Ivan Casas-Rocha

ivanpedrocr.com   casas061@umn.edu

Education

University of Minnesota	**2025 − 2030**
Ph.D. in Mathematics	

University of Central Florida	**2022 − 2025**
B.S. in Mathematics with Honors, UCF GPA 4.00	

Relevant Coursework

Probability Theory: Measure Theoretic Probability (Graduate), Stochastic Calculus for Finance (self-study Shreve book II), Probability and Random Processes

Analysis & PDEs: Real Analysis (Graduate), Differential Geometry (Graduate), Functional Analysis (self-study Functional Analysis by Haïm Brézis), Partial Differential Equations, Fourier Analysis

Discrete Mathematics: Graph Theory, Combinatorics, Data Structures and Algorithms, Linear Algebra

Research

Honors Undergraduate Thesis on the Nonlinear Schrödinger Equation (NLS)	**2024 − 2025**
Real and Complex Analysis, PDEs, MATLAB, C	*Dr. Robert Jenkins*

- Develop the theory and mathematical solution of the Inverse Scattering Transform and Dressing Method for solving NLS.
- Implementation of the Dressing Method in C using the GNU MPFR, an arbitrary-precision computation library, for computing multi-soliton solutions to the NLS equation. Computed hundreds of samples of 100-soliton solutions using a Macbook Air which have previously been computed using supercomputers.
- Used MATLAB to analyze the statistical properties of these samples as a model for nonlinear random waves.

thesis | code

Directed Research on (K_3, K_5)-co-critical graphs and Ramsey minimal graphs	**2023–2024**
Graph Theory, Combinatorics	*Dr. Zi-Xia Song*

- Worked on extending our previous work on the minimum degree of (K_3, K_4)-co-critical graphs to (K_3, K_5)-co-critical graphs.
- Gave five one-hour presentations at the UCF Discrete Mathematics Seminar on results in Ramsey-minimal graphs and co-critical graphs by mathematicians such as Paul Erdős, László Lovász, and Jacob Fox.

The Minimum Degree of (K_s, K_t)-co-critical graphs	**2023**
Graph theory, Combinatorics	*Dr. Zi-Xia Song, Benjamin Snyder*

- Attained a sharp lower bound on the minimum degree of (K_3, K_4)-co-critical graphs and proved a general lower bound for all (K_s, K_t)-co-critical graphs, extending a result of Galluccio, Simonovits, and Simonyi.
- Presented at the Mathematics Association of America Suncoast 45th Regional Meeting and the UCF 2024 Student Scholar Symposium. Paper is submitted to the Journal of Graph Theory.

Work Experience

TA for MAD 4203 and MAD 4301 (Combinatorics and Graph Theory)	**2024-2025**
Graph Theory, Combinatorics, Teaching	*Dr. Zi-Xia Song, Dr. Yue Zhao*

Held office hours twice a week, answered questions and taught topics on combinatorics and graph theory at UCF.

Undergraduate Learning Assistant for Ordinary Differential Equations I	**2023**
Ordinary Differential Equations	

Junior Software Developer	**2021-2022**
JavaScript, SQL, Data Analytics, React, Python, pandas	

Lead developer of eCGlobal's data analytics team. Implemented dozens of dashboards with interactive filters, sorting, visualizations, etc., to allow clients such as Heineken, Unilever, Itau Bank, and Diageo, to draw insightful market research conclusions about consumer demographics, opinions, and other KPIs.

Papers, Conferences, and Awards

- GAANN Fellowship from the Department of Mathematics of the University of Minnesota
- The Minimum Degree of (K_s, K_t)-co-critical graphs, B. Snyder, Z. Song, Submitted to Journal of Graph Theory. arXiv
- Presenter, Mathematics Association of America (MAA) Suncoast 45th Regional Meeting, 2024. slides
- Poster presentations at UCF Student Scholar Symposiums 2024, 2025.
- Atlanta Lecture Series in Graph Theory and Combinatorics XXVIII, Georgia Tech. March 2024