Joseph Fluegemann

Curriculum Vitae

Contact and Personal Information

Email Address: jkf68@cornell.edu

Citizenship: United States

Education and Employment

September 2024 - present. Visiting Associate, Special Year on Algebraic and Geometric Combinatorics, Institute for Advanced Study.

August 2017 - August 2024. PhD in Mathematics (Minor: Theoretical Physics), Cornell University.
-6/14/2024: Passed thesis defense; thesis title: Smooth Points on Positroid Varieties. (Thesis Committee: Allen Knutson (head), Liam McAllister, Karola Meszaros)
-6/4/2021: Completed requirements for PhD Minor in Theoretical Physics (passed 1-year sequence in quantum field theory and general relativity).
-8/20/2020: Passed A-exam (qualifying exam), earned M.S. in mathematics.

August 2014 - Dec 2017. M.S. Mathematics, San Jose State University.
-Thesis: Gauge Theory, Connections, and Holonomy: Background for the Ambrose-Singer Theorem.

August 2013 - March 2015. Researcher, Quantum Artificial Intelligence Laboratory at NASA Ames.
- 3 publications (listed below)

August 2009 - May 2013. B.A. Cognitive Science, University of California, Berkeley.
- Completed the requirements for a concentration in Cognitive Psychology

Publications

Journal Articles/Preprints

"Smooth Points on Positroid Varieties II: Deletion/Contraction and N=4 Supersymmetric Yang Mills Theory." Joseph Fluegemann. In Preparation.

"Smooth Points on Positroid Varieties." Joseph Fluegemann. (2024) https://arxiv.org/abs/2407.21116. Submitted to Transactions of the American Mathematical Society.

"Determination and Correction of Persistent Biases in Quantum Annealers." Alejandro Perdomo-Ortiz, Bryan O'Gorman, Joseph Fluegemann, Rupak Biswas, Vadim N. Smelyanskiy. *Nature Scientific Reports* vol. 6 (2016). [arXiv:1503.05679]

"A Performance Estimator for Quantum Annealers: Gauge Selection and Parameter Setting." Alejandro Perdomo-Ortiz, Joseph Fluegemann, Rupak Biswas, Vadim N. Smelyanskiy. (2015). [arXiv:1503.01083]

"A Quantum Annealing Approach For Fault Detection and Diagnosis of Graph-Based Systems." Alejandro Perdomo-Ortiz, Joseph Fluegemann, Sriram Narasimhan, Rupak Biswas, Vadim N. Smelyanskiy. *The European Physical Journal Special Topics* 224, no. 1 (2014): 131-148. [arXiv:1406.7601v2]

Conference Proceedings

"Programming and Tuning a Quantum Annealing Device to Solve Real World Problems." Alejandro Perdomo-Ortiz, Bryan O'Gorman, Joseph Fluegemann, Vadim N. Smelyanskiy. *APS Meeting Abstracts 1*, 38001 (2015). [http://meetings.aps.org/link/BAPS.2015.MAR.L38.1]

"A Quantum Approach to Diagnosis of Multiple Faults in Electrical Power Systems." Alejandro Perdomo-Ortiz, Joseph Fluegemann, Sriram Narasimhan, Vadim N. Smelyanskiy, Rupak Biswas. *2014 IEEE International Conference on Space Mission Challenges for Information Technology* [SMC-IT] (2014): 46-53. [doi:10.1109/SMC-IT.2014.14]

Funding

Full funding, AGNES Summer School on Intersection Theory on Moduli Spaces, Brown University, 7/11-24/2023.

Full funding, Scattering Amplitudes Program at Munich Institute for Astro-, Particle and BioPhysics (MIAPbP), 7/18-29/2022.

Full funding package, Scattering Amplitudes Program at Munich Institute for Astro-, Particle and BioPhysics (MIAPbP), 7/18-29/2022.

Full funding, Visiting Scholar at Penn State University, 12/5-11/2021, sponsored by Jacob Bourjaily.

Partial funding, Harvard CMSA Spacetime and Quantum Mechanics Master Class Workshop, 10/28-30/2019, recommended by Nima Arkani-Hamed.

Cornell graduate student summer fellowship, Summer 2020.

Full funding package for MSRI 843, Séminaire de Mathématiques Supérieures 2018: Derived Geometry and Higher Categorical Structures in Geometry and Physics summer graduate school.

Cornell University Graduate Student Fellowship. 2017-2018 academic year.

Awards

2017 Verner E. Hoggatt Scholarship Award (Top Award in the Department of Mathematics and Statistics at SJSU)

2016 Math Department Scholarship Award (SJSU)

Talks

Invited Talks

University of Michigan, Combinatorics Seminar, 11/15/2024.

University of Waterloo, Algebraic and Enumerative Combinatorics Seminar, 10/31/2024.

University of Washington, Combinatorics Seminar, 10/23/2024.

Rutgers University, Algebra Seminar, 10/9/2024.

Pennsylvania State University, Geometry, Algebra, and Physics Seminar, 12/7/2021.

Poster Presentations

Smooth Points on Positroid Varieties. 6/19/2024. Amplitudes Conference and Summer School. Institute for Advanced Study.

