Eric Yu

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Education

University of Illinois at Urbana-Champaign — Expected May 2024
BS in Physics, BS in Mathematics
Minor: Computer Science
Unweighted GPA: 3.97/4.0

Grants and Awards

National Center for Supercomputing Applications SPIN Internship ($9600) — Fall 2023
Office of Undergraduate Research Research Support Grant ($1750) — March 2023
Ralph O. Simmons Undergraduate Research Scholarship ($3000) — May 2022
Lorella M. Jones Summer Research Award ($3000) — May 2021

Presentations

E. Yu. "Gravitational waves from black holes surrounded by massive accretion disks." July 2023, UIUC STEM Career Exploration and Symposium (pdf)

E. Yu, N. Aldrees, & J. Doppelt. "3D visualizations of tilted black holes with self-gravitating accretion disks." April 2023, UIUC Undergraduate Research Symposium (pdf)

Research Experiences

Undergraduate Research Assistant — June 2023 - Present
National Center for Supercomputing Applications — Urbana, IL
Mentored by Professor Antonios Tsokaros

- Develop an addition to *COCAL* (Compact Object CALculator, a code that computes initial data for a variety of astrophysical systems) that solves the initial value problem in numerical relativity for a rotating neutron-star surrounded by a self-gravitating gaseous disk for an upcoming paper

Lead Undergraduate Research Assistant — June 2021 - Present
Illinois Relativity Group — Urbana, IL
Mentored by Professor Stuart L. Shapiro

- Lead a team of 5 undergraduates to create 3D visualizations on supercomputers of neutron stars, black hole disks, and binary black holes using an internally developed and maintained 50,000-line VisIt CLI-based code
- Developed a set of *Python*/*Bash*/*C++* scripts that extract and visualize gravitational waveforms from numerical relativity simulation data using a new and more intuitive contour plot rendering technique
- Co-developed a set of *Python* scripts that can measure the proper circumference of black holes, neutron stars, and accretion disks in curved spacetime
- Visualizations presented at 2 symposiums, and featured in 3 Phys. Rev. D articles and CASC 2023

Published Visualizations

M. Ruiz, A. Tsokaros, & S. L. Shapiro. "General relativistic magnetohydrodynamic simulations of accretion disks around tilted binary black holes of unequal mass." 2023, arXiv:2302.09083

M. Kotak, E. Yu, J. Huang, J. Zhou, M. Ruiz, A. Tsokaros, L. Sun, & S. L. Shapiro. "What happens when Black Holes collide?" CASC 2023 Brochure p14

A. Tsokaros, M. Ruiz, S. L. Shapiro, & V. Paschalidis. "Self-gravitating disks around rapidly spinning, tilted black holes: General relativistic simulations." 2022, Phys. Rev. D 106, 104010, arXiv:2209.04454

A. Tsokaros, M. Ruiz, S. L. Shaprio, & Kōji Uryū. "Magnetohydrodynamic simulations of self-consistent rotating neutron stars with mixed poloidal and toroidal magnetic fields." 2021, Phys. Rev. Lett. 128, 061101, arXiv:2111.00013

Coursework

Physics: Classical Mechanics, Electrodynamics, Quantum Mechanics, Statistical Mechanics, General Relativity

Mathematics: Multivariable Calculus, Statistics and Probability, Linear Algebra, Differential Equations, Differential Geometry, Abstract Algebra, Real Analysis

Computer Science: Data Structures, Machine Learning, Numerical Analysis

Skills

- Programming: Python, Shell Scripting, C++, Java, Fortran
- Libraries: NumPy, Matplotlib, Scipy, Pytorch, Pandas
- Operating systems: Mac OS, Linux, Windows
- Software: LaTeX, Git, VisIt