Salvatore Cardamone
Curriculum Vitae

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Employment

2021 – Present **Senior Signal Processing Engineer, CoMind Technologies**
I have led the internal development of the signal processing pipeline required for the procurement of neurological signals from experimental data. I have led work to scope out a comprehensive set of work packages that will allow for this processing to be conducted in a quasi-realtime fashion, thereby allowing the experimentalists to optimise configurations on-the-fly. I am also involved in the development of embedded and low-level software, including control suites for digital acquisition and waveform generation.

2018 – 2021 **Senior Engineer, Cambridge Consultants Ltd**
My work largely dealt with the physical layer in 5G, projects including:
* Porting of performance critical sections of PXSCH to CUDA.
* Development of in-house implementation of the full NR PHY (primarily FEC and channel estimation/ equalisation) for an embedded platform.
* Benchmarking throughput of LDPC codec on a CEVA DSP.

I worked on other wireless standards (BR/EDR and BLE) for low-power embedded systems. I was involved in the winning and subsequent completion of work commissioned by a multinational hardware vendor, concerning the appraisal of a novel SIMD HPC platform for specific workloads in geophysical resource exploration.
I led the quantum technologies special interest group, obtaining internal funding for the development of several internal demonstrators.

2016 – 2018 **Postdoctoral Research Associate, The University of Cambridge**
Postdoctoral research associate with Dr Alex Thom, working on the acceleration of common HPC workloads in computational chemistry with dataflow FPGAs. This involved the design of benchmarks using conventional multithreaded/ multicore systems and GPUs, and optimisation of algorithms/ memory-access patterns for each platform. I was involved in discussions with Maxeler Technologies, giving feedback on useful features that could be incorporated into their high-level synthesis toolchain to facilitate the porting of academic HPC codebases to their platform.

Education

2012 – 2016 **Doctor of Philosophy**
Theoretical Chemistry *The University of Manchester*
Researched the use of machine learning in computational chemistry to aid in the prediction of atomic multipole moments, obtained through Bader decomposition, as a function of molecular conformation. I worked with novel domain of application metrics to quantify the validity of training sets on-the-fly, and consequent iterative training set refinement strategies.

2009 – 2012 **Bachelor of Science**, 1st Class (Hons)
Biochemistry, *The University of Sheffield*

Computer Skills

Fluent C, C++17, bash, FORTRAN90, MATLAB, python, git, OpenCL, CUDA, MPI, OpenMP
Competent perl, LaTeX, java, Haskell, VHDL

Awards and Prizes

July 2015 **BBSRC Funded Studentship**
Daresbury National Laboratory, Warrington
Implemented a novel isokinetic ensemble thermostatting methodology within the framework of the DL_POLY molecular dynamics package.

Summer 2011 **The Biochemical Society Bursary Award**
Waltho Lab, University of Sheffield
Performed molecular dynamics simulations on phosphoglucokinase.

Summer 2007 **The Nuffield Foundation Scholarship**
Loadman Lab, Bradford Institute for Cancer Therapeutics
Evaluated the efficacy of a tumour-specific compound targeting matrix metalloproteinases.

Conferences

talks **FPL, 2018**, *Dublin, Ireland*
FPGAs and Quantum Monte Carlo: Automated Porting using CAOS
Paderborn Centre for Parallel Computing, 2018, *Paderborn, Germany*
FPGAs in a Multiprocessing Environment for Quantum Monte Carlo
Xilinx, 2018, *Dublin, Ireland*
Numerical Precision in Quantum Monte Carlo and Importance for FPGAs
HiPEAC, 2017, *Stöckholm, Sweden*
FPGA Acceleration of Diffusion Monte Carlo
Symposium on Computational Chemistry, 2015, *Manchester, UK*
Conformational Sampling of Vibrational Modes for Machine Learning

posters **ACS National Meeting 2016**, *San Diego, USA*
A Novel Domain of Application for Machine Learning
Quantum Monte Carlo Conference, *Tuscany, Italy*
An Analysis of Bader Decompositions of Molecular Systems at Various Levels of Theory

Teaching Experience

University of Cambridge
Academic supervisor for the third year courses:

- Theoretical Techniques (A4)
- Perturbation Theory and Further Quantum Mechanics (B7)
- Electronic Structure Theory (C6)

Have supervised a summer student and an MPhil candidate in our lab, both completing successful projects in quantum chemistry/ software development. Also a senior laboratory demonstrator for computational and theoretical laboratories in chemistry part of natural sciences tripos.

University of Manchester
Supervised two successful Masters students over the course of my PhD, one of which resulted in an academic publication.

Extracurricular Activities

Along with my dance partner, I was the national pre-amateur champion in ballroom dancesport. We competed internationally in China and mainland Europe. I was the president of the ballroom and latin dancesport societies at both the Universities of Manchester and Sheffield. I am a fluent speaker of Italian and am competent in French.

Salvatore Cardamone
Academic Publications

Publications to Date

Those publications for which I have conducted the majority of work have been labeled with an asterisk.

Peverelli, F, Rabozzi, M, Cardamone, S, Del Sozzo, E, Thom, AJWT, Santambrogio, MD & Di Tucci, L, Automated Acceleration of Dataflow-Oriented C Applications on FPGA-Based Systems, *IEEE 27th Annual International Symposium on Field-Programmable Custom Computing Machines (FCCM)*, **2019**

*Cardamone S, Kimmitt JRR, Burton HGA, Todman TJ, Li S, Luk, W & Thom AJWT, Field-Programmable Gate Arrays and Quantum Monte Carlo: Power Efficient Co-processing for Scalable High-Performance Computing, *International Journal of Quantum Chemistry*, **2019**, 119(12), 12817

Jensen K, Benson R, Cardamone S & Thom AJWT, Simple and Fast Quasidiabats from Self-Consistent Field Metadynamics, *Journal of Chemical Theory and Computation*, , **2018**, 14(9), 4269-4639

Zielinski F et al., Geometry Optimization with Machine Trained Topological Atoms, *Nature Scientific Reports*, **2017**, 7(1), 12817

*Cardamone S, Caine B, Blanch E & Popelier PLA, The Computational Prediction of Raman and ROA Spectra of Charged Histidine Tautomers in Aqueous Solution, *Physical Chemistry Chemical Physics*, **2016**, 18(39), 27377-27389

Maxwell P, Cardamone S & Popelier PLA, The Prediction of Topologically Partitioned Intra-Atomic and Inter-Atomic Energies by the Machine Learning Method Kriging, *Theoretical Chemistry Accounts*, **2016**, 135(8), 195-210

*Cardamone S & Popelier PLA, Prediction of Conformationally Dependent Atomic Multipole Moments in Carbohydrates, *Journal of Computational Chemistry*, **2015**, 36(32), 2361-2373

*Hughes T, Cardamone S & Popelier PLA, Realistic Sampling of Amino Acid Geometries for a Multipolar Polarizable Force Field, *Journal of Computational Chemistry*, **2015**, 36(24), 1844-1857

*Cardamone S, Hughes T & Popelier PLA, Multipolar Electrostatics, *Physical Chemistry Chemical Physics*, **2014**, 16(22), 10367-10387