Marc D. Riedel, Ph.D.

Curriculum Vitae, August 18, 2026

Academic Rank
Full Professor, Electrical & Computer Engineering
Graduate Faculty, Biomedical Informatics & Computational Biology
University of Minnesota, Twin Cities

Contact Information

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Minneapolis, MN 55455
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EDUCATION

- Ph.D., Electrical Engineering, 2004
  California Institute of Technology

  Dissertation Title: "Cyclic Combinational Circuits"
  Advisor: Jehoshua Bruck
  Committee: Yaser Abu-Mostafa, Jehoshua Bruck, Ali Hajimiri, Alain Martin, Erik Winfree, and Andrew Viterbi[1]

- B.Eng., Electrical Engineering, 1995
  Minor in Mathematics, 1995
  McGill University

POSITIONS

- Founder and CEO, 2021–present
  FemtoFluidics

- Full Professor, 2024–present
  Electrical and Computer Engineering
  University of Minnesota, Twin Cities

- Assistant & Associate Professor, 2006–2024
  Electrical and Computer Engineering
  University of Minnesota, Twin Cities

- Faculty Member, 2006–2021
  Digital Technology Center
  University of Minnesota, Twin Cities

- Graduate Faculty, 2008–present
  Biomedical Informatics and Computational Biology Program
  University of Minnesota, Twin Cities

[1] External from the *Viterbi* School of Engineering, University of Southern California.

- Postdoctoral Fellow, Computation and Neural Systems, 2004–2005
  California Institute of Technology
  Funded by the NIH Human Genome Research Institute

- Lecturer, 2004–2005
  Computation and Neural Systems
  California Institute of Technology

- Research and Teaching Assistant, 2001–2004
  Electrical Engineering
  California Institute of Technology

MEMBERSHIPS in PROFESSIONAL SOCIETIES

- **Senior Member**, Institute of Electrical and Electronics Engineers (IEEE)
- **Member**, Associate for Computing Machinery (ACM)
- **Member**, ACM/Special Interest Group on Design Automation (ACM/SIGDA)

HONORS AND AWARDS

- Paper titled "MITRA: Reconfigurable, Low-Latency, and Power-Efficient In-Memory Stochastic Architecture for Transcendental Functions" received the **Best Paper Award** at the 2026 ACM/IEEE International Symposium on Low Power Electronics and Design (ISLPED).
- **Oracle Research Fellow**.
- **CAREER Award** from the National Science Foundation.
- Paper titled "The Synthesis of Combinational Logic to Generate Probabilities" nominated for the **IEEE/ACM William J. McCalla Best Paper Award** at the International Conference on Computer-Aided Design (ICCAD).
- **Charles H. Wilts Prize** for the Best Doctoral Research in Electrical Engineering at Caltech.
- Paper titled "The Synthesis of Cyclic Combinational Circuits" received the **Best Paper Award** at the Design Automation Conference (DAC).

RESEARCH FUNDING

External Sponsored Funding[2]

1. Agency: **National Science Foundation**
   Program: Small Business Innovation Research (SBIR), Phase I
   Title: "*Drug Discovery meets Moore's Law: Synthesizing DNA-Encoded Libraries with Electronics*"
   Investigator: Marc Riedel (PI)
   Awardee: FemtoFluidics Incorporated
   Amount: $294,932
   My Share: $294,932
   NSF I-Corps Supplement: $20,000
   Award Number: 2423382
   Duration: 2024–2025

2. Agency: **National Science Foundation**
   Program: SemiSynBio III
   Title: "*Moving Millions of Droplets at Megahertz Speeds: DNA Computing, DNA Storage, and Synthetic Biology on an Industrial Platform for Digital Microfluidics*"
   Investigators: Marc Riedel (PI), Kate Adamala (co-PI), David Soloveichik (co-PI), and Anil Reddy (co-PI)
   Amount: $1,000,000
   My Share: $300,000
   Duration: 2022–2025

3. Agency: **NSF**
   Program: Computer and Information Science and Engineering (CISE): Core Programs
   Title: "*Energy-efficient quantum materials based magnetic tunnel junctions for unconventional computing applications*"
   Investigators: Jian-Ping Wang (PI), Ulya Karpuzcu (co-PI), and Marc Riedel (co-PI)
   Amount: $500,000
   My Share: $51,000
   Duration: 2024–2026

4. Agency: **Oracle**
   Program: Oracle Research Fellow
   Title: "*The UMN/Mayo Computational Human Immuno-Peptidome (CHIP) Project*"
   Investigator: Marc Riedel (PI)
   Amount: $200,000
   My Share: $200,000
   Duration: 2022–2025

5. Agency: **Seagate**
   Program: MINT
   Title: "*Routing and Optimization of Digital Microfluidics for DNA Storage*"
   Investigator: Marc Riedel (PI)
   Amount: $115,000

[2] *All amounts are total amounts, not direct amounts. My share is listed.*

My Share: $115,000
Duration: 2021–2024

6. Agency: **National Science Foundation**
   Program: CISE Foundations of Emerging Technologies
   Title: "*Computationally Predicting and Characterizing the Immune Response to Viral Infections*"
   Investigator: Marc Riedel (PI)
   Amount: $200,000
   My Share: $200,000
   Duration: 2020–2023

7. Agency: **DARPA**
   Program: Molecular Informatics
   Title: "*Storage and Processing with Native DNA*"
   Investigators: Olgica Milenkovic (PI), Marc Riedel (co-PI), David Soloveichik (co-PI), Huimin Zhao (co-PI), and Alvaro Gonzalo Hernandez (co-PI)
   Amount: $2,200,000
   My Share: $550,000
   Duration: 2018–2022

8. Agency: **National Science Foundation**
   Program: CISE Software and Hardware Foundations
   Title: "*Advanced Signal Processing with Molecular Reactions*"
   Investigators: Keshab Parhi (PI) and Marc Riedel (co-PI)
   Amount: $400,000
   My Share: $200,000
   Duration: 2014–2018

9. Agency: **National Science Foundation**
   Program: CISE Software and Hardware Foundations
   Title: "*Back to the Future with Printed, Flexible Electronics Design in a Post-CMOS Era when Transistor Counts Matter Again*"
   Investigators: K. Bazargan (PI), D. Frisbie (co-PI), R. Harjani (co-PI), and D. Lilja (co-PI), Marc Riedel (co-PI)
   Amount: $800,000
   My Share: $143,664
   Duration: 2014–2018

10. Agency: **National Science Foundation**
    Program: CISE Software and Hardware Foundations
    Title: "*Digital Yet Deliberately Random – Synthesizing Logical Computation on Stochastic Bit Streams*"
    Investigators: Marc Riedel (PI), K. Bazargan (co-PI), R. Harjani (co-PI), and D. Lilja (co-PI)
    Amount: $300,000
    My Share: $83,333
    Duration: 2012–2015

11. Agency: **National Science Foundation**
    Program: CISE Software and Hardware Foundations

Title: "*Digital Signal Processing with Biomolecular Reactions*"
Investigators: Keshab Parhi (PI) and Marc Riedel (co-PI)
Amount: $400,000
My Share: $200,000
Duration: 2011–2014

12. Agency: **National Science Foundation**
Program: **NSF CAREER Award**
Title: "*Computing with Things Small, Wet, and Random – Design Automation for Digital Computation with Nanoscale Technologies and Biological Processes*"
Investigator: Marc Riedel (PI)
Amount: $500,000
My Share: $500,000
Duration: 2009–2015

13. Agency: **National Science Foundation**
Program: CISE Design Automation for Micro and Nano Systems
Title: "*Synthesizing Signal Processing Functions with Biochemical Reactions*"
Investigators: Keshab Parhi (PI) and Marc Riedel (co-PI)
Amount: $200,000
My Share: $100,000
Duration: 2009–2011

14. Agency: **SRC Focus Center Research Program (FCRP)**
Program: Functional Engineered Nano-Architectonics (FENA)
Title: "*The Concurrent Logical and Physical Design of Nanoscale Digital Circuits*"
Investigator: Marc Riedel (PI)
Amount: $325,000
My Share: $325,000
Duration: 2007–2010

University Sources

1. Agency: University of Minnesota, Digital Technology Center
Program: Digital Technology Initiatives (DTI) Seed Grant
Title: "*Computational Method for Forward Biological Engineering*"
Investigators: Y. Kaznessis (PI), C. Schmidt-Dannert (co-PI), and M. Riedel (co-PI)
Amount: $97,800
My Share: $32,600
Duration: 2011–2012

2. Agency: University of Minnesota
Program: Biomedical Informatics and Computational Biology (BICB)
Funding: Student Traineeships for Brian Fett and Adrianna Fitzgerald
Investigator: Marc Riedel (PI)
Amount: $78,000
My Share: $78,000
Duration: 2007–2009

PUBLICATIONS and PRESENTATIONS[3]

Peer-Reviewed Journal Articles

1. "Evasive Spike Variants Elucidate the Preservation of T Cell Immune Response to the SARS-CoV-2 Omicron Variant"
   Arnav Solanki,† James Cornette, Julia Udell,† George Vasmatzis, and Marc Riedel
   IEEE/ACM Trans. on Computational Biology and Bioinformatics, 2024

