Wolfgang Tichy

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Education:

2001   Ph.D. in Physics, Cornell University, Ithaca, NY, USA
1996   Diplom in Physik, Universität Karlsruhe, Karlsruhe, Germany

Appointments and professional Training:

2014-date   Professor of Physics, Physics Department
            Florida Atlantic University (FAU), Boca Raton, FL 33431, USA
2010-2014   Associate Professor of Physics, Physics Department
            Florida Atlantic University (FAU), Boca Raton, FL 33431, USA
2005-2010   Assistant Professor of Physics, Physics Department
            Florida Atlantic University (FAU), Boca Raton, FL 33431, USA
2002-2004   Postdoctoral Associate, Institute for Gravitation & the Cosmos
            Penn State University, State College, PA, USA
2001-2002   Postdoctoral Associate, Albert-Einstein-Institut, Golm, Germany
1996-2001   Ph.D. student of Professor É. Flanagan, Cornell University, Ithaca, NY, USA
1996-2001   Teaching Assistant, Cornell University, Ithaca, NY, USA
1995-1996   Diplomstudent of Professor G. Schön, Universität Karlsruhe, Karlsruhe
1995-1996   Tutor in Physik, Universität Karlsruhe, Karlsruhe

Research Interests:

- Numerical simulation of black holes and neutron stars

- Finite volume, discontinuous Galerkin, and spectral methods

- Binary systems as sources of gravitational waves

- Construction of realistic initial data for black holes and neutron stars

- Post-Newtonian initial data for black holes

Open Source Software published under the GPL license:

- SGRID: Create initial data for binary neutron stars, with arbitrary masses and spins on any orbits, https://github.com/sgridsource

- CactusSgrid: Load binary neutron stars initial data into the Einstein Toolkit to calculate the stars' subsequent inspiral and merger, https://github.com/wofti/CactusSgrid

- TGRAPH: Visualize and plot data from numerical relativity calculations, https://github.com/wofti/tgraph

Publications and Preprints:

L. Ji, A. Adhikari, W. Tichy, "Toward Moving Puncture Simulations with the Generalized Harmonic System", in preparation

G. Doulis, S. Bernuzzi, W. Tichy, "Entropy based flux limiting scheme for conservation laws", accepted for publication in Phys. Rev. D, arXiv:2401.04770 [gr-qc]

R. Gamba, M. Breschi, S. Bernuzzi, A. Nagar, W. Cook, G. Doulis, F. Fabbri, N. Ortiz, A. Poudel, A. Rashti, W. Tichy, M. Ujevic, "Analytically improved and numerical-relativity informed effective-one-body model for coalescing binary neutron stars", submitted to Phys. Rev. D, arXiv:2307.15125 [gr-qc]

H. R. Rüter, V. Sagun, W. Tichy, T. Dietrich, "Quasi-equilibrium configurations of binary systems of dark matter admixed neutron stars", Phys. Rev. **D108**, 124080 (2023), arXiv:2301.03568 [gr-qc]

W. Tichy, L. Ji, A. Adhikari, A. Rashti, M. Pirog, "The new discontinuous Galerkin methods based numerical relativity program Nmesh", Class. Quantum Grav. **40**, 025004 (2023), arXiv:2212.06340

A. Gonzalez, F. Zappa, M. Breschi, S. Bernuzzi, D. Radice, A. Adhikari, A. Camilletti, S. V. Chaurasia, G. Doulis, S. Padamata, A. Rashti, M. Ujevic, B. Brügmann, W. Cook, T. Dietrich, A. Perego, A. Poudel, W. Tichy, "Second release of the CoRe database of binary neutron star merger waveforms", Class. Quantum Grav. **40**, 085011 (2023), arXiv:2210.16366 [gr-qc]

T. Feghhi, W. Tichy, and A. W. C. Lau, "Pulling a harmonically bound particle subjected to Coulombic friction: A nonequilibrium analysis", Phys. Rev. **E106**, 024407 (2022)

S. Mukherjee, N. K. Johnson-McDaniel, W. Tichy, S. L. Liebling, "Conformally curved initial data for charged, spinning black hole binaries on arbitrary orbits", arXiv:2202.12133 [gr-qc]

