Matthew Kowalski

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Education

University of California, Los Angeles — *Los Angeles, CA*

Ph.D. Mathematics — *August 2021 - Present*

M.A. Mathematics — *August 2021 - December 2022*

- Focused areas of study: dispersive PDEs, completely integrable systems, and harmonic analysis

Michigan State University — *East Lansing, MI*

B.S. Advanced Mathematics — *August 2017 - May 2021*

B.S. Physics — *August 2017 - May 2021*

B.S. Computational Mathematics — *August 2017 - May 2021*

- Minor in Computer Science, Honors College, graduated with high honors

Research

Graduate Student Researcher — *University of California, Los Angeles*

Under supervision of Monica Vişan and Rowan Killip — *Spring 2023 - Present*

- Focus: dispersive partial differential equations, completely integrable systems, and harmonic analysis
  Currently investigating dispersive decay for a variety of dispersive and completely integrable PDEs.

Professorial Assistant — *IceCube Neutrino Observatory*

Under Supervision of Tyce DeYoung — *Fall 2017 - Spring 2021*

- Focus: experimental particle astrophyics, computational simulation
  Created a simulation of photons scattering within ice to correct approximations used in IceCube's detector model.

Publications/Preprints

Turbulent threshold for continuum Calogero-Moser models — *arXiv preprint*

James Hogan, Matthew Kowalski — *January 2024*

Abstract. We determine the sharp mass threshold for Sobolev norm growth for the focusing continuum Calogero–Moser model. It is known that below the mass of 2π, solutions to this completely integrable model enjoy uniform-in-time H^s bounds for all $s \geq 0$. In contrast, we show that for arbitrarily small $\varepsilon > 0$ there exists initial data $u_0 \in H^\infty_+$ of mass $2\pi + \varepsilon$ such that the corresponding maximal lifespan solution $u : (T_-, T_+) \times \mathbb{R} \to \mathbb{C}$ satisfies $\lim_{t \to T_\pm} \|u(t)\|_{H^s} = \infty$ for all $s > 0$. As part of our proof, we demonstrate an orbital stability statement for the soliton and a dispersive decay bound for solutions with suitable initial data.

Presentations

Dispersive decay for energy-critical NLS

UCLA Participating Anaylsis Seminar — *May 2024*

Turbulent threshold and dispersive decay for continuum Calogero-Moser models

Special Session on Nonlinear Hamiltonian PDEs - 2024 Spring Eastern Sectional Meeting — *April 2024*

Continuum Calogero-Moser models

UCLA Participating Analysis Seminar — *February 2024*

How Shor factors 21

Graduate Student Organization Weekly Seminar — *November 2023*

Sobolev growth of N-solitons for CM-DNLS

UCLA Participating Analysis Seminar — *November 2023*

Undergraduate Mentoring

University of California - Los Angeles

Departmental Reading Program Mentor — *January 2024 - Present*

- Fourier analysis and split-step methods for cubic NLS — Shawn Mosharaf — *Winter 2024*
- TBD — Shawn Mosharaf — *Spring 2024*

Teaching

University of California - Los Angeles

Teaching Fellow — *September 2021 - Present*

- Linear Algebra — Math 115A — *Spring 2024 + Fall 2023 + Spring 2023*
- Differential Equations — Math 33B — *Spring 2024 + Winter 2023 + Spring 2022*
- Ordinary Differential Equations —Math 135 — *Winter 2024*
- Linear and Nonlinear Systems of Differential Equations — Math 134 — *Fall 2023*
- Differential and Integral Calculus, Integration and Infinite Series — Math 31AB — *Spring 2023 + Fall 2022 + Fall 2021*
- Calculus of Several Variables —Math 32B — *Winter 2023 + Winter 2022*
- Complex Analysis for Applications — Math 132 — *Fall 2022 + Summer 2022*

Michigan State University

Undergraduate Learning Assistant — *August 2017 - May 2019*

- Physics for Scientists and Engineers II — Physics 184 — *Spring 2019*
- Introductory Physics I/II —Physics 231/232C — *Spring 2018 + Fall 2017*

Honors and Awards

June 2022 **Summer Mentored Research Fellowship**, *UCLA*

May 2021 **Board of Trustees Award**, *Mich. State Univ.*

April 2020 **Dr. Marshall and Barbara Hestenes Endowed Scholarship Award**, *Mich. State Univ.*