Joe Jackson

Google Scholar | website | email

Academic Positions

Dickson Instructor, The University of Chicago, Department of Mathematics — Sep. 2023 – present

Education

The University of Texas at Austin, PhD in Mathematics — Sep. 2018 – Aug. 2023

Swarthmore College, BA in Mathematics — Sep. 2014 – May 2018

Awards and Funding

NSF Mathematical Sciences Postdoctoral Research Fellowship — Sep. 2023 – Aug. 2026
three-year postdoctoral fellowship awarded by the National Science Foundation

NSF Graduate Research Fellowship Program — Sep. 2020 – Aug. 2023
three-year graduate student fellowship awarded by the National Science Foundation

Frank Gerth III Outstanding Dissertation Award (UT Austin) — May 2024
awarded to roughly 5 graduating math PhD students per year

Frank Gerth III Graduate Excellence Award (UT Austin) — May 2020
awarded to roughly 3 math PhD students/year based on preliminary courses and exams

Research

I am interested in probability, partial differential equations, optimal control, and game theory. Much of my recent work is related to weakly interacting particle systems, mean field control, and mean field games.

Preprints

1. *A selection principle for submodular potential mean field games*
   with Samuel Daudin and Benjamin Seeger
   in preparation, preliminary version available at www.jjacksonmath.com/research/
2. *Uniform in time weak convergence for a Fleming-Viot particle system with hard killing*
   with Pierre Cardaliaguet, Marco Cirant, and Panagiotis E. Souganidis
   arXiv:2609.22561
3. *The mean-field limit of online stochastic vector balancing*
   with Christian Fiedler, Daniel Lacker, and Jonathan Niles-Weed
   arXiv:2605.14149
4. *Unconditional well-posedness of the master equation for monotone mean field games of controls*
   with Álpar Mészáros
   arXiv:2601.22845
5. *Quantitative convergence for displacement monotone mean field games of controls*
   with Álpar Mészáros
   arXiv:2507.17014

Papers under revision

6. *A non-asymptotic approach to stochastic differential games with many players under semi-monotonicity*
   with Marco Cirant and Davide Francesco Redaelli
   arXiv:2505.01526, revision submitted to **Probability Theory and Related Fields**

Published or accepted papers

7. *Mean field control with stopping*

with Pierre Cardaliaguet and Panagiotis E. Souganidis
arXiv:2603.21204, to appear in **Journal de Mathématiques Pures et Appliquées**

8. *Error estimates for finite-dimensional approximations of HJB equations on the Wasserstein space*
with Samuel Daudin and Benjamin Seeger
arXiv:2510.02652, to appear in **Annals of Applied Probability**

9. *Mean field control with absorption*
with Pierre Cardaliaguet and Panagiotis E. Souganidis
Mathematics of Operations Research 2026, DOI: 10.1287/moor.2025.1233

10. *Quantitative convergence for mean field control with common noise and degenerate idiosyncratic noise*
with Alekos Cecchin, Samuel Daudin, and Mattia Martini
Electronic Journal of Probability 2025, DOI: 10.1214/25-EJP1435

11. *Sharp convergence rates for mean field control in the region of strong regularity*
with Pierre Cardaliaguet, Nikiforos Mimikos-Stamatopoulos, and Panagiotis E. Souganidis
Annals of Probability 2026, DOI: 10.1214/25-AOP1793

12. *Well-posedness of HJ equations in the Wasserstein space: non-convex Hamiltonians and common noise*
with Samuel Daudin and Benjamin Seeger
Communications in Partial Differential Equations 2025, DOI: 10.1080/03605302.2024.2432678

13. *Concentration bounds for stochastic systems with singular kernels*
with Antonios Zitridis
Proceedings of the AMS 2025, DOI: 10.1090/proc/17160

14. *On the optimal rate for the convergence problem in mean field control*
with Samuel Daudin and François Delarue
Journal of Functional Analysis 2024, DOI: 10.1016/j.jfa.2024.110660

15. *Quantitative convergence for displacement monotone mean field games with controlled volatility*
with Ludovic Tangpi
Mathematics of Operations Research 2024, DOI: 10.1287/moor.2023.0106

16. *Approximately optimal distributed stochastic control beyond the mean field setting*
with Daniel Lacker
Annals of Applied Probability 2025, DOI: 10.1214/24-AAP2114

17. *An algebraic convergence rate for the optimal control of McKean-Vlasov dynamics*
with Pierre Cardaliaguet, Samuel Daudin, and Panagiotis E. Souganidis
SIAM Journal on Control and Optimization 2023, DOI: 10.1137/22M1486789

18. *On quasilinear parabolic systems and FBSDEs of quadratic growth*
Annals of Applied Probability 2024, DOI: 10.1214/23-AAP1966

19. *The reverse Hölder inequality for matrix-valued stochastic exponentials and applications to quadratic BSDE systems*
Stochastic Processes and their Applications 2023, DOI: 10.1016/j.spa.2023.02.011

20. *Global existence for quadratic FBSDE systems and application to stochastic differential games*
Electronic Communications in Probability 2023, DOI: 10.1214/23-ECP513

21. *A new monotonicity condition for ergodic BSDEs and ergodic control with super-quadratic Hamiltonians*
with Gechun Liang
SIAM Journal on Control and Optimization 2023, DOI: 10.1137/21M1460958

22. *Existence and uniqueness for non-Markovian triangular quadratic BSDEs*
with Gordan Žitković
SIAM Journal on Control and Optimization 2022, DOI: 10.1137/21M1435689

