive sensing, optimization, signal and image processing. Lab notebook: lts2.epfl.ch/blog/mdeff
- Software Engineer** (part-time 30%), Energy R&D, Infoteam SA, Givisiez 2011 – 2015
Part-time software engineer in the Energy R&D team. The team is responsible to further develop and maintain one of the core products of the company: StreamX, a control-command (SCADA) tool which can serve as a data acquisition and routing engine or as a supervisor for energy distribution, transport and production facilities via its embedded ad-hoc visualization. It comes as a set of modules which provides, among the runtime, a centralized configuration tool, an IEC 61850 engineering tool and a data management engine. Company website: infoteam.ch
- Electronics Specialist** (part-time, apprenticeship), Meggitt SA 2005 – 2011
Production, test, quality assurance, repair, certification and development of sensing systems for the aerospace and energy markets. Required the respect of strict quality standards.

LANGUAGES

French: native language English: fluent (C2) German: intermediate level (B2)

EXTRA-CURRICULAR ACTIVITIES

- Musician in two bands, playing at the Swiss national championship
- Firefighter officer
- Computing systems and open source enthusiast
- Interests in entrepreneurship and start-ups

PUBLICATIONS (Google Scholar, arXiv)

- Learning to Recognize Musical Genre from Audio
Michaël Defferrard, Sharada P. Mohanty, Sean F. Carroll, Marcel Salathé
The Web Conference (WWW), 2018
- FMA: A Dataset For Music Analysis
Michaël Defferrard, Kirell Benzi, Pierre Vandergheynst, Xavier Bresson
International Society for Music Information Retrieval Conference (ISMIR), 2017
- Structured Sequence Modeling with Graph Convolutional Recurrent Networks
Youngjoo Seo, Michaël Defferrard, Pierre Vandergheynst, Xavier Bresson
arXiv 2016
- Convolutional Neural Networks on Graphs with Fast Localized Spectral Filtering
Michaël Defferrard, Xavier Bresson, Pierre Vandergheynst
Conference on Neural Information Processing Systems (NIPS), 2016

TEACHING EXPERIENCE

- A Network Tour of Data Science, EPFL 09/2018 - 12/2018
Topics: Data Science, Network Science, Spectral Graph Theory, Graph Signal Processing.
Design curriculum, give tutorials on tools, give a lecture, manage class and student projects.
- graphSIP summer school, Aussois 09/2018
Topic: Graph Signal Processing Applications to 3D clouds of points and neurosciences
Gave a lecture on graph neural networks and a practical session on Graph Signal Processing
- A Network Tour of Data Science, EPFL 09/2017 - 12/2017
Topics: Data Science, Network Science, Spectral Graph Theory, Graph Signal Processing.
Design curriculum, give tutorials on tools, give a lecture, manage class and student projects.
- A Network Tour of Data Science, EPFL 09/2016 - 12/2016
Topics: Data Science, Neural Networks, Spectral Graph Theory, Graph Signal Processing.
Help design curriculum, teach computational tools, manage class and student projects.
- Continuous education in Data Science, EPFL 09/2016
Topics: Data Science, Neural Networks.
Teached computational tools and the Python scientific stack.
- Signal and Systems, EPFL 02/2016 - 05/2016
Topic: Signal Processing.
Assisted the students during exercise sessions.

ADVISING EXPERIENCE

- Alexandre Cherqui, Master Thesis 02/2018 - 07/2018
Topic: Deep Learning on Graphs for Semantic Segmentation of Point Clouds
- Chibueze Ukachi, Semester Project 02/2017 - 05/2017
Topic: Music Information Retrieval on the Free Music Archive
- Thomas Grivaz, Semester Project 09/2016 - 12/2016
Topic: Studying Graph Convolutional Neural Networks
- Yoann Ponti, Semester Project ([blogpost](#)) 09/2016 - 12/2016
Topic: Musical Score Generation with Recurrent Neural Networks

PROFESSIONAL SERVICE

Workshops and Summer Schools Organization

- Musical Genre Recognition Challenge, The Web Conference (WWW) 04/2018
- Open Science in Practice Summer School, EPFL 09/2017
- Deep Learning on Irregular Domains Workshop, BMVC 09/2017 & 09/2018

Reviewing

- Transactions on Pattern Analysis and Machine Intelligence (TPAMI) 2017 - 2018
- IEEE Transactions on Neural Networks and Learning Systems (TNNLS) 2017
- Journal of Selected Topics in Signal Processing (J-STSP) 2016

TALKS

Deep Learning on Graphs

- Deep Learning on Irregular Domains Workshop, BMVC 09/2017
- Graph Signal Processing Workshop, CMU 05/2017
- NetSci-X, Tel Aviv 01/2017
- Geometric Deep Learning Seminar, Tel Aviv University 01/2017
- Swiss Machine Learning Day, EPFL 11/2016

