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# Roland Haas

## Curriculum vitae

### Contact information

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### Professional Experience

- 07/2016– **Senior research programmer**, *National Center for Supercomputing Applications*, University of Illinois, Urbana, IL  
current Numerical Relativity
- 09/2014– **Junior scientist / Postdoc**, *Albert Einstein Insititute*, Potsdam, Advisor:  
07/2016 Alessandra Buonanno  
Numerical Relativity
- 09/2011– **Postdoctoral research fellow**, *Caltech*, Pasadena, Advisor: Christian Ott  
08/2014 Numerical Relativity
- 08/2008– **Postdoctoral research fellow**, *Georgia Tech*, Atlanta, Advisor: Pablo Laguna  
09/2011 Numerical astrophysics

### Education

- 12/2005– **PhD in physics**, *University of Guelph*, Guelph  
08/2008 *Self-force on point particles in orbit around a Schwarzschild black hole*  
Advisor: Eric Poisson
- 09/2003– **MSc in physics**, *University of Guelph*, Guelph  
12/2005 *Mass loss of a scalar charge in cosmological spacetimes*  
Advisor: Eric Poisson
- 09/1999– **Diplom in physics**, *Universitaet Konstanz*, Konstanz, Germany  
09/2003 unfinished, left for Canada
- 09/1990 **High school**, *Scheffel Gymnasium*, Lahr, Germany  
–08/1999

## Professional Activities

- 07/2023 Lead organizer, Einstein Toolkit CSSI Working Workshop, Rochester Institute of Technology, Rochester, NY
- 07/2023 Presenter, Einstein Toolkit Summer School, Rochester Institute of Technology, Rochester, NY
- 07/2022 Lead organizer, Einstein Toolkit CSSI Working Workshop, University of Illinois, Urbana, IL
- 06/2022 Co-organizer and presenter, Einstein Toolkit Summer School, University of Idaho, Moscow, ID
- 07/2021 Lead organizer, Einstein Toolkit Summer School, University of Illinois, Urbana, IL
- 08/2020 Presenter, North American Einstein Toolkit Workshop, Louisiana State University, Baton Rouge, LA
- 09/2019 Presenter and scientific organization committee member, European Einstein Toolkit Meeting, King's College London, London, UK
- 06/2019 Presenter, North American Einstein Toolkit workshop, Rochester Institute of Technology, Rochester, NY
- 10/2018 Co-organizer, Deep Learning for Multimessenger Astrophysics: Real-time Discovery at Scale workshop, University of Illinois, Urbana, IL
- 09/2018 Presenter, European Einstein Toolkit Workshop, University of Lisbon, Lisbon, Portugal
- 07/2018 Presenter and scientific organization committee member, North American Einstein Toolkit workshop, Georgia Tech, Atlanta, GA
- 06/2018 Presenter and organization committee member, Mexican Einstein Toolkit school, Tecnológico de Monterrey, Guadajaraaa
- 10/2017 Presenter, EU Einstein Toolkit 2017 & EdFest, Universitat de les Illes Balears, Palma
- 07/2017 Lead organizer of the EinsteinToolkit workshop at the NCSA / UIUC meeting in Urbana-Champaign
- 02/2017 Participant, Workshop on MHD method in the Einstein Toolkit, Columbia University, New York, NY
- 10/2016 Observer, ExaHyPE consortium meeting, LRZ, Garching
- 06/2016 Participant, Einstein Toolkit EU School and Workshop, University of Trento, Trento
- 08/2015 Participant, ET Workshop 2015, University of Stockholm, Stockholm
- 07/2015 Local organizing committee member, CGWAS Caltech Gravitatioanl Wave Astrophysics School, Caltech, Pasadena, CA
- 06/2014 Co-organizer, Capra Meeting on Radiation Reaction in General Relativity, Caltech, Pasadena, CA

- 07/2013 Organizer of the Einstein Toolkit Summer Workshop at Caltech, where all maintainers met to discuss future directions of the project.
- 07/2013 Local organizing committee member and presenter, CGWAS Caltech Gravitational Wave Astrophysics School, Caltech, Pasadena, CA
- 2012–2014 Organizer of the relativity section of the weekly TAPIR seminars.
- 10/2012 Participant, ET Workshop Fall, Rochester Institute of Technology, Rochester, NY
- 04/2012 Presenter and co-organizer of the EinsteinToolkit workshop at the APS meeting in Atlanta
- 2011–2020 Member, LIGO Science Collaboration
- 04/2009 Session chair Numerical Simulations of Black holes and Neutron Stars, April APS meeting, Washington DC.
- 2008–current Maintainer of the Einstein Toolkit, a collaborative NSF funded effort by LSU, NCSA, RIT, Georgia Tech, and Caltech to provide robust simulation codes for numerical relativity and numerical astrophysics.
- 2007–current Referee for JOSS, PRD, PRL, and CQG.

