XINCHEN HUA

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Github ⋄ Linkedin

EDUCATION

University of Chicago, Chicago, Illnois *Sep 2023 - Current*
M.S. in Computational and Applied Mathematics (MCAM)
PhD qualify courses: Functional Analysis, Variation Method, Partial Differential Equations, Real and Complex Analysis (Qualify Exam), Dynamic System, Differential Manifold, Fourier Analysis, Topological Insulator, Stochastic Process and Brown Motion, Probability Measure.

Rutgers University, New Brunswick, New Jersey *Sep 2021 – Aug 2023*
B.A. in Mathematics (Honors)
Minor in Economics
Major GPA: 3.92/4.0
Cumulative GPA: 3.63/4.0
Relevant coursework: Abstract Algebra, Linear Algebra, Real and Complex Analysis, Probability Theory, Partial Differential Equations, Ordinary Differential Equation, Linear Optimization, Topology, Fourier Analysis, Intro to Differential Geometry.

RESEARCH INTERESTS

I am interested in partial differential equations, especially those arising from physical and geometric backgrounds.

RESEARCH EXPERIENCE

The University of Chicago May 2024 – Now
Master Thesis Chicago, IL, USA

- Under the supervision of Professor Guillaume Bal at the University of Chicago, I worked on the master thesis, Dirac and Schrödinger Equations with cubic nonlinearities.
- Conducted the existence and uniqueness of the solution to n-dimensional Schrödinger operators with compact, bounded, and smooth perturbations applying on the particles in R^n space by the contraction mapping theroem with different topologies such as $\mathbf{L}^\infty$, weighted-$\mathbf{L}^p$, $\mathbf{S}(\mathbf{R}^n)$.
- Genrealized the Green's functions for Schrödinger Equation in the form of Hunkel function. Resolved the regularity issues for $\frac{1}{r}$ in the 2-D Dirac Equation with single domain wall.

Rutgers REU Jul 2023 – Oct 2023
Research Assistant Piscataway, NJ, USA

- Worked with Weihao Zheng on the RISE Reading Program on the book, Lectures on Differential Equations and Differential Geometry, Luis Nirenberg, ISSN: 978-7-04-050302-9
- Conducted materials on Maximal Principle, Perron method for the Dirichlet problem and Schauder estimates with interior estimates on strong Barrier problems and general boundary value problems.
- Conducted materials on classic differential geometry topics including Hadamard's principle, Asymptotic coordinates in small balls, and Hilbert's theorem on hyperbolic surfaces (negative Gauss curvature), which resulted in presentation.

Rutgers RISE Dec 2022 – May 2023
Research Assistant Piscataway, NJ, USA

- Under supervision of Professor William Yun Chen at Rutgers Math Department, worked on the topics with Plane Curve and Contact Geometry.
- Conducted materials include an example of a contactomorphism between two different 3-manifolds and an example of an algorithmic way of obtaining the conormal knot of a given plane curve and explained Legendrian isotopy and the Legendrian invariants $J_1(S^1)$.
- Showed some properties of the invariants for the conormal knot of plane curves and how dangerous self-tangency during the regular homotopy process affects the invariants.

Hopssen Group (H.K.) Limited May 2022 - Jul 2022
Artificial Intelligence Algorithm Analysis Intern Hong Kong, China

- Utilized the Topological Data Analysis (TDA) tool and Persistent Ontology to extract valuable information from high-dimensional sparse data.
- Reconstructed and visualized three-dimensional point cloud data without causing information loss during representation learning.
- Participated in developing a topology optimization algorithm for a composite swing arm mechanical structure using a non-oscillatory interpolation algorithm.

PUBLICATIONS AND PROJECTS

- Xinchen Hua. "Dirac and Schrödinger Equations with Cubic Nonlinearities (Master thesis Continuing)." 2024.
- Xinchen Hua. "Relax Functional with Mild Purtabations (Variation Method)." 2024.
- Xinchen Hua. "Plane Curve and Contact Geometry. (Undergrad thesis)." 2023.
- Xinchen Hua. Will Bitcoin Become Currency." *International Journal of Education and Technology*, 2020. ISSN: 2709-4278.
- Xinchen Hua. "Geometry and Topology Qualify Exam Guideline." 2024.
- Xinchen Hua, Bingheng Yang. "Remarks on Proof of Homoclinic Bifurcation Theorem. (Dynamic System)" 2023.
- Xinchen Hua. "Fourier Analysis and Its Applications (Summer REU)." 2024.

ACHIEVEMENTS

RISE Program Scholar *Summer 2023*

DRP Program Scholar *Summer 2023*

William Lowell Putnam Mathematical Competition Candidate *Fall 2022*

BISU NEU Program Scholar *Spring 2020*

SKILLS/HOBBIES

Programming Languages	Python, Mathematica, SQL, MATLAB, HTML
Machine Learning Tools	Pytorch, Tensorflow, Sklearn, Pandas, Numpy
Databases	MySQL, Oracle
Topological Data Analysis	TDA
Hobbies	Basketball (National Second Tier Athelete), Football (High School Team Member)
Languages	Chinese (Mandarin): Native English: Advanced French: Upper Intermediate