Francesco Forcher

Personal Data

Place and Date of Birth:	Italy | 5 July 1994
Current location:	Zurich and Lugano, Switzerland
Email:	francesco.forcher@gmail.com
Website:	forcher.dev
LinkedIn:	francesco-forcher
Personal Github:	github.com/f-forcher
Languages:	English C2, Italian native

Summary

Machine Learning Engineer and **Developer** with over **10 years** of development experience, including **5 years** of professional experience. Expertise in transforming AI prototypes into **reliable, performant, and production-ready cloud-native applications**. I emphasize fast, reliable product development with good attention to detail.

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 Containers**, **Kubernetes**
Have experience:	**C++**, **Java**, **R**, **Matlab**, **Stochastic Differential Equations**, **Deep Learning**, **Time Series**, **JavaScript**

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**:

- Develop with Rust **several engine and query language features**, such as Boolean formulas and COUNT algorithms.
- Integration of AI/ML features into the product. Bring 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 API development, including **gRPC** and **REST API** for ResultSets and Schemas. Implemented different **caching** and **paging** mechanisms.

Jan 2021 - Jun 2021

BLU Software

Data warehouse Developer 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.

May 2020 - Dec 2020

PAUL SCHERRER INSTITUT PSI

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**.

Sep 2016 - May 2018

Technical Student at CERN, BE-ABP-HSS

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

- Contributed to the **UA9** collaboration. My thesis has been published as CERN internal note.
- Analyzed with `ROOT` fast nuclear dechanneling for high energy particle beams in bent crystals, improved the simulation accuracy of `SixTrack` software.
- Develop advanced statistical routines to analyze large quantities of data, using **Python Pandas** and **scikit-learn**
- Some improvements to **FFT** Python GPU code in PyHEADTAIL.

Education

Sep 2018 - Dec 2020

MSc in Computational Science and Engineering at **ETH Zürich**

Courses:

- Design of Parallel and High-Performance Computing,
- Stochastics (Probability and Statistics)
- Quantum Information Theory
- Contract Design
- Numerical Methods for Partial Differential Equations
- Computational Statistics
- How To Write Fast Numerical Code
- Molecular and Materials Modelling
- Particle Accelerator Physics and Modeling
- Computer Vision
- Deep Learning

July 2020

Summer School: Effective High-Performance Computing and Data Analytics with GPUs at **CSCS**

Effective exploitation of 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

BSc in Physics at the **University of Padova**

Bachelor in Physics, with an emphasis in Computational Physics.

Main works and achievements

- AI, NLP, Computer Vision achievements
  - Development, productisation and integration of AI cloud-native microservices from a research prototype. Focus on Julia, Python, Gaussian Processes and forecasting.
  - 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: 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 group 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.*
- Data analysis and processing at CERN
  - Scripts to analyze the bending angle and channeling: I improved Python scripts (using **Pandas** and **Scikit-learn**) to analyze crystal characteristics for CERN's **UA9** experiment.
  - Enabled the analysis of **very noisy** datasets, and the results has a **significant impact** in the tender process to award the crystal manufacture contract, worth **several hundred thousands CHF**.
  - Investigation of dechanneling in bent Si crystals: **C++** data analysis for the simulation of nuclear dechanneling in crystals. Fast routines to analyze large amounts of data were developed.
- Silver medal at the 2nd level **XXVII Physics Olympics**, Venezia and Treviso, 2013