Samuel A. Ballas

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Employment

Florida State University — Tallahassee, Florida
- Director of Pure Mathematics — 2023-Present
- Associate Professor — 2022-Present
- Assistant Professor — 2016-2022

University of California at Santa Barbara — Santa Barbara, California
- RTG Visiting Assistant Professor — July 2013-July 2016

Education

University of Texas at Austin — Austin, Texas
- Ph.D., Mathematics — May 2013
  Thesis: *Flexibility and Rigidity of Three-Dimensional Convex Projective Structures.*
  Advisor: Alan Reid
- M.A., Mathematics — May 2011

Emory University — Atlanta, Georgia
- B.S. Mathematics., *Summa cum Laude* — May 2007
  Thesis: *Geometrically Finite Fuchsian Groups and the Patterson-Sullivan Measure.*
  Advisor: David Borthwick

Research Interests

Low-dimensional topology, hyperbolic geometry, real projective geometry, discrete groups, deformation theory, higher Teichmüller theory.

Publications and Preprints

- *On the existence of Parseval frames for vector bundles*
  (with T. Needham and C. Shonkwiler), Trans. Amer. Math. Soc. Ser. B 12 (2025), 395-416

- *Tame and relatively elliptic $\mathbb{CP}^1$-structures on the thrice punctured sphere*
  (with P. Bowers, A. Casella, and L. Ruffoni), Alg. Geom. Top. 24-8 (2024), 4589-4650

- *The moduli space of marked generalized cusps in real projective manifolds*
  (with D. Cooper and A. Leitner), Conf. Geom. & Dyn. vol 26 (2022), 111-164

- *Gluing equations for real projective structures on 3-manifolds*
  (with A. Casella), Geom. Dedicata 215 (2021) 69-131.

- *Thin subgroups isomorphic to Gromov–Piatetski-Shapiro lattices*
  Pacific J. Math. 309 (2020), no 2, 257–266.

- *Constructing thin subgroups of $\mathrm{SL}(n+1,\mathbb{R})$ via bending*
  (with D.D. Long), Algebr. Geom. Topol. 20-4 (2020), 2071–2093

- *Constructing convex projective 3-manifolds with generalized cusps*
  J. London. Math. Soc. 103-4 (2021) 1276–1313.

- *Generalized cusps in real projective manifolds: classification*
  (with D. Cooper and A. Leitner), J. Topol. 13-4 (2020) 1455–1496

- *Properly convex bending of hyperbolic manifolds*
  (with L. Marquis), Groups, Geom, & Dynam 14 (2020), no. 2, 653-688.

- *Convex projective structures on non-hyperbolic 3-manifolds*
  (with J. Danciger and G.S. Lee), Geom. & Topol 22 (2018) 1593–1646.

- *Constructing thin subgroups commensurable with the figure-eight knot group*
  (with D.D. Long), Algebr. Geom. Topol. 15 (2015) no. 5, 3011-3024.

- *Finite volume properly convex deformations of the figure-eight knot*,
  Geom. Dedicata 178 (2015), 49-73.

- *Deformations of non-compact, projective manifolds*,
  Algebr. Geom. Topol. 14 (2014), no. 5, 2595-2625.

In Preparation

- *Convex projective Dehn filling*
  (with J. Danciger, G.S. Lee, and L. Marquis).

Selected Talks

- *Parseval frames on vector bundles*
  Codes and Expansions (CodEx) Seminar, Online seminar   Feb 2024

- *A convex projective Dehn filling theorem*
  AMS Southwest Sectional Meeting, GA Tech   Mar 2023

- *Complex Projective Structures on Surfaces*
  University of Florida, Colloquium   Feb 2022

- *Properly Convex Dehn Fillings*
  Virginia Geometry Seminar   Oct 2021

- *Triangulations in Low Dimensional Geometry and Topology*
  Cal Poly San Luis Obispo, Colloquium   Feb 2021

- *Gluing Equations for Projective Structures on 3-manifolds*
  Oklahoma State University, Topology Seminar   Nov 2020

- *Gluing Equations for Projective Structures on 3-manifolds*
  Trends in Low Dimensional Topology, Online Seminar   Jun 2020

- *Gluing Equations for Projective Structures on 3-manifolds*[*]
  Oklahoma State University, Topology Seminar   Apr 2020

- *Gluing Equations for Projective Structures on 3-manifolds*[*]
  AMS Sectional Meeting, Special Session on Trends in Teichmüller Theory   Mar 2020

