Kevin R. Sanft

Department of Computer Science
University of North Carolina Asheville
ksanft@unca.edu

Academic Employment

Chair, Department of Computer Science, University of North Carolina Asheville, 2022-Present

Associate Professor, Department of Computer Science, University of North Carolina Asheville, 2021-Present

Assistant Professor, Department of Computer Science, University of North Carolina Asheville, 2015-2021

Postdoctoral Associate, School of Mathematics, University of Minnesota, 2014-2015

Visiting Assistant Professor, Department of Mathematics, Statistics, and Computer Science/ Center for Interdisciplinary Research, St. Olaf College, 2012-2014

Education

Ph.D. in Computer Science, University of California, Santa Barbara (UCSB), 2012
Computational Science and Engineering emphasis
NSF Graduate Research Fellowship
NSF IGERT Fellowship in Computational Science and Engineering

M.S. in Computer Science, University of California, Santa Barbara, 2011

Summer Teaching Institute for Associates Certificate, University of California, Santa Barbara, 2010

B.S, B.A in Computer Science and Mathematics, Augsburg College, Minneapolis, MN, 2002

Peer-reviewed Publications [* indicates supervised (current or former) undergraduate author]

S. Matthew*, F. Carter*, J. Cooper*, M. Dippel*, E. Green*, S. Hodges*, M. Kidwell*, D. Nickerson*, B. Rumsey*, J. Reeve*, L. Petzold, K.R. Sanft, B. Drawert. GillesPy2: a Biochemical Modeling Framework for Simulation Driven Biological Discovery. *Letters in Biomathematics*, 10(1), 87-103, 2023.

K.R. Sanft, B. Drawert, A. Whitley. Modified Specifications Grading in Computer Science: Preliminary Assessment and Experience Across Five Undergraduate Courses. *Journal of Computing Sciences in Colleges*, 36(5): 34-46, 2021.

K.R. Sanft and B.F.M. Intoy. Period Estimation and Noise in a Neutrally Stable Stochastic Oscillator. *Spora: A Journal of Biomathematics*, Vol. 6, 26-39, 2020.

K.R. Sanft. Assessing Ethics in a Computer Science Curriculum: Instrument Description and Preliminary Results. *Journal of Computing Sciences in Colleges*, 35(4): 90-96, 2019.

K.R. Sanft and H.G. Othmer. Constant-complexity Stochastic Simulation Algorithm with Optimal Binning. *J Chem Phys,* 143, 074108, 2015.

O.A. Hall-Holt and K.R. Sanft. Statistics-infused Introduction to Computer Science, *Proc. 46th ACM Technical Symposium on Computer Science Education (SIGCSE) 2015*.

E. Wallace, D.T. Gillespie, K.R. Sanft, L.R. Petzold. The linear noise approximation is valid over limited times for any chemical system that is sufficiently large. *IET Systems Biology,* 6(4):102-115, 2012.

K.R. Sanft, S. Wu, M. Roh, J. Fu, R.K. Lim, L.R. Petzold. StochKit2: software for discrete stochastic simulation of biochemical systems with events. *Bioinformatics*, 27(17):2457-8, 2011.

K.R. Sanft, D.T. Gillespie, L.R. Petzold. Legitimacy of the stochastic Michaelis-Menten approximation. *IET Systems Biology*, 5(1):58-69, 2011.

C. Luni, J.E. Shoemaker, K.R. Sanft, L.R. Petzold, F.J. Doyle III. Confidence from uncertainty - A multi-target drug screening method from robust control theory. *BMC Systems Biology*, 4:161, 2010.

C. Luni, K.R. Sanft, L.R. Petzold, F.J. Doyle III. Modeling of detailed insulin receptor kinetics affects sensitivity and noise in the downstream signaling pathway. *Proc. IFAC Intl. Symposium on Dynamics and Control of Process Systems (DYCOPS) 2010*.

D.T. Gillespie, Y. Cao, K.R. Sanft, L.R. Petzold. Abridging chemical reaction networks: it's a subtle business. *Proc. Foundations of Systems Biology in Engineering (FOSBE) Conf. 2009*.

E.C. Kwei, J.E. Shoemaker, K.R. Sanft, L.R. Petzold, F.J. Doyle III. Model-based therapeutic target discrimination using stochastic simulation and robustness analysis in an insulin signaling pathway. *Proc. FOSBE Conf. 2009*.

D.T. Gillespie, Y. Cao, K.R. Sanft, L.R. Petzold. The subtle business of model reduction for stochastic chemical kinetics. *J Chem Phys*, 130, 064103, 2009.

E.C. Kwei, K.R. Sanft, J.E. Shoemaker, L.R. Petzold, F.J. Doyle III. Modeling and systems analysis of insulin signaling. [Extended Abstract] *Proc. AIChE Annual Meeting 2008*.

E.C. Kwei, K.R. Sanft, L.R. Petzold, F.J. Doyle III. Systems analysis of the insulin signaling pathway. *Proc. 17th IFAC World Congress, July 2008*.