2. "Evaluating NetMHCpan Performance on non-European HLA Alleles Not Present in Training Data"
   Thomas Atkins,† Arnav Solanki,† George Vasmatzis, James Cornette, and Marc Riedel
   Frontiers in Immunology, Vol. 14, 2024

3. "Characterizing Polynomial Arithmetic with Stochastic Circuits"
   Patrick Holec,† Weikang Qian,† Marc Riedel, and Ivo Rosenberg
   Journal of Multiple-Valued Logic and Soft Computing, Vol. 44, Nos. 5–6, p. 483, 2025

4. "Computing Mathematical Functions with Chemical Reactions via Stochastic Logic"
   Arnav Solanki,† Tonglin Chen,† and Marc Riedel
   PLOS One, Vol. 18, No. 5, 2023

5. "Digital Circuits and Neural Networks Based on Acid-Base Chemistry Implemented by Robotic Fluid Handling"
   Ahmed A. Agiza, Kady Oakley, Jacob K. Rosenstein, Brenda M. Rubenstein, Eunsuk Kim, Marc Riedel, and Sherief Reda
   Nature Communications, Vol. 14, No. 496, 2023

6. "Neural Network Execution using nicked DNA and Microfluidics"
   Arnav Solanki,† Purab Sutradhar, Zak Griffin, Amlan Ganguly, and Marc Riedel
   PLOS One, Vol. 18, No. 10, 2023

7. "A Comparison Study of Spin Transfer Torque and Spin-Orbit Torque Based Stochastic Computing Using Computational Random Access Memory (SC-CRAM)"
   Brandon Zink, Marc Riedel, Ulya Karpuzcu, and Jian-Ping Wang
   IEEE Transactions on Magnetics, Jan. 2023

8. "Parallel Pairwise Operations on Data Stored in DNA: Sorting, XOR, Shifting, and Searching"
   Arnav Solanki,† Tonglin Chen,† and Marc Riedel
   International Journal of Natural Computing, Sep. 2023

9. "Automated Routing of Droplets for DNA Storage on a Digital Microfluidics Platform"
   Ajay Manicka,† Andrew Stephan,† Sriram Chari, Gemma Mendonsa, Peyton Okubo,† John Stolzberg-Schray,† Anil Reddy, and Marc Riedel
   Royal Society of Chemistry – Digital Discovery, Vol. 2, pp. 1436–1451, 2023

[3]Marc Riedel's advisees are denoted with (†).

10. "A Stochastic Computing Scheme of Embedding Random Bit Generation and Processing in Computational Random Access Memory (SC-CRAM)"
Brandon Zink, Yang Lv, Masoud Zabihi, Husrev Cilasun, Sachin Sapatnekar, Ulya Karpuzcu, Marc Riedel, and Jian-Ping Wang
IEEE Journal of Exploratory Solid-State Computational Devices and Circuits, Vol. 9, No. 1, pp. 29–37, 2023

11. "Hydrophobicity Identifies False Positives and False Negatives in Peptide-MHC Binding Predictions"
Arnav Solanki,† Marc Riedel, James Cornette, Julia Udell,† and George Vasmatzis
Frontiers in Oncology, Vol. 12, No. 1034810, 2022

12. "Performing Stochastic Computation Deterministically"
M. Hassan Najafi, Devon Jenson,† David J. Lilja, and Marc D. Riedel
IEEE Trans. on Very Large Scale Integration (VLSI) Systems, Vol. 27, No. 12, 2019

13. "Computing Mathematical Functions using DNA via Fractional Coding"
S. Ahmad Salehi,† Xingyi Liu, Marc Riedel, and Keshab Parhi
Nature Scientific Reports, Vol. 8, No. 8312, 2018

14. "Low-Cost Sorting Network Circuits using Unary Processing"
M. H. Najafi, D. Lilja, M. Riedel, and K. Bazargan
IEEE Trans. on Very Large Scale Integration Systems, Vol. 26, No. 8, pp. 1471–1480, 2018

15. "A Study on Monotone Self-Dual Boolean Functions"
Mustafa Altun† and Marc D. Riedel
Acta Mathematicae Applicatae Sinica, Vol. 33, No. 1, pp. 43–52, 2018

16. "Polysynchrous Clocking: Exploiting the Skew Tolerance of Stochastic Circuits"
M. Hassan Najafi, David Lilja, Marc Riedel, and Kia Bazargan
IEEE Transactions on Computers, Vol. 66, No. 10, pp. 1734–1746, 2017

17. "Time-Encoded Values for Highly Efficient Stochastic Circuits"
M. H. Najafi, S. Jamali-Zavareh, D. Lilja, M. Riedel, K. Bazargan, and R. Harjani
IEEE Trans. on Very Large Scale Integration Systems, Vol. 25, No. 5, pp. 1644–1657, 2017

18. "A Reconfigurable Architecture with Sequential Logic-based Stochastic Computing"
M. Hassan Najafi, Peng Li, David Lilja, Weikang Qian,† Kia Bazargan, and Marc Riedel
ACM J. on Emerging Technologies in Computing Systems, Vol. 13, No. 4, pp. 1–28, 2017

19. "Chemical Reaction Networks for Computing Polynomials"
S. Ahmad Salehi,† Keshab Parhi, and Marc Riedel
ACS Synthetic Biology, Vol. 6, No. 1, pp. 76–83, 2017

20. "Molecular Sensing and Computing Systems"
S. Ahmad Salehi,† Keshab Parhi, and Marc Riedel
IEEE Trans. on Molecular, Biological, and Multi-Scale Communications, Vol. 1, No. 3, 2015

21. "Synthesizing Cubes to Satisfy a Given Intersection Pattern"
Weikang Qian,† Marc Riedel, and Ivo Rosenberg
Journal of Discrete Applied Mathematics, Vol. 193, pp. 11–38, 2015

22. "Computation on Stochastic Bit Streams: Digital Image Processing Case Studies"
Peng Li, David Lilja, Weikang Qian,† Kia Bazargan, and Marc Riedel
IEEE Trans. on Very Large Scale Integration (VLSI) Systems,
Vol. 22, No. 3, pp. 449–462, 2014

23. "Logical Computation on Stochastic Bit Streams with Linear Finite State Machines"
Peng Li, David Lilja, Weikang Qian,† Marc Riedel, and Kia Bazargan
IEEE Transactions on Computers, Vol. 63, No. 6., pp. 1474–1486, 2014

24. "Discrete-Time Signal Processing with DNA"
Hua Jiang†, S. Ahmad Salehi,† Marc Riedel, and Keshab Parhi
ACS Synthetic Biology, Vol. 2, No. 5, pp. 245–254, 2013

25. "Gene Regulatory Network Modeling Using Literature-Curated and High Throughput Data"
Vishwesh Kulkarni†, Reza Arastoo, Anupama Bhat, Kalyanasundaram Subramanian,
Mayuresh Kothare, and Marc Riedel
Systems and Synthetic Biology, Vol. 6, No. 3–4, pp. 69–77, 2012

26. "The Synthesis of Cyclic Dependencies with Boolean Satisfiability"
John Backes† and Marc Riedel
ACM Trans. on Design Automation of Electronic Systems, Vol. 17, No. 4, pp. 1–24, 2012

27. "Digital Signal Processing with Molecular Reactions"
Hua Jiang†, Marc Riedel, and Keshab Parhi
IEEE Design & Test of Computers, Vol. 29, No. 3, pp. 31–31, 2012

28. "Robust Computation through Percolation: Synthesizing Logic with Percolation
in Nanoscale Lattices"
Mustafa Altun† and Marc Riedel
Int. Journal of Nanotechnology and Molecular Computation, Vol. 3, No. 2, pp. 12–30, 2011

29. "Logic Synthesis for Switching Lattices"
Mustafa Altun† and Marc Riedel
IEEE Transactions on Computers, Vol. 61, No. 11, pp. 1588–1600, 2012

30. "Cyclic Boolean Circuits"
Marc Riedel and Jehoshua Bruck
Journal of Discrete Applied Mathematics, Vol. 160, No. 13–14, pp. 1877–1900, 2012

31. "Transforming Probabilities with Combinational Logic"
Weikang Qian,† Marc Riedel, Hongchao Zhou, and Jehoshua Bruck
IEEE Trans. on CAD of Integrated Circuits & Systems, Vol. 30, No. 9, pp. 1279–1292, 2011

32. "Characterizing the Memory of the GAL Regulatory Network in *Saccharomyces cerevisiae*"
Vishwesh Kulkarni†, Venkatesh Kareenhalli, Ganesh Viswananthan, and Marc Riedel
Systems and Synthetic Biology, Vol. 5, No. 3–4, pp. 97–104, 2011

33. "Rate-Independent Constructs for Chemical Computation"
Philip Senum† and Marc Riedel
PLOS One, Vol. 6, Issue 6, 12 pages, 2011

34. "Uniform Approximation and Bernstein Polynomials with Coefficients in the Unit Interval"
Weikang Qian,† Marc Riedel, and Ivo Rosenberg
European Journal of Combinatorics, Vol. 32, No. 3, pp. 448–463, 2011