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[*]Cancelled due to COVID-19 pandemic

- *Gluing Equations for Projective Structures on 3-manifolds*
  FRG Workshop, University of Michigan   Dec 2019

- *Gluing Equations for Projective Structures on 3-manifolds*
  Geometry Seminar
  Stanford University   Mar 2019

- *Thin Groups via Bending*
  Topology Seminar
  Rice University   Feb 2019

- *Thin Groups from Projective Geometry*
  Thin Groups in Number Theory, Geometry and Topology
  Rice University   May 2018

- *Convex Projective Structures in Low Dimensions*
  University of Georgia, Topology Seminar   April 2018

- *Generalized Cusps in Convex Projective Manifolds*
  GEAR Retreat, Stanford University   August 2017

- *Generalized Cusps in Convex Projective Manifolds*
  Dynamics on Character Varieties Workshop, University of Rennes I   June 2017

- *Rank 1 Deformations of Non-cocompact Hyperbolic Lattices*
  University of Texas Topology Seminar   March 2017

- *Geometric Structures on Manifolds*
  UF/FSU Topology and Dynamics Meeting
  University of Florida   February 2017

- *Classification of Generalized Cusps*
  Joint Mathematics Meetings, Special Session on Group Actions and Geometric Structures,
  Atlanta, GA   January 2017

- *Classification of Generalized Cusps*
  California Institute of Technology, Geometry and Topology Seminar   April 2016

- *Geometric Structures on Manifolds*
  Mathematics Colloquium
  Florida State University   January 2016

- *Gluing Convex Projective Manifolds*
  Higher Teichmuler theory and Higgs bundles: interactions and new trends
  Heidelberg   November 2015

- *Convex Projective Structures on Manifolds*
  A Mini Course at Workshop on Geometric Structures
  KIAS, Seoul, South Korea   November 2014

- *Geometry of Cusps in Convex Projective Manifolds*
  Workshop on Geometry and Physics, Univeristy of Pittsburgh   May 2014

- *Geometry of Cusps in Convex Projective Manifolds*
  RTG Workshop on Geometric Structures and Discrete Groups, UT Austin May 2014

- *A Geometric Description of (P)SL$_4$(ℝ) Hitchin Representations*
  Workshop on Higher Teichmüller-Thurston Theory, Northport, Maine   June 2013

- *Convex Projective Structures on Non-compact 3-manifolds*
  California Institute of Technology, Geometry and Topology Seminar   May 2013

- *Convex Projective Deformations of the Figure-8 Knot Complement*
  AMS Special Session on Algebraic and Geometric Structures of 3-manifolds   April 2013

- *Convex Projective Deformations of Non-Compact Manifolds*
  Arizona State University Differential Geometry Seminar   January 2013

- *Convex Projective Deformations of Non-Compact Manifolds*
  Purdue University Geometric Analysis Seminar   January 2013

- *Convex Projective Structures on 3-manifolds*
  University of California at Santa Barbara Topology Seminar   October 2012

- *Twisted Cohomology and Deformation Theory*
  GEAR Junior Retreat, Urbana, Illinois   July 2012

Teaching Experience

Florida State University

- MAC 2313 *Calculus III*   Spring 2025
- MGF 3301 *Intro to Advanced Math*   Fall 2024
- MTG 5932 *Lie groups*   Summer 2024
- MAS 5932 *Arithmetic groups*   Spring 2024
- MAA 4402 *Complex Variables*   Summer 2023
- MAC 2313 *Calculus III*   Spring 2023
- MTG 5327 *Topology II*   Spring 2023
- MTG 4212, *College Geometry*   Fall 2022
- MTG 5326 Graduate Topology I   Fall 2022
- *MTG 5932, Differential Geometry of Principal Bundles*   Spring 2022
- *MAD 3105, Discrete Math II*   Spring 2022
- *MAC 2313, Calculus III*   Fall 2021
- *MTG 5932, Geometric Structures on Manifolds*   Spring 2021
- *MAD 3105, Discrete Math II*   Fall 2020
- *MAC 2312, Calculus II*   Spring 2020
- *MAC 2313, Calculus III*   Fall 2019
- *MAC 2312, Calculus II*   Spring 2019
- *MTG 5327, Graduate Topology II*   Spring 2019
- *MAC 2313, Calculus III*   Fall 2018
- *MTG 5326, Graduate Topology I*   Fall 2018
- *MAP 2303, ODEs*   Spring 2018
- *MAC 2312, Calculus II*   Spring 2017
- *MAC 2313, Calculus III*   Fall 2016

