MARC HARKONEN

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CAREER SUMMARY

Machine Learning Researcher • Mathematician • Software Developer

- *Mathematics PhD* with 8 year full-time research and project experience in mathematics, machine learning, statistics, data analysis and computational algebra. Proven track record of coming up with innovative, state-of-the-art solutions to a wide variety of applied problems, with several scientific publications.
- *Lifelong programming enthusiast* with more than 8 years experience working with various languages and software systems such as C, C++, Python and R. I love seeing theory come to life through code.
- *A passion for problem solving,* driven by rigorous mathematical intuition and a dedication to learning and developing myself. I thrive in settings where problems may be ambiguously posed.

AREAS OF EXPERTISE

- Machine Learning
- Gaussian Processes
- Speech AI
- Software Development

- Python (PyTorch)
- C++
- R
- Algorithm Design

- Mathematics
- Statistics
- Data Analysis
- Scientific Communication

PROFESSIONAL EXPERIENCE

Fano Labs, Hong Kong SAR China   **02.2023 – Present**

Research Scientist

Research and development of technologies in speech AI. Current focus is in the design and implementation of state-of-the-art speaker diarization models.

Max Planck Institute for Mathematics in the Sciences, Leipzig, Germany   **05.2022 – 02.2023**

Postdoctoral Researcher

Academic research in non-linear algebra and applications. Research includes applications of algebraic partial differential equation theory to machine learning and Gaussian Processes, using PyTorch.

Key accomplishments:

- *Organized a 3-day workshop* with participants from around the world. This led to a new collaboration between myself and two other attendees on a new research project in machine learning.
- *Acting as a computational consultant for the research group,* where my expertise in computational methods and C++ programming was used to improve research output in several projects.

Georgia Institute of Technology, Atlanta, GA, USA   **08.2017 – 05.2022**

Graduate Student Researcher, and Graduate Student Instructor

Academic research and teaching activities. Wrote and published research papers in mathematics, accompanied by code or software. Attended and presented at numerous conferences, workshops, and organized the weekly student algebra seminar at Georgia Tech.

Key accomplishments:

- ***Was an active member of the Applied Algebra community,*** with several research visits throughout my PhD studies, including at Brown University (Providence, RI), the Institute of Statistical Mathematics (Tokyo, Japan), Sorbonne Universite (Paris, France), and Max Planck Institute (Leipzig, Germany).
- ***Instructed two full undergraduate courses in Statistics and Differential Equations.*** Due to COVID-19, I designed the courses from the ground up in a remote format, prepared a syllabus, lectures, exercises and exams. Student feedback after the courses was excellent.

<u>CERN</u>, Geneva, Switzerland   **06.2015 – 09.2015**

Research Intern

Statistical data analysis and particle identification in proton-proton collisions inside the Large Hadron Collider. Data consisted of central diffractive processes with 7 TeV and 13 TeV collisions in the ALICE detector. Data analysis was performed using in-house tools using the ROOT C++ interpreter.

Key achievements:

- ***Analyzed data on several levels***, ranging from low-level, raw sensor voltages, to higher level, expert reconstructions of particle trajectories in 3D, and implemented novel data analysis routines in C++.

EDUCATION

PhD, Mathematics   **08.2017 – 05.2022**

Georgia Institute of Technology, Atlanta, GA

Minor in Statistics, GPA: 4.0/4.0, recipient of the Vaisala Fellowship (Finland) & Chateaubriand Fellowship (France)

Master of Science (Tech), Mathematics   **08.2015 – 05.2017**

Aalto University, Helsinki, Finland

GPA: 5.0/5.0

Exchange year, Statistics and Computer Science   **09.2016 – 05.2017**

University of Tokyo, Tokyo, Japan

Also studied Japanese (Intermediate level), GPA: 4.0/4.0

Bachelor of Science (Tech), Mathematics   **09.2012 – 05.2015**

Aalto University, Helsinki, Finland

Minor in Computational Science and Engineering, GPA: 4.96/5.0

Exchange semester, Computer Science and Numerical Mathematics   **05.2014 – 08.2014**

Stanford University, Stanford, CA, USA

Attended the Stanford Summer International Honors Program.

SELECTED PROJECT EXPERIENCE

Computer vision   github.com/haerski/streetViewGuessr

Wrote an AI in PyTorch that guesses the country in which a random Google Street View picture was taken. Transfer learning using convolutional neural networks. Training data obtained from Google's cloud API.

Machine learning and time series forecasting   github.com/haerski/mortality

Predicting life insurance client mortality during a pandemic. Resulted in a model that would learn and predict based on local COVID infection patterns. Joint with the University of Minnesota and Securian Financial.