35. "An Architecture for Fault-Tolerant Computation with Stochastic Logic"
Weikang Qian,† Xin Li, Marc Riedel, Kia Bazargan, and David Lilja
IEEE Transactions on Computers, Vol. 60, No. 1, pp. 93–105, 2011

36. "The Synthesis of Stochastic Logic for Nanoscale Digital Circuits"
Weikang Qian,† John Backes†, and Marc Riedel
Int. Journal of Nanotechnology and Molecular Computation, Vol. 1, No. 4, pp. 39–57, 2009

37. "Computing in the RAIN: A Reliable Array of Independent Nodes"
Vasken Bohossian, Charles Fan, P. LeMahieu, Marc Riedel, Lihao Xu, and Jehoshua Bruck
IEEE Trans. on Parallel and Distributed Computing, Vol. 12, No. 2, pp. 99–114, 2001

Peer-Reviewed Magazine Articles

1. "Interconnects for DNA, Quantum, In-Memory and Optical Computing"
Amlan Ganguly, Sergi Abadal, Ishan Thakkar, Natalie Enright Jerger, Marc Riedel, Masoud Babaie, Rajeev Balasubramonian, Abu Sebastian, Sudeep Pasricha, and Baris Taskin
IEEE Micro, Vol. 42, No. 3, pp. 40–49, 2022

2. "An Overview of Time-Based Computing with Stochastic Constructs"
M. Hassan Najafi, S. Jamali-Zavareh, D. Lilja, M. Riedel, K. Bazargan and R. Harjani
IEEE Micro, Vol. 37, No. 6, pp. 62–71, 2017

Peer-Reviewed Book Chapters

1. "Synthesis of Polynomial Functions"
Weikang Qian† and Marc Riedel
Stochastic Computing: Techniques and Applications, Chapter 4
W. Gross and V. Gaudet, editors, Springer, 2019

2. "Deterministic Approaches to Bitstream Computing"
Marc Riedel
Stochastic Computing: Techniques and Applications, Chapter 5
W. Gross and V. Gaudet, editors, Springer, 2019

3. "Synchronous Sequential Computations with Biomolecular Reactions"
V. Kulkarni†, H. Jiang†, E. Kharisov, N. Hovakimyan, M. Riedel, and K. Parhi
Systems and Synthetic Biology
Vikram Singh and Pawan K. Dhar editors, Springer, 2015

4. "Synthesizing Combinational Logic to Generate Probabilities: Theories and Algorithms"
Weikang Qian,† Marc Riedel, Kia Bazargan, and David Lilja
Advanced Techniques in Logic Synthesis, Optimizations and Applications
Sunil Khatri and Kanupriya Gulati editors, Springer, pp. 1–28, 2011

5. "Tolerating Faults in Counting Networks"
Marc Riedel and Jehoshua Bruck
Dependable Network Computing,
Dimiter Avresky editor, Kluwer, pp. 267–278, 2000

Preprints

1. "Maximizing Memory-Level Parallelism via Integrated Stochastic Logic-in-Memory Architectures"
   Farzad Razi,† Mehran Moghadam, Sercan Aygun, M. Hassan Najafi, and Marc Riedel
   arXiv preprint arXiv:2604.23146, 2026

Peer-Reviewed Conference Papers

1. "MITRA: Reconfigurable, Low-Latency, and Power-Efficient In-Memory Stochastic Architecture for Transcendental Functions"
   Farzad Razi,† Mehran Moghadam, M. Hassan Najafi, Sercan Aygun, and Marc Riedel
   ACM/IEEE International Symposium on Low Power Electronics and Design (ISLPED), 2026
   Best Paper Award

2. "Breaking New Ground: Division Directly in Memory"
   Farzad Razi,† Mehran Shoushtari Moghadam, M. Hassan Najafi, Sercan Aygun, and Marc Riedel
   2025 IEEE 33rd Annual International Symposium on Field-Programmable Custom Computing Machines (FCCM), pp. 289–289, 2025

3. "A Scalable, Deterministic Approach to Stochastic Computing"
   Yadu Kiran† and Marc Riedel
   IEEE/ACM Great Lakes Symposium on VLSI, 2022

4. "Parallel Pairwise Operations on Data Stored in DNA: Sorting, Shifting, and Searching"
   Tonglin Chen,† Arnav Solanki,† and Marc Riedel
   International Conference on DNA Computing and Molecular Programming, 2021

5. "The Role of Hydrophobicity in Peptide-MHC Binding"
   Arnav Solanki,† Marc Riedel, James Cornette, Julia Udell,†
   Ishaan Koratkar†, and George Vasmatzis
   International Symposium on Mathematical and Computational Oncology, 2021

6. "Cascadable Stochastic Logic for DNA Storage"
   Arnav Solanki,† Tonglin Chen,† and Marc Riedel
   IEEE Int. Conference on Visual Communications and Image Processing, 2021

7. "Concentration-based Polynomial Calculations on Nicked DNA"
   Tonglin Chen† and Marc Riedel
   IEEE Int. Conference on Acoustics, Speech, and Signal Processing, 2020

8. "Performing Stochastic Computation Deterministically"
   M. Hassan Najafi, Devon Jenson,† Marc Riedel, and David J. Lilja
   IEEE Int. Symposium of Circuits and Systems, 2020

9. "Deterministic Methods for Stochastic Computing using Low-Discrepancy Sequences"
   M. Hassan Najafi, David J. Lilja, and Marc Riedel
   IEEE/ACM Int. Conference on Computer-Aided Design, Article 51, 2018

10. "Power and Area Efficient Sorting Networks using Unary Processing"
    M. Hassan Najafi, D. J. Lilja, M. Riedel, and K. Bazargan
    IEEE Int. Conference on Computer Design, 2017

11. "Unary Positional Computing"
McKenzie van der Hagen† and Marc Riedel
IEEE Global Conference on Signal and Information Processing, 2017

12. "Molecular Computation of Complex Markov Chains with Self-Loop State Transitions"
S. Ahmad Salehi,† Marc Riedel, and Keshab Parhi
IEEE Asilomar Conference on Signals, Systems and Computers, pp. 478–483, 2017

13. "Time-Encoded Values for Highly Efficient Stochastic Circuits"
M. H. Najafi, S. Jamali-Zavareh, D. Lilja, M. Riedel, K. Bazargan, and R. Harjani
IEEE Int. Symposium on Circuits & Systems, 2017

14. "Computing Polynomials with Positive Coefficients using Stochastic Logic by Double-NAND Expansion"
S. Ahmad Salehi,† Yin Liu, Marc Riedel and Keshab Parhi
ACM Great Lakes Symposium on VLSI, 2017

15. "Synthesis of Correlated Bit Streams for Stochastic Computing"
Yin Liu, Megha Parhi†, Marc Riedel, and Keshab Parhi
IEEE Asilomar Conference on Signals, Systems and Computers, 2016

16. "A Deterministic Approach to Stochastic Computing"
Devon Jenson† and Marc Riedel
IEEE/ACM Int. Conference on Computer-Aided Design, 2016

17. "Computing Polynomials using Chemical Reaction Networks"
S. Ahmad Salehi,† Keshab Parhi, and Marc Riedel
IEEE Globecom Symposium, 2016

18. "Polysynchronous Stochastic Circuits"
M. Hassan Najafi, David Lilja, Marc Riedel, and Kia Bazargan
IEEE/ACM Asia and South Pacific Design Automation Conference, 2016

19. "Markov Chain Computations using Molecular Reactions"
S. Ahmad Salehi,† Marc Riedel, and Keshab Parhi
IEEE Int. Conference on Digital Signal Processing, pp. 689–693, 2015
Best Paper Award finalist

20. "Effect of Bit-Level Correlation in Stochastic Computing"
Megha Parhi†, Marc Riedel, and Keshab Parhi
IEEE Int. Conference on Digital Signal Processing, pp. 463–467, 2015

21. "Asynchronous Discrete-Time Signal Processing with Molecular Reactions"
S. Ahmad Salehi,† Marc Riedel, and Keshab Parhi
IEEE Asilomar Conference on Signals, Systems, and Computers, pp. 493–497, 2014

22. "IIR Filters Using Stochastic Arithmetic"
Naman Saraf, Kia Bazargan, David Lilja, and Marc Riedel
IEEE/ACM Conference on Design, Automation and Test in Europe, pp. 1–6, 2014

23. "Digital Logic with Molecular Reactions"
Hua Jiang†, Marc Riedel and Keshab Parhi
IEEE/ACM Int. Conference on Computer-Aided Design, pp. 721–727, 2013

24. "Stochastic Functions Using Sequential Logic"
Naman Saraf, Kia Bazargan, David Lilja and Marc Riedel
IEEE Int. Conference on Computer Design, pp. 507–510, 2013

25. "Using Cubes of Non-State Variables with Property Directed Reachability"
John Backes† and Marc Riedel
IEEE Conference on Design, Automation, and Test in Europe, pp. 807–810, 2013

