Igor **Krawczuk**

ML and Optimization researcher · Ph.D. candidate

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"Learning is Living"

Summary

Originally trained as an electrical and computer engineer, I am currently a researcher and terminal Ph.D. student at the LIONS laboratory at EPFL. My doctoral studies started with neuromorphic computing hardware - trying to build brain inspired ML accelerators - and slowly drifted into applied ML and ML/optimization theory. This has given me the chance to work with the "full stack" of ML research and engineering, going from hardware design, over systems programming with C,C++ and Rust, to large scale ML and RL systems in tensorflow, pytorch and jax. I also supervised over 20 students and interns, worked with half a doze industrial partners, co-founded 3 startups and ran the IT infrastructure in our lab.

I am interested in using the language of ML and optimization theory to improve products, automate and analyze decision making and design better institutions and autonomous systems.

Skills

ML-Eng	Experience building and training ML and RL models with Pytorch,jax and Tensorflow, including distributed training
ML-Ops	Experience in dataset curatation, cluster administration (local and cloud) and enabling the tracking of large scale distributed experiments with ray,DVC,Wandb as well as self-administrated MLflow
DevOps	Experience building and administrating systems using AWS, Docker, Kubernetes, Github+Gitlab CI,MinIO,Slurm
Programming	Rust (expert), Python (expert), C/C++ (expert), JAVA (professional), LaTeX (professional), Go (familiar),CUDA (basic)
Front-end	Have built and deployed prototypes and demos with Hugo, HTML5, LESS, SASS, TypeScript, Rust-web, Elm
Languages	German (native), English (fluent), French(fluent), Polish(basic), Norwegian(basic)

Work Experience

LSM and LIONS labs @ EPFL

Lausane,Switzerland

Researcher & Ph.D candidate — *Sep. 2017 - Sep 2023 (est)*

- 6 conference publications, worked with over a dozen industry partners
- supervised 24 students in semester, Bachelors and Master students,as well as 2 interns
- participated in grant writing that brought~200'000 CHF of funding to the lab
- lab side sysadmin for a cluster of 30 machines, contact person for procurement of over 250'000 CHF
- Deployed a centralized monitoring environment(Grafana, InfluxDB) to quantify the usage of this cluster

Samsung Korea

Seoul, S.Korea

Visiting researcher — *Apr. 2018 - Jun. 2018*

- As part of my PhD I had the chance to work on high dimensional multi-objective optimisations using Gaussian Processes in conjunction with evolutionary algorithms
- Gathered requirements from my hosting division,surveyed the literature for fitting solutions, prepared and validated a PoC and faciliated knowledge transfer to the team for full implementation

SCI-STI-MM@EPFL

Lausanne, Switzerland

Research intern — *Mar. 2017 - Aug. 2017*

- Researching the possibilities of Machine Learning in Dataflow Programming
- Developed a decision tree based scheduler for dataflow programs

ML/AI freelancer

EU area

ML/AI prototyping consultancy — *Aug. 2014 - Feb 2017*

- Freelance consultant, designed and implemented a range of projects from Embedded System Firmware(C) over custom crawler, ETL and classification stacks(Python) to automated lead tracking using NLP (Python) and more
- Highlight 1: Developed a custom C++ and RocM based ML framework for a client with AMD GPUs before they were supported by Tensorflow etc.
- Highlight 2: Prototyped computer vision algorithms for aquaculture heatlh monitoring

Blik

Munich, Germany

Resident Consultant/Tech lead — *Nov. 2016- Feb. 2017*

- Developing the first product iteration of their integrated intra-logistics Localization and tracking system

EPFL *Lausanne, Switzerland*

TA & Laboratory assistant *Nov 2015 - May 2015*

- Characterized Metal-Oxide Memristors using Agilent ATP
- Guided and supported students through VHDL implementations of Multi-Core CPUs

Publications

Note: The * indicates equal contribution

Adversarial Training descends without descent: Finding actual descent directions based on Danskin's theorem *Accepted to ICLR 2023*

*Fabian Latorre, ***Igor Krawczuk***, *Leello Tadesse Dadi, Thomas Pethick, Volkan Cevher *2023-05-01*

Distributed Extra-gradient with Optimal Complexity and Communication Guarantees *Accepted to ICLR 2023*

*Ali Ramezani-Kebrya, *Kimon Antonakopoulos, ***Igor Krawczuk***, *Justin Deschenaux, Volkan Cevher *2023-05-01*

