

# Maurice D. Hanisch

Google Scholar: MD Hanisch  
LinkedIn: MauriceHanisch

Email: mhanisch@caltech.edu  
Mobile: (626) 394-7713

## Education

<b>California Institute of Technology, Ph.D. Math &amp; CS</b> <ul style="list-style-type: none"><li>Pursuing research in ML for quantum chemistry and materials science, advised by Prof. Anima Anandkumar.</li><li>Fully funded through the Kortschak Fellowship, awarded based on academic excellence and research potential.</li></ul>	09/2025 – Present Pasadena, USA
<b>ETH Zurich, M.Sc. Physics</b> 5.77/6.00 (Top 12%) <ul style="list-style-type: none"><li>Expanded analytical skills with a focus on quantum theory and information technologies, with 30% excess credits in mathematics, ML and probabilistic AI involving 8 team projects, all graded 6.00/6.00 (🟢 projects).</li></ul>	09/2022 – 05/2024 Zurich, Switzerland
<b>LMU Munich, B.Sc. Physics</b> 1.28/1.00 (Top 10%) <ul style="list-style-type: none"><li>Acquired extensive grounding in key physics fields, providing a strong foundation in the principles driving modern technologies, and fostering advanced analytical and problem-solving skills.</li></ul>	10/2018 – 09/2022 Munich, Germany

## Work Experience

<b>Bloomberg CTO Office, Security Research Intern, Julien Vanegue's Team</b> <ul style="list-style-type: none"><li>Stress-tested the CHERI CPU architecture, a \$300 million industry-academic security effort, by attempting to break its memory-safety guarantees to determine its suitability for Bloomberg's infrastructure.</li><li>Discovered multiple attack vectors that compromise both spatial and temporal memory safety guarantees.</li><li>Contributed mitigations to the open-source CHERI software via multiple PRs (🟢 jemalloc, 🟢 dmalloc, 🟢 c-guide).</li></ul>	06/2025 – 09/2025 New York, USA
<b>California Institute of Technology, ML Research Intern, Anima Anandkumar's Group</b> <ul style="list-style-type: none"><li>Led a large-scale benchmark, retraining seven SOTA molecular models for open-shell and charged systems, validating our proposed method, <i>OrbitAll</i>, in our published work.</li><li>Developed a differentiable quantum feature generation pipeline for GNN-based models, enabling end-to-end differentiability of physics-informed learning of quantum chemical properties.</li><li>Submitted PRs to chemistry ML tooling: PyTorch (🟢 optimized eigensolver selection) and tblite (🟢 lightweight SCF restarts).</li></ul>	09/2024 – 05/2025 Pasadena, USA

## Research Experience

<b>IBM, Master's Thesis, Stefan Woerner's Group</b>   📄 Thesis (PDF), 🌐 Project repository 6.00/6.00 <ul style="list-style-type: none"><li>Conducted state-of-the-art research on error correction at a global leader in the quantum computing industry.</li><li>Developed a Python/C++ decoding pipeline that scaled to billions of measurement records per run, enabling one of IBM's then-largest error-correction experiments.</li><li>Designed and deployed the full experimental pipeline on IBM Q hardware, showing that analog-information decoding can improve logical error rates by up to 30x in large-scale repetition-code experiments.</li></ul>	09/2023 – 05/2024 Zurich, Switzerland
<b>ETH Zurich, Summer Project, Jonathan Home's Group</b>   📄 Thesis (PDF) <ul style="list-style-type: none"><li>Investigated the motional interaction of ions trapped in an electromagnetic field for use in quantum computing.</li><li>Designed and simulated trapping potentials using Python to enable a beamsplitter interaction.</li><li>Experimentally validated the designed potentials on GKP-encoded qubits within a trapped-ion setup.</li></ul>	06/2023 – 08/2023 Zurich, Switzerland
<b>MPI for Quantum Optics, Bachelor's Thesis, Ignacio Cirac's Group</b>   📄 Thesis (PDF) 1.30/1.00 <ul style="list-style-type: none"><li>Investigated efficient algorithm design and resource optimization for Gaussian quantum circuits.</li><li>Applied complexity theory and mathematical techniques to prove that bosonic Gaussian circuits can be implemented on quantum computers with exponentially fewer qubits compared to a direct encoding.</li></ul>	04/2022 – 09/2022 Garching, Germany

## Selected Publications

<b>MGB: The Material Generation Benchmark</b> <ul style="list-style-type: none"><li>L. Yan, B.S. Kang, <u>M.D. Hanisch</u>, J. Ma, A. Anandkumar - NeurIPS AI4Mat Workshop (2025)</li></ul>
<b>OrbitAll: A Unified Quantum Mechanical Representation Deep Learning Framework for All Molecular Systems</b> <ul style="list-style-type: none"><li>B.S. Kang, V.C. Bhethanabotla, <u>M.D. Hanisch</u>, W.A. Goddard III, A. Anandkumar - arXiv:2507.03853 (2025)</li></ul>
<b>Soft information decoding with superconducting qubits</b> <ul style="list-style-type: none"><li><u>M.D. Hanisch</u>, B. Hetényi, J.R. Wootton - arXiv:2411.16228 (2024)</li></ul>

## Extracurricular Activities and Competitions

<ul style="list-style-type: none"><li>Participated in 10+ technical competitions and workshops across cities like Paris, Munich, Zurich and New York, sponsored by companies ranging from consulting firms (Bain, McKinsey) to tech giants (Bloomberg, Infineon, NVIDIA, EDF).</li><li>Frequently selected through competitive application processes, often with expenses (travel, accommodation, meals) covered.</li><li>Won over \$3500 in hackathon prizes for projects using recurrent NNs, time series, LLMs, CUDA-Q, SageMaker and Hugging Face.</li></ul>
<b>Hackathons:</b> 1 <sup>st</sup> /30 at ETH QHack 2024: 🟢 NVIDIA task   1 <sup>st</sup> /12 at LOQC 2023: 🟢 EDF task   2 <sup>nd</sup> /6 at ETH QHack 2023: 🟢 IQM task

## Technical Skills and Interests

<b>Programming:</b>	Python, C, C++, Fortran, Matlab, SQL   PyTorch, TensorFlow, Scikit-learn   Git, Linux, LaTeX, Docker
<b>Languages:</b>	German (native), French (native), English (C1: IELTS 8/9), Italian (A1)
<b>Interests:</b>	Weightlifting, Volleyball, Calisthenics, Surfing, Chess