

# Svilen Kanev

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## Research Interests

My main interests are in the areas of computer systems and architectures. Very broadly, I like exploring hardware-software approaches to lower-level problems. I spend a lot of time on performance analysis for datacenters, looking for optimization opportunities in all layers of the computing stack. My work spans: profiling techniques, distributed systems, CPU microarchitecture, compiler feedback-directed optimization, simulation, datacenter power management, reliability to voltage noise, power delivery design, and parallelism, to name a few.

## Education

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|-----------|---|
| 2012–2016 | <b>School of Engineering and Applied Sciences, Harvard University</b><br>PhD in Computer Science; MS in Computer Science<br>Advised by Professor David Brooks and Professor Gu-Yeon Wei |
| 2008–2012 | <b>School of Engineering and Applied Sciences, Harvard University</b><br>Bachelor of Arts in Computer Science<br>Advised by Professor David Brooks, GPA 3.69/4.00                       |
| 2007–2008 | <b>Faculty of Physics, Sofia University, Bulgaria</b><br>Worked towards a Bachelor of Science in Experimental Physics before moving to Harvard.   |

## Honors and Awards

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|------------------|--|
| 2023             | Paper selected for inclusion in International Symposium for Computer Architecture (ISCA) 25-Year Retrospective: 1996–2020 [ <b>98 significant papers over 25 years</b> ] |
| 2020, 2016, 2011 | Top Picks from the Computer Architecture Conferences. <i>Institute of Electrical and Electronic Engineers (IEEE) Micro</i> [ <b>11 papers annually</b> ]                 |
| 2014, 2015       | Communications of the ACM Research Highlight. <i>Association of Computing Machinery</i> [ <b>10 papers annually</b> ]  |
| 2019             | John Atanasoff Award. <i>President of Bulgaria</i> [ <b>for overall contribution to computer science</b> ]   |

## Student Awards

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|------|--|
| 2015 | Siebel scholar, Class of 2016. <i>Siebel foundation</i> [ <b>93 graduate students worldwide</b> ]  |
| 2012 | Outstanding Undergraduate Researcher Award (runner-up). <i>Computing Research Association</i> [ <b>4 undergraduate students USA-wide</b> ] |

## Professional Experience

- Since Sep 2016      **Google**      Senior Software Engineer  
Datacenter performance analysis, characterization, and optimization.
- Jun 2009 – Sep 2016      **Harvard University**      Research Assistant  
*Architecture group under Prof. David Brooks*  
Various topics on the hardware–software boundary: reliability for voltage variation; power delivery design; power–performance modeling; datacenter applications; automatic parallelization.
- Oct 2015 – Jan 2016      **Google**      Software Engineering Intern  
Jun 2014 – Nov 2014      *Languages and platforms group under Dr. Tipp Moseley*  
At-scale workload characterization and performance opportunities for datacenter applications.
- Jun 2013 – Aug 2013      **Google**      Software Engineering Intern  
Jun 2012 – Nov 2012      *Platforms group under Dr. Kim Hazelwood*  
Investigated power management opportunities for datacenter-scale applications
- Jun 2011 – Aug 2011      **Microsoft Research**      Research Intern  
*Architecture group under Prof. Doug Burger*  
Worked on the Explicit Datagraph Execution (EDGE) E2 architecture; Evaluated policies related to dynamic core composability and created power models for the architecture.
- Jun 2010 – Aug 2010      **Intel**      Software Engineering Intern  
*VSSAD group under Dr. Robert Cohn*  
Developed a scheme for compressing execution traces which relies on instruction interpretation; Developed a partial IA32 functional simulator as part of the scheme.
- Oct 2008 – Jun 2009      **Harvard-Smithsonian Center for Astrophysics**      Research Assistant  
Developed software to stack X-Ray sources from the Chandra observatory; The software allowed analysis of objects at previously unreachable observation depths.
- Sep 2008 – May 2013      **Robotic Football Club (RFC) Cambridge**      Software Team Lead  
Developed software for the RFC team in Robocup’s small-sized league; Led a development team of 5-10 undergraduates; Responsible for a 20-30 KLOC codebase.
- Nov 2007 – Aug 2008      **DAVID Holding**      Web Developer  
Front-end and back-end of a document management system; Developed custom solutions to corporate customers; Optimized the core system to handle heavy enterprise workloads.

