

## EDUCATION

NOTRE DAME, IN JUL 2018 – PRESENT	<b>University of Notre Dame</b> <i>Doctor of Philosophy Computer Science and Engineering</i> Doctoral Advisor <a href="#">Dr Siddharth Joshi</a>
LONDON, UK SEP 2016 – AUG 2017	<b>University College London</b> <i>Master of Science Computational Finance</i> Graduated with Distinction
INGOLSTADT, DE OCT 2013 – AUG 2016	<b>Catholic University of Eichstätt-Ingolstadt</b> <i>Bachelor of Science Business Administration with a Specialisation in Economics</i> Graduated ranked 2 <sup>nd</sup>

## AREAS OF INTEREST

Spiking Neural Networks (SNNs) · Neural Network Model Quantization · Bio-inspired and Neuromorphic Computing  
Hardware Acceleration of Machine Learning Algorithms · Event-based Computer Vision

## RELEVANT PUBLICATIONS

- **Clemens JS Schaefer**, Siddharth Joshi, “Quantizing Spiking Neural Networks with Integers”, International Conference on Neuromorphic Systems (ICONS), 2020
- **Clemens JS Schaefer**, Mark Horeni, Pooria Taheri, Siddharth Joshi, “LSTMs for Keyword Spotting with ReRAM-based Compute-In-Memory Architectures”, IEEE International Symposium on Circuits and Systems (ISCAS), 2021
- **Clemens JS Schaefer**, Patrick Faley, Emre Neftci, Siddharth Joshi, “Memory Organization for Energy Efficient Learning and Inference in Digital Neuromorphic Accelerators”, IEEE International Symposium on Circuits and Systems (ISCAS), 2020
- Sourav Dutta, **Clemens JS Schaefer**, Jorge Tomas Gomez, Siddharth Joshi, Suman Datta, “Supervised Learning in All FeFET-Based Spiking Neural Network: Opportunities and Challenges”, Frontiers in Neuroscience, 2020
- Weier Wan, Rajkumar Kubendran, **Clemens JS Schaefer**, S. Burc Eryilmaz, Wenqiang Zhang, Dabin Wu, Stephen Deiss, Priyanka Raina, He Qian, Bin Gao, Siddharth Joshi, “Edge AI without Compromise: Efficient, Versatile and Accurate Neurocomputing in Resistive Random-Access Memory”, under review for Nature ([arXiv:2108.07879](https://arxiv.org/abs/2108.07879))
- **Clemens JS Schaefer**, Siddharth Joshi, “Memory Organization and Structures for On-Chip Learning in Spiking Neural Networks”, IEEE 63rd International Midwest Symposium on Circuits and Systems (MWSCAS), 2020

For more publications and citations see [Google Scholar](#).

## EXPERIENCE

NOTRE DAME, IN JUN 2019 – PRESENT	<b>University of Notre Dame</b> <i>Graduate Research Assistant, Department of Computer Science and Engineering</i> <ul style="list-style-type: none"><li>• Researching and developing low-power event-based machine learning algorithms, amongst other for computer vision and object recognition, by advancing machine learning algorithms with findings from neuroscience (such as neural dynamics) and making them biologically plausible.</li><li>• Investigating the tradeoff between energy and accuracy of efficient quantized spiking neural networks which can be implemented in digital accelerators with different weight storage methods, resulting in an ISCAS conference paper.</li><li>• Analyzing quantization for convolutional spiking neural networks trained with local learning, demonstrating <math>\approx 73\%</math> memory savings at the cost of <math>\approx 1\%</math> accuracy, results subsequently published and presented at ICONS.</li><li>• Collaborating with researchers from the department of electrical engineering and simulating spiking neural networks with neurons based on properties from FerroFET devices, culminating in a joint journal paper.</li></ul>
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<p>VIRTUAL JUN 2021 – SEP 2021</p>	<p><b>Google LLC</b> <i>Research Intern, QKeras and Application-Specific Machine Learning Team</i></p> <ul style="list-style-type: none"> <li>• Researching automated heterogeneous quantization and extending company internal quantization efforts by gradient based bit-width adaptation.</li> <li>• Exploring various forms of surrogate gradients to train quantized neural networks.</li> </ul>
<p>AUG 2020 – SEP 2020</p>	<p><b>Telluride Neuromorphic Cognition Engineering Workshop</b>, Participant</p> <ul style="list-style-type: none"> <li>• Working on the meta-learning challenge (learning with limited data) by applying few-shot learning principals to convolutional spiking neural networks.</li> <li>• Developed proof-of-concept for spiking few-shot learning with self-supervision to learn semantically meaningful features.</li> </ul>
<p>JUL 2020</p>	<p><b>Design Automation Conference (DAC)</b>, Young Student Fellow</p> <ul style="list-style-type: none"> <li>• Selected as a Young Student Fellow to attend the conference on a stipend and enjoy additional training and networking opportunities, as well as a chance to present my current research to the community.</li> <li>• Winning the DAC Young Fellows Research Video Award.</li> </ul>
<p>NOTRE DAME, IN SEP 2018 – MAY 2019</p>	<p><b>University of Notre Dame</b> <i>Graduate Teaching Assistant, Department of Computer Science and Engineering</i></p> <ul style="list-style-type: none"> <li>• Fall semester for “Introduction to Computing C/C++ Programming” and in the spring semester for “Elements of Computing 2”.</li> <li>• Coordinating undergrad TAs, grading assignments, projects and exams on time, holding office hours to counsel students and lecturing when the instructor was absent.</li> </ul>
<p>FRANKFURT, DE MAR 2018 – JUL 2018</p>	<p><b>Ernst &amp; Young GmbH</b> <i>Quant Team/Data Scientist, Financial Accounting Advisory Services</i></p> <ul style="list-style-type: none"> <li>• Performing benchmark analysis for various financial instruments (e.g. equities, bonds, foreign exchange instruments and futures). Investigating price deviations and anomalies along with visualizing the deviations on a portfolio level and communicating the results with international teams.</li> <li>• Developing a tool to aid the data handling for equity, bond and forward pricing using technologies such as Python3, Flask and SQLite.</li> <li>• Carrying out large scale bond price deviation analysis to characterize deviations. Training various machine learning models such as ridge regression, support vector regression and regression trees using python-based libraries, e.g. scikit-learn, NumPy, pandas, matplotlib.</li> </ul>

## RELEVANT COURSE WORK

Hardware Platforms for Deep Learning and Optimization · Advanced Computer Architecture  
Machine Learning · Complexity and Algorithms · Operating Systems · VLSI Circuit Design

## SKILLS

**Programming Languages:** Python (proficient), JAX (proficient), PyTorch (proficient), TensorFlow (proficient), C++ (basic)

**Tools:** Matlab (intermediate), Cadence Virtuoso (basic), L<sup>A</sup>T<sub>E</sub>X(intermediate)

**Languages:** German (native), English (proficient, TOEFL iBT 112), Spanish (conversational)

## FELLOWSHIP AND SERVICE

OCT 2013 – AUG 2017 | **Friedrich-Naumann-Foundation for Liberty**, Fellowship Holder

JUN 2014 – JUN 2015 | **Catholic University Eichstätt-Ingolstadt**, Student Representative

NOV 2014 – APR 2015 | **German Academic Exchange Service**, Fellowship Holder

AUG 2014 – SEP 2014 | **Kolping Youth**, Social Ecological Workcamp

References available upon request.