Nathan W. Brei
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EDUCATION

Technical University of Munich
M.Sc. (Hons) Computational Science and Engineering 2016 - 2018

Thesis: Generating Small Sparse Matrix Multiplication Kernels for Knights Landing
Generated optimally vectorized multiplication routines for arbitrary small sparse matrices. Demonstrated a speedup for kernels of the SeisSol seismic simulator. Created a Python domain-specific language which generates raw AVX-512 instructions, improving on LibXSMM.

Honors Project: Data-Intensive Distributed Computing Workflows in Light Microscopy
Scaled Carl Zeiss's 'Zen' image processing suite to high-throughput scenarios. Leveraged Apache Storm for automatic cloud deployment, scaling, and fault-tolerance. Frontend was an IronPython API; backend mixed C# and Java. Served as technical lead on a team of 7.

Teaching Assistant: Scientific Computing I, Winter Semester 2017

Massachusetts Institute of Technology
B.Sc. Aerospace Engineering 2007 - 2011

Capstone project: MIT Laboratory of Information Decision Systems 2011
Inferring information about the surroundings from ultrawideband radio waveforms. Multiclass classification of barriers blocking the line-of-sight, using support vector machines and MATLAB.

Undergraduate research: MIT Technology Laboratory for Advanced Materials and Structures, 2010
Grew aligned carbon nanotube forests on carbon fibers. Designed and built a device to hold individual carbon fibers under tension inside a CVD furnace.

Undergraduate research: MIT Daylighting Lab 2008
Used genetic algorithms for shape optimization to improve a building's daylighting performance. Integrated existing numerical codes and wrote tools for cleaning/annotating geometry. Frontend was a SketchUp CAD plugin in Ruby; backend was C. Worked on a team of 5 people.

EXPERIENCE

Droit Financial Technologies, Software Developer 2013 - 2015

8th employee, 5th engineer. Contributed to ADEPT, a system for determining regulatory compliance obligations on derivatives trades. Knowledge engineering to model regulations which vary over time and interact in unstructured ways. Designed versioning systems to distinguish logic changes driven by regulators, driven by clients, or driven internally. Used Drools, Java, and Groovy.

Designed and built a system for visually auditing decisions. All inputs, outputs, and version information are persisted to a MySQL or Oracle database. The system traces its execution path by annotating flowcharts and decision tables.

Designed and built an AngularJS app for graphical rule editing, version management, and visualization/auditing, which replaced Drools Guvnor. The backend used Java, Spring, Hibernate.

Makani Power, Design Engineer Intern 2013

Contributed to Makani's Wing 7 integrated ground station, a truck-based platform acting as a winch, battery array, and perch for a UAV. Designed and fabricated structural elements and chain drives using steel, plastic, and carbon fiber. Used Siemens NX CAD and CosmosWorks FEA.

Daedalus Innovation, Backend Web Developer 2012 - 2013

Web application development using Python/Django/Postgres/Heroku.