## Grants and Awards

- 07/2023–current Co-Principal investigator of NSF OAC grant 2310548 “Elements: An initial value solver for the era of multi-messenger astrophysics” (USD 597,233, 3 yrs)
- 04/2020–current Principal investigator of NSF OAC grant 2004879 “The Einstein Toolkit ecosystem: Enabling fundamental research in the era of multi-messenger astrophysics” (USD 683,514, 4 yrs)
- 07/2016–06/2022 Co-principal investigator of NSF OAC grant 1550514 “Einstein Toolkit Community Integration and Data Exploration” (USD 450,000, 6 yrs)
- 10/2020–current Principal investigator of NSF XRAC grant TG-PHY160053 “Convergence of Numerical Relativity and Deep Learning for Gravitational Wave Astrophysics”
- 2010–2012 NSERC postdoctoral Fellowship (USD 80,000)
- 2006–2008 NSERC postgraduate scholarship (CAD 41,000)
- 2005 Ontario Graduate Scholarship (CAD 15,000)
- 2005 Governor General’s Academic Medal *Awarded by the Governor General to the student graduating with the highest average from a university program*

## Research Interests and Areas

- Numerical relativity
- Relativistic (magneto-)hydrodynamics
- Extreme mass ratio inspirals and self-force problems
- Black hole perturbation theory
- Gravitational and electromagnetic emission from mixed black hole—star systems
- The Einstein Toolkit

- Numerical techniques for mesh refinement, and elliptic problems

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## Software

- “Einstein Toolkit”, <https://einsteintoolkit.org>
- “Cactus Computational Toolkit”, <https://cactuscode.org>
- “Carpet mesh refinement driver”, <https://bitbucket.org/eschnett/carpet>
- “CarpetX mesh refinement driver”, <https://github.com/eschnett/carpetx>
- “Outflow”, <https://github.com/rhaas80/Outflow>
- “ReadInterpolate”, <https://github.com/rhaas80/ReadInterpolate>
- “GRHydro”, <https://bitbucket.org/einsteintoolkit/einsteinevolve>
- “IllinoisGRMHD”, [https://bitbucket.org/zach\\_etienne/wvuthorns](https://bitbucket.org/zach_etienne/wvuthorns)
- “Simulation Factory”, <https://bitbucket.org/simfactory/simfactory2>
- “Eccentricity reduction for NR simulations”, <https://github.com/ncsagravity/eccred>
- “SpEC”, <https://www.black-holes.org/code/SpEC.html>
- “mpitar”, <https://git.ncsa.illinois.edu/rhaas/mpitar>
- “parfu”, [https://github.com/ncsa/parfu\\_archive\\_tool](https://github.com/ncsa/parfu_archive_tool)
- “pa\_volume”, [https://github.com/rhaas80/pa\\_volume](https://github.com/rhaas80/pa_volume)
- Einstein Toolkit Summer School 2021 website, <https://github.com/EinsteinToolkit/et2021uiuc>
- Einstein Toolkit CI testing service, <https://github.com/EinsteinToolkit/tests/tree/scripts>

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## Students mentored

- Jeffrey Kaplan. Graduate Student. Project: binary neutron star inspirals with SpEC.
- Jonas Lippuner. Graduate Student. Project: binary neutron star inspirals with SpEC.
- Sherwood Richers. Graduate Student. Project: Neutrino Transport in Supernova Simulations.
- Shawn Rosofksy. Graduate Student. Project: binary neutron star inspirals with Cactus.
- Yufeng Luo. Graduate Student. Project: Stability of rotating neutron stars. University of Wyoming.
- Hannah Klion. Summer Undergraduate Research Fellowship (SURF) student in 2012. Project: Gravitational Waves from Rapidly Rotating Core-Collapse Supernovae.
- Cheol Woo (Peter) Park. Summer Undergraduate Research Fellowship (SURF) student in 2012. Project: black hole perturbation theory and white dwarf disruption by an intermediate mass black hole.
- Cutter Coryell. Summer Undergraduate Research Fellowship (SURF) student in 2013. Project: Testing Fully Dynamical Adaptive Mesh Refinement in the Einstein Toolkit.

