Daniel Sanchez

Curriculum Vitae, April 2019

CONTACT INFORMATION

Daniel Sanchez
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Cambridge MA 02139

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EDUCATION

Ph.D. in Electrical Engineering, August 2012
Stanford University

M.Sc. in Electrical Engineering, April 2009
Stanford University

International Exchange ECE Student, 2006–2007
University of Wisconsin-Madison

Telecommunication Engineering Degree, August 2007
Technical University of Madrid (UPM), Spain

HONORS AND AWARDS

Google Faculty Research Award – 2019

Inducted to MICRO Hall of Fame – 2018

Two IEEE Micro Top Picks Honorable Mentions – 2017

IEEE Micro Top Picks Award – 2016

Best Paper Award at MICRO-48 – 2015

NSF CAREER Award – 2015

Google Faculty Research Award – 2014, 2015 (awarded twice)

TIBCO Career Development Professorship, 2012-2015 – Cambridge, 2012

IEEE Micro Top Picks Award – 2012

Hewlett-Packard Stanford School of Engineering Fellowship 2009-2012 – Stanford, 2009

Spanish National Award in Telecommunication Engineering, third place (awarded among top graduating students of all Spanish universities) – Madrid, 2009

Fundacion Caja Madrid Fellowship for graduate studies 2007–2009 – Madrid, 2007

Vodafone Spain Scholarship for U.S. exchange students – Madrid, 2006

Best first-cycle (first three-year) academic record of the School of Telecommunication Engineering at UPM award – Madrid, 2005

Government of Madrid Excellent Academic Performance Scholarship – Madrid, 2002–2006 (awarded four times)

WORK EXPERIENCE

Associate Professor without Tenure (tenure-track), July 2017–present
Assistant Professor, September 2012–June 2017
Electrical Engineering and Computer Science Department, Massachusetts Institute of Technology, Cambridge MA

Research Assistant, June 2008–August 2012
Computer Systems Laboratory, Stanford University, Stanford CA

Software Engineering Intern, October–November 2011
Cluster Management Group, Google Inc., Mountain View CA

Graduate Technical Intern, June–September 2010
MPR-PAR, Intel Labs, Santa Clara CA

Research Assistant, February–August 2007
Computer Science Department, University of Wisconsin-Madison, Madison WI

TEACHING EXPERIENCE

Instructor (with Joel S. Emer), 6.823 "Computer System Architecture," MIT EECS, Spring 2019, Spring 2017, Spring 2016, Spring 2015, Spring 2014

Instructor (with Chris J. Terman, Silvina Hanono Wachman, and Arvind), 6.004 "Computation Structures," MIT EECS, Fall 2018, Spring 2018, Fall 2017, Fall 2015, Fall 2014, Fall 2013

Instructor (with Joel S. Emer), 6.888 "Parallel and Heterogeneous Computer Architecture," MIT EECS, Spring 2013

Instructor (recitations), 6.004 "Computation Structures," MIT EECS, Fall 2012

Teaching Assistant, EE382A "Advanced Processor Architecture," Stanford University, March–June 2009

CONFERENCE PAPERS

Po-An Tsai, **Daniel Sanchez**, "Compress Objects, Not Cache Lines: An Object-Based Compressed Memory Hierarchy", In *Proc. of the 24th international conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS-XXIV)*, April 2019

Anurag Mukkara, Nathan Beckmann, Maleen Abeydeera, Xiaosong Ma, **Daniel Sanchez**, "Exploiting Locality in Graph Analytics through Hardware-Accelerated Traversal Scheduling", In *Proc. of the 51th annual IEEE/ACM international symposium on Microarchitecture (MICRO-51)*, October 2018

Po-An Tsai, Yee Ling Gan, **Daniel Sanchez**, "Rethinking the Memory Hierarchy for Modern Languages", In *Proc. of the 51th annual IEEE/ACM international symposium on Microarchitecture (MICRO-51)*, October 2018

Po-An Tsai, Changping Chen, **Daniel Sanchez**, "Adaptive Scheduling for Systems with Asymmetric Memory Hierarchies", In *Proc. of the 51th annual IEEE/ACM international symposium on Microarchitecture (MICRO-51)*, October 2018