## Publications

[\[Google scholar\]](#) [\[Full list\]](#)

## Conferences

**CDPU: Co-designing Compression and Decompression Processing Units for Hyperscale Systems**

Sagar Karandikar, Ani Udipi, JunSun Choi, Joonho Whangbo, Jerry Zhao, Svilen Kanev, Edwin Lim, Jyrki

Antero Alakuijala, Vrishab Madduri, Yakun Sophia Shao, Borivoje Nikolic, Krste Asanovic, Parthasarathy Ranganathan

*International Symposium on Computer Architecture (ISCA)*. June 2023. [\[Abstract\]](#) [\[PDF\]](#)

### **EMISSARY: Enhanced Miss Awareness Replacement Policy for L2 Instruction Caching**

Nayana Prasad Nagendra, Bhargav Reddy Godala, Ishita Chaturvedi, Atmn Patel, Svilen Kanev, Tipp Moseley, Jared Stark, Gilles A. Pokam, Simone Campanoni, and David I. August

*International Symposium on Computer Architecture (ISCA)*. June 2023. [\[Abstract\]](#) [\[PDF\]](#)

### **AsmDB: Understanding and Mitigating Front-End Stalls in Warehouse-Scale Computers.**

Grant Ayers, Nayana Prasad Nagendra, David I. August, Hyoun Kyu Cho, Svilen Kanev, Christos Kozyrakis, Trivikram Krishnamurthy, Heiner Litz, Tipp Moseley, Parthasarathy Ranganathan

*International Symposium on Computer Architecture (ISCA)*. June 2019. [\[Abstract\]](#) [\[PDF\]](#)

### **Mallacc: Accelerating memory allocation.**

Svilen Kanev, Sam (Likun) Xi, Gu-Yeon Wei, David Brooks

*International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS)*. April 2017. [\[Abstract\]](#) [\[PDF\]](#) [\[Slides\]](#) [\[Code\]](#)

### **Profiling a Warehouse-Scale Computer.**

Svilen Kanev, Juan Pablo Darago, Kim Hazelwood, Parthasarathy Ranganathan, Tipp Moseley, Gu-Yeon Wei, David Brooks

*International Symposium on Computer Architecture (ISCA)*. June 2015. [\[Abstract\]](#) [\[PDF\]](#) [\[Slides\]](#)

### **Tradeoffs between Power Management and Tail Latency in Warehouse-Scale Applications.**

Svilen Kanev, Kim Hazelwood, Gu-Yeon Wei, David Brooks

*International Symposium on Workload Characterization (IISWC)*. October 2014. [\[Abstract\]](#) [\[PDF\]](#) [\[Slides\]](#)

### **HELIX-RC: An Architecture-Compiler Co-Design for Automatic Parallelization of Irregular Programs.**

Simone Campanoni, Kevin Brownell, Svilen Kanev, Timothy M. Jones, Gu-Yeon Wei, David Brooks

*International Symposium on Computer Architecture (ISCA)*. June 2014. [\[Abstract\]](#) [\[PDF\]](#)

### **Characterizing and Evaluating Voltage Noise in Multi-Core Near-Threshold Processors.**

Xuan Zhang, Tao Tong, Svilen Kanev, Saekyu Lee, Gu-Yeon Wei, David Brooks

*International Symposium on Low Power Electronics and Design (ISLPED)*. September 2013. [\[PDF\]](#)

### **XIOSim: Power-Performance Modeling of Mobile x86 Cores.**

Svilen Kanev, Gu-Yeon Wei, David Brooks

*International Symposium on Low Power Electronics and Design (ISLPED)*. July 2012. [[PDF](#)]

### **Portable Trace Compression through Instruction Interpretation.**

Svilen Kanev, Robert Cohn

*International Symposium on Performance Analysis of Systems and Software (ISPASS)*. April 2011. [[PDF](#)]

### **Voltage Smoothing: Characterizing and Mitigating Voltage Noise in a Production Processor Using Software-Guided Thread Scheduling.**

Vijay Janapa Reddi, Svilen Kanev, Wonyoung Kim, Simone Campanoni, Michael D. Smith, Gu-Yeon Wei, David Brooks

*43rd Annual International Symposium on Microarchitecture (MICRO)*. December 2010. [[PDF](#)]

## **Journals**

### **AsmDB: Understanding and Mitigating Front-End Stalls in Warehouse-Scale Computers.**

Nayana Prasad Nagendra, Grant Ayers, David I. August, Hyoun Kyu Cho, Svilen Kanev, Christos Kozyrakis, Trivikram Krishnamurthy, Heiner Litz, Tipp Moseley, Parthasarathy Ranganathan

*IEEE Micro's Top Picks in Computer Architecture Conferences*. May 2020. [[Link](#)]