- Dhara Mehta. Undergraduate researcher (SPIN) in 2017. Project: Automatically prune and archive simulation results produced by the Einstein Toolkit.
- Wei Ren. Undergraduate researcher in 2017. Project: Extrapolating gravitational waves produced by the Einstein Toolkit to Scri+.
- Daniel Johnson. Undergraduate researcher in 2017. Python Open-source Waveform ExtractoR: An open source, python package to monitor and post-process numerical relativity simulations.
- Nikita Jain. Undergraduate researcher (SPIN) in 2017. Project: A GPU accelerated BSSN using GAMER.
- Pablo Brubeck. Undergraduate research fellow in 2017. Project: Producing initial data for Cactus using LORENE.
- Sibow Wang. Undergraduate researcher (SPIN) in 2017. Project: Using the Adams-Bashforth timestepper in Cactus.
- Vedant Puri. Undergraduate researcher (SPIN) in 2017. Testing Scheduled Jacobi Relaxation methods for use in the Einstein Toolkit.
- Debopam Sanyal. Undergraduate researcher (SPIN) in 2018. Comparing methods to extrapolate gravitational waves to Scri+
- Nicolas White. Undergraduate researcher (INCLUSION) in 2018. Incorporating the ENIGMA gravitational wave model into LALsuite.
- Sarah Habib. Undergraduate researcher (INCLUSION) in 2018, 2019. Gauge invariant measurement of eccentricity in gravitational waves, implementing a method to reduce eccentricity in simulations using the Einstein Toolkit.
- Zeran Zhu. Undergraduate researcher (SPIN) in 2018. Generic output routines for the Einstein Toolkit.
- Bing-Jyun (Johnny) Tsao. Undergraduate researcher (SPIN) in 2019. Solving the Poisson equation on irregular domains.
- Brockton Brendal. Undergraduate researcher in 2019. Implementing methods to extrapolate gravitational waves to Scri+ in the NCSA POWER code.
- Bridgette Davey. Undergraduate researcher (INCLUSION) in 2019. Processing numerical relativity simulation results for use by LIGO.
- Joseph Adamo. Undergraduate researcher in 2019. Incorporating the ENIGMA gravitational wave model into LALsuite.
- Kaiwen Zhang. Undergraduate researcher in 2019. Improving the quality of gravitational waves produced using the Einstein Toolkit.
- Yufeng Luo. Undergraduate researcher in 2019. DataVault an opens storage infrastructure for results obtained using the Einstein Toolkit.
- Robert Nagel. Undergraduate researcher in 2020. Constructing a uniform framework to characterize numerical relativity waveforms.
- Nuocheng Pan. Undergraduate researcher in 2020. Improving the robustness of the ENIGMA waveform generation code.
- Mohammed Jamil. Undergraduate researcher in 2020. Using GitHub action for continuous integration testing of the Einstein Toolkit.
- Mingxin Li. Undergraduate researcher in 2021. Improving performance of characterizing numerical relativity waveforms.

- Parth Tiyagi. Undergraduate researcher in 2021. On the fly training data generation for large scale artificial neural network based gravitational waveform searches.
- Hrishikesh Kalyanaraman. Undergraduate researcher in 2022. Continuous integration testing for the Einstein Toolkit.
- Nadine Kuo. Undergraduate researcher in 2022. Continuous integration testing for the Einstein Toolkit.
- Lisa Leung. Undergraduate researcher in 2022. Improving quality of Einstein Toolkit binary black hole simulations.
- Ashley Turner. Undergraduate researcher in 2023. Improving quality of Einstein Toolkit binary black hole simulations.
- Chirag Maheshwari. Undergraduate researcher in 2023. Improving quality of Einstein Toolkit binary black hole simulations.

## █ Lectures

- Tutorial session on using the Einstein Toolkit at the Einstein Toolkit workshop at Rochester, 2023.
- Tutorial session on using the Einstein Toolkit at the Einstein Toolkit workshop at Dublin, 2022.
- Tutorial session on using the Einstein Toolkit at the Numerical Relativity Summer School at ICERM, 2022.
- Tutorial session on using the Einstein Toolkit at the Einstein Toolkit workshop at UIdaho, 2022.
- Tutorial session on using the Einstein Toolkit at the Einstein Toolkit workshop at LSU, 2020.
- Tutorial session on using the Einstein Toolkit at the Einstein Toolkit workshop at RIT, 2019.
- Lecture on using MPI and OpenMP at the PIRE Winter School at the University of Arizona, 2018.
- Tutorial session on using adaptive mesh refinement at the EU Einstein Toolkit workshop in Lisbon, Portugal, 2018.
- Tutorial session on writing an analysis module at the Spring Einstein Toolkit workshop attached to the April APS meeting in Atlanta, 2012.
- Tutorial session and introduction to the Einstein Toolkit at the Summer Einstein Toolkit workshop at the Caltech Gravitational-Wave Astrophysics School 2013.