Mark C. Jeffrey, Victor A. Ying, Suvinay Subramanian, Hyun Ryong Lee, Joel Emer, **Daniel Sanchez**, "Harmonizing Speculative and Non-Speculative Execution in Architectures for Ordered Parallelism", In *Proc. of the 51th annual IEEE/ACM international symposium on Microarchitecture (MICRO-51)*, October 2018

Xiangyao Yu, Yu Xia, Andrew Pavlo, **Daniel Sanchez**, Larry Rudolph, Srinivas Devadas, "Sundial: Harmonizing Concurrency Control and Caching in a Distributed OLTP Database Management System", In *Proc. of the VLDB Endowment (PVLDB)*, June 2018

Nosayba El-Sayed, Anurag Mukkara, Po-An Tsai, Harshad Kasture, Xiaosong Ma, **Daniel Sanchez**, "KPart: A Hybrid Cache Partitioning-Sharing Technique for Commodity Multicores," In *Proc. of the 24th international symposium on High Performance Computer Architecture (HPCA-24)*, February 2018

Xu Ji, Chao Wang, Nosayba El-Sayed, Xiaosong Ma, Youngjae Kim, Sudharshan Vazhkudai, Wei Xue, **Daniel Sanchez**, "Understanding Object-level Memory Access Patterns Across the Spectrum: Are HPC Applications Any Different?," In *Proc. of the 2017 ACM/IEEE International Conference on High Performance Computing, Networking, Storage and Analysis (SC17)*, November 2017

Sabrina Neuman, Jason Miller, **Daniel Sanchez**, Srini Devadas, "Using Application-Level Thread Progress Information to Manage Power and Performance," In *Proc. of the 35th IEEE International Conference on Computer Design (ICCD-35)*, November 2017

Po-An Tsai, Nathan Beckmann, **Daniel Sanchez**, "Nexus: A New Approach to Replication in Distributed Shared Caches," In *Proc. of the 26th international conference on Parallel Architectures and Compilation Techniques (PACT-26)*, September 2017

Maleen Abeydeera, Suvinay Subramanian, Mark C. Jeffrey, Joel Emer, **Daniel Sanchez**, "SAM: Optimizing Multithreaded Cores for Speculative Parallelism," In *Proc. of the 26th international conference on Parallel Architectures and Compilation Techniques (PACT-26)*, September 2017

Suvinay Subramanian, Mark C. Jeffrey, Maleen Abeydeera, Hyun-Ryong Lee, Victor Ying, Joel Emer, **Daniel Sanchez**, "Fractal: An Execution Model for Fine-Grain Nested Speculative

Parallelism," In *Proc. of the 44th annual International Symposium in Computer Architecture (ISCA-44)*, June 2017

Po-An Tsai, Nathan Beckmann, **Daniel Sanchez**, "Jenga: Sidestepping the Performance-Energy Tradeoff through Software-Defined Cache Hierarchies," In *Proc. of the 44th annual International Symposium in Computer Architecture (ISCA-44)*, June 2017

Nathan Beckmann, **Daniel Sanchez**, "Maximizing Cache Performance Under Uncertainty," In *Proc. of the 23rd international symposium on High Performance Computer Architecture (HPCA-23)*, February 2017

Mark C. Jeffrey, Suvinay Subramanian, Maleen Abeydeera, Joel Emer, **Daniel Sanchez**, "Data-Centric Execution of Speculative Parallel Programs," In *Proc. of the 49th annual IEEE/ACM international symposium on Microarchitecture (MICRO-49)*, October 2016 *(IEEE Micro's Top Picks 2016 Honorable Mention)*

Guowei Zhang, Virginia Chiu, **Daniel Sanchez**, "Exploiting Semantic Commutativity in Hardware Speculation," In *Proc. of the 49th annual IEEE/ACM international symposium on Microarchitecture (MICRO-49)*, October 2016 *(IEEE Micro's Top Picks 2016 Honorable Mention)*

Harshad Kasture, **Daniel Sanchez**, "TailBench: A Benchmark Suite and Evaluation Methodology for Latency-Critical Applications," In *Proc. of the IEEE International Symposium on Workload Characterization (IISWC)*, September 2016 *(best paper nominee)*

