Paul Gustafson

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Employment

The Ambrus Group September 2022 – Present
Quantitative Researcher

University of Pennsylvania August 2021 – June 2023
Postdoctoral Researcher, Electrical and Systems Engineering

Wright State University September 2018 – August 2021
Research Scientist, Department of Electrical Engineering

Knowledge Based Systems, Inc. October 2011 – September 2012
Programmer Analyst

Education

Texas A&M University 2013 – 2018
Doctor of Philosophy in Mathematics
Advisor: Eric Rowell

Texas A&M University 2012 – 2013
Bachelor of Science in Mathematics

Princeton University 2007 – 2011

Research Interests

Category theory, type theory, hybrid dynamical systems, topological quantum computation

Publications and Preprints

P. Gustafson, M.S. Im, R. Kaldawy, M. Khovanov, Boolean TQFTs with accumulating defects, sofic systems, and automata for infinite words, arXiv:2312.17033.

P. Gustafson, M.S. Im, R. Kaldawy, M. Khovanov, Z. Lihn, Automata and one-dimensional TQFTs with defects, *Lett. Math. Phys.* 113 (2023), no. 93.

S. Cui, P. Gustafson, Y. Qiu, Q. Zhang, From torus bundles to particle-hole equivariantization, *Lett. Math. Phys.* 112 (2022), no. 15.

M. Kvalheim, P. Gustafson, D. E. Koditschek, Conley's fundamental theorem for a class of hybrid systems, *SIAM J. Appl. Dynam. Syst.* 20 (2021), no. 2, 784-825.

J. Culbertson, P. Gustafson, D. E. Koditschek, P. F. Stiller, Formal composition of hybrid systems, *Theory and Applications of Categories* 35 (2020), no. 45, 1634-1682.

P. Gustafson, A. Kimball, E. C. Rowell, Q. Zhang, Braid group representations from twisted tensor products of algebras, *Peking Math. J.* 2 (2020), 103-130.

A. Deaton, P. Gustafson, L. Mavrakis, E. C. Rowell., S. Poltoratski, S. Timmerman, B. Warren, Q. Zhang, Integral metaplectic modular categories, *J. Knot Theory Ramifications*, 29 (2020), no. 5, 2050032.

P. Gustafson, E. C. Rowell, Y. Ruan, Metaplectic categories, gauging and Property F, *Tohoku Math. J.* 72 (2020), no. 3, 411-424.

P. Bruillard, P. Gustafson, J. Plavnik, E. C. Rowell, Dimension as a quantum statistic and the classification of metaplectic categories, in *Topological phases of matter and quantum computation*, 89–113, Contemp. Math., 747, Amer. Math. Soc., Providence, RI, 2020.

P. Gustafson, Finiteness for mapping class group representations from twisted Dijkgraaf-Witten theory, *J. Knot Theory Ramifications* 27 (2018), no. 6, 1850043.

R. Fernandes, B. Li, K. Vadakkeveedu, A. Verma, P. Gustafson, et al., Agent-based analysis of trustworthiness in wireless sensor networks, *Proc. SPIE* 8407, Multisensor, Multisource Information Fusion: Architectures, Algorithms, and Applications 2012, 84070W (May 1, 2012); doi:10.1117/12.920781.

P. Gustafson, N. Savir, E. Spears, A characterization of refinable rational functions, *Am. J. Undergrad. Res.* 5 (3): 11-20 (Nov. 11, 2006).

Conference Presentations

Compositional Robotics: Mathematics and Tools (ICRA 2021 Workshop), hosted online, May 2021.

TRIPODS/DATA-INSPIRE Workshop on Dynamics, Topology, and Robotic Control, hosted online by Rutgers University, May 2021.

BIRS-CMO Workshop on Topological Complexity and Motion Planning, hosted online by Banff International Research Station, September 2020.

AMS Special Session on Applied Category Theory, U.C. Riverside, Riverside, CA, November 2019.

Workshop on Higher Category Approach to Certifiably Correct Quantum Information Processing Systems, Washington, D.C., February 2019.

AMS Special Session on Quantum Symmetries, The Ohio State University, Columbus, OH, March 2018.

AMS Special Session on Tensor Categories: Bridging Algebra, Topology, and Physics; U.C. Riverside, Riverside, CA, November 2017.

AMS Special Session on Invariants of Links and 3-Manifolds, U. North Texas, Denton, TX, September 2017.

AMS Special Session on Fusion Categories and Applications, Indiana University, Bloomington, IN, April 2017.

AMS Special Session on Fusion Categories and Topological Phases of Matter, University of Utah, Salt Lake City, UT, April 2016.

Teaching Experience (Texas A&M University)

Mentor
REU on Mathematics of TQC — Summer 2017, Summer 2018

Instructor of Record
Mathematical Concepts – Calculus (M131) — Spring 2017

Teaching Assistant
Engineering Mathematics II (M152) — Fall 2015, Spring 2018
Engineering Mathematics I (M151) — Spring 2016, Fall 2017

Grader
Algebraic Topology I (M643) — Fall 2016

Counselor
SMaRT High School Math Camp — Summer 2009, Summer 2010

Workshop Participation

Research School on Quantum Symmetries, Universidad de los Andes, Bogota, Colombia, June 2019.

AMS Mathematical Research Community on Quantum Symmetries, Whispering Pines, RI, June 2018.

School and Workshop on Univalent Mathematics, University of Birmingham, UK, December 2017.

AMS Mathematical Research Community on Homotopy Type Theory, Snowbird, UT, June 2017.

Agda Implementors' Meeting XXV, Chalmers University of Technology, Gothenburg, Sweden, May 2017.

Graduate Workshop on Topological Quantum Field Theory, Simons Center for Geometry and Physics, Stony Brook, NY, August 2015.

Oregon Programming Languages Summer School, University of Oregon, July 2013.