

Aleksander Wennersteen

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Technical Skills – In right-decreasing order of familiarity:

- Languages: C++ 14 – Python – Fortran 2008 – Matlab
- Languages I was proficient in within the last 12 months with extensive experience: CUDA, NodeJS
- Parallel programming: MPI, OpenMP, C++ threads | Not used recently: pthreads, PGAS, OmpSs.
- Git, Jira, Puppet, Containers, Agile work environment, OpenStack, SQL and NoSQL database queries.
- HPC, extreme-scale algorithms, optimization, machine learning, cloud and distributed computing.

Experience

Summer Student – CERN – June - August 2018

- Container technologies (Singularity) for High Performance Computing, batch, and the Worldwide LHC Computing Grid (WLCG). Report: <https://doi.org/10.5281/zenodo.1438401>
- Investigated how to best introduce containers into the CERN HPC ecosystem, and made recommendations on how to integrate it into current efforts to streamline CERN computing.
- HPC architecture design discussions with the Square Kilometre Array (SKA) and Meerkat telescopes.
- Part of the CERN openlab programme. Selected as one out of 41 among 1820 applicants worldwide.
- Gained skills in Agile workflow, DevOps, HPC, cloud computing, sysadmin, and Puppet configuration.

Technical co-founder (CTO)/principal developer – Merrygos.com – November 2017 – March 2018

- Architected, designed and implemented hybrid social network/marketplace (front and back-end).
- Added basic continuous integration CI/CD pipeline with CircleCI and Heroku connected to GitHub.
- Gained skills in architecture design and business, NodeJS, Angular, Bootstrap, Heroku, AWS S3.

Visiting researcher – Extreme computing group at BSC – July, August 2017 + until February 2018 remote.

- Used deep Q-learning and Monte Carlo tree search to solve partially observable Markov decision processes for navigation and collision avoidance in a crowd with heterogeneous CPU + GPU set-up.
- Gained skills in algorithm design for large scale and massively parallel computations and research, combining deep learning with CPU based (MC tree search) and GPU based (movement) algorithms.
- Wrote code in Python and C++ with TensorFlow and Keras (Python), also a lot of CUDA and MPI. Interfaced with OpenGL based graphics code that generated the simulations.
- Studied deep learning and Monte Carlo theory, with emphasis on mathematical foundations.
- Fully funded by the Partnership for Advanced Computing in Europe (PRACE) - Summer of HPC.
- Blog posts: <https://summerofhpc.prace-ri.eu/author/aleksanderw/>

Porting Grid, a Quantum Chromodynamics library, to GPUs – Univ. Edin. SOPA – May, June 2017

- Potentially of great importance as Grid is being considered to form the basis for the new data parallel API of the US Exascale QCD project, pending portability. NVIDIA research collaboration.
- Grid uses templates to generate code that maps complicated structures to SIMD lanes, in a way that is optimal for the individual architectures, upon which the library is built.
- We ported the expression template engine, tensor structures and basic QCD structures to GPUs.
- Collaborated across continents, used pre-release CUDA versions and bleeding edge C++ features.
- Related paper: <https://arxiv.org/abs/1710.09409> | Production code: github.com/paboyle/Grid

Software Engineer Intern at Kongsberg Norspace – June, July 2016

- Designed and developed software to automate the calibration process for the climate chambers.
- Freeing up one of the main tasks of the head of calibration and allowing for much more frequent calibration than would be possible even with a dedicated full-time employee.

Education

Mathematical Physics (MPhys, equivalent to BSc + MSc) – the University of Edinburgh 2014-2019

Masters project (Individual): Ab initio random structure searches for Topological Insulators. Using Density Functional Theory (DFT) to search for novel topological insulators. Supervisor: Miguel Martinez-Canales.

Senior honours project (Individual 1 semester): Density Functional (Perturbation) Theory (DFPT). First-principles DFPT calculation of vibrational Raman spectra using Quantum Espresso. Attempted implementing new DFPT capabilities, rewrote finite difference (FD) calculation for Raman spectra and started documenting previously undocumented FD code in QE. Supervisor: Miguel Martinez-Canales.

Senior honours group project (Full year, 6-person group): Quantum Entanglement. My focus: quantum computing, foundations of quantum theory, quantum gravity and string theory.

Courses: Applied maths courses in operations research and (large scale/sparse) optimisation, statistics, game theory, relational databases, object-oriented programming (Java), numerical algorithms.

Non-assessed courses: HPC architectures, multiple parallel programming courses, foundations of databases, machine learning and pattern recognition, topology, quantum computing and category theory.

Summer schools

Programming and Tuning Massively Parallel Systems (PUMPS), Barcelona – June 26-30, 2017

- Covered advanced GPU programming techniques for heterogeneous clusters.
- Single- and multi-GPU programming, deep learning, sparse data methods, dynamic parallelism.
- Full syllabus: <http://bcw.ac.upc.edu/PUMPS2017/>
- Received €500 grant by the UPC-BSC NVIDIA Center of Excellence to attend.

CERN Summer 2018

- Configuration management: OpenStack cloud set-up and Puppet configuration training.
- Summer student (IT and physics) lectures and IT seminars targeted at CERN staff.
- Workshops: software exploitation, web penetration testing and prevention, Golang.

PRACE Summer of HPC Summer School, Ostrava, Czech Republic – July 3-7, 2017

- Parallel programming techniques, how to set up HPC systems, In-situ visualisation with ParaView.
- Scientific communication and outreach training; blog writing, videos, social media.

Other

- Attended Nvidia GTC Europe 18 for an update on Nvidia's progress on HPC and deep learning.
 - Invited to Google Cloud Next 18 in London and learnt about the Google Cloud Platform (GCP).
 1. Lectures on DevOps, analytics and the machine learning capabilities of GCP.
 - Attended the Linux Foundation's Open Source Summit Europe 18 + Embedded + IoT + Security.
 1. Internals of Linux kernel and memory management, cybersecurity etc...
 - Introduction to Spark: PRACE training event by the Edinburgh Parallel Computing Centre (EPCC)
 1. Two-day training event in using Apache Spark on a cluster for data analysis.
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Other

Former volleyball player: 2012 2nd division champions, school team placed 9th nationally in 2012, team captain of 3rd and 4th division teams, also coached volleyball at school level and extra-curricular boys U19.