Curriculum Vitae

PERSONAL INFORMATION

Nathan W Brei

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Sex M | Date of birth 10/06/1989 | Nationality USA

CV for reviewers of the BGCE survey

EDUCATION AND TRAINING

Sept 2015 – Present

M.Sc. (Hons) Computational Science and Engineering

Technical University of Munich

- Main courses: Numerical Programming, Scientific Computing, Fundamental Algorithms, Advanced Programming, Parallel Programming, Parallel Numerics, Scientific Visualization, Patterns in Software Engineering
- Elective courses: Computational Fluid Dynamics lab, Multidisciplinary Design Optimization
- Honors Project: Data-Intensive Distributed Computing Workflows in Light Microscopy

Feb 2013 – Aug 2013

Self-Guided Programming Workshop

Recurse Center, New York, NY

- A writer's workshop for programmers. Intensive study of functional and logic programming paradigms. Worked on self-guided projects, including DSLs for generating CAD assemblies and simulations of transit networks. Introduced to the programming languages Julia, Clojure core.logic, and OCaml.

Sept 2007 – June 2011

S.B. Aerospace Engineering

Massachusetts Institute of Technology, Cambridge, MA

- GPA: 3.6/5
- Aerospace courses: Aerodynamics, Structural Mechanics, Computational Methods, Principles of Autonomy and Decision-making, Flight Vehicle Engineering, Experimental Projects
- Math courses: Calculus with Theory, Differential Equations, Complex Variables, Linear Algebra, Computational Science and Engineering
- Awards: 3rd Place Lufthansa Prize for Excellence in German Studies

Aug 2003 – June 2007

International Baccalaureate

International School of Düsseldorf

GPA: 3.65/4 IB exams: 41/45

Awards: National Merit Finalist, etc

WORK EXPERIENCE

Sept 2013 – Sept 2015

Software Engineer

Droit Financial Technologies, New York, NY

Droit provides a system for determining regulatory compliance obligations for over-the-counter derivatives trades. The system is running in production at two major financial institutions. The stack was Java, Groovy, Spring, Hibernate, Drools, JBoss, MySql, AngularJS. I was employee #8. My work involved core knowledge representation & management, rules engines, introspection, and visualization.

FinTech/Regulatory Compliance/Computational Law/Software Engineering

Oct 2012 – Feb 2013

Mechanical Engineering Intern

Makani Power, Alameda, CA

Makani Power (now "Google Makani") is developing a kite-like airborne wind turbine. I contributed to the design and implementation of the Wing 7 ground station: a truck-mounted anchor, winch, perch, and power station. My work focused on the mechanical design of structural elements and chain drives. Rapid iteration meant designing parts in CAD, performing finite element analyses, and building prototypes in the machine shop.

Mechanical Engineering/Renewable Energy/Computer-aided Design

June 2012 – Sept 2012

Archaeology Intern

Fairfield Foundation, Gloucester, VA

Archaeological fieldwork at four colonial sites in Tidewater Virginia, involving surveying, digging, cleaning, interpreting, and mapping test units and shovel tests. Lab work involving sorting, cleaning, and cataloguing artifacts. I also did archival research on a historic estate, and helped renovate a 1920's gas station.

Archaeology

June 2011 – June 2012

Software Engineer

Daedalus Innovation, Boston, MA

Daedalus provides software engineering contracting for rapid development of startup minimum-viable products. My particular project was BookAndTalk, a site for arranging video chats between authors and book groups. The stack was Python, Django, PostgreSQL, OpenTok, Heroku. My work involved coding basic site functionality, integrating with external libraries such as OpenTok, and managing the deployment.

Software Engineering

June 2010 – Sept 2010

Undergraduate Research

MIT Technology Laboratory for Advanced Materials and Structures, Cambridge, MA

Designed, machined, and tested a device to hold individual carbon fibers under tension inside a CVD furnace. Grew aligned carbon nanotube forests. Prepared carbon fibers with various coatings and tested their tensile strength. Prepared and cured graphite-epoxy composites.

Material Science/Nanotechnology/Mechanical Engineering

June 2008 – Sept 2008

Undergraduate Research

MIT Daylighting Lab, Cambridge, MA

Coded a daylighting simulation plugin, as part of a team of 5 people, for SketchUp using Ruby and Java. Integrated code and equations from multiple master's theses. The plugin, `LightSolve', calculated natural lighting characteristics and interactively assisted with design optimization.

Architecture/Building Technology/Software Engineering

PERSONAL SKILLS

Mother tongue(s) English

Other language(s) German

Communication skills

- At MIT, presented designs and results from capstone project, etc., to a panel of professors
- At Droit, presented demos of exploratory prototypes to colleagues and leadership
- At Droit, gave presentations describing upcoming design decisions and their ramifications
- At Droit, participated in Q&A sessions with technical experts from prospective clients
- At Droit, interviewed prospective colleagues
- At TUM, presented demos of the BGCE project including live coding

Organisational / managerial skills

- At Droit, reorganized the entire codebase: merged many small repositories into a single monorepo, reorganized the package structure, and streamlined the build process.
- At TUM, served as the technical lead on the BGCE project, developing roadmaps and task breakdowns, managing risk and technical debt, and coordinating work among 7 people over the course of 9 months

Job-related skills

- Source control management using Git
- Continuous integration using Jenkins
- Refactoring and pattern-based architecture

Computer skills

- Office software: Microsoft Word, PowerPoint, Access; LaTeX
- Computer-aided design: SolidWorks, Rhino, Siemens NX, SketchUp
- Databases: Hibernate, PostgreSQL, MySQL
- Programming languages: C, C++, Java, Python, Matlab, Julia, Haskell, Clojure
- Parallel programming: Pthreads, OpenMP, MPI, Apache Storm

Other skills

Machine shop: Water jet, MIG welder, 3D printer, lathe, mill, autoclave, forklift
Drawing: Manual drafting, perspective projection, portraiture

ADDITIONAL INFORMATION

Projects

Senior Capstone Project
MIT Laboratory for Information Decision Systems (2010 – 2011)

Designed and executed a year-long experiment, with Robert Han, under the guidance of Prof Moe Win. Applied machine learning techniques to ultra-wideband radio waveforms to improve localization performance. Tested ability to identify the material of barriers possibly blocking the line of sight.

BGCE Honors Project
TUM Chair of Scientific Computing with Carl Zeiss Microscopy (2016 – 2017)

Led a team of 7 people to design and implement a distributed system for image processing. The system allows an end-user to construct computation graphs using Zeiss' existing image processing libraries and deploy them to an Apache Storm cluster. Images acquired from an attached microscope are sent to the cluster and processed in soft real time. The resulting throughput scales with the size of the cluster while the latency remains bounded.