JOHANNES WEIDENFELLER

M.SC. APPLIED MATHEMATICS M.SC. COMPUTER SCIENCE

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ABOUT ME

I graduated from ETH Zürich with a M.Sc. in applied mathematics in 2020. In 2021, I worked as a research intern at IBM Zurich, investigating quantum optimization algorithms. I obtained a second M.Sc. in computer science with a major in machine intelligence from ETH Zürich in autumn 2023 and am currently looking for a PhD position. My main research interests lie in computer vision and deep learning with a focus on applications for augmented reality and computer graphics.

EDUCATION

- **ETH ZÜRICH - M.Sc. Computer Science** **2021 - 2023**
  GPA: 5.8/6.0 (with distinction)
  Major in machine intelligence and minor in data management with a focus on deep learning and computer vision
  Master's Thesis on the automated discovery of critical blind spots in object detection models through the usage of a structured query language
- **ETH ZÜRICH - M.Sc. Applied Mathematics** **2018 - 2020**
  GPA: 5.92/6.0 (with distinction)
  Focus on quantum information theory with additional coursework in differential and symplectic geometry and computational quantum physics
  Master's Thesis on the advantage of constant-depth quantum algorithms over constant-depth classical algorithms
- **RWTH UNIVERSITY AACHEN - B.Sc. Mathematics** **2015 - 2018**
  GPA: 1.1 on scale from 1-4 (excellent)
  Application Area: Physics
  Bachelor's Thesis on the classification of vector bundles on the Riemann sphere

WORK EXPERIENCE

- **ESSENTIAL VISION (ETH ZURICH) - App Developer** **2022-2023**
  Full development of augmented reality app "Essential Vision" for visualizing and interacting with animated 3D medical models on Microsoft HoloLens 2. This includes the visualization of segmented models, MRI and simulation data, implementing multi-user interactions on both local and remote networks, and the creation of new models and tutorials.
- **IBM RESEARCH ZURICH - Research Intern** **2020-2021**
  Implementation of a framework to benchmark quantum optimization algorithms and investigation of their potential advantage over classical optimization algorithms.
  Development of new algorithms for transpiling quantum circuits to common qubit architectures.
- **ETH ZURICH - Summer School Volunteer** **2019**
  Volunteering for two week-long summer schools on quantum computing and foundations
- **RWTH UNIVERSITY AACHEN - Teaching Assistant (Linear Algebra)** **2017**

SCHOLARSHIPS

GERMAN ACADEMIC SCHOLARSHIP FOUNDATION - April 2019

DEAN'S LIST
RWTH University - January 2018
Inclusion in Dean's List awarded to the best 5 percent of students in each year

SKILLS/CERTIFICATIONS

QISKIT ADVOCATE - October 2019
Member of IBM's global Qiskit Advocate Program for active contributors in the Qiskit community

PROGRAMMING LANGUAGES

General	Python, C#, C++, Swift
ML Modules	PyTorch, TensorFlow
Quantum Modules	Qiskit, Q#

LANGUAGES

German	native
English	fluent
Spanish	A2 level
French	A2 level

REFERENCES

PROF. DR. SEBASTIAN KOZERKE
Professor of Medical Imaging
ETH Zurich
Email: kozerke@biomed.ee.ethz.ch

DR. STEFAN WÖRNER
Manager, Quantum Computational Science
IBM Quantum
Email: zrlwor@ch.ibm.com

PUBLISHED WORK

- **Scaling of the Quantum Approximate Optimization Algorithm on Superconducting Qubit Based Hardware** **2022**

  Weidenfeller, Johannes, et al. 'Scaling of the Quantum Approximate Optimization Algorithm on Superconducting Qubit Based Hardware'. Quantum, vol. 6, Dec. 2022, p. 870. DOI.org (Crossref), https://doi.org/10.22331/q-2022-12-07-870.

OTHER RESEARCH

- **MASTER'S THESIS - Structured query language for discovering critical blind spots in deep learning models** **2023**

  Implementation and comparison of different automated slice-discovery methods for the task of object detection based on queries for visual relations via multimodal embeddings and scene graph generation models
  Investigation of the usefulness of these methods in the context of automated slice discovery and generation of slice descriptions.

- **SEMESTER PROJECT - Context Privacy for Large Language Models** **2022**

  Investigation of information leakage and implementation of an inference attack for the context in queries for large language models under access to the model output and architecture

- **MASTER'S THESIS - On Shallow Quantum Circuits** **2019**

  Review and unification of recent results proving an unconditional separation between the complexity classes of constant-depth (shallow) quantum circuits, and their classical counterparts, under the view point of graph states
  Extension of existing results to a broader class of computational problems defined by arithmetic games, through the introduction of higher-dimensional generalized GHZ states

- **SEMESTER PROJECT - Visual Question Answering** **2019**

  Proposal and investigation of a new neural network model architecture for tackling problems at the intersection of vision and language through introduction of additional visual attention layers in the BERT architecture

- **SEMESTER PAPER - Geometric Quantization** **2014**

  Self-contained review of the topic of geometric quantization detailing the motivation behind the different stages of pre-quantization and holomorphic quantization

- **BACHELOR'S THESIS - Classification of vector bundles on the Riemann sphere** **2014**

  Review of the theory behind deriving the holomorphic, smooth, and continuous isomorphism classes of vector bundles on the Riemann sphere, including a newly devised constructive proof for the Birkhoff factorization of an invertible matrix with coefficients in the space of Laurent polynomials based on elementary matrix operations