23. *A characterization of solutions of quadratic BSDEs and a new approach to existence*
with Gordan Žitković
Stochastic Processes and their Applications 2022, DOI: 10.1016/j.spa.2022.01.006

24. *On the Speed of an Excited Asymmetric Random Walk* (REU paper, supervised by Jonathon Peterson)
with Mike Cinkoske and Claire Plunkett
Rose-Hulman Undergraduate Mathematics Journal 2018

Invited Presentations

Conferences and workshops

- 20 Years of Mean Field Games | Chicago, IL | Feb. 2027
- AMS Western Sectional | Tempe, AZ | Nov. 2026
- SIAM Conference on Partial Differential Equations | Pittsburgh, PA | Nov. 2025
- SIAM Conference on Control and its Applications | Montreal, Canada | Aug. 2025
- SIAM Conference on Financial Mathematics and Engineering | Miami, FL | Jul. 2025
- 2025 Durham Symposium on Mean Field Games | Durham University, United Kingdom | Mar. 2025
- SIAM Annual Meeting | Spokane, WA | Jul. 2024
- Mean Field models in Optimal Control and Multi-Agent Dynamics | Varese, Italy | Jun. 2024
- 10th International Congress on Industrial and Applied Mathematics | Tokyo, Japan | Aug. 2023
- IMSI Distributed Solutions to Complex Societal Problems Reunion Workshop | Chicago, IL | Feb. 2023
- Mean Field Games and Applications | Paris, France | Dec. 2022
- IMSI Summer School on "Introduction to Decision-Making and Uncertainty" | online | Jul. 2021
- Western Conference on Mathematical Finance | online | Jan. 2021

Seminar talks

- USC Mathematical Finance Seminar | Nov. 2026
- Columbia University Applied Probability Seminar | Feb. 2026
- NYU Tandon School of Engineering, Finance and Risk Engineering seminar | Sep. 2025
- Université Paris Cité probability seminar | Jun. 2025
- University of Padova joint probability and analysis seminar | Jun. 2025
- UW Madison PDE and Geometric Analysis seminar | Apr. 2025
- UNC Department of Statistics and Operations Research IDEAS Seminar | Apr. 2025
- Princeton ORFE Financial Mathematics Seminar | Sep. 2024
- Berkeley IEOR Seminar | Sep. 2024
- Durham University Analysis Seminar | Sep. 2024
- Illinois Institute of Technology, Stochastic Analysis and Mathematical Finance Seminar | Feb. 2024
- Purdue University Probability Seminar | Nov. 2023
- Duke University Probability Seminar | Nov. 2023
- USC Mathematical Finance Seminar | Oct. 2023
- Georgia Tech PDE Seminar | Oct. 2023
- CMU Probability and Mathematical Finance Seminar | Oct. 2023
- Durham University Analysis Seminar | Sep. 2023
- London School of Economics Stochastics and Financial Mathematics Seminar | Oct. 2022
- Imperial College London Finance and Stochastics Seminar | Oct. 2022
- Columbia University Mathematical Finance Seminar | Sep. 2022

Teaching and Mentoring

Instructor, The University of Chicago

Analysis in $\mathbb{R}^n$ *I* (two sections), autumn quarter 2026
Analysis in $\mathbb{R}^n$ *I* (two sections), autumn quarter 2025
Accelerated Analysis in $\mathbb{R}^n$ *II*, winter quarter 2025

Teaching Assistant, The University of Texas at Austin

Probability I, fall 2019
Calculus for Science, fall 2018

REU mentor, The University of Chicago
supervised 8 summer reading projects during the summers of 2024, 2025, and 2026

DRP mentor, The University of Chicago

served as a mentor for 6 independent study projects as part of the U Chicago Directed Reading Program

Sunday Morning Math Group Volunteer, The University of Texas at Austin

worked with local elementary and middle school students as part of the Sunday Morning Math Group (SMMG) at UT Austin from 2019 - 2023

DRP mentor and organizer, The University of Texas at Austin

mentored 5 students as part of the UT Austin Directed Reading program, and served as an organizer spring 2021 to spring 2022

Analysis and Probability Prelim Bootcamp Leader, The University of Texas at Austin

led "bootcamps" in summer 2020 and 2021 to help beginning graduate students prepare for preliminary exams

Volunteer, Lehman High School

volunteered through UT Austin's UTeach program at Lehman High School (in the Austin area) to give several presentations and work with students in small groups on sample AP exam questions

Service

Referee report or quick opinions for the journals:

- Courant Journal of Pure and Applied Mathematics
- Communications on Pure and Applied Mathematics
- Probability Theory and Related Fields
- Annals of Probability
- Journal de Mathématiques Pures et Appliquées $(\times 2)$
- Annals of Applied Probability $(\times 4)$
- Journal of Functional Analysis $(\times 2)$
- Communications in Partial Differential Equations
- SIAM Journal of Mathematical Analysis
- SIAM Journal on Control and Optimization $(\times 2)$
- Mathematics of Operations Research
- Numerical Algebra Control and Optimization
- Mathematics and Financial Economics
- Dynamic Games and Applications
- Applied Mathematics and Optimization $(\times 2)$

- ESAIM: Control, Optimisation and Calculus of Variations

Referee for the thesis of Davide F. Redaelli at the University of Padua.

Organizer of the U Chicago Probability Seminar, fall 2026

Organizer of the Junior Probability seminar at UT Austin, fall 2020 - spring 2022