Other Talks

What is a Leading Singularity? Amplitudes and Combinatorics Synergy Event, Institute for Advanced Study, October 2024.

Grassmannian Integrals in N=4 Supersymmetric Field Theory (based on arXiv:1410.0621). 9/19/2023 and 10/3/2023. Geometry and Amplitudes Zoom Journal Club.

Allen Knutson's Juggling Patterns and N=4 Supersymmetric Quantum Field Theories. 9/21/2021. Olivetti Club, Cornell University.

Positroids. 2/16/2021. Olivetti Club, Cornell University.

The Electromagnetic Field Tensor. 10/16/2018. Olivetti Club, Cornell University.

Examples of (Pre)Factorization Algebras. 2/14/2017. Topics in Factorization Algebras, Math 270, UC Berkeley.

Intro to J-Holomorphic Curves. 11/22/2016. Symplectic Topology Learning Seminar, UC Berkeley.

Kähler Manifolds. 10/27/2016. Symplectic Topology Learning Seminar, UC Berkeley.

Gray Stability. 10/18/2016. Symplectic Topology Learning Seminar, UC Berkeley.

Chern Classes. 9/22/2016. Symplectic Topology Learning Seminar, UC Berkeley.

Spectral Flow, Asymptotic Operators, and the Conley-Zehnder Index. 9/12/2016, Symplectic Field Theory Seminar, UC Berkeley.

Conferences/Schools Attended

Amplitudes 2024 Summer School and Conference at the Institute for Advanced Study in Princeton, 6/10-21/2024.

Amplitudes 2022 Summer School and Conference in Prague, Czech Republic, 8/1-12/2022.

Amplitudes 2021 Summer School hosted by SAGEx virtually, 8/9-13/2021.

The Amplitude Games MITP Virtual Summer School (accepted application), 7/21-30/2021.

Geometry and Scattering Amplitudes Online Journal Club (hosted by David Damgaard and Robert Moerman), ongoing, regular participant.

Positive Geometries in Scattering Amplitudes and Beyond MITP virtual workshop. 6/17-18/2021.

Geomplitudes, QMAP at UC Davis virtual workshop. 2/8-9/2021.

Celestial Holography School, virtual workshop hosted by PCTS. 2/2-5/2021.

Amplitudes 2020, virtual conference hosted by Brown University. 5/11-15/2020.

Spacetime and Quantum Mechanics Master Class Workshop at Harvard CMSA. 10/28-30/2019

MSRI 843, Séminaire de Mathématiques Supérieures 2018: Derived Geometry and Higher Categorical Structures in Geometry and Physics summer graduate school.

Cornell Topology Festival. May 2018.

Berkeley MSRI: Introductory Workshop, Modern Riemannian Geometry. January 2016.

Berkeley MSRI: Kähler Geometry, Einstein Metrics, and Generalizations. March 2016.

Teaching

Cornell University

Math 4410 Intro to Combinatorics grader (Fall 2023)

Math 3360 Applicable Algebra grader (Spring 2023)

Math 4220/5220 Complex Analysis grader (Fall 2022)

Math 2930 Differential Equations for Engineers TA (Spring 2022)

Math 3210 Manifolds and Differential Forms grader (Fall 2021)

Math 4310 Advanced undergraduate Linear Algebra grader (Fall 2020)

Math 2940 Linear Algebra for Engineers TA (Spring 2020, Spring 2021)

Math 1920 Multivariable Calculus for Engineers TA (Fall 2019, Spring 2020, Summer 2020, Fall 2020, Summer 2020, Summer 2021)

SJSU

Math 133A Ordinary Differential Equations workshop facilitator (Spring 2017)

Math 42 Discrete Mathematics workshop facilitator (Spring 2017)

Math 32 Multivariable Calculus workshop facilitator (Spring 2016)

Math 123 Linear Algebra and Differential Equations workshop facilitator (Spring 2016)

Math 133A Ordinary Differential Equations grader (Spring 2017)

Mentoring

Mentoring Mikhail Zubarev on a research project on nonplanar on-shell diagrams, Fall 2024.

Mentored Michael Emmett Clark on a research project on plabic diagrams and pipe dreams, Summer 2024.

Mentored Syna Kikanamada on a project on BCFW, Summer 2024.

Service

June 2023 - present. Organizer for the Zoom Amplitudes and Geometry Journal Club.

March 2024: invited and organized visit of Jacob Bourjaily for a talk at the Cornell Algebra seminar titled: Non-Polylogarithmic and Non-Planar On-Shell Varieties in the Grassmannian

2020, 2021 Cornell mentor for incoming graduate students

Cornell University 2017-2018 first year mathematics graduate students class representative.

Miscellaneous

Programming: MATLAB, Mathematica, Macaulay2

Programming used in past: JAVA, Python, HTML, CSS

Awards: Phi Kappa Phi invitation, 2005 Synopsys Science and Technology Championship - First Place in Chemistry

Modern Languages: English (native proficiency), Mandarin Chinese (professional working proficiency C1/C2), Korean (intermediate-advanced B2)

Last updated: November 15, 2024