Steven Dorsher

Former Computational Physicist and Astronomer

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EXPERIENCE

Tutor.com, Remote, *Calculus, Physics, and Astronomy Tutor*

AUGUST 2020 - PRESENT

Independent Research, Saint Cloud, Minnesota– *Computational Stellar Orbits*

AUGUST 2018 - JANUARY 2022

Numerically simulated the energy transfer between a binary star system and an orbiting planet in Newtonian Gravity in Python.

Louisiana State University, Baton Rouge — *Research and Teaching Assistant, Computational General Relativity*

JUNE 2014 - DECEMBER 2017

Simulated a stellar mass blackhole orbiting a supermassive black hole, using the scalar self-force approximation, by numerically solving a differential equation. In this approximation, the scalar charge experiences the self-force due to the causal interactions between the particle and its previous coordinates on the Schwarzschild spacetime. Ported this code to roundoff precision from FORTRAN to C++. Implemented the discontinuous Galerkin method and multiple coordinate systems. Verified the solver with the canonical wave equation. Confirmed the behavior of the self-force in the "post-merger" ring-down limit of the "blackholes". Verified the self-force over circular and geodesic orbits. Used fits and extrapolation in Python to determine that the rouandoff and truncation error relative to another team's code was 1/10,000.

Created a 48x48 pixel image of a black hole in Python by numerically integrating general relativistic equations along the line of site.

LIGO gravitational wave detector candidate event database prototype.

Saint Cloud State University, Saint Cloud, Minnesota — *Computational Physics Researcher*

JULY 2012 - JULY 2013

Invented and simulated a low-storage algorithm for a fractional calculus in C++. Improved the accuracy by a factor of 100.

SKILLS

Research

Programming

Mathematics

Statistics

Data Analysis

Numerical Methods

Python

C++

Pandas

Physics

Astronomy

Teaching

AWARDS

Summer Research Fellowship, University of Minnesota Department of Physics, 2008

University Fellowship, University of Minnesota, 2006-2007

University Fellowship, Ohio State University, 2004-2005

University of Minnesota, Minneapolis — *Research and Teaching Assistant, Computational Gravitational Waves*

AUGUST 2006 - MAY 2011

Wrote and tested a prototype statistical data analysis package based on radon transforms of spectrograms, in MATLAB, to look for signals with a frequency that changed linearly with time, in the LIGO gravitational wave detector. Simulated and analytically studied the gravity gradient noise due to seismic waves.

Ohio State University, Columbus — *Research and Teaching Assistant, Computational Exoplanets Statistics*

AUGUST 2004 - MAY 2006

Calculated the first statistics characterizing how common exoplanets are, using computational methods in FORTRAN informed by

Massachusetts Institute of Technology, Cambridge — *Undergraduate Thesis, Computational Cosmology*

JANUARY 2003 - MAY 2004

Evaluated the feasibility of measuring the cosmological constant using Einstein rings and properties of lensing galaxies, via a simulation in C.

EDUCATION

Louisiana State University — *Master of Science, Physics*

JUNE 2014 - DECEMBER 2017

Unofficial Thesis in Numerical Relativity

LIGO Scientific Collaboration Membership

University of Minnesota — *Master of Science, Physics*

AUGUST 2006 - JULY 2013

Four publications in Gravitational Wave Detection and Newtonion Noise

LIGO Scientific Collobartion Membership and Authorship

Contribution to the NOvA Neutrino Detector Technical Design Report

Ohio State University — *Master of Science, Astronomy*

AUGUST 2004 - AUGUST 2006

Exoplanet Statistics Publication

MIT — *Bachelor of Science, Physics*

AUGUST 2000 - JUNE 2004

Undergraduate Thesis in Cosmology