## █ Invited talks

- “Gravitational and electromagnetic signatures from the tidal disruption of stars”, Caltech, Pasadena, CA. CaJAGWR Seminars. April, 2012.
- “Three-Dimensional General-Relativistic Hydrodynamic Simulations of Binary Neutron Star Coalescence and Stellar Collapse with Multipatch Grids”, UIUC, Urbana-Champaign, IL. Theoretical Astrophysics and General Relativity Seminar. April, 2013.

- “Core collapse and binary neutron star inspiral simulation using multipatch grids”, University of Southampton, Southampton, UK. Gravity Seminar. February, 2015.
- “Update on binary neutron star merger simulations”, Max-Planck-Institute for Gravitational Physics, Golm, Germany. AEI Seminar. April, 2016.
- “Simulating multi-physics astrophysical problems using current and future codes”, Leibnitz Rechenzentrum, Garching, Germany. ExaHYPe collaboration meeting. April, 2017.
- “Update on binary neutron star merger simulations”, Goethe-University, Frankfurt, Germany. Astro coffee. April, 2017.
- “Community astrophysics science with the Einstein Toolkit”, UIUC, Urbana-Champaign, IL. Theoretical Astrophysics and General Relativity Seminar. September, 2017.
- “Assessing confidence in numerical relativity waveforms of binary neutron star mergers”, Nikhef, Amsterdam, Netherlands. Seminar talk. September, 2018.
- “Present and future astrophysics simulations using the Einstein Toolkit”, University of Wyoming, WY, Colloquium presentation. December, 2021.
- “Using computational physics to study relativity and more”, University of Guelph, ON, Colloquium presentation. September, 2023.

## Contributed talks and posters

- “HydroOpenMPToy status”, King’s College London, London, UK. Einstein Toolkit Workshop. September, 2019
- “The NCSA eccentric gravitational waveform catalog”, Denver, Colorado. APS April Meeting. April, 2019
- “The NCSA eccentric gravitational waveform catalog”, Denver, CO. APS April Meeting. April, 2019
- “BOSS-LDG using Blue Waters for LIGO data analysis”, Columbus, OH. APS April Meeting. April, 2018
- “Assessing confidence in numerical relativity waveforms of binary neutron star mergers”, Columbus, Ohio. APS April Meeting. April, 2018
- “HydroOpenMPToy status”, University des Illes Balears, Palma, Spain. Einstein Toolkit Workshop. October 2017.
- “Neutron star simulations with SpEC”, University of Stockholm, Stockholm, Sweden. MICRA meeting. August, 2015
- “Postprocessing data in Cactus”, University of Stockholm, Stockholm, Sweden. Einstein Toolkit Workshop. June, 2015
- “Binary Neutron Star simulations using SpEC”, University of Thessaloniki, Thessaloniki, Greece. Workshop on Binary Neutron Star Mergers. May, 2015
- “Binary Neutron Star simulations using SpEC”, UCSD, San Diego, CA. Pacific Coast Gravity Meeting. March, 2014
- “Binary Neutron Star simulations using SpEC”, Savannah, GA. APS April Meeting. April, 2014
- “Self-force driven inspiral of a scalar point particle into a Schwarzschild black hole”, UCLA, Los Angeles, CA. TASC Meeting 2013. December, 2013
- “Binary NS simulations using SpEC”, Uniwersytet Warszawski, Warsaw, Poland. Amaldi meeting. July, 2013
- “Binary NS simulations using SpEC”, Denver, CO. APS April Meeting. April, 2013
- “Binary NS simulations using SpEC”, UCD, Davis, CA. Pacific Coast Gravity Meeting. March, 2013
- “Binary NS simulations using SpEC”, Carnegie Observatories, Pasadena, CA. TASC Meeting 2012. November, 2012
- “Self-force driven inspiral of a scalar point particle into a Schwarzschild black hole: a progress report”, University of Maryland, College Park, MD. Capra Meeting on Radiation Reaction in General Relativity. June, 2012
- “Progress report: Binary NS simulations using SpEC”, Atlanta, GA. APS April Meeting. April, 2012
- “Self-force driven inspiral of a scalar point particle into a Schwarzschild black hole”, UCSB, Santa Barbara, CA. Pacific Coast Gravity Meeting. March, 2012
- “Gravitational and Electromagnetic Signatures from the Tidal Disruption of a White Dwarf by an Intermediate Mass Black Hole”, Florida Atlantic University. Boca Raton, FL. Gulf Coast Gravity Meeting. May, 2011



