

Francesco FORCHER

PERSONAL DATA

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LANGUAGES: English C2, Italian native

SUMMARY

Software Developer and Machine Learning Engineer with **over 6 years** of **professional** experience, driven by a lifelong passion for programming and mathematics. I emphasize fast, reliable, iterative development with good attention to detail. **ETH Zürich CSE MSc.**

ABOUT ME

- Main areas of interest include Rust development, AI/Machine Learning, Computer Vision, NLP, physics, robotics, High-Performance Computing (HPC), functional programming, distributed systems.
- Good teamplayer, I have experience working in teams with different structures. I've learned to tap into each team member's strengths to get the best results.
- Always on the look for better tools and methodologies, I proactively seek improved ways to handle problems.

TECHNOLOGY AREAS

Currently: **Rust, Python, Julia, Data Warehouse, Docker, Kubernetes, Time Series Forecasting**
Previous experiences: **C++, Java, R, Javascript/Typescript, Stochastic Differential Equations, Deep Learning, Matlab**

EMPLOYMENT

JUN 2021 - MAR 2024



RUST DATABASE DEVELOPER AND AI ENGINEER at **NATZKA**

Contributed to the design and development of a next-generation **OLAP database for data warehousing**:

- Development of **several engine and query language features**, such as Boolean formulas and COUNT algorithms, with **Rust**.
- Integration of AI/ML features into the product. Bringing Python and Julia scripts from research prototypes into production-ready **containerized microservices**, integrating state-of-the-art **Gaussian Process** based time series **forecasting services** optimized for **low latency**.
- Worked on a custom **Julia distributed logger** for **observability**.
- Research on a custom **Kubernetes predictive autoscaler** for our deployments.
- Advanced custom load testing with **Grafana k6**.
- Contributed to database API development, including **gRPC** and **REST API**. Implemented different **caching** and **paging** mechanisms.

JAN 2021 - JUN 2021



DATA WAREHOUSE CONSULTANT at **BLU software**

- Integration of a PostgreSQL database as data warehouse and its plugin Timescale for fast timeseries inserts and queries.
- Used **Talend** and **Airflow** for **ETL/ELT** workloads.
- Created interactive forecasts of demand using Facebook's Prophet framework.

SEP 2016 - MAY 2018



DATA ANALYST at **CERN, BE-ABP-HSS**

CERN Technical Student in the Beams Department, Accelerator and Beam Physics Group.

- I developed advanced statistical **routines** using **Python Pandas** and **scikit-learn** to analyze crystal parameters for CERN's **UA9** experiment.
- Enabled the analysis of **very noisy** datasets, with a significant impact in the tender process to award the crystal manufacture contract worth **several hundred thousands CHF**.
- My **thesis** has been published as **CERN internal note**.
- Using **C++ ROOT** library, I developed routines to analyze nuclear dechanneling for high energy particle beams in bent crystals, improved the simulation accuracy of **SixTrack** software.

EDUCATION

SEP 2018 - DEC 2020



ETH Zürich Master's Degree in COMPUTATIONAL SCIENCE AND ENGINEERING

Master's degree with a selection of courses on high performance parallel computing, differential equations, Computational Statistics, Deep Learning and Computer Vision.

MAY 2020 - DEC 2020



Master thesis at Paul Scherrer Institut

ETHZ CSE Master Thesis at Paul Scherrer Institut, titled: "Intrusive **Uncertainty Quantification** of Maps"

- Developed an application to perform intrusive **Polynomial Chaos** expansion to **quantify uncertainty** in simulations based on approximate Hamiltonian maps, using **symbolic computation**.
- A deep learning network approach has been evaluated to speed up the stochastic map calculation.
- Developed in **Python** using **SymPy** and scaled into a distributed process using **Dask**.
- Project: "Precise Simulation of a Compact μ EDM Storage Ring". Utilizing **scipy**, a high-precision fully relativistic numerical simulation of a small scale muon storage ring has been developed.

JULY 2020



Swiss National Supercomputing Centre SUMMER SCHOOL: Effective High-Performance Computing and Data Analytics with GPUs

How to effectively exploit state-of-the-art hybrid High-Performance Computing (HPC) systems, with a special focus on Data Analytics. Some topics covered:

- GPU architectures, GPU programming (CUDA and OpenACC)
- Python HPC libraries (Numpy/SciPy/Dask/Numba)
- Machine Learning and GPU optimized frameworks (Rapids)
- Deep Learning on HPC platforms (TensorFlow)

OCT 2013 - SEP 2017



University of Padova Bachelor's Degree in PHYSICS

Physics degree with an emphasis in Computational Physics, simulations, statistics and data analysis.

WORKS AND ACHIEVEMENTS

- AI, ML, NLP, Computer Vision
 - Contributed to a public policy study by using the **OpenAI ChatGPT-4 API** to perform reliable automated large-scale thematic and **sentiment analysis** of reports scraped from companies and organizations' websites.
 - Research on code and query generation with **LLM**, using agentic LLM frameworks and **vector databases** such as **AutoGPT** and **Weaviate**.
 - **Gesture Controlled Robot**: As High School final project, I developed an Arduino robot controlled remotely through Bluetooth by hand movements, detected from an Android application using the **OpenCV** Computer Vision library. Uses Java and Arduino languages.
- ETH projects
 - **Deep Learning**: *Imaging Time-Series to improve deep neural networks forecasting.*
 - **How to write fast numerical code**: *High performance implementation of Density Estimation with Distribution Element Trees.*
 - **Design of Parallel and High Performance Computing**: *Fast parallel implementation in C++ and OpenMPI of an algorithm for the construction of a suffix tree.*
- SILVER MEDAL at the 2nd level **XXVII Physics Olympics**, Venezia and Treviso, 2013