Marc D. Riedel, Ph.D.

Curriculum Vitae, August 20, 2023

Academic Rank

Associate Professor with Tenure, Electrical & Computer Engineering
Graduate Faculty, Biomedical Informatics & Computational Biology
University of Minnesota, Twin Cities

Contact Information

address: 200 Union St. S.E.
Minneapolis, MN 55455
email: mriedel@umn.edu
tel.: 612-275-9878

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

- Associate Professor with Tenure, 2012–present
  Electrical and Computer Engineering
  University of Minnesota, Twin Cities

- Assistant Professor, 2006–2012
  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

- **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: **NSF**
   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

[2] *All amounts are total amounts, not direct amounts.*

2. 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: 2022–2023

3. Agency: **Seagate**
   Program: MINT
   Title: "*Routing and Optimization of Digital Microfluidics for DNA Storage*"
   Investigator: Marc Riedel (PI)
   Amount: $115,000
   My Share: $115,000
   Duration: 2021–2023

4. Agency: **NSF**
   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

5. 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

6. 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

7. 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

8. 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

9. 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

10. 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

11. 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

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

2. "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

3. "Neural Network Execution using nicked DNA and Microfluidics"
Arnav Solanki,† Purab Sutradhar, Zak Griffin, Amlan Ganguly, and Marc Riedel
PLOS One, 2023 (under review)

4. "A Scalable, Deterministic Approach to Performing Multiplication in Unary"
Yadu Kiran† and Marc Riedel
Frontiers in Nanotechnology, 2023 (under review)

5. " 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, 2023 (under review)

6. "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, accepted – to appear, 2023

7. "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, accepted – to appear, 2023

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

8. "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

9. "Conditionally Improved Synthesis of Polynomial Arithmetic Through Stochastic Logic"
Patrick Holec,† Weikang Qian,† Marc Riedel, and Ivo Rosenberg
Journal of Multiple-Valued Logic and Soft Computing, accepted – to appear, 2023

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

11. "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

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. "Computation of Mathematical Functions using DNA via Fractional 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. "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

17. "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

18. "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

19. "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, Vo. 13, No. 4, pp. 1–28, 2017

20. "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

21. "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

22. "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

23. "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

24. "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

25. "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

26. "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

27. "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

28. "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

29. "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

Before Tenure

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

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

32. "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

33. "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

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

35. "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

36. "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

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

38. "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 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

Before Tenure

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

Peer-Reviewed Conference Papers

1. "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, Sachin Sapatnekar, Ulya Karpuzcu, and Jian-Ping Wang
   IEEE Magnetics Recording Conference, 2023 (under review)

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

3. "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

4. "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

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

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

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

8. "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

9. "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

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

11. "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

12. "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

13. "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

14. "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

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

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

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

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

19. "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

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

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

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

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

24. "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

25. "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

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

27. "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

Before Tenure

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

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

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

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

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

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

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

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

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

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

38. "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**)

39. "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

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

41. "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

42. "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

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

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

45. "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

46. "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)

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

48. "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**)

49. "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

Before Tenure

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 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 Bengzhe Li
U.S. Patent 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 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

Before Tenure

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

2. "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

3. "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

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

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

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

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

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

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

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

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

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

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

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

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

Before Tenure

16. "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

17. "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

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

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

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

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

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

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

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

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

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

27. "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

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

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

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

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

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

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

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

35. "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. "Data Storage and Computing with DNA"
ECE Department Session, Centennial & Jubilee Celebration
University of Minnesota, May 2023

2. "Moving Droplets at MHz Speeds: DNA Storage with Digital Microfluidics"
Annual MINT Review
University of Minnesota, Oct. 2022

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

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

5. "Digital Microfluidics for DNA Storage"
Annual MINT Review, *University of Minnesota*, virtual, Nov. 2021

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

7. 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

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

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

10. "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

11. "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

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

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

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

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

16. "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

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

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

Before Tenure

19. "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

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

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

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

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

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

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

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

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

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

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

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

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

32. 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

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

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

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

36. "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

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

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

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

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

TEACHING at the UNIVERSITY of MINNESOTA

Lecture-Based Courses

- EE 1001, "Introduction to Electrical Engineering": Spring 2022 and Spring 2023
- EE 1301, "Introduction to Computing Systems": Fall 2009, Spring 2010, Fall 2010, Fall 2011, Fall 2012, and Fall 2013
- 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
- EE 2361, "Introduction to Microntrollers": 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, and Spring 2023
- 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 departmen, with well over 100 students many semesters.
- 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–)
   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. Julia Udell (2018–)
   Dissertation topic: Computational Immunology

2. Ajay Manicka (2018–)
   Dissertation topic: DNA Storage

3. Yadu Kiran (2017–)
   Dissertation topic: Stochastic Computing

4. Arnav Solanki (2018–2023)
   Dissertation Title: "Carving a Niche in the Intersection of Computer Engineering and Molecular Biology"
   Now Postdoc in ECE at UMN.

5. 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.

6. 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.

7. Hua Jiang (2009–2012)
   Dissertation title: "Digital Logic and Digital Signal Processing with Molecular Reactions."
   Now Senior Software Engineer at Netflix.

