

# PROFESSOR DI WU

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## FACULTY APPOINTMENT

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<b>Assistant Professor</b>   <i>Electrical and Computer Engineering</i> University of Central Florida	Aug. 2023 – Present Orlando, FL, USA
<b>Joint Assistant Professor</b>   <i>Computer Science</i> University of Central Florida	Aug. 2023 – Present Orlando, FL, USA

## EDUCATION

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<b>Doctor of Philosophy</b>   <i>Electrical and Computer Engineering</i> University of Wisconsin–Madison <ul style="list-style-type: none"><li>• Advisor: Joshua San Miguel</li><li>• Thesis: Power-Efficient Computer Architecture via Unary and Approximate Computing</li><li>•  <b>Harold Peterson Outstanding Dissertation Award</b></li></ul>	Sep. 2017 – Jul. 2023 Madison, WI, USA
<b>Master of Engineering</b>   <i>Microelectronics</i> Fudan University	Sep. 2012 – Jan. 2015 Shanghai, China
<b>Bachelor of Science</b>   <i>Microelectronics</i> Fudan University	Sep. 2007 – Jul. 2012 Shanghai, China

## RESEARCH INTEREST

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- Computer architecture  
— efficiency, etc.
- Emerging computing  
— neuromorphic, quantum, etc.
- Domain specific acceleration  
— AI, BCI, cryptography, etc.
- Heterogeneous system  
— CXL, etc.

## HONORS AND AWARDS

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<b>Harold Peterson Outstanding Dissertation Award</b>  UW–Madison	2024
<b>Distinguished Artifact Evaluation Award</b>  ASPLOS	2024
<b>Machine Learning and Systems Rising Star</b> MLCommons	2023
<b>Capstone PhD Teaching Award Nomination</b> UW–Madison	2022
<b>Grainger Wisconsin Distinguished Graduate Fellowship</b> 1 of the 3 PhD students selected from College of Engineering, UW–Madison	2022
<b>Student Travel Award</b> ISCA	2022

<b>Dissertator Travel Award (twice)</b> UW–Madison	2022
<b>Ph.D. Forum Invitation</b> DAC	2021
<b>IEEE Micro Top Pick</b> <a href="#">↗</a> 1 of the 12 publications selected from all computer architecture publications in 2020	2021
<b>Gerald Holdridge Outstanding Teaching Assistant Award</b> UW–Madison	2020
<b>Chancellor’s Opportunity Fellowship</b> UW–Madison	2019
<b>Student Research Travel Award</b> UW–Madison	2019
<b>Student Research Competition Travel Award</b> ASPLOS	2019
<b>Student Travel Award</b> ASPLOS	2019
<b>Qualcomm Innovation Fellowship Finalist</b> <a href="#">↗</a> Qualcomm	2019
<b>Foxconn SmartCity Competition Winner</b> Foxconn	2019
<b>Hiran Mayukh Award</b> <a href="#">↗</a> UW–Madison	2018
<b>Rising Star Award</b> HiSilicon	2015
<b>National Scholarship (ranking 1/67)</b> Fudan University	2015
<b>Excellent Student Union Leader</b> Fudan University	2010
<b>Third Prize Freshman Scholarship (ranking 3/45)</b> Fudan University	2007

## PUBLICATIONS

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### Conference

- [1] Evaluating Unary GEMM for Low-Precision AI: Toward Scalable Energy-Efficient DL Accelerators  
Prabhu Vellaisamy, Harideep Nair, **Di Wu**, Shawn Blanton, John Paul Shen  
*IEEE Computer Society Annual Symposium on VLSI (ISVLSI)*, 2024
- [2] ALISA: Accelerating Large Language Model Inference via Sparsity-Aware KV Caching [Acceptance rate=19.6%]  
Youpeng Zhao, **Di Wu**, Jun Wang  
*International Symposium on Computer Architecture (ISCA)*, 2024

- [3] Carat: Unlocking Value-Level Parallelism for Multiplier-Free GEMMs [Acceptance rate=18.6%]  
Zhewen Pan, Joshua San Miguel, **Di Wu**  
*International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS), 2024*  
[Open-source artifact](#)   
 **Distinguished Artifact Evaluation Award**
- [4] 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*
- [5] 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](#) 
- [6] When Dataflows Converge: Reconfigurable and Approximate Computing for Emerging Neural Networks [Invited]  
**Di Wu**, Joshua San Miguel  
*International Conference on Computer Design (ICCD), 2021*
- [7] 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*
- [8] 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*
- [9] 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**
- [10] Approximate Hardware Techniques for Energy-Quality Scaling Across the System [Invited]  
Younghyun Kim, Joshua San Miguel, Setareh Behrooz, Tianen Chen, Kyuin Lee, Yongwoo Lee, Jingjie Li, **Di Wu**  
*International Conference on Electronics, Information, and Communication (ICEIC), 2020*
- [11] 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*
- [12] In-Stream Stochastic Division and Square Root via Correlation [Acceptance rate=18.9%]  
**Di Wu**, Joshua San Miguel  
*Design Automation Conference (DAC), 2019*
- [13] 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*

- [14] 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
- [15] 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
- [16] 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] Exploration of Unary Arithmetic-Based Matrix Multiply Units for Low Precision DL Accelerators  
Prabhu Vellaisamy, Harideep Nair, **Di Wu**, Shawn Blanton, John Paul Shen  
*Workshop on Unary Computing (WUC), collocated with International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS)* (2024)
- [2] xBrain: Brain-Like Computing for Explainable Brain-Computer Interfaces  
Queenly Xie, Prabhu Vellaisamy, **Di Wu**  
*Young Architect Workshop (YArch), collocated with International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS)* (2024)
- [3] 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] Unleashing The Potential of LLMs for Quantum Computing: A Study in Quantum Architecture Design  
Zhiding Liang, Jinglei Cheng, Rui Yang, Hang Ren, Zhixin Song, **Di Wu**, Tongyang Li, Yiyu Shi  
*arXiv Pre-print* (2023)

