








DI WU

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EDUCATION

Doctor of Philosophy <i>Electrical and Computer Engineering</i> University of Wisconsin–Madison	Sep. 2017 – Present Madison, WI, USA
<ul style="list-style-type: none">• Advisor: Joshua San Miguel• Thesis: Power-Efficient Computing for Edge Machine Learning	
Master of Engineering <i>Microelectronics</i> Fudan University	Sep. 2012 – Jan. 2015 Shanghai, China
Bachelor of Science <i>Microelectronics</i> Fudan University	Sep. 2007 – Jul. 2012 Shanghai, China

RESEARCH INTEREST

- Emerging computer architecture
- Deep learning acceleration
- Brain computer interface
- Fault-tolerant quantum computing
- Unary computing
- Neuromorphic computing
- Approximate computing
- Reconfigurable computing


HONORS AND AWARDS



Machine Learning and Systems Rising Star MLCommons	2023
Capstone PhD Teaching Award Nomination UW–Madison	2022
Grainger Wisconsin Distinguished Graduate Fellowship (1 out of 3) College of Engineering, UW–Madison	2022
Student Travel Award International Symposium on Computer Architecture (ISCA)	2022
Dissertator Travel Award (twice) Department of Electrical and Computer Engineering, UW–Madison	2022
Ph.D. Forum at Design Automation Conference (DAC) Special Interest Group on Design Automation (SIGDA)	2021
IEEE Micro Top Pick (1 out of 12)  Selected from all Computer Architecture Publications in 2020	2021
Gerald Holdridge Outstanding Teaching Assistant Award Department of Electrical and Computer Engineering, UW–Madison	2020

Chancellor’s Opportunity Fellowship UW–Madison	2019
Student Research Travel Award UW–Madison	2019
Student Research Competition Travel Award International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS)	2019
Student Travel Award International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS)	2019
Qualcomm Innovation Fellowship Finalist  Qualcomm	2019
Foxconn SmartCity Competition Winner Foxconn	2019
Hiran Mayukh Award  UW–Madison Computer Architecture Community	2018
Rising Star Award HiSilicon	2015
National Scholarship (ranking 1/67) Fudan University	2015
Excellent Student Union Leader (as Sports Minister) Zhangjiang Campus, Fudan University	2010
Third Prize Freshman Scholarship (ranking 3/45) Fudan University	2007


PUBLICATIONS

Conference

- [1] uBrain: A Unary Brain Computer Interface [Acceptance rate=16.8%]
Di Wu, Jingjie Li, Zhewen Pan, Younghyun Kim, Joshua San Miguel
International Symposium on Computer Architecture (ISCA), 2022
- [2] uSystolic: Byte-Crawling Unary Systolic Array [Acceptance rate=30.5%]
Di Wu, Joshua San Miguel
International Symposium on High-Performance Computer Architecture (HPCA), 2022
[Open-source software: uSystolic-Sim](#) 
- [3] When Dataflows Converge: Reconfigurable and Approximate Computing for Emerging Neural Networks [Invited]
Di Wu, Joshua San Miguel
International Conference on Computer Design (ICCD), 2021
- [4] UNO: Virtualizing and Unifying Nonlinear Operations for Emerging Neural Networks [Acceptance rate=26.4%]
Di Wu, Jingjie Li, Setareh Behrooz, Younghyun Kim, Joshua San Miguel
International Symposium on Low Power Electronics and Design (ISLPED), 2021

