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 Vandergheynst, 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 Vandergheynst. 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)

- 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   09/2017 – 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

- 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
- Graph Signal Processing Workshop, EPFL   06/2018
- Open Science in Practice Summer School, EPFL   09/2017
- Deep Learning on Irregular Domains Workshop, BMVC   09/2017

Journal Reviewing
- Transactions on Pattern Analysis and Machine Intelligence (TPAMI)   2017
- 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
- Silicon Valley Startup Camp   2014
- Award for excellence, Phonak Communications   2012
- Award for excellence, UPCF (Union Patronale du Canton de Fribourg)   2009

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 maintainance 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.