- [2] Representation Range Needs for 16-Bit Neural Network Training  
 Valentina Popescu, Abhinav Venigalla, [Di Wu](#), Robert Schreiber  
*arXiv Pre-print* (2021)  
[Resource: Mixed-Precision Training – Data Formats – CB16 Half-Precision](#) 

## INVITED TALKS

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<b>Salvage Deep Learning Efficiency: A Unary Computing Approach</b> University of Minnesota Twin Cities	Mar. 2024 Minneapolis, MN, USA
<b>Salvage Deep Learning Efficiency: A Unary Computing Approach</b> University of Louisiana at Lafayette	Nov. 2023 Virtual
<b>Unary Computing for Power-Efficient Computer Architecture</b> AMD Research	Jul. 2023 Virtual
<b>Unary Computing for Power-Efficient Computer Architecture</b> University of Central Florida	Feb. 2023 Orlando, FL, USA
<b>Unary Computing for Power-Efficient Computer Architecture</b> University of California, Los Angeles	Nov. 2022 Virtual
<b>uBrain: A Unary Brain Computer Interface</b> University of Central Florida	Nov. 2022 Virtual
<b>Unary Computing for Power-Efficient Computer Architecture</b> University of California, Santa Barbara	Oct. 2022 Virtual

## EMPLOYMENT

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<b>Research Assistant</b> Department of Electrical and Computer Engineering, UW–Madison	Sep. 2017 – Jul. 2023 Madison, WI, USA
<b>Research Intern</b> Cerebras Systems	May 2022 – Sep. 2022 Sunnyvale, CA, USA
<b>Research Intern</b> Cerebras Systems	May 2020 – Sep. 2020 Sunnyvale, CA, USA
<b>Research Intern</b> Meta (Formerly Facebook)	May 2019 – Sep. 2019 Palo Alto, CA, USA
<b>Digital Circuit Engineer</b> HiSilicon	Mar. 2015 – May 2017 Shanghai, China
<b>Research Assistant</b> State Key Laboratory of ASIC and System, Fudan University	Sep. 2012 – Jan. 2015 Shanghai, China

## TEACHING AND MENTORING

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<b>Instructor</b> EEL5796 (Big Data Computer Architecture and Systems), UCF	Spring 2024
ECE697 (Capston Project in Machine Learning and Signal Processing), UW–Madison	Summer 2023
<b>Teaching Assistant</b> ECE554 (Digital Engineering Lab), UW–Madison	Spring 2022
ECE454 (Mobile Computing Lab), UW–Madison	Fall 2021
ECE454 (Mobile Computing Lab), UW–Madison	Fall 2020

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

### **Guest Lecturer**

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

## **PROFESSIONAL SERVICE**

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### **Panelist**

NSF Medium Panel in Division of Computer and Network Systems (CNS)	2024
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### **Committee**

Organizing Committee of Workshop on Unary Computing (WUC)	2024
Organizing Committee of Quantum Computing for Drug Discovery Challenge at ICCAD	2023
Program Committee of ICCAD	2024
Program Committee of PhD Forum at DAC	2024
Program Committee of Young Architect Workshop (YArch)	2024
Program Committee of ISCA	2024
Program Committee of ISPASS	2024
Program Committee of HPCA	2024
Program Committee of ICA3PP	2023
Program Committee of ICCD	2023, 2024
Program Committee of IISWC	2023
Program Committee of Young Architect Workshop (YArch)	2023
Program Committee of ASPLOS Artifact Evaluation	2021
Program Committee of MICRO Artifact Evaluation	2021
Program Committee of ASPLOS Artifact Evaluation	2020

### **Mentor**

Computer Architecture Long-term Mentoring (CALM)	2024
Young Architect Workshop (YArch)	2023
Undergrad Architecture Mentoring Workshop (uArch)	2023, 2024
MICRO – “Meet a Senior PhD Student”	2020

### **Journal Reviewer**

ACM Transactions on Architecture and Code Optimization (TACO)
ACM Transactions on Embedded Computing Systems (TECS)
ACM Transactions on Reconfigurable Technology and Systems (TRETS)
IEEE Transactions on Circuits and Systems I (TCAS-I)
IEEE Transactions on Computers (TC)
IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems (TCAD)
IEEE Signal Processing Letters (SPL)
Journal of Network and Computer Applications (JNCA)

## FUNDING

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**AMD AI & HPC Fund** 2024  
AMD

## FORMER STUDENTS

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**Parker McLeod** 2024  
AMD Orlando Full-time

**Tyler Goldsmith** 2024  
AMD Orlando Full-time

**Mustafa Nisar** 2024  
AMD Toronto Co-op

**James Chen** 2024  
Department of Electrical and Computer Engineering, UCF Undergrad

**Francisco Soriano** 2024  
Department of Electrical and Computer Engineering, UCF Undergrad

**Zhewen Pan** 2022  
Department of Electrical and Computer Engineering, UW–Madison PhD

**Ruokai Yin** 2021  
Department of Electrical Engineering, Yale University PhD

## REFERENCE

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**Professor Joshua San Miguel**

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**Professor Younghyun Kim**

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**Professor John Paul Shen**

jpshen@cmu.edu

**Professor Timothy Sherwood**

sherwood@cs.ucsb.edu

**Professor Ulya R. Karpuzcu**

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PhD advisor

University of Wisconsin–Madison

PhD committee member

University of Wisconsin–Madison

Carnegie Mellon University

University of California, Santa Barbara

University of Minnesota, Twin Cities