- [5] Normalized Stability: A Cross-Level Design Metric for Early Termination in Stochastic Computing [Acceptance rate=30.2%]
Di Wu, Ruokai Yin, Joshua San Miguel
Asia and South Pacific Design Automation Conference (ASP-DAC), 2021
- [6] uGEMM: Unary Computing Architecture for GEMM Applications [Acceptance rate=18.3%]
Di Wu, Jingjie Li, Ruokai Yin, Hsuan Hsiao, Younghyun Kim, Joshua San Miguel
International Symposium on Computer Architecture (ISCA), 2020
Open-source software: [UnarySim](#) 
 Awarded 1 out of 12 IEEE Micro Top Picks 2021 from all computer architecture publications in 2020
- [7] Approximate Hardware Techniques for Energy-Quality Scaling Across the System [Invited]
Younghyun Kim, Joshua San Miguel, Setareh Behroozi, Tianen Chen, Kyuin Lee, Yongwoo Lee, Jingjie Li,
Di Wu
International Conference on Electronics, Information, and Communication (ICEIC), 2020
- [8] SECO: A Scalable Accuracy Approximate Exponential Function Via Cross-Layer Optimization [Acceptance rate=35.2%]
Di Wu, Tianen Chen, Chienfu Chen, Oghenefego Ahia, Joshua San Miguel, Mikko Lipasti, Younghyun Kim
International Symposium on Low Power Electronics and Design (ISLPED), 2019
- [9] In-Stream Stochastic Division and Square Root via Correlation [Acceptance rate=18.9%]
Di Wu, Joshua San Miguel
Design Automation Conference (DAC), 2019
- [10] Convergence-Optimized Variable Node Structure for Stochastic LDPC Decoder
Qichen Zhang, Yun Chen, Di Wu, Xiaoyang Zeng, Yeong-luh Ueng
International Conference on Acoustics, Speech and Signal Processing (ICASSP), 2016
- [11] An Area-Efficient Architecture for Stochastic LDPC Decoder
Qichen Zhang, Yun Chen, Di Wu, Xiaoyang Zeng, Yeong-luh Ueng
International Conference on Digital Signal Processing (DSP), 2015
- [12] Latency-Optimized Stochastic LDPC Decoder for High-Throughput Applications
Di Wu, Yun Chen, Qichen Zhang, Lirong Zheng, Xiaoyang Zeng, Yeong-luh Ueng
International Symposium on Circuits and Systems (ISCAS), 2015
- [13] A High-Throughput LDPC Decoder for Optical Communication
Di Wu, Yun Chen, Yuebin Huang, Yeongluh Ueng, Lirong Zheng, Xiaoyang Zeng
International Conference on ASIC (ASICON), 2013

Journal

- [1] uGEMM: Unary Computing for GEMM Applications [Acceptance rate=9.9%]
Di Wu, Jingjie Li, Ruokai Yin, Hsuan Hsiao, Younghyun Kim, Joshua San Miguel
IEEE Micro 41.3 (2021), pp. 50–56
 IEEE Micro Top Pick Issue 2021
- [2] In-Stream Correlation-Based Division and Bit-Inserting Square Root in Stochastic Computing
Di Wu, Ruokai Yin, Joshua San Miguel
IEEE Design & Test 38.6 (2021), pp. 53–59
- [3] Strategies for Reducing Decoding Cycles in Stochastic LDPC Decoders
Di Wu, Yun Chen, Qichen Zhang, Yeong-luh Ueng, Xiaoyang Zeng
IEEE Transactions on Circuits and Systems II: Express Briefs 63.9 (2016), pp. 873–877

- [4] An Efficient Multirate LDPC-CC Decoder With a Layered Decoding Algorithm for the IEEE 1901 Standard
Yun Chen, Qichen Zhang, **Di Wu**, Changsheng Zhou, Xiaoyang Zeng
IEEE Transactions on Circuits and Systems II: Express Briefs 61.12 (2014), pp. 992–996

Workshop

- [1] T-MAC: Temporal Multiplication with Accumulation
Zhewen Pan, **Di Wu**, Joshua San Miguel
Young Architect Workshop (YArch), collocated with International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS) (2022)

Pre-Print

- [1] Representation Range Needs for 16-Bit Neural Network Training
Valentina Popescu, Abhinav Venigalla, **Di Wu**, Robert Schreiber
arXiv Pre-print (2021)

OPEN-SOURCE SOFTWARE

GitHub

- [1] uSystolic-Sim: A Simulator for Weight Stationary Systolic Arrays with Multiple MAC Cycles and Varying Bitwidth [↗](#)
“uSystolic: Byte-Crawling Unary Systolic Array”, *HPCA* 2022
- [2] UnarySim: A Simulator for General Unary Computing [↗](#)
“uGEMM: Unary Computing Architecture for GEMM Applications”, *ISCA* 2020

INVITED TALKS

Unary Computing for Power-Efficient Computer Architecture University of California, Santa Barbara (Virtual)	Oct. 2022 Santa Barbara, CA, USA
uBrain: A Unary Brain Computer Interface University of Central Florida (Virtual)	Nov. 2022 Orlando, FL, USA
Unary Computing for Power-Efficient Computer Architecture University of California, Los Angeles (Virtual)	Nov. 2022 Los Angeles, CA, USA
Unary Computing for Power-Efficient Computer Architecture University of Central Florida	Feb. 2023 Orlando, FL, USA

EMPLOYMENT

Research Assistant Department of Electrical and Computer Engineering, UW–Madison	Sep. 2017 – Now Madison, WI, USA
<ul style="list-style-type: none">• Unary computing<ul style="list-style-type: none">* Universal general matrix multiply (GEMM) operations* Metric-guided design methodology* Open-source simulators* Unary deep learning architecture* Algorithm-hardware co-design methodology	

