Francesco FORCHER

PERSONAL DATA

PLACE AND DATE OF BIRTH:	Italy | 1994
CURRENT LOCATION:	Zurich and Lugano, Switzerland
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LANGUAGES:	English C2, Italian native

SUMMARY

Machine Learning Engineer and **Developer** with **over 5 years** of **professional** experience, driven since a young age by a lifelong passion for programming. Expertise in transforming AI/ML prototypes into **reliable, performant, and production-ready cloud-native applications**. I emphasize fast, reliable product development with good attention to detail. **ETH Zürich CSE MSc**.

ABOUT ME

- Main areas of interest include AI/Machine Learning, Computer Vision, NLP, physics, robotics, High-Performance Computing (HPC), functional programming, distributed systems and databases.
- 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

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

EMPLOYMENT

JUN 2021 - CURR

AI/ML/Database Developer 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 **quantificate 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 mainly in **Python** using **SymPy** and scaled into a distributed process using **Dask**.
- Project: "Precise Simulation of a Compact μEDM 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