R. Frigerio, M.M.B. Breteler, L.M.L. de Lau, K.R. Sanft, J.H. Bower, J.E. Ahlskog, B.R. Grossardt, M. de Andrade, D.M. Maraganore, W.A. Rocca. Number of children and risk of Parkinson's disease. *Movement Disorders*, 22(5):632-9, 2007.

R. Frigerio, K.R. Sanft, B.R. Grossardt, B.J. Peterson, A. Elbaz, J.H. Bower, J.E. Ahlskog, M. de Andrade, D.M. Maraganore, W.A. Rocca. Chemical exposures in Parkinson's disease: A population-based case-control study. *Movement Disorders*, 21(10):1688-92, 2006.

W.A. Rocca, B.R. Grossardt, B.J. Peterson, J.H. Bower, M.R. Trennery, J.E. Ahlskog, K.R. Sanft, M.de Andrade, D.M. Maraganore. The Mayo Clinic cohort study of personality and aging: design and sampling, reliability and validity of instruments, and baseline description. *Neuroepidemiology*, 26(3):119-29, 2006.

R. Frigerio, A. Elbaz, K.R. Sanft, B.J. Peterson, J.H. Bower, J.E. Ahlskog, B.R. Grossardt, M. de Andrade, D.M. Maraganore, W.A. Rocca. Education and occupations preceding Parkinson's disease: A population-based case-control study. *Neurology*, 65(10):1575-83, 2005.

Book Chapters

B. Drawert, K.R. Sanft, J.H. Abel, S. Hellander, A. Pourzanjani, A. Hellander, L.Petzold. *Stochastic Simulation of Well-Mixed and Spatially Inhomogeneous Biochemical Systems.* Book chapter in Quantitative Biology: Theory, Computational Methods, and Models, Eds. B. Munsky, W.S. Hlavacek, L.S. Tsimring, MIT Press, 2018.

Articles in Preparation [* indicates supervised (current or former) undergraduate author]

K.R. Sanft, H. Joseph*, J. Ravi*, L.R. Petzold. StochKit2R: An R Package for Efficient Discrete Stochastic Simulation [in preparation].

Academic Talks [Contributed=peer reviewed]

Modeling and Simulation of Discrete Stochastic and Hybrid Systems in GillesPy2, Biomathematics and Ecology, Education and Research Conference, University of Richmond, 5 November 2023. [Contributed]

Algorithms for Simulating Large Spatial Discrete Stochastic Biochemical Models, University of California Riverside, Department of Mathematics, PDE and Applied Math Seminar, 5 May 2021. [Virtual; Invited]

Modified Specifications Grading in Computer Science: Preliminary Assessment and Experience Across Five Undergraduate Courses, Consortium for Computing Sciences in Colleges Southeastern (CCSC:SE) Conference, UNC Asheville, 22-23 January 2021. [Virtual; Contributed, with B. Drawert and A. Whitley]

Assessing Ethics in a Computer Science Curriculum: Instrument Description and Preliminary Results, Consortium for Computing Sciences in Colleges Southeastern (CCSC:SE) Conference, Auburn University, 26 October 2019. [Contributed]

Period Drift in a Neutrally Stable Stochastic Oscillator. Biomathematics and Ecology, Education and Research (BEER) Conference, University of Wisconsin, La Crosse, 5 October 2019. [Contributed]

Scaling of Discrete Stochastic Simulation Algorithms for Reaction Diffusion Processes, Conference on Multiscale Modeling in Biology. University of Minnesota, 20 May 2019. [Invited]

Spatial simulation and analysis of actin filament dynamics and wave propagation. Isaac Newton Institute, Cambridge University, 21 June 2016. [Invited]

Statistics-infused Introduction to Computer Science. ACM Technical Symposium on Computer Science Education (SIGCSE), Kansas City, MO, 5 March 2015. [Contributed, with O.A. Hall-Holt]

Scaling Properties of Exact Simulation Algorithms for Spatially Discretized Stochastic Reaction-Diffusion Processes. Banff International Research Station Workshop: Particle-Based Stochastic Reaction-Diffusion Models in Biology. Banff, AB, CA, 10 November 2014. [Invited]

Efficient Simulation of the Stochastic Michaelis-Menten Approximation. University of Minnesota, School of Mathematics, Math Biology Seminar. Minneapolis, MN, 23 October 2013. [Invited]

Exploiting stiffness for efficient discrete stochastic biochemical simulation. SIAM Conference on Computational Science and Engineering. In minisymposium: Biology, Stochastic Modeling and the Mathematics of Simulation, Boston, MA, 1 March 2013. [Contributed minisymposium (invited by minisymposium organizer Gil Strang)]

Turn down the volume, turn up the noise: a course module in discrete stochastic modeling and simulation. Joint Mathematics Meetings. MAA Contributed Paper Session: Trends in Undergraduate Mathematical Biology Education, San Diego, CA, 12 January 2013. [Contributed]