8. Mustafa Altun (2008–2012)
   Dissertation title: "Logic Synthesis for Networks of Four-Terminal Switches."
   Now Associate Professor at Istanbul Technical University.

9. 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–)
   Thesis title: "Bit Encoding for SIMD Operations on DNA"

2. Zoe Dormuth (2018–2019)
   Project title: "DNA Storage and Computation"

3. Vahbai 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 (2023)
- NEXUS One Honors Program Mentor (2022)
- NSF Research Experiences for Undergraduates (REUs): Lawrence Hessburg (2015–2016), and Michelle Kleckler (2015–2016)
- Undergraduate Research Scholarship (URS): Jacob Miller (2018–2018)
- 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 Derhagen (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), and Megan Adamek (2022)
- 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), Vendant Goyal (2016–2017), Michelle Kleckler (2016–2017), Ryan Mathison (2016–2017), McKenzie van Derhagen (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), Chang, Yangyang (EE), Chen, Tonglin (EE), Cherupalli, Hari (EE) Debrunner, Ianna (MCB), Fang, Jianxin (EE), Faraji, Rasoul (EE), Foo Kune, Denis (CS), Ge, Lulu (EE), Ghassabani, Elaheh (CS), Gu, Chenjie (EE), Guo, Shuo (EE), Gupta, Sakeet (EE), Gupta, Saurabh (CS), Hegde, Shashank (EE) Hong, Rankyung (CS), Hong, Rankyung Hyoung (EE), Huai, Lian (EE), Jiang, Hua (EE), Johnathan, Albert (CS), Johnson, Albert (CS), Katis, Andreas (CS), Kim, Hyoung (EE), Kim, Seong (EE), Knuesel, Robert (EE), Kong, Xiangzhen (Bio), Kumar, Sanjay (EE), Lao, Yingie (EE), Li, Peng (EE), Liu, Qunzeng (EE), Liu, Xingyi (EE), Liu, Yin (EE), Maidee, Pongstorn (EE), Mignas, Manas (CS), Najafi, Hassan (EE), Ness, Andrew (EE), Oh, Kwangsung (CS), Pham, Huang (CS), Qian,

Weikang (EE), Ravishankar, Bhaskar (EE), Safizadeh, Hamid (EE), Salehi, Ahmad (EE), Saraf, Naman (EE), Shin, Jonghyeon (Physics), Sindhu, Rohit (CS), Sivaswamy, Satish (EE), Solanki, Arnav (EE) Sreekumar, Nikhil (CS) Srivastava, Ayushi (CS), Stephan, Andrew (EE), Swiniarski, Bennett (CEMS), Udell, Julia (BICB), Van Dyke, Krisna (Bio), Wang, Jing (EE), Wang, Ningyuan (Psychology), Wang, Xiaofei (EE), Wang, Yao (EE), Wang, Zhiheng (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) Fett, Brian (EE), Hoffman, Brandon (CS), Kambam, Praveen (CS), Lee, Young Sub (CS), Ness, Andrew (EE), Oh, Kwangsung (CS), Santhapuram, Vaishnavi (CS) Sharma, Vaibhav (CS), Sindhu, Rohit (CS), Srivastava, Ayushi (CS), Sugavanam, Kambam (CS), Swiniarski, Bennett (CEMS), Upadhyay, Satya Prakash (EE), Vishwanath, Sumanth Kaushik (CSE), Wang, Ningyuan (CS)

PROFESSIONAL SERVICE

Editorships

- Guest Associate Editor, *IEEE Trans. on Emerging Topics in Computing*
  Special Issue on Approximate and Stochastic Computing, 2018

Panels, Tutorials, Chairing Sessions, and Workshops

- Chaired Session "Genetic Circuits Meet Ising Machines"
  IEEE/ACM Int. Conference on Computer-Aided Design, 2022
- 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. Symposium on Nanoscale Architectures*, 2010
  Panelist: "CAD for Nanoelectronic Circuits and Architectures – Are We There Yet?"
- *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, 2021–2022)
- IEEE/ACM Design Automation Conference (2012–2014, 2017–2018)
- IEEE Int. Conference on Communication (2017)
- International Conference on Computational Methods in Systems Biology (2017–2018)
- ACM Int. Conference on Nanoscale Computing and Communication (2016)
- 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; Proceedings of the National Academy of Sciences; PLOS One; IEEE Transactions on Computers; IEEE Trans. on Computer-Aided Design of Circuits and Systems; IEEE Trans. on Information Theory; IEEE Trans. on Molecular, Biological, and Multi-Scale Communications; IEEE Trans. on Nanotechnology; ACM Trans. on Design Automation*

of Electronic Systems; ACM Journal on Emerging Technologies; Bioinformatics; Journal of Chemical Physics; SIAM Journal on Scientific Computing; ACS Synthetic Biology; and Journal of Discrete and Applied Math

Review Panels

- National Science Foundation's Biocomputation Cluster (2014, 2015, 2017, 2022, 2023)
- National Science Foundation's Software and Hardware Foundations Cluster (2009, 2010, 2017)
- National Science Foundation's Expeditions in Computing (2018)

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–)
- 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–)
- Faculty Senator (2013–2016)
- History of Science, Technology and Medicine (HSTM) Faculty Search Committee (2018–2019)
- Interdisciplinary Informatics Seed Grant Program Review Panel (2009)