<ul style="list-style-type: none"> * Unary brain computer interface architecture 	
<ul style="list-style-type: none"> • Approximate and reconfigurable computing <ul style="list-style-type: none"> * Reconfigurable nonlinear approximation * Systolic array with hybrid dataflows for GEMM and nonlinear operations 	
Research Intern	May 2022 – Sep. 2022
Cerebras Systems	Sunnyvale, CA, USA
<ul style="list-style-type: none"> • Wafer-scale computer architecture for deep learning <ul style="list-style-type: none"> * Wafer-scale power-performance projection * Nonlinear operation vectorization 	
Research Intern	May 2020 – Sep. 2020
Cerebras Systems	Sunnyvale, CA, USA
<ul style="list-style-type: none"> • Novel 16-bit FP (CB16) format for deep learning training (commercialized) ↗ 	
Research Intern	May 2019 – Sep. 2019
Meta (Formerly Facebook)	Sunnyvale, CA, USA
<ul style="list-style-type: none"> • Deep learning quantization <ul style="list-style-type: none"> * Post-training quantization * Quantization-aware training 	
Digital Circuit Engineer	Mar. 2015 – May 2017
HiSilicon	Shanghai, China
Research Assistant	Sep. 2012 – Jan. 2015
State Key Laboratory of ASIC and System, Fudan University	Shanghai, China
<ul style="list-style-type: none"> • Low-density Parity-Check (LDPC) decoder architecture 	

TEACHING AND MENTORING

Teaching Assistant

ECE554 (Digital Engineering Lab), UW–Madison	Spring 2022, Spring 2020, Fall 2019, Spring 2019, Fall 2018
ECE454 (Mobile Computing Lab), UW–Madison	Fall 2021, Fall 2020
ECE552 (Introduction to Computer Architecture), UW–Madison	Fall 2018

Guest Lecturer


ECE757 (Advanced Computer Architecture II), UW–Madison	Spring 2021, Spring 2020
ECE752 (Advanced Computer Architecture I), UW–Madison	Spring 2019


Student Mentor

(Graduate) Unary computing: Deep learning architecture, UW–Madison	2022 – 2023
(Undergraduate) Unary computing: Brain computer interface architecture, UW–Madison	2021 – 2023
(Undergraduate) Unary computing: Metric-guided design methodology, UW–Madison	2019 – 2021

PROFESSIONAL SERVICE

Committee Member

IEEE International Symposium on Workload Characterization (IISWC)  2023

Young Architect Workshop (YArch)  2023

International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS) – Artifact Evaluation 2021, 2020

International Symposium on Microarchitecture (MICRO) – Artifact Evaluation 2021

Conference Reviewer

International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS) 2023

International Symposium on Computer Architecture (ISCA) 2023, 2022, 2020, 2019

International Symposium on High-Performance Computer Architecture (HPCA) 2021


International Symposium on Microarchitecture (MICRO) 2022, 2021, 2019

Design Automation Conference (DAC) 2020, 2018

International Symposium on Circuits and Systems (ISCAS) 2023, 2022

Program Mentor

Young Architect Workshop (YArch)  2023

Undergrad Architecture Mentoring Workshop (uArch)  2023

International Symposium on Microarchitecture (MICRO) – “Meet a Senior PhD Student” 2020

Journal Reviewer

Journal of Network and Computer Applications (JNCA)

ACM Transactions on Reconfigurable Technology and Systems (TRETS)

PROFESSIONAL DEVELOPMENT

NSF Funding: Why, What and How with Computer Sciences Professor Oct. 2022
School of Computer, Data & Information Sciences, UW–Madison Madison, WI, USA

DIVERSITY, EQUITY AND INCLUSION

Student Volunteer 2010
Expo 2010 Shanghai China Shanghai, China

Sports Minister 2009
Zhangjiang Campus, Fudan University Shanghai, China

Volunteer Caregiver 2008
Shanghai Guanxin School (for students with disabilities) Shanghai, China

REFERENCE

Professor Joshua San Miguel

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Professor Younghyun Kim

younghyun.kim@wisc.edu

Professor Timothy Sherwood

sherwood@cs.ucsb.edu

Professor John Paul Shen

jpshen@cmu.edu

Professor Ulya R. Karpuzcu

ukarpuzc@umn.edu

PhD advisor

University of Wisconsin–Madison

PhD committee member

University of Wisconsin–Madison

University of California, Santa Barbara

Carnegie Mellon University

University of Minnesota, Twin Cities