CHRIS CUMMINS

http://chriscummins.cc
chrisc.101@gmail.com

EDUCATION

2018 (expected)

Ph.D, Informatics
University of Edinburgh, School of Informatics
Advisers: H. Leather & P. Petoumenos

Developing novel compiler optimisations for patterns-based parallel programming. My research focuses on the intersection of algorithmic skeletons and compilers, aiming to address the challenge of parallel programming through the efficient compilation of high-level patterns.

2015

MSc by Research, Pervasive Parallelism *(Distinction)*
University of Edinburgh, School of Informatics
Thesis: *Autotuning Stencil Codes with Algorithmic Skeletons*
Advisers: H. Leather & P. Petoumenos

Runtime adaptive tuning for heterogeneous parallelism, demonstrating 3.79× speedup of multi-GPU stencil programs. Achieved using supervised machine learning, distributed training sets, and synthetic benchmark generation. High-level GPGPU programming with OpenCL. Currently preparing for two workshop publications and submission to the ACM TACO journal.

2014

MEng Electronic Engineering & Computer Science *(First Class Honours)*
Aston University, School of Engineering & Applied Science
Thesis: *Protein Isoelectric Point Database*
Adviser: I. T. Nabney

Created and open sourced a novel search engine and research tool for molecular biochemistry. Developed full integration of BLAST search tools, a publicly accessible API, and tooling to generate synthetic payloads from confidential datasets for whitebox systems testing. Published in Bioinformatics journal.

PROFESSIONAL EXPERIENCE

2012–2013

Intel Corporation
Open Source Developer intern

Patched `ioctl` subsystem in Linux kernel. Developed a novel SIMD register visualisation tool for Intel GPU assembly programming. Implemented GTK+ support for Wayland display server. Fixed memory and usability bugs in GNOME desktop applications. Developed particle effects engine for a 3D rendering program. Rapid prototyping of Android applications. Numerous contributions to open source projects.

2010–2014

Freelance
Web Developer

Full-stack development for small businesses, including graphic design and branding. Frontend experience with JavaScript; backend development using Clojure, Node.js, PHP, MySQL, PostgreSQL, and Jekyll. Clients have included publishing companies, musicians, and a beauty parlour.

2008

Rolls Royce Holdings plc
Work placement in the Design Methods & Improvements team.

PUBLICATIONS

2016 (in preparation)

C. Cummins, P. Petoumenos, M. Steuwer, H. Leather. **Towards Collaborative Performance Tuning of Algorithmic Skeletons**. High-Level Programming for Heterogeneous and Hierarchical Parallel Systems.

We present OmniTune — an extensible and distributed framework for dynamic autotuning of optimisation parameters at runtime. OmniTune uses a client-server model with a flexible API to support machine learning enabled autotuning. Training data is shared across a network of cooperating systems.

2016 (submitted)

C. Cummins, P. Petoumenos, M. Steuwer, H. Leather. **Autotuning OpenCL Workgroup Size for Stencil Patterns**. The 6th International Workshop on Adaptive Self-tuning Computing Systems.

Three methodologies for predicting performant workgroup sizes for stencil patterns on CPUs and multi-GPUs: the first, using classifiers to predict the optimal workgroup size; the second and third proposed methodologies employ the novel use of regressors for performing classification by predicting the runtime of kernels and the relative performance of different workgroup sizes, respectively. We evaluate the effectiveness of each technique, finding that autotuning provides a median 3.79× speedup over the best possible fixed workgroup size, achieving 94% of the maximum performance.

2015

E. Bunkute, C. Cummins, F. Crofts, G. Bunce, I. T. Nabney, D. R. Flower. **PIP-DB: The Protein Isoelectric Point Database**. Bioinformatics, 31(2), 295-296. Chicago

A protein's isoelectric point or pI corresponds to the solution pH at which its net surface charge is zero. The Protein Isoelectric Point database (PIP-DB) has collected and collated data from the literature to provide an increasingly comprehensive database for comparison and benchmarking purposes. A web application has been developed to warehouse this database and provide public access to this unique resource. PIP-DB is fully searchable across a range of properties.

AWARDS

2014 **Institute of Engineering & Technology Prize**

Annual prize for the top student at Aston University who showed distinction and outstanding merit on an IET accredited course.

2009 **Arkwright Scholarship, Rolls Royce Holdings plc**

A funded industrial scholarship awarded to less than 250 students nationwide for demonstrating exceptional skill in design & technology subjects.

2009 **Engineering Education Scheme of England**

Research & development of a (now patented) supermarket trolley mounted shopping aid. Responsible for designing the wireless power and charging system.

2008 **AESSEAL Design Innovation Award**

Cash prize for first place in an industrial 3D CAD competition.

ACADEMIC ACTIVITIES

2015 **Reviewer:** International Symposium on Code Generation and Optimization

2015 **Volunteer:** International Conference on Parallel Computing

2014 **Presenter:** Pervasive Parallelism Industrial Engagement Event