Christian Koertje

Masters Graduate Student
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Goals/Research Interests

To apply my training in physics and mathematics to real world problems in physical sciences. Also, to continue life-long learning with a PhD and beyond. Research interests include nonlinear dynamics and chaos, complex systems, condensed matter physics, and applied mathematics.

Education

M.S. Systems Science, Binghamton University, SUNY (2023)

Specializations: Complex Systems Modeling and Simulation

Thesis: "Social Nucleation in Opinion Dynamics"

Supervisors: Hiroki Sayama and Sang Won Yoon

B.S. Physics with Honors, University of North Carolina Wilmington (2021)

Awards: Summa Cum Laude

Thesis: "Relativistic Dynamics: A Journey to the Center of a Black Hole"

Supervisor: Russell Herman

B.A. Mathematics, University of North Carolina Wilmington (2021)

Awards: Summa Cum Laude

Senior Project: "Nonlinear Dynamics of the Emden Fowler Equation"

Publications

Submitted

Research Experience

Masters Thesis *In Progress*

Social Nucleation in Opinion Dynamics

Supervisor: Hiroki Sayama

RESEARCH PROJECT ASSISTANT *January 2022 – Present*

DEVS-based Virtual AS-IS Simulation Test Platform (DVAST)

Supervisors: Sang Won Yoon and Bernard Zeigler

RESEARCH PROJECT ASSISTANT *January 2022 – Present*

Simulation Predictive Analytics (SimPA)

Supervisors: Sang Won Yoon and Bernard Zeigler

RESEARCH PROJECT ASSISTANT *August 2021 – December 2021*

Simulation project team member focused on central fill pharmacy automation.

Supervisors: Sang Won Yoon and Soongeol Kwon

HONORS THESIS *August 2020 – May 2021*

"Relativistic Dynamics: A Journey to the Center of a Black Hole"

Supervisor: Russell Herman

Black holes tend to be host myriad interesting problems in general relativity. Here we explored the different regions of spacetime in and around a black hole from a dynamical systems approach. BKL singularity dynamics present the signatures of chaos on the approach to a singularity.

RESEARCH ASSISTANT *January 2020 – May 2020*

Emergent Pattern Formation of Algae in Coral Reef Systems (not published)

Supervisor: Dylan McNamara

Halimeda is a species of algae found in coral reefs to exhibit a hexagonal pattern formation which can be modeled by a reaction-diffusion system and numerically explored. We explored various techniques of nonlinear diffusion in numerical models.

PRESENTATIONS

CONFERENCE TALKS

1. Koertje, C. & Sayama, H. (2022). Stability of opinion formation PDE model based on expanded non-local perception kernel, Northeast Regional Conference on Complex Systems.

AWARDS

1. **Adrian D. Hurst Mathematics Scholarship** (2020)
   Awarded to a rising junior, senior, or graduate student who has declared a major in mathematics or a student in a pre-engineering transfer program and is a full time student at UNCW.

2. **Douglas Smith Scholarship of Mathematics** (2019)
   This scholarship is merit-based and awarded annually to an undergraduate student who has declared a major in the Department of Mathematics and Statistics.

TEACHING EXPERIENCE

Tutoring, University of North Carolina Wilmington (2018 – 2021)

- UNCW University Learning Center as part of the math services. Provided help for students in Math and Physics classes.
- Courses tutored include: Introductory Analysis, Calculus 1 & 2, Multivariable Calculus, Differential Equations and Introductory Physics 1 & 2 (both with and without calculus).

WORKSHOPS ATTENDED

ComSciCon-NY, Cornell University (2022)

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Physics in the Ground Beneath our Feet, Princeton University (2022)

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EXTRACURRICULARS

1. Member of Sigma Pi Sigma, the physics honors society (2019–)
2. Member of Pi Mu Epsilon, the mathematics honors society (2021–)
3. Vice President of the Society of Physics Students at UNCW (2020 – 2021)
4. Member of the Society of Physics Students at UNCW (2019 – 2021)
5. Member of the UNCW Math Club (2018 – 2021)
6. Member of the Society for Industrial and Applied Mathematics (SIAM) (2021–)

REFERENCES

Hiroki Sayama, D.Sc., Binghamton University, SUNY

Position: Professor of Systems Science

Relationship: M.S. Supervisor

Email: sayama@binghamton.edu

Russell L. Herman, Ph.D., University of North Carolina Wilmington

Position: Professor of Physics and Mathematics

Relationship: Mentor and Honors Supervisor

Email: hermanr@uncw.edu

Phone: (910)-962-3722

Dylan McNamara, Ph.D., University of North Carolina Wilmington

Position: Professor of Physics and Physical Oceanography

Relationship: Mentor

Email: mcnamarad@uncw.edu

Phone: (910)-962-2588