University of California, Santa Barbara

- *Math 260P, Projective Structures on Manifolds*   Spring 2016
- *Math 108A, Introduction to Linear Algebra*   Fall 2015
- *Math 8, Transition to Higher Mathematics*   Fall 2015

- *Math 260P, The Casson Invariant*   Spring 2015
- *Math 6A, Vector Calculus*   Winter 2015
- *Math 108A, Introduction to Linear Algebra*   Fall 2014
- *Math 260P, Representations of Surface Groups*   Spring 2014
- *Math 8, Transition to Higher Mathematics*   Winter 2014
- *Math 103, Introduction to Group Theory*   Fall 2013

Mentorship

Ph.D. Students

- Jared Miller   2024
- Ferhat Karabatman (joint with T. Needham)   Current

Faculty

- Oishee Banerjee (teaching mentor)   2023-Present
- Ali Kara (teaching mentor)   2024-Present

Postdocs

- Brandon Doherty (teaching mentor)
- Florian Stecker (supervisor)   2022-Present
- Eunjung Noh (teaching mentor)   2021-2023
- Ignat Soroko (teaching mentor)   2021-2022
- Alex Casella (supervisor)   2018-2021

Ph.D. Committee Member

- Theodore Weisman (advisor Jeffrey Danciger, University of Texas at Austin)
- Paul Eugenio (advisor Oskar Vafek, Physics)
- Anindya Chanda (advisor Sergio Fenley)
- Aamir Rasheed (advisor Wolfgang Heil)
- Jay Leach (advisor Kathleen Petersen)
- Opal Graham (advisor Phil Bowers)
- John Bergschneider (advisor Wolfgang Heil)
- Leona Sparaco (advisor Kathleen Petersen)

Honors in the Major

- Jessica Bellaire (supervisor)   2024

Independent Study

- Jessica Bellaire (2022, undergraduate, mathematics of Euler disks)
- Daniel Hartman (2018, graduate student, geometric structures and characteristic classes)
- Jose Bousa (2017, undergraduate, projective geometry)

Funding and Awards

Grants Awarded

- Committee on Faculty Research Support award, Council for Research and Creativity (COFRS), Florida State University, $20,000, Summer 2022.

- Supplement to DMS 1709097, $27,483, 2021-2023.

- NSF research grant DMS 1709097- *Geometry and topology of convex projective manifolds*, $139,278, 2017-2021

- First Year Assistant Professor Award, Council for Research and Creativity, Florida State University, $20,000, Summer 2017

Conferences and Workshops

- AMS Special Session
  AMS Southeastern sectional meeting
  Florida State University   Mar 2024
- UF/FSU Topology and Geometry meeting
  Florida State University   Nov 2023
- AMS Special Session
  AMS Southeastern sectional meeting
  University of Florida   Nov 2019
- UF/FSU Topology and Geometry meeting
  Florida State University   Feb 2019
- GEAR network junior retreat
  Stanford University   July 2017

Departmental Service

- Director of Pure Mathematics   2023-Present
- Faculty Evaluation Committee   2023-Present
- Algebra Tenure Track Hiring Committee   2022-23
- Geometry/Topology Tenure Track Hiring Committee   2021-22
- Organized Job Application Workshop   2019
- Library Committee   2018-22
- Organizer (Topology seminar)   2018-2024

University Service

- Faculty Senator   2021-Present

Professional Service

- Journal Referee
  - *Journal of Differential Geometry*
  - *Transactions of the AMS*
  - *Publications Mathématiques de l'IHES*
  - *International Mathematics Research Notices*
  - *Journal of the London Mathematical Society*
  - *Algebraic and Geometric Topology*
  - *Geometriae Dedicata*

- *Pacific Journal of Mathematics*
- *Proceedings of the AMS*
- Reviewer for Mathematical Reviews   2014-Present
- Judge for Capital Regional Science and Engineering Fair   2017, 2019, 2024

Honors, Awards, and Fellowships

- Research Training Grant Postdoc, UC Santa Barbara   2013-2016
- Research Training Grant Fellowship, UT Austin   2011-2012
- Deborah Jackson Award recipient, Emory University   2007

Professional Memberships and Associations

- Member of the American Mathematical Society (AMS)   2007-present.

Last updated Jan 24, 2025