- “Gravitational and Electromagnetic Signatures from the Tidal Disruption of a White Dwarf by an Intermediate Mass Black Hole”, Anaheim, CA. APS April Meeting. May, 2011
- “Progress Report: Gravitational and Electromagnetic Signatures from Tidal Disruption of a White Dwarf by an Intermediate Mass Black Hole”, North Carolina State University, Raleigh, NC. Eastern Gravity Meeting. May, 2010
- “Gravitational and Electromagnetic Signatures from the Tidal Disruption of a White Dwarf by an Intermediate Mass Black Hole”, Washington, DC. APS April Meeting. February, 2010
- “Black Hole - Neutron Star Binary Simulations at Georgia Tech”, Louisiana State University, Baton Rouge, LA. Gulf Coast Gravity Meeting. April, 2009
- “Electromagnetic self-force for eccentric orbits in Schwarzschild spacetime”, CNRS, Orleans, France. Capra meeting on Radiation Reaction, June, 2008
- “Electromagnetic self-force for eccentric orbits in Schwarzschild spacetime: A progress report”, St. Louis University, St Louis, MO. Midwest Relativity Meeting, November, 2007
- “Scalar self-force for eccentric orbits in Schwarzschild spacetime”, University of Alabama, Huntsville, AL. Capra meeting on Radiation Reaction, June, 2007
- “Scalar self-force for eccentric orbits in Schwarzschild spacetime”, University of New Brunswick, Fredericton, NB. Canadian Conference on General Relativity and Relativistic Astrophysics, May, 2007
- “Scalar self-force for eccentric orbits in Schwarzschild spacetime”, Washington University, St Louis, MO. Midwest Relativity Meeting, November, 2006

## Publications

	Scopus	Google Scholar	... since 2018
Citations	4063	6015	4319
h-index	61	40	35
i10-index	N/A	56	54

- [1] Shankar, S., Mösta, P., Brandt, S. R., et al., “GRaM-X: a new GPU-accelerated dynamical spacetime GRMHD code for Exascale computing with the Einstein Toolkit,” *Classical and Quantum Gravity*, 40, 205009 (2023).
- [2] Park, H., Patel, P., Haas, R., & Huerta, E. A., “APACE: AlphaFold2 and advanced computing as a service for accelerated discovery in biophysics,” arXiv e-prints, arXiv:2308.07954 (2023).
- [3] Luo, Y., Zhang, Q., Haas, R., Etienne, Z. B., & Allen, G., “HPC-driven computational reproducibility,” arXiv e-prints, arXiv:2307.01343 (2023).
- [4] Werneck, L., Cupp, S., Assumpção, T., et al., “The Einstein Toolkit,” Zenodo, (2023).
- [5] Foucart, F., Duez, M. D., Haas, R., et al., “General relativistic simulations of collapsing binary neutron star mergers with Monte Carlo neutrino transport,” *PhRvD*, 107, 103055 (2023).

