puljak.ema@gmail.com
linkedin/ema-puljak
github/emapuljak
scholar.google
emapuljak.com

TECHNICAL SKILLS

Developed Python Package: tn4ml
(Tensor Networks for Machine Learning)

Programming languages
Python, Julia, R

Scientific/ML packages
Jax, Pytorch, Quimb, Qibo, Tensorflow, Pennylane, Qiskit

Statistical analysis
pandas, NumPy scikit-learn, SciPy

Technical tools
Slurm Workload Manager, CUDA, Git, Notion

Creative tools
Canva, Exalidraw, Keynote

SOFT SKILLS

- Able to adapt quickly to new technologies, algorithms, tools, and programming languages
- Experienced in creating and presenting impactful educational content - presentations at over 10 conferences
- Excellent organizational, planning and communicational skills
  - Led a research project consisting of 6 people and distributed tasks
  - Supervised master student project
  - Mentored summer student at CERN
- Well versed in public speaking
  - Experienced in presenting at international conferences to technical and non-technical audiences
- Effective team player with significant experience in multidisciplinary collaboration

Languages

English (Proficient)
Spanish (Spoken)
French (Elementary)
Croatian (Native)

EMA PULJAK

QUANTUM-INSPIRED MACHINE LEARNING RESEARCHER

WORK EXPERIENCE

PhD Researcher
Quantum / Quantum-Inspired Machine Learning
CERN, Geneva
(10/2021 - now)

- **Tensor Networks for real-world applied Machine Learning problems**
  - tn4ml Python library that implements Machine Learning pipeline for Tensor Networks
  - Designed and developed Tensor Network pipeline for cancer detection in CT lung scans
  - Implemented a Tensor Network model for anomaly detection in high-energy physics
    - showcased a potential of being deployed in real-time event selection system at the Large Hadron Collider (LHC) at CERN (poster)
- **Quantum Clustering algorithms for anomaly detection in High-Energy Physics**
  - Implemented Quantum Kmedians clustering (comparable to classical algorithms) [DOI]
  - Used Grover algorithm for finding cluster centers
  - Created a tutorial on Unsupervised Quantum Clustering in Qibo (tutorial)

Technical Student: Machine Learning for Particle Physics
CERN, Geneva
(03/2020 - 08/2021)

- Developed fast inference real-time Autencoder model for anomaly detection at the LHC
- Formulated pruning and dequantization strategies for neural networks to satify latency and resource constraints for model's deployment on the FPGA
- Responsible for organizing a hackathon attracting 50+ people (website)

Machine Learning Intern: Natural Language Processing
University of Zagreb
(11/2019 - 02/2020)

- Built Natural Language Processing models and annotated in-house datasets to develop a software for analysis and filtering of targeted CVs (curriculum vitae)

EDUCATION

Universitat Autònoma de Barcelona (Spain)
Doctoral degree in Physics (mid 2025)

- Thesis: Advancing Anomaly Detection with Quantum Unsupervised Algorithms and Tensor Networks: Applications in High-Energy Physics and Medical Imaging

University of Zagreb (Croatia)
Master (2021) and **Bachelor** (2018) in **Computer Science**

- Thesis: Anomaly detection with autoencoders at the Large Hadron Collider at CERN

CONFERENCES / TALKS

- Showcased a poster at Quantum Techniques in Machine Learning in Australia (2024)
  - Quantum-Inspired Tensor Networks for unsupervised and supervised cancer detection in medical imaging
- Prepared and delivered a 2hr lecture talk at University of Zurich
  - Introduction to Quantum Machine Learning and Tensor Networks
- How Tensor Networks connect Quantum and Classical Machine Learning
- Prepared and lectured at CERN Summer School Lecture series
  - Basics of Quantum Computing (talk and slides)
  - Introduction to Tensor Networks (talk, slides, tutorial)
- What the fuss is Quantum Machine Learning? (talk)
- The Role of Quantum Computing in shaping the future of Machine Learning
- Quantum Computing: technology that will change the world (talk, slides)
- Presented a poster at International Quantum Tensor Network Conference (Flatiron Institute, New York City, USA) (poster)

HOBBY | Cooking and designing recipes for Quantum Cooking website [quantum.cooking]