M. Ujevic, A. Rashti, H. Gieg, W. Tichy, T. Dietrich, "High-accuracy high-mass ratio simulations for binary neutron stars and their comparison to existing waveform models", Phys. Rev. **D106**, 023029 (2022), arXiv:2202.09343 [gr-qc]

A. Rashti, F. M. Fabbri, B. Brügmann, S. V. Chaurasia, T. Dietrich, M. Ujevic, W. Tichy, "New pseudospectral code for the construction of initial data", Phys. Rev. **D105**, 104027 (2022), arXiv:2109.14511 [gr-qc]

R. Dudi, A. Adhikari, B. Brügmann, T. Dietrich, K. Hayashi, K. Kawaguchi, K. Kiuchi, K. Kyutoku, M. Shibata, W. Tichy, "Investigating GW190425 with numerical-relativity simulations", Phys. Rev. **D106**, 084039 (2022), arXiv:2109.04063 [gr-qc]

R. Dudi, T. Dietrich, A. Rashti, B. Bruegmann, J. Steinhoff, W. Tichy, "High-accuracy simulations of highly spinning binary neutron star systems", Phys. Rev. **D105**, 064050 (2022), arXiv:2108.10429 [gr-qc]

A. Poudel, W. Tichy, B. Brügmann, T. Dietrich, "Increasing the accuracy of binary neutron star simulations with an improved vacuum treatment", Phys. Rev. **D102**, 104014 (2020), arXiv:2009.06617

[gr-qc]

S. V. Chaurasia, T. Dietrich, M. Ujevic, K. Hendriks, R. Dudi, F. M. Fabbri, W. Tichy, B. Brügmann, "Gravitational waves and mass ejecta from binary neutron star mergers: Effect of the spin orientation", Phys. Rev. **D102**, 024087 (2020), arXiv:2003.11901 [gr-qc]

W. Tichy, A. Rashti, T. Dietrich, R. Dudi, B. Brügmann, "Constructing Binary Neutron Star Initial Data with High Spins, High Compactness, and High Mass-Ratios", Phys. Rev. **D100**, 124046 (2019), arXiv:1910.09690 [gr-qc]

T. Dietrich, A. Samajdar, S. Khan, N.K. Johnson-McDaniel, R. Dudi, W. Tichy, "Improving the NRTidal model for binary neutron star systems", Phys. Rev. **D100**, 044003 (2019), arXiv:1905.06011 [gr-qc]

S.V. Chaurasia, T. Dietrich, N.K. Johnson-McDaniel, M. Ujevic, W. Tichy, B. Brügmann, "Gravitational waves and mass ejecta from binary neutron star mergers: Effect of large eccentricities", Phys. Rev. **D98**, 104005 (2018), arXiv:1807.06857 [gr-qc]

T. Dietrich, D. Radice, S. Bernuzzi, F. Zappa, A. Perego, B. Brügmann, S.V. Chaurasia, R. Dudi, W. Tichy, M. Ujevic, "CoRe database of binary neutron star merger waveforms", Class. Quantum Grav. **35** (2018) 24LT01, arXiv:1806.01625 [gr-qc]

T. Dietrich, S. Bernuzzi, B. Brügmann, W. Tichy, "High-resolution numerical relativity simulations of spinning binary neutron star mergers", Proceeding for the 26th Euromicro International Conference on Parallel, Distributed, and Network-Based Processing in Cambridge 2018, PDP 2018 IEEE Catalog Number: CFP18169 arXiv:1803.07965 [gr-qc]

T. Dietrich, S. Bernuzzi, B. Brügmann, M. Ujevic, W. Tichy, "Numerical Relativity Simulations of Precessing Binary Neutron Star Mergers", Phys. Rev. **D97**, 064002, 2018, arXiv:1712.02992 [gr-qc]

T. Dietrich, S. Bernuzzi, W. Tichy, "Closed-form tidal approximants for binary neutron star gravitational waveforms constructed from high-resolution numerical relativity simulations", Phys. Rev. **D96**, 121501, 2017, arXiv:1706.02969 [gr-qc]

T. Dietrich, S. Bernuzzi, M. Ujevic, W. Tichy, "Gravitational waves and mass ejecta from binary neutron star mergers: Effect of the stars' rotation", Phys. Rev. **D95**, 044045, 2017, arXiv:1611.07367 [gr-qc]

