Jennifer SeilerPhD

Computational Physicist

Personal

Location: Washington, DC
Place of Birth: Washington, DC
Citizenship: United States
First Language: English

Contact

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Programming

C#, C/C++, Python, Fortran, Pascal, R, Java, JavaScript, JQuery, Unity, XML, SQL, SML, Basic, Perl, HTML, LaTeX, Aduino, Octave, MATLAB, sed, lisp, CSS3 & HTML5...

Keywords

Computational Physics, Numerical Simulation, High Performance Computing, Finite Element Analysis, Statistical Methods, Reproducibility Practices, Gravitational Astrophysics, Discrete mathematics, Scientific computing, Mathematical modeling, Data Science...

Languages

English (native)
German (basic)
Spanish (basic)

Summary

I am a computational physicist and game developer looking for a stimulating new challenge. For the past 17 years I have worked on various large scale computational modeling and simulation projects. I have also worked in developing and promoting reproducible research and analysis methods, and maintainable shared code. Although my degrees are in physics, I have very strong and unique computer science background in software development and testing, numerical simulations, analysis, database management, and game design. I like hunting dragons and I get compulsively excited about results on the horizon. I am never bored.

Education

Max Planck Institute For Gravitational Physics — *Ph.D., magna cum laude*
Potsdam, Germany — Aug 2005 - Feb 2010
Thesis Title: *Numerical Simulations of Binary Black Hole Spacetimes and a Novel Approach to Outer Boundaries*
Thesis Advisers: Luciano Rezzolla & Bernard Schutz
University Affiliation: Gottfried Leibniz Universität Hannover via the International Max Plank Research School Fellowship

Cornell University — *B.A., Honors Physics*
Ithaca, NY — Aug 2001 - May 2005
Adviser: Saul Teukolsky
Research Emphasis: Computational Physics; Numerical Relativity

Hayfield Secondary School — *H.S., Honors A.P.*
Alexandria, VA — Sept 1997 - June 2001
Research Emphasis: Physics; Architecture; Computer Science

Fellowships, Grants, and Awards

- Visiting Scientist Grant from Universitat de les Illes Balears for October 2010
- Three of the top cited GR papers of 2009
- James Hartle Award: *Constraint Preserving Boundaries in 2nd Order Form* at GRG18
- NASA NY Space Grant 2003: For work under Saul Teukolsky on DUSTVis
- FermiLab Internships for Physics Majors 2002: BTeV Trigger Algorithm
- US DoD's SEAP (Science and Engineering Apprenticeship Program) 2001
- Award of Recognition of Outstanding Achievement 2001, Solid State Physics from the US Naval Research Laboratory
- Treasurer for the Cornell Chapter of Society of Physics Students 2003-2005
- Recognition from Nat. Science Teachers Association 2000
- Recognition from Graduate Women in Science 2000, Theoretical Physics (for *Acoustic Thermometry of Sea Water*)
- Intel Science Talent Search Semifinalist 2001 (for *Longitudinal Flow in Au-Au Collisions*)
- University of Southern California Young Scientist of the Year 2000
- CIA Outstanding Young Scientist (for *Acoustic Thermometry of Sea Water*)
- Armed Forces and Communications and Electronics scholarship summer of '99
- Award of Recognition: Society of Women Engineers (*Acoustic Thermometry of Sea Water*)
- Physlink.com Young Scientist of the Year 2000 (for Acoustic Thermometry of Sea Water)

Research and Professional Experience

Giant Army **April 2015 - Current**

I work as Developer and Staff Astrophysicist on improving the physics, planetary science, climate simulation, and stellar astronomy of Universe Sandbox. The game is a physics-based space simulator that allows users to simulate galaxies, planetary systems, climates, collisions, structure formation, and much more.

Columbia University **February 2013 - October 2014**

Postdoctoral position in the Department of Statistics researching issues of reproducibility in science. A major focus was ResearchCompendia.science. ResearchCompendia is a web service that allows researchers to run codes associated with scientific publications. The service allows authors of publications to create companion websites on which others may reproduce the paper's results or to run their own parameters.

NASA Goddard Space Flight Center **March 2010 -July 2012**

NASA Postdoctoral Position (NPP) in the numerical relativity group for the LISA project. I wrote numerical simulations of binary black hole spacetimes, electromagnetic counterparts to black hole interactions, and matter fields around binary black hole systems.

Max-Planck Institut für Gravitationsphysik **June 2005 - February 2010**

PhD work on numerical simulations of black hole spacetimes. My focus was on well-posed constraint preserving boundary conditions. With additional work on constraint damping methods, gravitational wave detectability, and phenomenological waveforms and predictions for merged binary final spin and recoil velocity.

Albert Einstein Institute **June 2004 - August 2004**

Visiting scientist in Potsdam, Germany. I wrote a parallelised numerical code to generate initial data and evolve a simulation of the propagation of gravitational waves off a potential in a three dimensional coordinate system and track constraint propagation and violation.