- [6] Curtis, S., Bosch, P., Mösta, P., et al., “Outflows from Short-Lived Neutron-Star Merger Remnants Can Produce a Blue Kilonova,” arXiv e-prints, arXiv:2305.07738 (2023).
- [7] Joshi, A. V., Rosofsky, S. G., Haas, R., & Huerta, E. A., “Numerical relativity higher order gravitational waveforms of eccentric, spinning, nonprecessing binary black hole mergers,” PhRvD, 107, 064038 (2023).
- [8] Kumar, R., Dexheimer, V., Jahan, J., et al., “Theoretical and Experimental Constraints for the Equation of State of Dense and Hot Matter,” arXiv e-prints, arXiv:2303.17021 (2023).
- [9] Werneck, L. R., Etienne, Z. B., Murguia-Berthier, A., et al., “Addition of tabulated equation of state and neutrino leakage support to IllinoisGRMHD,” PhRvD, 107, 044037 (2023).
- [10] Zlochower, Y., Brandt, S. R., Diener, P., et al., “The Einstein Toolkit,” Zenodo, (2022).
- [11] Radice, D., Bernuzzi, S., Perego, A., & Haas, R., “A new moment-based general-relativistic neutrino-radiation transport code: Methods and first applications to neutron star mergers,” MNRAS, 512, 1499 (2022).
- [12] Schnetter, E., Brandt, S., Cupp, S., et al., “CarpetX,” Zenodo, (2022).
- [13] Brandt, S. R., Bozzola, G., Cheng, C.-H., et al., “The Einstein Toolkit,” Zenodo, (2021).
- [14] Wei, W., Huerta, E. A., Yun, M., et al., “Deep Learning with Quantized Neural Networks for Gravitational-wave Forecasting of Eccentric Compact Binary Coalescence,” ApJ, 919, 82 (2021).
- [15] Luo, Y., Haas, R., Zhang, Q., & Allen, G., “DataVault: a data storage infrastructure for the Einstein Toolkit,” Classical and Quantum Gravity, 38, 135016 (2021).
- [16] Tsao, B.-J., Haas, R., & Tsokaros, A., “Source term method for binary neutron stars initial data,” Classical and Quantum Gravity, 38, 135008 (2021).
- [17] Habib, S., Ramos-Buades, A., Huerta, E. A., et al., “Initial data and eccentricity reduction toolkit for binary black hole numerical relativity waveforms,” Classical and Quantum Gravity, 38, 125007 (2021).
- [18] Chen, Z., Huerta, E. A., Adamo, J., et al., “Observation of eccentric binary black hole mergers with second and third generation gravitational wave detector networks,” PhRvD, 103, 084018 (2021).
- [19] Haas, R., Brandt, S. R., Gabella, W. E., et al., “The Einstein Toolkit,” Zenodo, (2020).
- [20] Mösta, P., Radice, D., Haas, R., Schnetter, E., & Bernuzzi, S., “A Magnetar Engine for Short GRBs and Kilonovae,” ApJL, 901, L37 (2020).

- [21] Ossokine, S., Buonanno, A., Marsat, S., et al., “Multipolar effective-one-body waveforms for precessing binary black holes: Construction and validation,” *PhRvD*, 102, 044055 (2020).
- [22] Brandt, S. R., Brendal, B., Gabella, W. E., et al., “The Einstein Toolkit,” Zenodo, (2020).
- [23] Etienne, Z. B., Paschalidis, V., Haas, R., Moesta, P., & Shapiro, S. L., “Illinois-GRMHD: GRMHD code for dynamical spacetimes,” *Astrophysics Source Code Library*, ascl:2004.003 (2020).
- [24] Vincent, T., Foucart, F., Duez, M. D., et al., “Unequal mass binary neutron star simulations with neutrino transport: Ejecta and neutrino emission,” *PhRvD*, 101, 044053 (2020).
- [25] Babiuc-Hamilton, M., Brandt, S. R., Diener, P., et al., “The Einstein Toolkit,” Zenodo, (2019).
- [26] Huerta, E. A., Allen, G., Andreoni, I., et al., “Enabling real-time multi-messenger astrophysics discoveries with deep learning,” *Nature Reviews Physics*, 1, 600 (2019).
- [27] Huerta, E. A., Haas, R., Habib, S., et al., “Physics of eccentric binary black hole mergers: A numerical relativity perspective,” *PhRvD*, 100, 064003 (2019).
- [28] Rebei, A., Huerta, E. A., Wang, S., et al., “Fusing numerical relativity and deep learning to detect higher-order multipole waveforms from eccentric binary black hole mergers,” *PhRvD*, 100, 044025 (2019).
- [29] Foucart, F., Duez, M. D., Hinderer, T., et al., “Gravitational waveforms from spectral Einstein code simulations: Neutron star-neutron star and low-mass black hole-neutron star binaries,” *PhRvD*, 99, 044008 (2019).
- [30] Allen, G., Andreoni, I., Bachelet, E., et al., “Deep Learning for Multi-Messenger Astrophysics: A Gateway for Discovery in the Big Data Era,” *arXiv e-prints*, arXiv:1902.00522 (2019).
- [31] Markakis, C. M., O’Boyle, M. F., Glennon, D., et al., “Time-symmetry, symplecticity and stability of Euler-Maclaurin and Lanczos-Dyche integration,” *arXiv e-prints*, arXiv:1901.09967 (2019).
- [32] Mösta, P., Roberts, L. F., Halevi, G., et al., “r-process Nucleosynthesis from Three-dimensional Magnetorotational Core-collapse Supernovae,” *ApJ*, 864, 171 (2018).
- [33] Belkin, M., Haas, R., Arnold, G. W., et al., “Container solutions for HPC Systems: A Case Study of Using Shifter on Blue Waters,” *arXiv e-prints*, arXiv:1808.00556 (2018).
- [34] Arzoumanian, Z., Baker, P. T., Brazier, A., et al., “The NANOGrav 11 Year Data Set: Pulsar-timing Constraints on the Stochastic Gravitational-wave Background,” *ApJ*, 859, 47 (2018).

