CHRIS CUMMINS

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EDUCATION

2019 (expected) | **Ph.D, Informatics**
University of Edinburgh, School of Informatics

Deep learning over programs. Developing machine learning methods for random program generation, compiler optimisations, and representative benchmarking. Applications for heterogeneous parallelism, testing, and adaptive performance tuning. To date: 4 publications, 3 invited talks, 5 posters, 4 conferences.

2015 | **MSc by Research, Pervasive Parallelism** *(Distinction)*
University of Edinburgh, School of Informatics
Thesis: *Autotuning Stencil Codes with Algorithmic Skeletons* (grade: 85%)

Runtime adaptive tuning for heterogeneous parallel systems, targeting a high level DSL for multi-GPU stencil programs. Machine learning over distributed training sets.

2014 | **MEng Electronic Engineering & Computer Science** *(First Class Honours)*
Aston University, School of Engineering & Applied Science
Thesis: *Protein Isoelectric Point Database* (grade: 90%)

Created a novel search engine for molecular biochemistry data. Integrated BLAST search tools, a publicly accessible API, and tooling to generate synthetic payloads from confidential datasets for whitebox systems testing. Released open source.

PUBLICATIONS

2017 | C. CUMMINS, P. PETOUMENOS, Z. WANG, H. LEATHER. **End-to-end Deep Learning of Compiler Heuristics**. PACT'17 (23% acceptance rate), Portland, Oregon.

Learning optimization heuristics directly from raw source code, without the need for feature extraction. Exceeds performance of state-of-the art predictive models using hand crafted features, and can transfer knowledge gained from one optimization task to another, even if the learned tasks are dissimilar.

2017 | C. CUMMINS, P. PETOUMENOS, Z. WANG, H. LEATHER. **Synthesizing Benchmarks for Predictive Modeling**. Best Paper CGO'17 (22% acceptance rate), Austin, Texas.

Deep learning over massive codebases from GitHub to generate benchmark programs. Automatically synthesizes OpenCL kernels which are indistinguishable from hand-written code, and improves state-of-the-art predictive model performance by $4.30\times$.

2016 | C. CUMMINS, P. PETOUMENOS, M. STEUWER, H. LEATHER. **Towards Collaborative Performance Tuning of Algorithmic Skeletons**. HLPGPU'16, HiPEAC, Prague.

A distributed framework for dynamic prediction of optimisation parameters using machine learning. Automatically exceeds human experts by $1.22\times$.

2016 | C. CUMMINS, P. PETOUMENOS, M. STEUWER, H. LEATHER. **Autotuning OpenCL Workgroup Size for Stencil Patterns**. ADAPT'16, HiPEAC, Prague.

Three methodologies to autotune stencil patterns using machine learning. Speedups of $3.79\times$ over the best possible static size, 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.

An open source search engine of protein isoelectric points. Provides public access to bioinformatics data from the literature for comparison and benchmarking purposes.

PROFESSIONAL EXPERIENCE

2016   **Codeplay Software**
Software Engineer Intern, Eigen SYCL Interface

Developing OpenCL port of Tensorflow. Implemented GPU memory management for Eigen. Compile time scheduling and kernel fusion for expression trees on GPUs. Proposed and designed a Python interface for VisionCpp as lead developer. Extensive C++ meta-programming.

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. Front-end experience with JavaScript; back-end development using Clojure, Node.js, PHP, MySQL, PostgreSQL, and Jekyll.

2008   **Rolls Royce Holdings plc**
Work placement in the Design Methods & Improvements team.

AWARDS

2017   **Best Paper Winner, CGO'17**

2015   **PhD studentship, EPSRC grant EP/L01503X/1**

2014   **Institute of Engineering & Technology Prize**
Annual prize for top engineering student at Aston University.

2009   **Arkwright Scholarship, Rolls Royce Holdings plc**
Funded scholarship awarded to less than 250 students nationwide.

2009   **Engineering Education Scheme of England**
R&D for a (now patented) supermarket trolley mounted shopping aid.

2008   **AESSEAL Design Innovation Award**

ACADEMIC ACTIVITIES

Invited Talks   SPLS 2017, Codeplay Software 2016, Ocado Technology 2016, Amazon Development Center 2016.

Posters   Google 2016, ACACES 2016, PLDI 2016, HiPEAC 2016, Google 2015, PPar 2015.

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

TECHNICAL SKILLS

Expert   C++, Python, git, GNU/Linux, bash.

Advanced   C, JavaScript, OpenCL, SQL, LaTeX, TensorFlow.