26. "An Efficient Implementation of Numerical Integration Using Logical Computation on Stochastic Bit Streams"
Weikang Qian,† Chen Wang, Peng Li, David Lilja, Kia Bazargan, and Marc Riedel
IEEE/ACM Int. Conference on Computer-Aided Design, pp. 156–162, 2012

27. "The Synthesis of Complex Arithmetic Computation on Stochastic Bit Streams Using Sequential Logic"
Peng Li, David Lilja, Weikang Qian,† Kia Bazargan, and Marc Riedel
IEEE/ACM Int. Conference on Computer-Aided Design, pp. 480–487, 2012

28. "Robust Tunable in vitro Transcriptional Oscillator Networks"
Vishwesh Kulkarni†, Theerachai Chanyaswad, Marc Riedel and Jongmin Kim
IEEE Asilomar Conference on Signals, Systems, and Computers, pp. 114–119, 2012

29. "The Synthesis of Linear Finite State Machine-based Stochastic Computational Elements"
Peng Li, Weikang Qian,† Marc Riedel, Kia Bazargan, and David Lilja
IEEE/ACM Asia and South Pacific Design Automation Conference, pp. 757–762, 2012

30. "Asynchronous Computation with Molecular Reactions"
Hua Jiang†, Marc Riedel, and Keshab Parhi
IEEE Asilomar Conference on Signals, Systems, and Computers, pp. 493–497, 2011

31. "Synchronous Sequential Computation with Molecular Reactions"
Hua Jiang†, Marc Riedel, and Keshab Parhi
IEEE/ACM Design Automation Conference, pp. 836–841, 2011

32. "Rate-Independent Constructs for Chemical Computation"
Philip Senum† and Marc Riedel
Pacific Symposium on Biocomputing, pp. 326–337, 2011

33. "Binary Counting with Chemical Reactions"
Aleksandra Kharam†, Hua Jiang†, Marc Riedel, and Keshab Parhi
Pacific Symposium on Biocomputing, pp. 302–313, 2011

34. "Networks of Passive Oscillators"
Vishwesh Kulkarni†, Marc Riedel, and Guy-Bart Stan
Allerton Conference on Communication, Control, and Computing, pp. 559–565, 2011

35. "A Synthesis Flow for Digital Signal Processing with Biomolecular Reactions"
Hua Jiang†, Aleksandra Kharam†, Marc Riedel, and Keshab Parhi
IEEE/ACM Int. Conference on Computer-Aided Design, pp. 417–424, 2010

36. "Lattice-Based Computation of Boolean Functions"
Mustafa Altun† and Marc Riedel
IEEE/ACM Design Automation Conference, pp. 609–612, 2010

37. "Reduction of Interpolants for Logic Synthesis"
John Backes† and Marc Riedel
IEEE/ACM Int. Conference on Computer-Aided Design, pp. 602–609, 2010

38. "Writing and Compiling Code into Biochemistry"
Adam Shea†, Brian Fett†, Marc Riedel, and Keshab Parhi
Pacific Symposium on Biocomputing, pp. 456–464, 2010

39. "The Synthesis of Combinational Logic to Generate Probabilities"
Weikang Qian,† Marc Riedel, Kia Bazargan, and David Lilja
IEEE/ACM Int. Conference on Computer-Aided Design, pp. 367–374, 2009
(Nominated for **IEEE/ACM William J. McCalla Best Paper Award**)

40. "Synthesizing Sequential Register-Based Computation with Biochemistry"
Adam Shea†, Brian Fett†, Marc Riedel, and Keshab Parhi
IEEE/ACM Int. Conference on Computer-Aided Design, pp. 136–143, 2009

41. "Nanoscale Digital Computation Through Percolation"
Mustafa Altun†, Marc Riedel, and Claudia Neuhauser
IEEE/ACM Design Automation Conference, pp. 615–616, 2009

42. "A Reconfigurable Stochastic Architecture for Reliable Computing"
Xin Li, Weikang Qian,† Marc Riedel, Kia Bazargan, and David Lilja
IEEE Great Lakes Symposium on VLSI Design, pp. 315–320, 2009

43. "Estimation and Optimization of Reliability of Noisy Digital Circuits"
Satish Sivaswamy, Kia Bazargan, and Marc Riedel
IEEE Int. Symposium on Quality Electronic Design, pp. 213–219, 2009

44. "Stochastic Transient Analysis of Biochemical Systems"
Bin Cheng† and Marc Riedel
Pacific Symposium on Biocomputing, pp. 4–14, 2009

45. "Module Locking in Biochemical Synthesis"
Brian Fett† and Marc Riedel
IEEE/ACM Int. Conference on Computer-Aided Design, pp. 758–764, 2008

46. "The Analysis of Cyclic Circuits with Boolean Satisfiability"
John Backes† and Marc Riedel
IEEE/ACM Int. Conference on Computer-Aided Design, pp. 143–148, 2008

47. "The Synthesis of Robust Polynomial Arithmetic with Stochastic Logic"
Weikang Qian† and Marc Riedel
IEEE/ACM Design Automation Conference, pp. 648–653, 2008
(Nominated as a **Research Highlight** in Communications of the ACM, 2010)

48. "Synthesizing Stochasticity in Biochemical Systems"
Brian Fett†, Jehoshua Bruck, and Marc Riedel
IEEE/ACM Design Automation Conference, pp. 640–645, 2007

49. "The Synthesis of Cyclic Combinational Circuits"
Marc Riedel and Jehoshua Bruck

IEEE/ACM Design Automation Conference, pp. 163–168, 2003
(Received the **DAC Best Paper Award**)

50. "Computing in the RAIN: A Reliable Array of Independent Nodes"
Vasken Bohossian, Charles Fan, P. LeMahieu, Marc Riedel, Lihao Xu, and Jehoshua Bruck
Int. Parallel and Distributed Processing Symposium, pp. 99–114, 2001

Peer-Reviewed Workshop Papers

1. "A Survey of Computation-Driven Data Encoding"
Weikang Qian,† Runsheng Wang, Yuan Wang, Marc Riedel, and Ru Huang
IEEE Int. Workshop on Signal Processing Systems, 2019

2. "Energy-Efficient Pulse-based Convolution Engine for Near-Sensor Processing"
M. Hassan Najafi, David J. Lilja, and Marc Riedel
ISCA Workshop on Unary Computing, 2019

3. "Fast-Converging, Scalable, Deterministic Bit-Stream Computing using Low-Discrepancy Sequences"
M. Hassan Najafi, David J. Lilja, and Marc Riedel
IEEE/ACM Int. Workshop on Logic & Synthesis, 2018

4. "A Deterministic Approach to Stochastic Computing"
Devon Jenson† and Marc D. Riedel
IEEE/ACM Int. Workshop on Logic and Synthesis, 2016
Nominated for Best Student Paper Award

5. "Using a Two-Dimensional Finite-State Machine for Stochastic Computation"
Peng Li, Weikang Qian,† David Lilja, Marc Riedel, and Kia Bazargan
IEEE/ACM Int. Workshop on Logic and Synthesis, 2012

6. "Case Studies of Logical Computation on Stochastic Bit Streams"
Peng Li, David Lilja, Weikang Qian,† Kia Bazargan, and Marc Riedel
Int. Workshop on Power and Timing Modeling, Optimization and Simulation, 2012

7. "Resolution Proofs as a Data Structure for Logic Synthesis"
John Backes† and Marc Riedel
IEEE/ACM Int. Workshop on Logic and Synthesis, 8 pages, 2011

8. "Synthesizing Cubes to Satisfy a Given Intersection Pattern"
Weikang Qian† and Marc Riedel
IEEE/ACM Int. Workshop on Logic and Synthesis, 2010

9. "Two-Level Logic Synthesis for Probabilistic Computation"
Weikang Qian† and Marc Riedel
IEEE/ACM Int. Workshop on Logic and Synthesis, 2010

10. "Reduction of Interpolants for Logic Synthesis"
John Backes† and Marc Riedel
IEEE/ACM Int. Workshop on Logic and Synthesis, 2010

11. "Digital Signal Processing with Biomolecular Reactions"
Hua Jiang†, Marc Riedel, and Keshab Parhi
IEEE Workshop on Signal Processing Systems, pp. 237–242, 2010

12. "The Synthesis of Cyclic Dependencies with Craig Interpolation"
John Backes† and Marc Riedel
IEEE/ACM Int. Workshop on Logic and Synthesis, 2009

13. "Synthesizing Sequential Register-Based Computation with Biochemistry"
Adam Shea†, Brian Fett†, Marc Riedel, and Keshab Parhi
IEEE/ACM Int. Workshop on Logic and Synthesis, 2009

14. "The Synthesis of Combinational Logic to Generate Probabilities"
Weikang Qian,† Marc Riedel, Kia Bazargan, and David Lilja
IEEE/ACM Int. Workshop on Logic and Synthesis, 2009

15. "The Synthesis of Stochastic Logic to Perform Multivariate Polynomial Arithmetic"
Weikang Qian† and Marc Riedel
IEEE/ACM Int. Workshop on Logic and Synthesis, 2008