DiGress: Discrete Denoising diffusion for graph generation *Accepted to ICLR 2023*

*Clement Vignac, ***Igor Krawczuk***, Antoine Siraudin, Bohan Wang, Volkan Cevher, Pascal Frossard *2023-05-01*

Proximal Point Imitation Learning *NeurIPS 2022*

Luca Viano, Angeliki Kamoutsi, Gergely Neu, **Igor Krawczuk**, Volkan Cevher *2022-10-31*

A Computational Turn in Policy Process Studies: Coevolving Network Dynamics of Policy Change *Complexity*

Maxime Stauffer, Isaak Mengesha, Konrad Seifert, **Igor Krawczuk**, Jens Fischer, Giovanna Di Marzo Serugendo *2022-04-13*

Filling gaps in trustworthy development of AI *Science*

Shahar Avin, Haydn Belfield, Miles Brundage, Gretchen Krueger, Jasmine Wang, Adrian Weller, Markus Anderljung, **Igor Krawczuk**, David Krueger, Jonathan Lebensold, Tegan Maharaj, Noa Zilberman *2021-21-09*

Toward Trustworthy AI Development: Mechanisms for Supporting Verifiable Claims *https://arxiv.org/abs/2004.07213*

Miles Brundage, Shahar Avin, Jasmine Wang, Haydn Belfield, Gretchen Krueger, Gillian Hadfield, Heidy Khlaaf, Jingying Yang, Helen Toner, Ruth Fong, Tegan Maharaj, Pang Koh, Wei, Sara Hooker, Jade Leung, Andrew Trask, Emma Bluemke, Jonathan Lebensold, Cullen O'Keefe, Mark Koren, Théo Ryffel, JB Rubinovitz, Tamay Besiroglu, Federica Carugati, Jack Clark, Peter Eckersley, Sarah Haas, de, Maritza Johnson, Ben Laurie, Alex Ingerman, **Igor Krawczuk**,and 29 others *2020-01-15*

Technical report, 183 citations on 2023-01-22

Multi-ReRAM synapses for artificial neural network training *2019 IEEE International Symposium on Circuits and Systems (ISCAS)*

Irem Boybat, Cecilia Giovinazzo, Elmira Shahrabi, **Igor Krawczuk**, Iason Giannopoulos, Christophe Piveteau, Manuel Le Gallo, Carlo Ricciardi, Abu Sebastian, Evangelos Eleftheriou, Yusuf Leblebici *2019-5-26*

Effect of metal buffer layer and thermal annealing on HfOx-based ReRAMs *2019 IEEE International Symposium on Circuits and Systems (ISCAS)*

Jury Sandrini, Behnoush Attarimashalkoubeh, Elmira Shahrabi, **Igor Krawczuk**, Yusuf Leblebici *2016-11-16*

Education

EPFL (École Polytechnique Fédérale de Lausanne) *Lausanne, Switzerland*

Ph. D. candidate in Electrical Engineering *Sep. 2017 - Sep. 2023 (est)*

- Part of the "Data Champion" project whose members offer their technical expertise other EPFL members
- Completed the "PRINCE2 Foundation 6th Edition" project management certificate as part of the doctorate

TUM (Technical University of Munich) *Munich, Germany*

M.Sc. in Electrical and Computer Engineering *Mar. 2014 - Feb. 2017*

- Master thesis at EPFL as part of an ERASMUS exchange Aug. 2015 - Nov. 2016
- Student representative on the faculty council, IT responsible for the student union

TUM (Technical University of Munich) *Munich, Germany*

B.Sc. in Electrical and Computer Engineering *Sep. 2011 - Aug. 2014*

- Member of the student union, treasurer responsible for over 250'000 € yearly cashflow

Honors & Awards

2015 **Deutschlandstipendium**, a German federal scholarship for excellent students

2015 **Semi-Finalist (with *BioCloud*)**, OneStart Europe by Oxbridge Biotech and SR One *London, UK*

2014 **Impact Hub Zürich, Climate Kic & Pro Juventute Social Impact Award**, HackZurich 2014 *Zurich, Switzerland*

Community service

2018-2022 **Reviewer for ICLR**,

2019-2022 **Reviewer for ICML**,

2019-2022 **Reviewer for NeuRIPS**,

2019-2022 **Reviewer for TMLR**,

2020-2021 **Mentor**, CHERI existential risk summer program *Switzerland*