

## BEN BURNS

email: [bburns46@gatech.edu](mailto:bburns46@gatech.edu)

website: [bburns.xyz](http://bburns.xyz)

github: [github.com/bburns-ds](https://github.com/bburns-ds)

### Interests

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Mathematics of machine learning, generative modeling, data assimilation, reduced-order modeling

### Education

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**Georgia Institute of Technology** 08/2024 - Present

Ph.D. in Computational Science and Engineering, *Expected 2029*.

Advisor: Peng Chen

**University of Massachusetts Amherst** 06/2020 - 05/2024

B.S. in Mathematics, B.A. in Computer Science.

*summa cum laude, honors with greatest distinction.*

Thesis: *A mean-field games approach to score-based generative modeling*

Advisors: Markos Katsoulakis and Benjamin J. Zhang

### Current Projects

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**Partial differential equation perspectives on score-based generative modeling** 2024

with Markos Katsoulakis and Benjamin J. Zhang (in preparation).

### Research Experience

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**SciML & UQ Group, Georgia Tech** 08/2024 - Present

Research Assistant. Supervised by Professor Peng Chen.

**Dynamic and Autonomous Robotic Systems Group, UMass Amherst** 09/2022 - 05/2024

Undergraduate Research Assistant. Supervised by Professor Donghyun Kim.

**REU in Mathematics, UMass Amherst** 06/2023 - 08/2023

Studied connections between diffusion-based generative models and mean field games.

Supervised by Professor Markos Katsoulakis and Dr. Benjamin J. Zhang.

**REU in Mathematics, UMass Amherst** 05/2022 - 08/2022

Studied geometry and topology of 4-manifolds and related mapping class groups.

Supervised by Professor R. İnanç Baykur.

**Air Traffic Systems Group, Noblis** 2021 - 2022

Research Intern. Supervised by Dr. Scott James.

### Selected Presentations and Posters

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**A mean-field games approach to score-based generative modeling** 06/2024

Canadian Applied and Industrial Mathematics Society (CAIMS) 2024 Annual Meeting

**A mean-field games approach to score-based generative modeling** 04/2024

Massachusetts Undergraduate Research Conference

**Why to learn diffusion models in the latent space** 04/2024

CS Theory Seminar, UMass Amherst

<b>Mean-field games for generative modeling</b> CS Theory Seminar, UMass Amherst	11/2023
<b>Score-based generative modeling with Hamilton-Jacobi-Bellman regularizers</b> Learning Learning Seminar, UMass Amherst	08/2023
<b>Introduction to topological data analysis</b> CS Theory Seminar, UMass Amherst	08/2022

## Scholarships, Grants, and Awards

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<b>Lifetime Undergraduate Course Assistant Award</b>	2024
<b>Commonwealth Honors College Research Grant</b>	2023
<b>Sheila R. Flynn Research Scholarship</b>	2023
<b>Berthiaume Innovation Challenge Winner</b>	2022

## Teaching

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<b>Undergraduate Course Assistant (UCA), UMass Amherst CICS</b> 10 semesters of experience in Intro to Programming, Algorithms, and Formal Language Theory. Graded assignments, hosted office hours, assisted recitation, and monitored forum. Recognized as Outstanding UCA four times, and honored with inaugural Lifetime UCA Award.	02/2021 - 05/2024
<b>Head Undergraduate Course Assistant, UMass Amherst CICS</b> Managed logistics for courses with 20+ staff and 300+ students. Ran staff meetings, designed homework and labs, hosted recitation and review sessions, and proctored exams.	09/2022 - 02/2024
<b>Grader, UMass Amherst Math &amp; Stats Dept.</b> Graded homework for Math 471: Number Theory.	09/2022 - 12/2022

## Service

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<b>UCA Program Coordinator, UMass Amherst CICS</b> Interviewed, hired and trained prospective undergraduate course assistants for all core CICS courses.	11/2022 - 05/2024
<b>UMassCTF Organizer, UMass Cybersecurity Club</b>	05/2024
<b>SIAM Chapter, UMass Amherst Math &amp; Stats Dept.</b> Helped initialize UMass student SIAM chapter and organized inaugural SIAM seminar	09/2023 - 05/2024
<b>HackUMass XI Organizer</b>	04/2023 - 11/2023
<b>New Voices Lead Peer Mentor, UMass Amherst CICS</b> Mentored cohort of 5 freshman students from underrepresented groups in computer science	09/2022 - 05/2023

## Workshops attended

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1. Reduced Order Modeling and Machine Learning for Large Eddy Simulation and Related Topics, Emory University, Oct 13-15, 2024.
2. Queen's University Mathematics Summer School, Queen's University, Jun 17-21, 2024.
3. Dartmouth Scholar's Program, Dartmouth College, Oct 12-15, 2023.