16. "The Synthesis of Stochastic Circuits for Nanoscale Computation"
Weikang Qian,† John Backes†, and Marc Riedel
IEEE/ACM Int. Workshop on Logic and Synthesis, 2007

17. "Application of LUT Cascades to Numerical Function Generators"
Tsutomu Sasao, Jon Butler, and Marc Riedel
Workshop on Synthesis & System Integration of Mixed Information, 2004

18. "Timing Analysis of Cyclic Combinational Circuits"
Marc Riedel and Jehoshua Bruck
IEEE/ACM Int. Workshop on Logic and Synthesis, 2004

19. "Cyclic Combinational Circuits: Analysis for Synthesis"
Marc Riedel and Jehoshua Bruck
IEEE/ACM Int. Workshop on Logic and Synthesis, 2003

Patents

1. "Parallel Computing using Stochastic Circuits and Deterministic Shuffling Networks"
Soheil Mohajer, Zhiheng Wang, Kiarash Bazargan, Marc Riedel,
David J. Lilja, and Sayed Abdolrasoul Faraji
U.S. Patent No. 11,018,689 B2, 2021

2. "Low Discrepancy Deterministic Bit-Stream Processing Using Sobol Sequences"
M. Hassan Najafi, David J. Lilja, Marc Riedel, Kia Bazargan,
Sayed A. Faraji, and Bingzhe Li
U.S. Patent No. 20,200,401,376 A1, 2021

3. "Sorting Networks using Unary Processing"
M. Hassan Najafi, David J. Lilja, Marc Riedel, and Kia Bazargan
U.S. Patent No. 20,200,143,234 A1, 2020

4. "Polysynchronous Stochastic Circuits"
   David J. Lilja, M. Hassan Najafi, Marc Riedel, and Kiarash Bazargan
   U.S. Patent No. 10,520,975 B2, 2019

5. "Stochastic Computation using Pulse-Width Modulated Signals"
   M. Hassan Najafi, S. Jamali-Zavareh, D. J. Lilja, M. Riedel, K. Bazargan, and R. Harjani
   U.S. Patent No. 10,740,686 B2, 2018

6. "Stochastic Computing on Deterministic Bit Streams"
   Devon Jenson† and Marc Riedel
   U.S. Patent No. 10,063,255, 2018

7. "Synthesis of Cyclic Combinational Circuits"
   Marc Riedel and Jehoshua Bruck
   U.S. Patent No. 7,249,341, 2007

8. "A Reliable Array of Distributed Computing Nodes"
   Vasken Bohossian, Charles Fan, Paul LeMahieu, Marc Riedel, Lihao Xu, and Jehoshua Bruck
   U.S. Patent No. 6,128,277, 2000

Presentations with Published Abstracts

1. "Random Access DNA Registers"
   Jake Kaslewicz† and Marc Riedel
   International Conference on DNA Computing and Molecular Programming, Baltimore, 2024

2. "A Comparison Study of Spin Transfer Torque and Spin-Orbit Torque Based Stochastic Computing Using Computational Random Access Memory (SC-CRAM)"
   Brandon Zink, Marc Riedel, Ulya Karpuzcu, and Jian-Ping Wang
   IEEE Magnetics Recording Conference, Minneapolis, 2023

3. "Stochastic Computing 2.0: New and Improved"
   Marc Riedel
   Energy Consequences of Information Workshop
   Sponsored by Air Force Office of Scientific Research, virtual, 2022

4. "Stochastic Computation on DNA Strands through Hydroxyl Nicking"
   Tonglin Chen,† Arnav Solanki,† and Marc Riedel
   Foundations of Nanoscience: Self-Assembled Architectures and Devices, virtual, 2020

5. "Stochastic Computing: A New Paradigm for Ultra Low Power, Fault-Tolerant, Skew-Tolerant Computing"
   Marc Riedel (**invited**)
   Energy Consequences of Information Workshop
   Sponsored by Air Force Office of Scientific Research, Santa Fe, NM, 2017

6. "A Deterministic Approach to Stochastic Computing"
   Devon Jenson† and Marc Riedel (**invited**)
   Information Theory and Applications Workshop, UC San Diego, 2017

7. "Polysynchronous Clocking for Stochastic Computing"
   Marc Riedel (**invited**)
   CMOS Emerging Technologies Workshop, Montreal, Quebec, 2016

8. "Polysynchronous Clocking for Molecular Computing"
   Marc Riedel (**invited**)
   Workshop on Communications, Inference, and Computing in Molecular and Bio. Systems, Los Angeles, CA, 2015

9. "Synchronous Computation and Signal Processing and DNA"
   Marc Riedel (**invited**)
   Workshop on Coding Techniques for Synthetic Biology, Urbana-Champaign, IL, 2015

10. "Probability as State Variable for Nanoscale Computation"
    Marc Riedel (**invited**)
    CMOS Emerging Technologies Workshop, Vancouver, BC, 2015

11. "Pipelining for Accuracy with Stochastic Computing"
    Marc Riedel (**invited**)
    Information Theory and Applications Workshop, UC San Diego, 2015

12. "Probability as State Variable for Nanoscale Computation"
    Marc Riedel (**invited**)
    Information Theory and Applications Workshop, UC San Diego, 2014

13. "A Biomolecular Implementation of Non-Linear Systems"
    Vishwesh Kulkarni†, Hua Jiang†, Theerachai Chanyaswad, Angelina Shudy, and Marc Riedel
    IEEE/ACM Int. Workshop on Bio-Design Automation, San Francisco, CA, 2012

14. "So Simple a Caveman Could Do It – Computing On Stochastic Bit Streams"
    Marc Riedel (**invited**)
    Information Theory and Applications Workshop, UC San Diego, 2012

15. "Synthesizing Logical Computation on Stochastic Bit Streams for Sensing Applications"
    Marc Riedel (**invited**)
    IEEE CANDE Workshop, San Jose, CA, 2011

16. "Digital Signal Processing with DNA"
    Hua Jiang†, Marc Riedel, and Keshab Parhi
    International Conference on DNA Computing, Pasadena, CA, 2011

17. "Synthesizing Logical Computation on Stochastic Bit Streams"
    Marc Riedel (**invited**)
    CMOS Emerging Technologies Workshop, Whistler, BC, 2011

18. "Asynchronous Sequential Computation with Molecular Reactions"
    Hua Jiang†, Marc Riedel, and Keshab Parhi
    IEEE/ACM Int. Workshop on Bio-Design Automation, San Diego, CA, 2011

19. "Biological Network Reconstruction Using Literature Curated and High Throughput Data"
    Vishwesh Kulkarni†, Kalyanasundaram Subramanian, Reza Arastoo,
    Mayuresh Kothare, and Marc Riedel
    IEEE/ACM Int. Workshop on Bio-Design Automation, San Diego, CA, 2011

20. "Rate-Independent Constructs for DNA Computing"
    Philip Senum† and Marc Riedel
    Annual Institute of Biological Engineering Conference, Atlanta, GA, 2011

21. "Lattice-Based Computation with Percolation"
Mustafa Altun† and Marc Riedel (**invited**)
IEEE/ACM Int. Symposium on Nanoscale Architectures, Anaheim, CA, 2010

22. "Signal Processing Functions with Biomolecular Reactions"
Hua Jiang†, Marc Riedel, and Keshab Parhi
IEEE/ACM Int. Workshop on Bio-Design Automation, Anaheim, CA, 2010

23. Session Summary: "Engineering Biology: Fundamentals and Applications"
Marc Riedel, Soha Hassoun, and Ron Weiss (**invited**)
IEEE/ACM Design Automation Conference, Anaheim, CA, 2010

24. "Digital Signal Processing with Biochemistry"
Marc Riedel (**invited**)
Symposium on the Foundations of Nanoscience, Salt Lake City, UT, 2010

25. "Iterative Computation with Biomolecular Reactions"
Hua Jiang†, Marc Riedel, and Keshab Parhi
Annual Institute of Biological Engineering Conference, Boston, MA, 2010

26. "Stochastic Logic and Stochastic Biological Processes"
Marc Riedel (**invited**)
Information Theory and Applications Workshop, UC San Diego, 2010

27. "Computing with Things Small, Wet, and Random"
Marc Riedel (**invited**)
IEEE CANDE Workshop, Monterey, CA, 2009

28. "Stochastic Chemical Reaction Networks"
Marc Riedel (**invited**)
International Workshop on Stochasticity, Banff, Alberta, 2009

29. "Synthesizing Sequential Register-Based Computation with Biochemistry"
Adam Shea†, Brian Fett†, Marc Riedel, and Keshab Parhi
IEEE/ACM Int. Workshop on Bio-Design Automation, San Francisco, CA, 2009

30. "Synthesizing Circuit Constructs with Chemical Reaction Networks"
Marc Riedel (**invited**)
Emergence in Chemical Systems Conference, Anchorage, AK, 2009

31. "Rate-Independent Biochemical Synthesis"
Adam Shea†, Brian Fett†, and Marc Riedel
Annual Institute of Biological Engineering Conference, Santa Clara, CA, 2009

32. "Modular Stochastic Biochemistry"
Brian Fett† and Marc Riedel
Synthetic Biology 4.0, Hong Kong, 2008