Cornell University **November 2002 - October 2004**

Worked for Prof. Saul Teukolsky on software for the visualization and analysis of numerical simulations of solutions to the Einstein equations. These included inspiraling neutron stars and black holes systems, binary black holes, and accretion disks.

Cornell University **December 2004 - May 2004**

Designed software for an industrial chemical waste exchange program, titled the National Trash to Treasure Network, for submission to the EPA as a project for voluntary participation offered to companies as an alternative to fines.

Fermi National Accelerator Lab **May 2002-August 2002**

Participated in the Internship for Physics Majors Program (IPM). I designed and programmed the track-finding algorithm for the Level 1 Trigger Code for the BTeV project. After finding tracks, it looks for detached tracks which signify an exotic decay, on-the-fly in the detector firmware.

Naval Research Laboratories **June 2001 - Sept. 2001**

Worked in the Electronics Science & Technology Division on the optimization of natural growth of Silicon dioxide, SiGe, and SiC samples via Molecular Beam Epitaxy. Experimented with the temperature and surface segregation dependencies of Phosphorous doping rates via MBE.

Michigan State University **May 2000 - August 2000**

I worked in the National Superconducting Cyclotron at Michigan State University. I wrote data analysis code in C++ and did the analysis of data collected of Au on Au collisions at energies from 20-60 AMeV for a better understanding the equation of state for stellar core collapses.

Publications

L. Rezzolla, P. Diener, E. N. Dorband, D. Pollney, C. Reisswig, E. Schnetter, J. Seiler. **The Final Spin From the Coalescence of Aligned-spin Black-hole Binaries**. *Astrophys. J. 674 (2008) L29*. Preprint: arXiv.org:0710.3345 [gr-qc]

L. Rezzolla, E. Barausse, E. N. Dorband, D. Pollney, C. Reisswig, J. Seiler and S. Husa. **On the final spin from the coalescence of two black holes**. *Phys. Rev. D 78 (2008) 044002*.
Preprint: arXiv:0712.3541[gr-qc]

J. Seiler, B. Szilagyi, D. Pollney. **Constraint Preserving Boundaries for a Generalized Harmonic Evolution Systems**. *Class. Quant. Grav. 25 (2008) 175020*. Preprint: arXiv:0802.3341 [gr-qc]

B. Aylott, *et al.* (including J. Seiler). **Testing gravitational-wave searches with numerical relativity waveforms: Results from the first Numerical INJection Analysis (NINJA) project**. *Class. Quant. Grav. 26 (2009) 165008*. Preprint: arXiv:0901.4399 [gr-qc].

B. Aylott, *et al.*(including J. Seiler). **Status of NINJA: the Numerical INJection Analysis project**. *Class. Quant. Grav. 26 (2009) 114008*. Preprint: arXiv:0905.4227 [gr-qc]

C. Reisswig, S. Husa, L. Rezzolla, E. Dorband, D. Pollney and J. Seiler. **Gravitational-wave detectability of equal-mass black-hole binaries with aligned spins**. *Phys. Rev. D 80 (2009) 124026*. Preprint: arXiv:0907.0462 [gr-qc]

L. Santamaria, F. Ohme, P. Ajith, B. Bruegmann, N. Dorband, M. Hannam, S. Husa, P. Moesta, D. Pollney, C. Reisswig, E. L. Robinson, J. Seiler, B. Krishnan. **Matching post-Newtonian and numerical relativity waveforms: systematic errors and a new phenomenological model for non-precessing black hole binaries** *Phys. Rev. D 82 (2010) 064016*. Preprint: arXiv:1005.3306 [gr-qc]

P. Ajith, M. Hannam, S. Husa, Y. Chen, B. Bruegmann, N. Dorband, D. Muller, F. Ohme, D. Pollney, C. Reisswig, L. Santamaria, J. Seiler. **"Complete" gravitational-waveforms for black-hole binaries with non-precessing spins**. *Phys. Rev. Lett. 106 (2011) 241101* Preprint: arXiv:0909.2867 [gr-qc]

V. Stodden, S. Miguez, J. Seiler. **ResearchCompendia.org: Cyberinfrastructure for Reproducibility and Collaboration in Computational Science**. *IEEE Computing in Science & Engineering 17(1) (2015) 12-19*. Access: Scientific Software Communities

V. Stodden, J. Seiler, Z. Ma. **An empirical analysis of journal policy effectiveness for computational reproducibility**. *Proceedings of the National Academy of Sciences 115.11 (2018): 2584-2589*.