Stochastic modeling and simulation in biology. Augsburg College Mathematics Department Colloquium, Minneapolis, MN, 26 April 2011. [Invited]

Model reduction in stochastic simulation of the enzyme-substrate reaction set. Workshop for Young Researchers in Mathematical Biology, Mathematical Biosciences Institute, Ohio State University, Columbus, OH, 1 September 2010. [Contributed]

My role as a Data Analyst and advice for math majors. Augsburg College Mathematics Department Colloquium, Minneapolis, MN, 18 February 2004. [Invited]

Calculating the motion of waves. Pi Mu Epsilon Undergraduate Research Conference, Collegeville, MN, 13 April 2002. [Contributed]

Grants

NCInnovation: 3 Moves Ahead, G. Colquitt [Appalachian State University], PI ($928,536, UNC Asheville Subaward: $172,417, 1/1/2026 - 12/31/2027).

Dogwood Health Trust: UNC Asheville Digital Opportunity, K. Sanft, PI ($20,000, 11/11/2024 - 11/28/2025).

NSF: Data Analytics Training and Scientific Computing Initiative (DATASCI), R. Sanft, PI ($1,999,399, 06/01/2025 - 05/31/2031).

Awards

2015 Career Development Award from the University of Minnesota Postdoctoral Association.

2014 Systems Biology Premium Award from the Institution of Engineering and Technology (with E. Wallace, D.T. Gillespie, L.R. Petzold).

2013 Travel Grant to attend Biomathematics and Ecology: Education and Research Conference.

2013 Travel Grant to attend the SIAM Conference on Computational Science and Engineering.

2012 Systems Biology Premium Award from the Institution of Engineering and Technology (with D.T. Gillespie, L.R. Petzold).

Industry Employment

2005-2006 Statistical Programmer, Bioinformatics Group, Dept. of Cardiac Rhythm Management Clinical Research, Medtronic, Inc., St. Paul, MN.

2003-2005 Data Analyst, Division of Biostatistics, Dept. of Health Sciences Research, Mayo Clinic, Rochester, MN.

2002 Software Engineer, Retek, Inc. [now Oracle Retail, part of Oracle, Inc.], Minneapolis, MN

2001 Software Engineer Intern, Retek, Inc. [now Oracle Retail, part of Oracle, Inc.], Minneapolis, MN

Service and Outreach

UNC Asheville Post Tenure Review Committee [2022-2025].

UNC Asheville Liberal Arts Core (general education requirements) Task Force [2023-2024].

UNC Asheville New Faculty Mentor Program Co-coordinator (with E. Chiang and C. Boone) [2020-2022].

UNC Asheville Dept. of Computer Science Assessment Liaison [2020-2023].

Presented *Data, Science and Simulation* as part of UNC Asheville OLLI's Interdisciplinary STEM Seminar Lecture series [9/26/2018].

UNC Asheville Dept. of Computer Science Admissions Liaison [2017-2023].

GEAR UP (Gaining Early Awareness and Readiness to Undergraduate Programs) Summer Camp at UNC Asheville: ran two sessions for middle school students demonstrating the virtual reality lab and programming robots [6/19/2017, 6/20/2017].

Asheville Museum of Science's ACE (Accelerating Community Engineers) Summer Camp at UNC Asheville: ran a session for 25 rising 2^{nd}-4^{th} grade students programming robots [6/28/2017].

UNC Asheville member of the working committee on the PAR Analytics Pilot, a General Administration program related to the application of data analytics to student retention strategies [2017].

NSF S-STEM grant ACES Scholarship Committee [2016-2021], The Cloud Living Learning Community Mentor [2017-2021], ACES Cohort Mentor [2019-2021].

UNC Asheville Honors Program Advisory Committee [2016-2018].

UNC Asheville Intellectual Property Committee [2016-2022].

St. Olaf College, Dept. of Mathematics, Statistics, and Computer Science (MSCS) Technology Group [Dept. committee on computational tools for MSCS courses. 2013-2014].

Presented “Creating and Presenting Research Posters” to UCSB Institute for Collaborative Biotechnologies SABRE (Summer Applied Biotechnologies Research Experience) students [undergraduate and M.S. students from HBCUs and MIs in STEM fields], 1 July 2011.

Volunteer participant in the UC Santa Barbara W.E.B. Du Bois Event to teach Educational Opportunity Program students about graduate school, 3 March 2010.

LEAPS (Let's Explore Applied Physical Science) FUSE (Family Ultimate Science Exploration): presented interactive science demonstrations to students and parents at Santa Barbara Junior High, 12 November 2008.

Reviewer: IEEE/ACM Transactions on Computational Biology and Bioinformatics, Journal of Chemical Physics, Physical Biology, IET Systems Biology, Proc. National Conference on Undergraduate Research, Bioinformatics, Biochemistry, Letters in Biomathematics, Consortium for Computing Sciences in Colleges: Southeastern Conference.