33. "Biochemical Pathways from Generic Designs"
Brian Fett† and Marc Riedel
Synthesis of Cells Meeting, Kobe, Japan, 2008

34. "The Computer-Aided Synthesis of Stochastic Biochemistry"
Brian Fett† and Marc Riedel
Advances in Synthetic Biology Conference, Cambridge, UK, 2008

35. "Synthesizing Stochasticity"
Brian Fett† and Marc Riedel
Synthetic Biology 3.0, Zürich, Switzerland, 2007

36. "Using The Probability Gradient to Analyze Bifurcating Biochemical Systems"
Brian Fett† and Marc Riedel
International Conference on Systems Biology, Yokohama, Japan, 2006

37. "Exact Stochastic Simulation with Event Leaping"
Marc Riedel and Jehoshua Bruck
International Conference on Systems Biology, Boston, MA, 2005

Invited Talks and Colloquia (without published abstracts)

1. "DNA Storage: In *Theory*, There's No Difference Between Theory and Practice.
But in *Practice* There Is."
SynBio Seminar Series
Host: Prof. Christian Hochberger
Technical University of Darmstadt, Germany, April 11, 2024

2. "DNA Storage: Theory and Practice"
ECE Magnetics Seminar
Host: Prof. Beth Stadler
University of Minnesota, 2023

3. "Data Storage and Computing with DNA"
ECE Department Session
Centennial & Jubilee Celebration
Host: Prof. Randall Victora
University of Minnesota, May 2023

4. "Moving Droplets at MHz Speeds: DNA Storage with Digital Microfluidics"
Annual MINT Review
Host: Prof. Randall Victora
University of Minnesota, Oct. 2022

5. "Stochastic Computing 2.0: New and Improved"
Charles L. and Ann Lee Brown Distinguished Seminar
Host: Prof. Farzad Farnoud
University of Virginia, April 2022

6. "Stochastic Computing 2.0: New and Improved"
Energy Consequences of Information Workshop
Air Force Office of Scientific Research, virtual, Feb. 2022

7. "Digital Microfluidics for DNA Storage"
Annual MINT Review

Host: Prof. Randall Victora
University of Minnesota, virtual, Nov. 2021

8. "DNA Storage and Computing: Theory and Practice"
IEEE Int. Green and Sustainable Computing Conference
Workshop on Computing with Unconventional Technologies (CUT), Oct. 2021

9. Invited Talk, "Peptide Binding and Immune Response:
Turning 100 million days of Computing Time into 3 months of Computing Time"
NSF Workshop on Predictive Intelligence for Pandemic Prevention, July 2021

10. Invited Talk, "DNA Storage and Computing: Theory and Practice"
Seagate, company-wide, virtual, May 2021

11. "Stochastic Logic for DNA Computing"
IEEE Int. Green and Sustainable Computing Conference
Workshop on Computing with Unconventional Technologies, Alexandria, VA, 2019

12. "A Deterministic Approach to Stochastic Computing with Coding Applications"
IEEE Global Conference on Signal and Information Processing
Workshop on Stochastic and Approximate Computing for Signal Processing and Machine Learning, Montreal, 2017

13. "Polysynchronous Clocking for Molecular Computing"
Bio Physics Seminar Series
Host: Elias Puchner
University of Minnesota, Sept. 29, 2016

14. "A Deterministic Approach to Stochastic Computing"
Waterloo Workshop on Stochastic Computing
Host: Vincent Gaudet
University of Waterloo, May 25, 2016

15. "The Future of Computer Engineering"
Keynote address to IEEE General Meeting, UMN Student Branch
Host: Karel Kalthoff
University of Minnesota, Jan. 25, 2016

16. "Towards a Computer Engineering Discipline with DNA"
Biochemistry Seminar
Host: Prof. Aseem Ansari
University of Wisconsin, Sept. 30, 2013

17. "The Modest Mathematician: Anecdotes from the Personal and
Professional Life of Ivo Rosenberg"
Honorary Doctorate Ceremony for Ivo Rosenberg
Host: Prof. Dietlinde Lau
University of Rostock, Germany, May 15, 2013

18. "Towards a Computer Engineering Discipline with DNA"
Computer Science Seminar
Host: Prof. Jack Lutz
Iowa State University, Nov. 30, 2012

19. Keynote: "Logical Computation on Stochastic Bit Streams"
Int. Workshop on Power and Timing Modeling, Optimization and Simulation (PATMOS)
Host: Prof. Alex Yakovlev
Newcastle University, UK, Sept. 2012

20. "Logic Synthesis for Networks of Four-Terminal Switches"
Computer Science Seminar
Host: Prof. Alex Sprintson
Texas A&M University, April 20, 2012

21. "Random and Loopy Circuits: Complexity in Electronic and Biological Circuit Design"
Dept. of Defense Research and Engineering Complex Systems Study
Host: Robert Bond
Squam Lake, NH, July 27, 2010

22. "Robust Stochastic Computation with Biomolecular Reactions"
NSF Workshop on Shared Organizing Principles in Biology
Organizer: Prof. Melanie Mitchel
Arlington, VA, May 25, 2010

23. "Computing with Things Small, Wet, and Random"
Biological and Medical Physics Seminar Series
Host: Prof. Vincent Noireaux
University of Minnesota, March 30, 2010

24. "Computing with Things Small, Wet, and Random"
Computer Science Seminar
Host: Prof. Soha Hassoun
Tufts University, March 1, 2010

25. Tutorial: "Programming Constructs for Chemical Reaction Networks"
Pacific Symposium on Biocomputing
Organizer: Dr. Gil Alterovitz
Kona, Hawaii, Jan. 7, 2010

26. "Computing with Things Small, Wet, and Random"
Electrical and Computer Engineering Seminar
Host: Prof. Azadeh Davoodi
University of Wisconsin, Feb. 27, 2009

27. "Computing with Things Small, Wet, and Random"
Electrical and Computer Engineering Seminar
Host: Prof. Lin Zhong
Rice University, Feb. 17, 2009

28. "Computing with Things Small, Wet, and Random"
Electrical and Computer Engineering Seminar
Host: Prof. Anxiao (Andrew) Jiang
Texas A&M University, Feb. 17, 2009

29. "Synthesizing Nearly Rate Independent Biochemical Computation"
NSF Expeditions in Computing – Molecular Programming Workshop
Organizer: Prof. Erik Winfree
Oxnard, CA, Jan. 10, 2009

30. "Computing with Things Small, Wet, and Random"
Electrical and Computer Engineering Seminar
Host: Prof. Rick Kiehl
UC Davis, Sep. 29, 2008

31. "Synthesizing Stochastic Logic"
SRC Center on Functional Engineered Nano-Architectonics (FENA) Annual Meeting
Organizer: Prof. Kang Wang
La Jolla, CA, June 13, 2008

32. Tutorial: "Synthesizing Stochastic Biochemical Reactions"
Tech Tune Up
Organizer: Prof. Ahmed Tewfik
University of Minnesota, May 26, 2008

33. "Synthesizing Stochasticity in Circuits and in Biology"
DARPA MTO LIBRA Workshop
Organizer: Dr. John Damoulakis
Arlington, VA, Nov. 29, 2007

34. Public Lecture: "Circuit Engineers Doing Biology –
A Discourse on the Changing Landscape of Scientific Research"
Café Scientifique Public Seminar Series, Bell Museum of Natural History
Organizer: Peggy Korsmo-Kennon
Bryant-Lake Bowl, Minneapolis, MN, Nov. 20, 2007

35. "High-Performance Computing for the Analysis and Synthesis of Biochemistry"
IBM Company Seminar
Host: Tim Mullins
Rochester, MN, Oct. 8, 2007

36. "Analysis and Synthesis of Biochemical Reactions"
Cadence Research Labs Seminar
Host: Dr. Andreas Kuehlmann
Berkeley, CA, May 24, 2007

37. Tutorial: "Analysis and Synthesis of Stochastic Biochemical Reactions"
Tech Tune Up
Organizer: Prof. Kia Bazargan
University of Minnesota, May 23, 2007

38. "Analysis and Synthesis of Stochastic Logic for Nanoscale Computation"
SRC Center on Functional Engineered Nano-Architectonics (FENA) Workshop
Organizer: Prof. Kang Wang
UCLA, April 19, 2007

39. "Synthesizing Stochasticity in Biochemical Reaction Networks"
Mathematical Biology Seminar
Host: Prof. Hans Othmer
University of Minnesota, March 21, 2007

40. "Exact Stochastic Simulation with Event Leaping"
Mathematical Biology Seminar
Host: Prof. Hans Othmer
University of Minnesota, Nov. 2, 2006

41. "Cycles – The Good and the Bad in Logic Synthesis and Computational Biology"
Medtronic Technology Quarterly Seminar
Host: Sara Audet
Fridley, MN, Oct. 5, 2006

42. "Cycles – The Good and the Bad in Logic Synthesis and Computational Biology"
Electrical Engineering Seminar
Host: Prof. Mustafa Khammash
UC Santa Barbara, May 17, 2006