Manuscripts

J. Seiler, J. Baker, B. Kelly **Precession Mapping of Black Hole Binaries via Minimization of Asymmetric Harmonic Modes of Gravitational Waves** [scrapped, scooped, March 2012]

J. Seiler, D. Pollney, B. Wardell, D. Nunez **Constraint Preserving Boundary Conditions for BSSN in the Linearized Regime** [scrapped, scooped Jan 2012]

J. Seiler, S. Husa, J. Baker **Numerical Simulation of Black Hole Binaries with 'Trumpet' Initial Data** [July 2012]

Further Technical Skills

Operating Systems: Linux (preferred), Mac (current), Unix, DOS, Windows

Libraries & Software: Unity, jQuery, Hadoop, NumPy/SciPy/iPython, LAPACK, HDF5, VTK, OpenDX, PBS, Globus, Scali, OpenMP, MPICH, LAM, Cactus, MATLAB, Arduino, vi, emacs, Photoshop, OpenOffice, Ableton, Flash, Mathematica, Maxima, ROOT, VisIt, Amira, PAW ...

Select Contributed Talks

“ResearchCompendia: Connecting Computation to Publication”
University of Texas Austin, TX, USA December 16, 2013
Scientific Software Days

“Binary Orbital Dynamics from the Analysis of Spherical Harmonic Modes of Gravitational Waves”
University of Maryland College Park, USA November 20, 2011
Gravity Theory Seminars

“Listening to the Geometry of Spacetime: Ripples in the Fabric of the Universe”
Burning Man, Black Rock City, NV August 29, 2011
Phage Talks: Institute For Higher Yearrning

“Gravitational-wave Detectability of Black-hole Binaries With Aligned Spins”
NASA Goddard Space Flight Center, USA March 26, 2010
Astrophysics Sciences Division Director’s Seminar

“Final Spin from Binary Black Hole Coalescence”
Salamanca, Spain September 19, 2008
XXXI Spanish Relativity Meeting (E.R.E. 2008)

“From General Relativity to Black Hole Observation”
Salamanca, Spain September 19, 2008
XXXI Spanish Relativity Meeting (E.R.E. 2008) (plenary talk)

“Final Spin from Binary Black Hole Coalescence”
California Institute of Technology, Pasadena, CA, USA August 22, 2008
TAPIR Theoretical Astrophysics and Relativity Seminar

“2nd Order in Space Constraint Preserving Summation by Parts Boundaries”
Puerto de la Cruz, Tenerife, Spain September 10-14, 2007
XXX Spanish Relativity Meeting (E.R.E. 2007)

“Constraint Preserving Boundary Treatment in 2nd Order Form”
Sydney, Australia July 8-14, 2007
18th International Conference on General Relativity and Gravitation (GRG18)

“Boundary Treatments for the Einstein Equations in 2nd Order Form”
Palma de Mallorca, Spain September 4-8, 2006
XXIX Spanish Relativity Meeting (E.R.E. 2006)

“Generalised Harmonic Coordinates in 2nd Order ”
AEI, Potsdam, Germany November, 2005
Sonder-Forschungsbereich / TransRegio 7 Video Seminars

“Generalised Harmonic Coordinates using Abigel”
Oberjoch, Germany October 10-14, 2005
2005 Oberjoch Seminars

Select Workshops and Conferences

19th International Conference on General Relativity and Gravitation (GRG19)
Mexico City, Mexico July 5-10, 2010

Numerical Relativity and Data Analysis/CAPRA Meeting (NRDA/CAPRA 2010)
Waterloo, Canada June 20-26, 2010

Numerical Relativity and Data Analysis Meeting (NRDA 2009)
Golm, Germany July 6-9, 2009

XXXI Spanish Relativity Meeting (E.R.E. 2008)
Salamanca, Spain September 15-19, 2008

Numerical Relativity and Data Analysis Meeting (NRDA 2008)
Syracuse, NY August 11-14, 2008

Frontiers in Numerical Gravitational Astrophysics (J.A. Wheeler School)
Erice, Italy June 27-July 5, 2008

Post Newton 2008 International Workshop
Jena, Germany June 11-14, 2008

XXX Spanish Relativity Meeting (E.R.E. 2007)
Puerto de la Cruz, Tenerife, Spain September 10-14, 2007

18th International Conference on General Relativity and Gravitation (GRG18)
Sydney, Australia July 8-14, 2007

AEI Performance Improvement Workshop
Albert-Einstein-Institut, Potsdam, Germany December 4-15, 2006

From Geometry to Numerics Workshop
Institut Henry Poincaré, Paris, France November 20-24, 2006

XXIX Spanish Relativity Meeting (E.R.E. 2006)
Palma de Mallorca, Spain September 4-8, 2006

New Frontiers in Numerical Relativity Conference
Albert-Einstein-Institut, Potsdam, Germany July 17-21, 2006

3rd High-End Visualization Workshop
University of Innsbruck, Obergurgl, Austria April 25-28, 2006

2005 Oberjoch Seminars
University of Tübingen, Oberjoch, Germany October 10-14, 2005

Extracurricular Interests

Coursera/EdX/Udacity classes, Physics outreach, Fire performance (poi, rope dart, staff), Open source programming, Electronics, Arduino, Sustainability outreach, Indoor and outdoor rock climbing, Skiing, Hiking, Kayaking, Scuba, Go, Interactive multimedia installation art, Burning Man community, Vegetarian cooking