- [35] Hossein Nouri, F., Duez, M. D., Foucart, F., et al., “Evolution of the magnetized, neutrino-cooled accretion disk in the aftermath of a black hole-neutron star binary merger,” *PhRvD*, 97, 083014 (2018).
- [36] Ott, C. D., Roberts, L. F., da Silva Schneider, A., et al., “The Progenitor Dependence of Core-collapse Supernovae from Three-dimensional Simulations with Progenitor Models of 12-40  $M_{\odot}$ ,” *ApJL*, 855, L3 (2018).
- [37] Huerta, E. A., Moore, C. J., Kumar, P., et al., “Eccentric, nonspinning, inspiral, Gaussian-process merger approximant for the detection and characterization of eccentric binary black hole mergers,” *PhRvD*, 97, 024031 (2018).
- [38] Johnson, D., Huerta, E. A., & Haas, R., “Python Open source Waveform ExtractoR (POWER): an open source, Python package to monitor and post-process numerical relativity simulations,” *Classical and Quantum Gravity*, 35, 027002 (2018).
- [39] Fedrow, J. M., Ott, C. D., Sperhake, U., et al., “Gravitational Waves from Binary Black Hole Mergers inside Stars,” *PhRvL*, 119, 171103 (2017).
- [40] Nouri, F. H., Duez, M. D., Foucart, F., et al., “Evolution of the Magnetized, Neutrino-Cooled Accretion Disk in the Aftermath of a Black Hole Neutron Star Binary Merger,” *arXiv e-prints*, arXiv:1710.07423 (2017).
- [41] Huerta, E. A., Haas, R., Fajardo, E., et al., “BOSS-LDG: A Novel Computational Framework that Brings Together Blue Waters, Open Science Grid, Shifter and the LIGO Data Grid to Accelerate Gravitational Wave Discovery,” *arXiv e-prints*, arXiv:1709.08767 (2017).
- [42] Huerta, E. A., Kumar, P., Agarwal, B., et al., “Complete waveform model for compact binaries on eccentric orbits,” *PhRvD*, 95, 024038 (2017).
- [43] Roberts, L. F., Ott, C. D., Haas, R., et al., “General-Relativistic Three-Dimensional Multi-group Neutrino Radiation-Hydrodynamics Simulations of Core-Collapse Supernovae,” *ApJ*, 831, 98 (2016).
- [44] Tacik, N., Foucart, F., Pfeiffer, H. P., et al., “Erratum: Binary neutron stars with arbitrary spins in numerical relativity [*Phys. Rev. D* 92, 124012 (2015)],” *PhRvD*, 94, 049903 (2016).
- [45] Haas, R., Ott, C. D., Szilagyi, B., et al., “Simulations of inspiraling and merging double neutron stars using the Spectral Einstein Code,” *PhRvD*, 93, 124062 (2016).
- [46] Barkett, K., Scheel, M. A., Haas, R., et al., “Gravitational waveforms for neutron star binaries from binary black hole simulations,” *PhRvD*, 93, 044064 (2016).
- [47] Tacik, N., Foucart, F., Pfeiffer, H. P., et al., “Binary neutron stars with arbitrary spins in numerical relativity,” *PhRvD*, 92, 124012 (2015).