TEACHING at the UNIVERSITY of MINNESOTA

Lecture-Based Courses

- EE 1001, "Introduction to Electrical Engineering": Spring 2022, Spring 2023, and Spring 2024
- EE 1301, "Introduction to Computing Systems": Fall 2009, Spring 2010, Fall 2010, Fall 2011, Fall 2012, Fall 2013, and Fall 2025
- EE 2301, "Introduction to Digital System Design": Spring 2007, Spring 2008, Spring 2009, Fall 2014, Fall 2016, Fall 2017, Fall 2018, Fall 2019, Fall 2020, Fall 2021, Fall 2022, Fall 2023, Fall 2024, and Fall 2026
- EE 2361, "Introduction to Microcontrollers": Fall 2015
- EE 5393, "Circuits, Computation, and Biology": Spring 2008, Fall 2008, Spring 2011, Spring 2012, Spring 2013, Spring 2014, Spring 2015, Spring 2016, Spring 2017, Spring 2018, Spring 2019, Spring 2020, Spring 2021, Spring 2022, Spring 2023, and Spring 2024
- EE 5583, "Error Control Coding": Fall 2012
- EE 5950, "Special Topics in Electrical and Computer Engineering": Fall 2006

Project-Based Courses

- EE 4951, "Senior Design": Spring 2008, Spring 2009, Fall 2011, Fall 2012, Fall 2013, Fall 2014, Fall 2015, Spring 2017, Spring 2018, Spring 2022
- IT 1311, "Freshman Design": Fall 2006

Curriculum Development

- EE 5393, "Circuits, Computation, and Biology": Developed new course. Has had the highest enrollment of any graduate course in the department many semesters, with well over 100 students.

- EE 2301, "Introduction to Digital System Design": Redesigned and modernized the lab component.

ADVISING and MENTORING

Postdoctoral Fellows Advised & Funded

1. Farzad Razi (2023–)
   Research topic: DNA Storage.
2. Arnav Solanki (2023–2024)
   Research topic: Computational Immunology.
3. Andrew Stephan (2021–2022)
   Research topic: DNA Storage.
4. Vishwesh Kulkarni (2011–2013)
   Research topic: Genetic Circuits.

Doctoral Students

1. Yadu Kiran (2017–)
   Dissertation topic: Stochastic Computing
2. Arnav Solanki (2018–2023)
   Dissertation Title: "Carving a Niche in the Intersection of Computer Engineering and Molecular Biology"
   Now Postdoc in ECE at UMN.
3. Ahmad Salehi (2012–2017)
   Received a University of Minnesota **Doctoral Dissertation Award**, 2015–2016.
   Dissertation title: "A Framework for Computing Discrete-Time Systems and Functions using DNA"
   Now Assistant Professor at the University of Kentucky.
4. John Backes (2009–2013)
   Received a University of Minnesota **Doctoral Dissertation Award**, 2012–2013.
   Dissertation title: "SAT-Based Techniques for Logic Synthesis."
   Now Senior Applied Scientist at Amazon Web Services.
5. Hua Jiang (2009–2012)
   Dissertation title: "Digital Logic and Digital Signal Processing with Molecular Reactions."
   Now Senior Software Engineer at Netflix.
6. Mustafa Altun (2008–2012)
   Dissertation title: "Logic Synthesis for Networks of Four-Terminal Switches."
   Now Associate Professor at Istanbul Technical University.
7. Weikang Qian (2006–2011)
   Dissertation title: "Synthesizing Logical Computation on Stochastic Bit Streams."
   Received a University of Minnesota **Doctoral Dissertation Award**, 2010–2011.
   Now Associate Professor at the Univ. of Michigan – Shanghai Jiao Tong Univ. Joint Institute.

Master's Students

1. Jake Kaslewicz (2023–2024)
   Thesis title: "Bit Encoding for SIMD Operations on DNA"
2. Zoe Dormuth (2018–2019)
   Project title: "DNA Storage and Computation"
3. Vaibhav Desai (2014–2017)
   Thesis title: "Data Cycling in Networks: Thoughts and Experiments"
4. Brian Fett (2006–2008)
   Thesis title: "Synthesizing Stochasticity with Biochemical Reactions"
5. Bin Cheng (2007–2008)
   Thesis title: "Stochastic Transient Analysis of Biochemical Systems"

Undergraduate Student Advising

- McNair Faculty Mentor for Jimena Jimenez (2023)
- NEXUS One Honors Program Mentor (2022)
- NSF Research Experiences for Undergraduates (REUs): Lawrence Hessburg (2015–2016) and Michelle Kleckler (2015–2016)
- Industry funded (Oracle, Seagate): Dillon Gustafson (2023), Thomas Atkins (2023), Lily Hymes (2024), and Artemis Pearson (2024)
- Undergraduate Research Scholarship (URS): Jacob Miller (2018–2019)
- Directed Undergraduate Research Opportunities Program (**UROP**) projects for: John Backes (2008), Adam Shea (2008), Phil Greenberg (2009), Dan Hudrlik (2009), Kathleen Thurmes (2009), Aleksandra Kharam (2010), Joshua Krist (2010), Phillip Senum (2010), Jing Xiong (2010), Nick Gunderson (2011), Tor Anderson (2012), Grant Elbert (2012, 2013), Joe Connelley (2013), Caleb Sykes (2014), Blake Anderson (2014), Andrew Decker (2014), Megha Parhi (2015), Alex Keddy (2015), Ryan Mathison (2016), McKenzie van der Hagen (2016), Owen Hoffend (2017), Arnav Solanki (2017), Aceif Oubaha (2017), Benjamin Ertl (2017), Harsh Patel (2018), Serena Nicoll (2018), Jack Erhardt (2018), Jacob Miller (2018), Steven Bulfer (2018), Emma Grant (2018), Jackson Benning (2019), Aaron Moll (2019), Minh Bui (2019), Bridgette Sieffert (2019), Collin Sieffert (2019), Kevin Vander Heyden (2020), Matt Vogel (2021), Henry Hein (2021), Chase Anderson (2021), Jacob Johnson (2022), John Stolzberg-Schray (2022), Renee Lee (2022), Peter Tran (2022), Megan Adamek (2022), and Brianna Phan (2026)
- Directed **Senior Honors** projects for: Jason Heebl (2006–2007), Tim Pankratz (2006–2007), John Kablan (2008–2009), John Backes (2008–2009), Phil Greenberg (2010–2011), Caitlin Race (2010–2011), Theerachai Chanyaswad (2011–2012), Phillip Senum (2012–2013), Thomas Daede (2013–2014), Megha Parhi (2014–2015), Andrew Erickson (2015–2016), Devon Jensen (2015–2016), Vedant Goyal (2016–2017), Michelle Kleckler (2016–2017), Ryan Mathison (2016–2017), McKenzie van der Hagen (2016–2017), Lawrence Hessburg (2017–2018), Zach Krueger (2017–2018), Tonglin Chen (2017–2018), Tait Anderson (2018–2019), Aceif Oubaha (2018–2019), Jackson Benning (2018–2019), Owen Hoffend (2019–2020), Keiran Arora (2021–2022), and Jake Kaslewicz (2022–2023)

Graduate Degree Committees

- Served on Ph.D. Committee of
  Altun, Mustafa (EE), Backes, John (EE), Bhaskar, S. (Bio), Biatek, Jason (CS), Boghrati, Baktash (EE), Boutcher, David (CS), Cai, Feng (EE), Chang, Yangyang (EE), Chen, Tonglin (EE), Cherupalli, Hari (EE), Debrunner, Ianna (MCB), Elbadry, Mohammad (EE), Fang, Jianxin (EE), Faraji, Rasoul (EE), Foo Kune, Denis (CS), Ge, Lulu (EE), Ghassabani, Elaheh (CS), Gu, Chenjie (EE), Guo, Shuo (EE), Gupta, Saket (EE), Hegde, Shashank (EE), Hong, Rankyung (CS), Huai, Lian (EE), Jiang, Hua (EE), Jonathan, Albert (CS), Katis, Andreas (CS), Kim, Nahyoung (EE), Kim, Seong (EE), Kim, Yungil (EE), Knuesel, Robert (EE), Kong, Xiangzhen (EE), Kramer, Lucas (CS), Kumar, Sanjay (EE), Lao, Yingjie (EE), Li, Peng (EE), Liu, Qunzeng (EE), Liu, Xingyi (EE), Liu, Yin (EE), Maidee, Pongstorn (EE), Minglani, Manas (EE), Najafi, Hassan (EE), Ness, Andrew (EE), Oh, Kwangsung (CS), Pham, Hung (CS), Qian, Weikang (EE), Ravishankar, Bhaskar (EE), Safizadeh, Hamid (EE), Salehi, Ahmad (EE), Saraf, Naman (EE), Shin, Jonghyeon (Physics), Sivaswamy, Satish (EE), Solanki, Arnav (EE), Sreekumar, Nikhil (CS), Stephan, Andrew (EE), Swiniarski, Bennett (CEMS), Udell, Julia (BICB), Van Dyke, Krisna (Bio), Wang, Jing (EE), Wang, Xiaofei (EE), Wang, Yao (EE), Wei, Yixun (CS), Xu, Chi (EE), Yuan, Bo (EE), Yuan, En (EE), Yun, Sangho (EE), Zhang, Chuan (EE)

