Brian Day

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Education

Ph.D. Physics Candidate Georgia Institute of Technology, Atlanta, GA — August 2017 - present
M.S. Physics Georgia Institute of Technology, Atlanta, GA — Summer 2018
B.S. Physics Georgia Institute of Technology, Atlanta, GA — May 2017

Research & Technical Experience

VR Software Developer — January 2023
International Institute for Sustainability with Knotted Chiral Meta Matter (SKCM2), Hiroshima University

- Developed and designed source code for VR simulations visualizing knotted structures for research and outreach
- Collaborated with Director and Outreach Chair of SKCM2 to prepare demonstrations for representatives from the World Premier International Research Center Initiative (WPI)
- Trained and supervised group of professionals to use as well as guide users through the simulations

Graduate Research Assistant — Spring 2018 - Present
Advisor: Dr. Elisabetta Matsumoto
Department of Physics, Georgia Institute of Technology

- Developing and designing computational physics engine for dynamical systems in spaces with intrinsic curvature
- Investigating and simulating the interplay between nonholonomic control systems and the geometry of its environment
- Developing and designing optimization algorithm to understand efficiency of motion of deformable bodies through sub-Riemannian geodesics in space of internal configurations
- Developing and designing educational, interactive 3D vector field visualization sandbox for static and dynamic fields in VR for undergraduate math and physics courses

Graduate Research Assistant — May 2021 - May 2022
Advisors: Dr. John Wise and Dr. Kwangho Park
Department of Physics, Georgia Institute of Technology

- Invesigating 3D accretion hydrodynamics for black holes in hyperaccretion limit using Enzo-e
- Translating dynamics from Enzo to Enzo-e to verify evidence of biconical accretion flows

Undergraduate Research Assistant — May 2014 - May 2017
Advisor: Dr. Deirdre Shoemaker
Department of Physics, Georgia Institute of Technology

- Analyzed effectiveness of Bayeswave modeling to recover waveforms from gravitational wave signal data through PCA between model and real data
- Completed undergraduate thesis as a member of the Laser Interferometer Gravitational Wave Observatory (LIGO) Collaboration

Honors & Awards

Student Government Association Conference Fund Travel Award ($250) — March 2023
College of Sciences Supplemental Travel Award ($250) — March 2023
School of Physics Travel Award ($250) — March 2023
Weatherly Fund Travel Award ($250) — August 2019
President's Fellowship ($5000 annually) — August 2017 - August 2021
Hitohiro Fukuyo Outstanding Physics Undergraduate Award — April 2017
HOPE and Zell Miller Scholarship — 2013 - 2017

Publications

Brian Day*, Steve Trettel, Elisabetta Matsumoto *Physics in Curved Space I: Internal Dynamics and Rigidity Constraints*, Manuscript in progress (2023)

Brian Day*, Steve Trettel, Elisabetta Matsumoto *Physics in Curved Space II: Nonholonomic Control Dynamics and Optimization*, Manuscript in progress (2023)

Brian Day*, Steve Trettel, Elisabetta Matsumoto *Mathematical Foundation of Optimization through sub-Riemannian Geometry in Geometric Mechanics Systems*, Manuscript in progress (2023)

Othman Alwari*, **Brian Day***, Elisabetta Matsumoto *Visualizing Virtual Vector Fields*, Published in Proceedings of Bridges 2022: Mathematics, Art, Music, Architecture, Culture (2022), http://archive.bridgesmathart.org/2022/bridges2022-367.html

Contributed Presentations

B. Day, S. Trettel, and E. A. Matsumoto, "Generalizing Deformable System Dynamics beyond Euclidean Geometry", APS March Meeting 2023, Las Vegas, Nevada, March 2023. (Talk)

B. Day, S. Trettel, and E. A. Matsumoto, "Using Sub-Riemannian Geometry to Characterize Mechanics of Deformable Systems", APS March Meeting 2022, Chicago, Illinois, March 2022. (Virtual Talk)

O. Alwari, **B. Day**, and E. A. Matsumoto, "Realtime Vector Field Rendering in Unity Game Engine for STEM Education", APS March Meeting 2022, Chicago, Illinois, March 2022. (Talk)

B. Day, S. Trettel, and E. A. Matsumoto, "Swimming through Curved Space", APS March Meeting 2021, Atlanta, Georgia, March 2021. (Virtual Talk)

B. Day and E. A. Matsumoto, "Visualizing Fields and Space Using Virtual Reality", Illustrating Geometry and Topology, ICERM, Providence, Rhode Island, September 2019. (Poster)

B. Day and E. A. Matsumoto, "Visualizing Virtual Vector Fields", Georgia Institute of Technology Teaching Day, Atlanta GA, April 2018. (Poster)

B. Day, "Bayeswave Analysis Study on Recovering Waveform Complexity through Reconstructions", Georgia Institute of Technology Undergraduate Research Symposium, Atlanta GA, April 2017. (Poster)

Teaching Experience

PHYS 6124 - Graduate Mathematical Methods Fall 2022, Fall 2021

PHYS 2231 - Honors Physics I: Mechanics Spring 2021

PHYS 2232 - Honors Physics II: Electricity and Magnetism Fall 2018, Fall 2019, Fall 2020

PHYS 2211 - Intro Physics I: Mechanics (Lab Instructor) Summer 2018, Spring 2019, Summer 2020

PHYS 2212 - Intro Physics I: Electricity and Magnetism (Lab Instructor) Summer 2019

Professional Activities

Morpho Software Workshop at Tufts University Attendee Summer 2022

Enzo-E Developers + Users Workshop Attendee Spring 2021

ICERM Illustrating Geometry and Topology Conference Attendee Fall 2019, Spring 2020

Outreach

Graduate Association of Physicists Mentor in Mentorship Program Fall 2022

Memberships

American Physical Society 2021 - Present

Leadership

Georgia Tech Archery Club - Membership Chair April 2018 - April 2019

– Organized and hosted several events for Yellow Jackets Archery team at Georgia Tech

Mentored Students

Othman Alrawi Georgia Institute of Technology, Atlanta, GA September 2021 - March 2022

Skills

Programming	Python, Mathematica, Java, C++/C#, JavaScript, HTML, Fortran
Software	Mathematica, Github, Microsoft Office, Rhino, Unity
Hardware	3D Printer (Ultimaker/Prusa/Cetus), VR equipment (HTC Vive/SteamVR)
Communication and Leadership	Technical Presentations, Technical/Research Papers, Lead and Supervise Technical Demonstration
Physics	Lagrangian and Hamiltonian Mechanics, Orbital Mechanics, Electromagnetism, Quantum Mechanics, Special and General Relativity, Geometric Mechanics, Statistical Mechanics, Computational Modeling
Mathematics	Data analysis, Systems of Nonlinear Ordinary Differential Equations, Partial Differential Equations, Computational Geometry