Mark C. Jeffrey, Suvinay Subramanian, Cong Yan, Joel Emer, **Daniel Sanchez**, "Unlocking Ordered Parallelism with the Swarm Architecture," In *IEEE Micro's Top Picks from the Computer Architecture Conferences*, May/June 2016

Xiangyao Yu, Andrew Pavlo, **Daniel Sanchez**, Srinivas Devadas, "TicToc: Time-Traveling Optimistic Concurrency Control," In *Proc. of the 2016 ACM SIGMOD/PODS conference*, June 2016

Anurag Mukkara, Nathan Beckmann, **Daniel Sanchez**, "Whirlpool: Improving Dynamic Cache Management with Static Data Classification," In *Proc. of the 21st international conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS-XXI)*, April 2016

Nathan Beckmann, **Daniel Sanchez**, "Modeling Cache Performance Beyond LRU," In *Proc. of the 22nd international symposium on High Performance Computer Architecture (HPCA-22)*, March 2016

Guowei Zhang, Webb Horn, **Daniel Sanchez**, "Exploiting Commutativity to Reduce the Cost of Updates to Shared Data in Cache-Coherent Systems," In *Proc. of the 48th annual IEEE/ACM international symposium on Microarchitecture (MICRO-48)*, December 2015 *(Best Paper Award)*

Mark C. Jeffrey, Suvinay Subramanian, Cong Yan, Joel Emer, **Daniel Sanchez**, "A Scalable Architecture for Ordered Parallelism," In *Proc. of the 48th annual IEEE/ACM international symposium on Microarchitecture (MICRO-48)*, December 2015 *(selected for IEEE Micro's Top Picks special issue of "most significant papers in computer architecture based on novelty and long-term impact" from 2015)*

Harshad Kasture, Davide B. Bartolini, Nathan Beckmann, **Daniel Sanchez**, "Rubik: Fast Analytical Power Management for Latency-Critical Systems," In *Proc. of the 48th annual IEEE/ACM international symposium on Microarchitecture (MICRO-48)*, December 2015

Christina Delimitrou, **Daniel Sanchez**, Christos Kozyrakis, "Tarcil: Reconciling Scheduling Speed and Quality in Large Shared Clusters," In *Proc. of the Sixth ACM Symposium on Cloud Computing (SOCC)*, August 2015

Nathan Beckmann, Po-An Tsai, **Daniel Sanchez**, "Scaling Distributed Cache Hierarchies through Computation and Data Co-Scheduling," In *Proc. of the 21st international symposium on High Performance Computer Architecture (HPCA-21)*, February 2015 *(best paper award nominee)*

Nathan Beckmann, **Daniel Sanchez**, "Talus: A Simple Way to Remove Cliffs in Cache Performance," In *Proc. of the 21st international symposium on High Performance Computer*

Architecture (HPCA-21), February 2015

Harshad Kasture, **Daniel Sanchez**, "Ubik: Efficient Cache Sharing with Strict QoS for Latency-Critical Workloads," In *Proc. of the 19th international conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS-XIX)*, March 2014

Nathan Beckmann, **Daniel Sanchez**, "Jigsaw: Scalable Software-Defined Caches," In *Proc. of the 22nd international conference on Parallel Architectures and Compilation Techniques (PACT-22)*, September 2013

Daniel Sanchez, Christos Kozyrakis, "ZSim: Fast and Accurate Microarchitectural Simulation of Thousand-Core Systems," In *Proc. of the 40th annual International Symposium in Computer Architecture (ISCA-40)*, June 2013

Daniel Sanchez, Christos Kozyrakis, "Scalable and Efficient Fine-Grained Cache Partitioning with Vantage," In *IEEE Micro's Top Picks from the Computer Architecture Conferences*, May/June 2012

Daniel Sanchez, Christos Kozyrakis, "SCD: A Scalable Coherence Directory with Flexible Sharer Set Encoding," In *Proc. of the 18th international symposium on High Performance Computer Architecture (HPCA-18)*, February 2012

Daniel Sanchez, David Lo, Richard M. Yoo, Jeremy Sugerman, Christos Kozyrakis, "Dynamic Fine-Grain Scheduling of Pipeline Parallelism," In *Proc. of the 20th international conference on Parallel Architectures and Compilation Techniques (PACT-20)*, October 2011