- M.S. Committee for:
  Adolf, Jeff (CS), Agashiwala, Nimish (CS), Bose, Amit (CS), Boutcher, David (EE), Chen, Bin (EE), Dai, Wuyang (EE), Desai, Vaibhav (EE), Dormuth, Zoe (EE), Du, Yuxuan (EE), Fett, Brian (EE), Gupta, Saurabh (CS), Hanson, Alexandra (CS), Hoffmann, Brandon (CS), Kambam Sugavanam, Praveen (CS), Kapare, Amrut (EE), Kariniemi, Ian (CS), Lao, Yingjie (EE), Lee, Young Sub (CS), Light, Matt (EE), Ness, Andrew (EE), Neubauer, Brett (ME), Ryden, Mathew (CS), Sankaralingam, Subramaniam (EE), Santhapuram, Vaishnavi (CS), Sharma, Vaibhav (CS), Sindhu, Rohit (CS), Srivastava, Ayushi (CS), Swiniarski, Bennett (CEMS), Upadhyay, Satya Prakash (EE), Vishwanath, Sumanth Kaushik (CSE), Wang, Ningyuan (EE), Wang, Zhiheng (EE)

PROFESSIONAL SERVICE

Editorships

- Guest Associate Editor, *IEEE Trans. on Molecular, Biological, and Multi-Scale Communications*
  Special Issue on Molecular Systems for Digital Information: Storage, Computation, and Cryptography, 2025–present
- Guest Associate Editor, *IEEE Trans. on Emerging Topics in Computing*
  Special Issue on Approximate and Stochastic Computing, 2015–2018
- Associate Editor, *IEEE Trans. on Computer-Aided Design of Integrated Circuits and Systems*, 2012–2013

Panels, Tutorials, Chairing Sessions, and Workshops

- Chaired Session "Genetic Circuits Meet Ising Machines"
  IEEE/ACM Int. Conference on Computer-Aided Design, 2022

- Chaired Session "In-Memory Computing Circuits and Architectures"
  IEEE/ACM Int. Conference on Computer-Aided Design, 2021
- Panelist, Session "Devices/Materials for Sustainability of Computing Systems"
  National Science Foundation Workshop on Sustainable Computing, 2022
- *IEEE/ACM Int. Conference on Computer-Aided Design*, 2022
  - **Chair** of Biological Systems and Electronics, Brain-Inspired Computing, and New Computing Paradigms Track
  - **Moderator** of Special Session "Challenges and Opportunities of Stochastic Computing in the Dusk of Moore's Law and the Dawn of Big Data"
- *Annual Conference of the Journal of Young Investigators*, Jan. 2022
  Panelist, Session "Interdisciplinary Research: Computer Science, Engineering, and Biology"
- *NSF Workshop on Predictive Intelligence for Pandemic Prevention*, 2021
  Panelist, Session "Rapid and Accurate Detection and Assessment of Emerging Pathogens"
- *IEEE/ACM Int. Workshop on Network-on-Chip Architectures*, 2020
  Panelist, Session "Unconventional Computing and What it Means for the Future of Interconnects"
- *IEEE Int. Conference on Design, Automation and Test in Europe*, 2017
  Organized Tutorial: "Stochastic Computing: The Hype and the Hope"
- *IEEE/ACM Int. Conference on Computer-Aided Design*, 2016
  - **Chair** of Biological Systems and Electronics, Brain-Inspired Computing, and New Computing Paradigms Track
  - **Moderator** of Special Session "Challenges and Opportunities of Stochastic Computing in the Dusk of Moore's Law and the Dawn of Big Data"
- *IEEE/ACM Int. Conference on Computer-Aided Design*, 2015
  Track Chair
- *IEEE/ACM Int. Conference on Computer-Aided Design*, 2014
  - Track Chair
  - Member, Front-End Best Paper Award Selection Committee
- Chaired Session "Optimization by Balancing, Rewriting & Rewiring"
  IEEE/ACM Int. Workshop on Logic and Synthesis, 2011
- *IEEE/ACM Int. Symposium on Nanoscale Architectures*, 2010
  Panelist: "CAD for Nanoelectronic Circuits and Architectures – Are We There Yet?"
- *IEEE Int. Workshop on Genomic Signal Processing and Statistics*, 2009
  Organized Special Session on Bio-Design Automation
- *IEEE/ACM Int. Workshop on Bio-Design Automation*
  - Founded Workshop in 2009
  - Steering Committee Chair (2009–2012)
  - General Chair (2010)
  - Technical Program Chair (2009)

Workshop attendance: **100 people** 2009, **85 people** in 2010, and **120 people** in 2011, more than 100 annually since.

- *IEEE/ACM Int. Workshop on Logic and Synthesis*
  - Program Chair (2009)
  - General Chair (2008)
  - Publications Chair (2007)
  - Panel Chair (2006)
- *IEEE Int. Workshop on Genomic Signal Processing and Statistics*, 2009
  Finance Chair

Technical Program Committee Memberships

- IEEE Computer Society Annual Symposium on VLSI (2023)
- IEEE/ACM Int. Conference on Computer-Aided Design
  (2008, 2014–2016, 2020–2022)
- Computing Research Association, Computing Innovation Fellows Program (Reviewer, 2021)
- IEEE/ACM Design Automation Conference (2012, 2014, 2017–2018)
- IEEE Int. Conference on Communications, Molecular, Biological, and Multi-Scale Communications Track (2017–2018)
- IEEE Global Conference on Signal and Information Processing,
  Symposium on Stochastic and Approximate Computing for Signal Processing and Machine Learning (2017)
- International Conference on Computational Methods in Systems Biology (2017)
- ACM Int. Conference on Nanoscale Computing and Communication (2016–2018)
- IEEE/ACM Int. Workshop on Bio-Design Automation (2009–2014)
- IEEE Great Lakes Symposium on VLSI (2009–2010)
- IEEE Int. Workshop on Genomic Signal Processing and Statistics (2009)
- IEEE/ACM Int. Workshop on Logic and Synthesis (2006–2014)

Journal Paper Refereeing

- Served as referee for numerous journals, including: *Nature Communications; Science; Nature Biotechnology; Nature Reviews Microbiology; Communications Medicine; Proceedings of the National Academy of Sciences; PLOS One; Journal of the Royal Society Interface; IEEE Transactions on Computers; IEEE Trans. on Computer-Aided Design of Integrated Circuits and Systems; IEEE Trans. on Emerging Topics in Computing; IEEE Trans. on Molecular, Biological, and Multi-Scale Communications; IEEE Trans. on Nanotechnology; IEEE Design & Test; IEEE Micro; IEEE Signal Processing Letters; ACM Trans. on Design Automation of Electronic Systems; ACM Journal on Emerging Technologies in Computing Systems; ACM Trans. on Architecture and Code Optimization; ACS Synthetic Biology; Synthetic Biology (Oxford); Frontiers in Nanotechnology; Microelectronics Journal; SIAM Journal on Scientific Computing; and Discrete Applied Mathematics*

Review Panels

- National Science Foundation's Biocomputation Cluster (2014, 2015, 2016, 2022)
- National Science Foundation's Software and Hardware Foundations Cluster (2009, 2010, 2017, 2024)
- National Science Foundation / Semiconductor Research Corporation Failure-Resistant Systems Program (2012)
- National Science Foundation's Future of Manufacturing (2024)
- National Science Foundation's Expeditions in Computing (2018, 2024)
- Ad hoc reviewer of National Science Foundation proposals (2010–2025)

Professional Interest Groups

- ACM Special Interest Group on Design Automation (SIGDA)
  - Associate Editor of SIGDA Newsletter (2006–2012)
  - Co-chair of Technical Committee on Logic/RTL Design (2006–2009)
  - Vice-Chair of CAD-athlon Programming Competition (2006–2007)

SERVICE to the UNIVERSITY of MINNESOTA

Electrical and Computer Engineering Department

- Mentor for McNair Scholars Program (2023)
- ECE 7-12 Revision Committee (2023–)
- Colloquium Coordinator (2018–2024)
- Student Advising Committee (2018–)
- Post-Tenure Review Committee (2021–2022)
- Standards & Awards Committee, Chair (2015–2017)
- Student Services Committee (2011–2014)
- Graduate Committee (2006–2010)
- Ph.D. Written Preliminary Exam (WPE) Committee: 2006–2007, 2007–2008, 2008–2009, 2010–2011, 2012–2013, 2014–2015, 2015–2016, and 2016–2017.

Biomedical Informatics and Computational Biology Program

- Member of Admissions Committee (2008–2009)

University-Wide

- Member of Charles Babbage Institute Advisory Board (2020–)
- Member of "Decision-Making in Research Spaces" CSE Committee (2023)
- Faculty Senator (2013–2016)
- History of Science, Technology and Medicine (HSTM) Faculty Search Committee (2018–2019)
- Interdisciplinary Informatics Seed Grant Program Review Panel (2009)