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. Published in HLPGPU '16 and ADAPT '16.

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 (preparing) C. Cummins, P. Petoumenos, M. Steuwer, H. Leather. **Collaborative Autotuning of Algorithmic Skeletons for OpenCL**. ACM Transactions on Architecture and Code Optimization.

Heterogeneous multi-cores are now the norm, yet we lack suitable high level models to program them. This paper discusses how algorithmic skeletons solve this problem, and how to make their performance competitive with hand written low level code.

2016 C. Cummins, P. Petoumenos, M. Steuwer, H. Leather. **Towards Collaborative Performance Tuning of Algorithmic Skeletons**. High-Level Programming for Heterogeneous and Hierarchical Parallel Systems, HiPEAC.

This paper presents an extensible and distributed framework for dynamic prediction of optimisation parameters at runtime. *OmniTune* provides a flexible API to enable predictive autotuning with machine learning, exceeding human experts by 1.22×.

2016 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, HiPEAC.

Three methodologies to autotune stencil patterns using machine learning classification and regression. We demonstrate 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

PIP-DB provides public access to a unique collation of bioinformatics data from the literature for comparison and benchmarking purposes.

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

Peer reviews ACM TACO (2016), LCTES 2016, CGO 2016.

Talks PPar lunch 2016, PPar kickoff 2014.

Posters HiPEAC 2016, PPar Industrial Engagement Event 2015.

Volunteering ParCo 2015.