### **Automatically Accelerating Non-Numerical Programs by Architecture-Compiler Co-Design.**

Simone Campanoni, Kevin Brownell, Svilen Kanev, Timothy M. Jones, Gu-Yeon Wei, David Brooks

*Communications of the ACM Research Highlights*. December 2017. [[PDF](#)]

### **Profiling a Warehouse-Scale Computer.**

Svilen Kanev, Juan Pablo Darago, Kim Hazelwood, Parthasarathy Ranganathan, Tipp Moseley, Gu-Yeon Wei, David Brooks

*IEEE Micro's Top Picks in Computer Architecture Conferences*. June 2016. [[PDF](#)]

### **CARB: A C-State Power Management Arbiter For Latency-Critical Workloads.**

Xin Zhan, Reza Azimi, Svilen Kanev, David Brooks, Sherief Reda

*IEEE Computer Architecture Letters (CAL)*. March 2016. [[PDF](#)]

### **Voltage Noise in Production Processors.**

Vijay Janapa Reddi, Svilen Kanev, Wonyoung Kim, Simone Campanoni, Michael D. Smith, Gu-Yeon Wei, David Brooks

*IEEE Micro's Top Picks in Computer Architecture Conferences*. February 2011. [[PDF](#)]

## Workshops & Theses & Invited

### RETROSPECTIVE: Profiling a Warehouse-Scale Computer.

Svilen Kanev, Juan Pablo Darago, Kim Hazelwood, Parthasarathy Ranganathan, Tipp Moseley, Gu-Yeon Wei, David Brooks

ISCA@50 25-Year Retrospective: 1996–2020. June 2023. [\[PDF\]](#)

### Efficiency in warehouse-scale computers: a datacenter tax study.

Svilen Kanev

PhD thesis. September 2016. [\[PDF\]](#)

### Breaking Cyclic-Multithreading Parallelization with XML Parsing.

Simone Campanoni, Svilen Kanev, Kevin Brownell, Gu-Yeon Wei, David Brooks

International Workshop on Parallelism in Mobile Platforms (PRISM). June 2014. [\[Abstract\]](#) [\[PDF\]](#)

### Measuring Code Optimization Impact on Voltage Noise.

Svilen Kanev, Timothy M. Jones, Gu-Yeon Wei, David Brooks, Vijay Janapa Reddi

Workshop on Silicon Errors in Logic -- System Effects (SELSE). March 2013. [\[PDF\]](#)

### Motivating Software-Driven Current Balancing in Flexible Voltage-Stacked Multicore Processors.

Svilen Kanev

Bachelor's thesis. May 2012. [\[PDF\]](#)

## Academic Service

### Conference / workshop organization

2022	Finance chair, 55th IEEE/ACM International Symposium on Microarchitecture (MICRO)
2021, 2020, 2019, 2017, 2016, 2015	Organizing committee founder, Workshop on Negative results, Opportunities, Perspectives, and Experiences (NOPE)

### Program committee member:

2022	49th IEEE/ACM International Symposium on Computer Architecture (ISCA)
2021	27th IEEE International Symposium on High-Performance Computer Architecture (HPCA) [industry track]
2020	International Symposium on Code Generation and Optimization (CGO)

2019	25th IEEE International Symposium on High-Performance Computer Architecture (HPCA) [extended committee]
2017	44th IEEE/ACM International Symposium on Computer Architecture (ISCA) [extended committee]

### Dissertation committee member

2019	For Fabian Gruber, INRIA center at University of Grenoble Alpes, France
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### Presentations

#### Conferences

Apr 2017	22nd ACM International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS)
Jun 2015	42nd IEEE/ACM International Symposium on Computer Architecture (ISCA)
Oct 2014	IEEE International Symposium on Workload Characterization (IISWC)
Jul 2012	International Symposium on Low Power Electronics and Design (ISLPED)
Apr 2011	IEEE International Symposium on Performance Analysis of Systems and Software (ISPASS)

### Invited university & industry research talks

Dec 2019	INRIA center at University of Grenoble Alpes
Aug 2015	Microsoft Research
Aug 2015	Amazon
Mar 2015	Duke University
Feb 2015	Google
Sep 2014	Cavium
Oct 2013	Industry-academia workshop, Cornell University

### Invited university guest lectures

Sep 2022	Modern Computing Systems (18-847B), Carnegie Mellon University
Jan 2022	Data Center Computing (18-847C), Carnegie Mellon University
Mar 2021	Advanced Computer Architecture (CS 246), Harvard University