- [48] Etienne, Z. B., Paschalidis, V., Haas, R., Mösta, P., & Shapiro, S. L., “Illinois-GRMHD: an open-source, user-friendly GRMHD code for dynamical spacetimes,” *Classical and Quantum Gravity*, 32, 175009 (2015).
- [49] Abdikamalov, E., Ott, C. D., Radice, D., et al., “Neutrino-driven Turbulent Convection and Standing Accretion Shock Instability in Three-dimensional Core-collapse Supernovae,” *ApJ*, 808, 70 (2015).
- [50] Foucart, F., O’Connor, E., Roberts, L., et al., “Post-merger evolution of a neutron star-black hole binary with neutrino transport,” *PhRvD*, 91, 124021 (2015).
- [51] Foucart, F., Deaton, M. B., Duez, M. D., et al., “Neutron star-black hole mergers with a nuclear equation of state and neutrino cooling: Dependence in the binary parameters,” *PhRvD*, 90, 024026 (2014).
- [52] Mösta, P., Richers, S., Ott, C. D., et al., “Magnetorotational Core-collapse Supernovae in Three Dimensions,” *ApJL*, 785, L29 (2014).
- [53] Mösta, P., Mundim, B. C., Faber, J. A., et al., “GRHydro: a new open-source general-relativistic magnetohydrodynamics code for the Einstein toolkit,” *Classical and Quantum Gravity*, 31, 015005 (2014).
- [54] Vega, I., Wardell, B., Diener, P., Cupp, S., & Haas, R., “Scalar self-force for eccentric orbits around a Schwarzschild black hole,” *PhRvD*, 88, 084021 (2013).
- [55] Reisswig, C., Ott, C. D., Abdikamalov, E., et al., “Formation and Coalescence of Cosmological Supermassive-Black-Hole Binaries in Supermassive-Star Collapse,” *PhRvL*, 111, 151101 (2013).
- [56] Shcherbakov, R. V., Pe’er, A., Reynolds, C. S., et al., “GRB060218 as a Tidal Disruption of a White Dwarf by an Intermediate-mass Black Hole,” *ApJ*, 769, 85 (2013).
- [57] Ott, C. D., Abdikamalov, E., Mösta, P., et al., “General-relativistic Simulations of Three-dimensional Core-collapse Supernovae,” *ApJ*, 768, 115 (2013).
- [58] Moesta, P., Mundim, B., Faber, J., et al., “General relativistic magnetohydrodynamics with the Einstein Toolkit,” *APS April Meeting Abstracts*, 2013, X10.001 (2013).
- [59] Reisswig, C., Haas, R., Ott, C. D., et al., “Three-dimensional general-relativistic hydrodynamic simulations of binary neutron star coalescence and stellar collapse with multipatch grids,” *PhRvD*, 87, 064023 (2013).
- [60] Zimmerman, P., Vega, I., Poisson, E., & Haas, R., “Self-force as a cosmic censor,” *PhRvD*, 87, 041501 (2013).
- [61] Hinder, I., Buonanno, A., Boyle, M., et al., “Error-analysis and comparison to analytical models of numerical waveforms produced by the NRAR Collaboration,” *Classical and Quantum Gravity*, 31, 025012 (2013).

- [62] Healy, J., Bode, T., Haas, R., et al., “Late inspiral and merger of binary black holes in scalar-tensor theories of gravity,” *Classical and Quantum Gravity*, 29, 232002 (2012).
- [63] Ott, C. D., Abdikamalov, E., O’Connor, E., et al., “Correlated gravitational wave and neutrino signals from general-relativistic rapidly rotating iron core collapse,” *PhRvD*, 86, 024026 (2012).
- [64] Löffler, F., Faber, J., Bentivegna, E., et al., “The Einstein Toolkit: a community computational infrastructure for relativistic astrophysics,” *Classical and Quantum Gravity*, 29, 115001 (2012).
- [65] Haas, R., Shcherbakov, R. V., Bode, T., & Laguna, P., “Tidal Disruptions of White Dwarfs from Ultra-close Encounters with Intermediate-mass Spinning Black Holes,” *ApJ*, 749, 117 (2012).
- [66] Bode, T., Bogdanović, T., Haas, R., et al., “Mergers of Supermassive Black Holes in Astrophysical Environments,” *ApJ*, 744, 45 (2012).
- [67] Haas, R., “Time domain calculation of the electromagnetic self-force on eccentric geodesics in Schwarzschild spacetime,” arXiv e-prints, arXiv:1112.3707 (2011).
- [68] Bogdanović, T., Bode, T., Haas, R., Laguna, P., & Shoemaker, D., “Properties of accretion flows around coalescing supermassive black holes,” *Classical and Quantum Gravity*, 28, 094020 (2011).
- [69] Bode, T., Haas, R., Bogdanović, T., Laguna, P., & Shoemaker, D., “Relativistic Mergers of Supermassive Black Holes and Their Electromagnetic Signatures,” *ApJ*, 715, 1117 (2010).
- [70] Haas, R., “Self-force on point particles in orbit around a Schwarzschild black hole,” Ph.D. Thesis, (2008).
- [71] Haas, R., “Scalar self-force on eccentric geodesics in Schwarzschild spacetime: A time-domain computation,” *PhRvD*, 75, 124011 (2007).
- [72] Haas, R., & Poisson, E., “Mode-sum regularization of the scalar self-force: Formulation in terms of a tetrad decomposition of the singular field,” *PhRvD*, 74, 044009 (2006).
- [73] Haas, R., & Poisson, E., “Mass change and motion of a scalar charge in cosmological spacetimes,” *Classical and Quantum Gravity*, 22, S739 (2005).