Others

- Opening a Large Audio Dataset, OSIP, EPFL 09/2017
- FMA: A Dataset For Music Analysis, Data Jam Days 11/2017

AWARDS & ACHIEVEMENTS

- Google PhD Fellowship Nominee 2016 & 2017
- Silicon Valley Startup Camp 2014
- Award for excellence, Phonak Communications 2012
- Award for excellence, UPCF (Union Patronale du Canton de Fribourg) 2009

SELECTED PROJECTS

Challenge: Learning to Recognize Musical Genre, EPFL 2017 - 2018
Based on the FMA dataset I created, I am co-organizing one of the Web conference (WWW'18) challenges, hosted [here](#). The goal of the participants is to recognize musical genres from audio. I was involved in writing the proposal, setting up evaluation and proposing a baseline model.

PyGSP: Graph Signal Processing in Python, LTS2, EPFL 2017 - present
The PyGSP is an open-source Python package to ease Signal Processing on Graphs. I've designed, develop, and maintain it as part of my research to generalize signal processing, and machine learning, to irregular domains.

Structured Auto-Encoder, Master thesis, LTS2, EPFL 2015
In this work, we introduced a technique that learns discriminative representations for Music Genre Recognition (MGR) in an unsupervised way. The novelty of the proposed technique is to design auto-encoders that make use of data structures to learn sparse representations and adaptive dictionaries. Our assumption, borrowed from the Manifold Learning field, is that data is sampled from smooth manifolds, which are here represented by similarity graphs between input data. As a consequence, the proposed auto-encoder finds sparse data representations that are quite robust w.r.t. perturbations. The model is formulated as a non-convex optimization problem. It can however be decomposed into iterative convex sub-optimization problems for which well-posed iterative schemes are provided. Numerical experiments showed higher classification performance and significant resistance to perturbations. ECTS: 30. Grade 6 / 6.

Graph-based image inpainting, Semester project, LTS2, EPFL 2014
The project goal was to explore the applications of spectral graph theory to address the inpainting problem of large missing chunks. We used a non-local patch graph representation of the image and proposed a structure detector which leverages the graph representation and influences the fill-order of our exemplar-based algorithm. Our method achieved state-of-the-art performances and the results will soon be published. ECTS: 11. Grade: 6 / 6.

Visualization of neuron morphologies, Semester project, Blue Brain Project, EPFL 2014
Our goal was to prove the feasibility of GPU-based tessellation to generate neuron membrane mesh representations from parametric descriptions of neurons. The developed prototype software produces a smooth, continuous and high-fidelity representation of neuron morphologies that can be used for scientific visualization. It is considered by the Blue Brain Project (BBP) visualization team as a replacement of their current offline mesh generation algorithm for real-time rendering. The implementation used C++, OpenGL and Qt. ECTS: 8. Grade: 6 / 6.

Silicon Valley Startup Camp, BCV 2014
Ten students were selected to participate to the Silicon Valley Startup Camp organized by the BCV bank. The camp was organized around workshops, business idea developments, pitch trainings and visits of companies. The aim was to bring a part of the Silicon Valley's mindset back in Switzerland. We visited some amazing startups such as Airbnb, Square, Jawbone, Evernote.

PyUNLocBox: a Python convex optimization toolbox, LTS2, EPFL 2014 - present
Design, development, and maintenance of the PyUNLocBox, an open-source Python convex optimization package using proximal splitting methods. The project involved a literature review of recent algorithms, their understanding, and agile software development techniques including revision control, unit tests, API documentation, tutorials, packaging, continuous integration testing. <https://github.com/epfl-lts2/pyunlocbox>

Silicon sensor module studies for ATLAS, bachelor thesis, Physics Division, LBNL 2012
This thesis was about the studies of silicon sensors arrays for the ATLAS detector upgrade of the LHC at CERN. This work involved a global understanding of the subject, clean room precision assembly, mechanical design, metrology measurements, the installation and characterization of a test setup, the development of a LabVIEW software, noise measurements and analysis. Phonak Communications award for excellence. ECTS: 12. Grade: 5.9 / 6.

Embedded communication gateway, Energy R&D, Infoteam SA, Givisiez 2011 - 2015
Design and development of a communication gateway (data acquisition, routing, archiving, event management and protocol conversion) on an embedded system intended for use in smart grids and decentralized energy production. Involved expertise at various level of the stack: hardware design, Linux kernel drivers, C# application, system deployment. The developed product was validated by a client for acquisition and will be installed in some electricity substations in 2015 for field testing.