Daniel Sanchez, Christos Kozyrakis, "Vantage: Scalable and Efficient Fine-Grain Cache Partitioning," In *Proc. of the 38th annual International Symposium in Computer Architecture (ISCA-38)*, June 2011 *(selected for IEEE Micro's Top Picks special issue of "most significant papers in computer architecture based on novelty and long-term impact" from 2011)*

Daniel Sanchez, Christos Kozyrakis, "The ZCache: Decoupling Ways and Associativity," In *Proc. of the 43rd annual IEEE/ACM international symposium on Microarchitecture (MICRO-43)*, December 2010

George Michelogiannakis, **Daniel Sanchez**, William J. Dally, Christos Kozyrakis, "Evaluating Bufferless Flow Control for On-Chip Networks," In *Proc. of the 4th ACM/IEEE international symposium on Networks-on-Chip (NOCS-2010)*, May 2010 *(best paper award candidate)*

Daniel Sanchez, Richard M. Yoo, Christos Kozyrakis, "Flexible Architectural Support for Fine-Grain Scheduling," In *Proc. of the 15th international conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS-XV)*, March 2010

Daniel Sanchez, Luke Yen, Mark D. Hill, Karthikeyan Sankaralingam, "Implementing Signatures for Transactional Memory," In *Proc. of the 40th annual IEEE/ACM international symposium on Microarchitecture (MICRO-40)*, December 2007

JOURNAL PAPERS

Guowei Zhang, **Daniel Sanchez**, "Leveraging Hardware Caches for Memoization," *Computer Architecture Letters (CAL)*, 2018

Nathan Beckmann, **Daniel Sanchez**, "Cache Calculus: Modeling Caches through Differential Equations," *Computer Architecture Letters (CAL)*, 2016

Daniel Sanchez, George Michelogiannakis, Christos Kozyrakis, "An Analysis of Interconnection Networks for Large Scale Chip-Multiprocessors", *ACM Transactions on Architecture and Code Optimization (TACO), Volume 7, Issue 1*, April 2010

THESES

Daniel Sanchez, "Hardware and Software Techniques for Scalable Thousand-Core Systems," *Ph.D. Thesis, Stanford University*, August 2012

TECHNICAL REPORTS

Nathan Beckmann, Po-An Tsai, **Daniel Sanchez**, "Jenga: Harnessing Heterogeneous Memories through Reconfigurable Cache Hierarchies," *MIT-CSAIL-TR-2015-035*, December 2015

Nathan Beckmann, **Daniel Sanchez**, "Bridging Theory and Practice in Cache Replacement," *MIT-CSAIL-TR-2015-034,* December 2015

Nathan Beckmann, **Daniel Sanchez**, "A Cache Model for Modern Processors," *MIT-CSAIL-TR-2015-011,* April 2015

Nathan Beckmann, **Daniel Sanchez**, "Jigsaw: Scalable Software-Defined Caches (Extended Version)," *MIT-CSAIL-TR-2013-017,* July 2013

Daniel Sanchez, "Design and Implementation of Signatures for Transactional Memory Systems," *University of Wisconsin-Madison Technical Report CS-TR-2007-1611*, September 2007

SERVICE

- Program co-chair for MICRO 2017.
- Program committee member for HotPar 2013, MICRO 2013, PACT 2014, MICRO 2014, HPCA 2015, MICRO 2015, HPCA 2016, Top Picks 2016, ISCA 2017, Top Picks 2018, ISCA 2018, Top Picks 2019, and MICRO 2019.
- Distinguished reviewer for ACM TACO 2014.
- External reviewer for PACT 2008, IEEE TC 2008, SPAA 2009, MICRO 2009, HPCA 2010, DATE 2010, ISCA 2010, PLDI 2010, HiPEAC 2011, ISCA 2011, MICRO 2011, ACM TACO 2011, IEEE TPDS 2011, IEEE TPDS 2012, HPCA 2012, ISCA 2012, ICS 2012, CAL 2012, MICRO 2013, PPoPP 2013, HPCA 2013, ISCA 2013, HPCA 2014, ISCA 2014, ASPLOS 2015, ISCA 2015, PPoPP 2016, ISPASS 2016, ISCA 2016, MICRO 2016, HPCA 2017, HPCA 2018, ASPLOS 2019, and ISCA 2019.