W. Tichy, "The initial value problem as it relates to numerical relativity", Rept. Prog. Phys. **80**, 026901, 2017, arXiv:1610.03805 [gr-qc]

T. Dietrich, M. Ujevic, W. Tichy, S. Bernuzzi, B. Bruegmann, "Gravitational waves and mass ejecta from binary neutron star mergers: Effect of the mass-ratio", Phys. Rev. **D95**, 024029, 2017, arXiv:1607.06636 [gr-qc]

T. Dietrich, N. Moldenhauer, N. K. Johnson-McDaniel, S. Bernuzzi, C. M. Markakis, B. Bruegmann, W. Tichy, "Binary Neutron Stars with Generic Spin, Eccentricity, Mass ratio, and Compactness - Quasi-equilibrium Sequences and First Evolutions", Phys. Rev. **D92**, 124007, 2015,

arXiv:1507.07100 [gr-qc]

W. Tichy, J. R. McDonald, W. A. Miller, "New efficient algorithm for the isometric embedding of 2-surface metrics in 3 dimensional Euclidean space", Class. Quantum Grav. **32**, 015002 (2015), arXiv:1411.0975 [gr-qc]

N. Moldenhauer, C. M. Markakis, N. K. Johnson-McDaniel, W. Tichy, B. Bruegmann, "Initial data for binary neutron stars with adjustable eccentricity", Phys. Rev. **D90**, 084043, 2014, arXiv:1408.4136 [gr-qc]

J. Aasi et al., W. Tichy [co-author], "The NINJA-2 project: Detecting and characterizing gravitational waveforms modelled using numerical binary black hole simulations", Class. Quantum Grav. **31**, 115004 (2014), arXiv:1401.0939 [gr-qc]

S. Bernuzzi, T. Dietrich, W. Tichy, B. Bruegmann, "Mergers of binary neutron stars with realistic spin", Phys. Rev. **D89**, 104021, 2014, arXiv:1311.4443 [gr-qc]

I. Hinder, A. Buonanno, M. Boyle, Z. B. Etienne, J. Healy, N. K. Johnson-McDaniel, A. Nagar, H. Nakano, Y. Pan, H. P. Pfeiffer, M. Pürrer, C. Reisswig, M. A. Scheel, E. Schnetter, U. Sperhake, B. Szilágyi, W. Tichy, B. Wardell, A. Zenginoglu, D. Alic, S. Bernuzzi, T. Bode, B. Brügmann, L. T. Buchman, M. Campanelli, T. Chu, T. Damour, J. D. Grigsby, M. Hannam, R. Haas, D. A. Hemberger, S. Husa, L. E. Kidder, P. Laguna, L. London, G. Lovelace, C. O. Lousto, P. Marronetti, R. A. Matzner, P. Mösta, A. Mroué, D. Müller, B. C. Mundim, A. Nerozzi, V. Paschalidis, D. Pollney, G. Reifenberger, L. Rezzolla, S. L. Shapiro, D. Shoemaker, A. Taracchini, N. W. Taylor, S. A. Teukolsky, M. Thierfelder, H. Witek, Y. Zlochower, "Error-analysis and comparison to analytical models of numerical waveforms produced by the NRAR Collaboration", Class. Quantum Grav. **31**, 025012 (2013), arXiv:1307.5307 [gr-qc]

P Ajith, Michael Boyle, Duncan A Brown, Bernd Brügmann, Luisa T Buchman, Laura Cadonati, Manuela Campanelli, Tony Chu, Zachariah B Etienne, Stephen Fairhurst, Mark Hannam, James Healy, Ian Hinder, Sascha Husa, Lawrence E Kidder, Badri Krishnan, Pablo Laguna, Yuk Tung Liu, Lionel London, Carlos O Lousto, Geoffrey Lovelace, Ilana MacDonald, Pedro Marronetti, Satya Mohapatra, Philipp Mösta, Doreen Müller, Bruno C Mundim, Hiroyuki Nakano, Frank Ohme, Vasileios Paschalidis, Larne Pekowsky, Denis Pollney, Harald P Pfeiffer, Marcelo Ponce, Michael Pürrer, George Reifenberger, Christian Reisswig, Lucía Santamaría, Mark A Scheel, Stuart L Shapiro, Deirdre Shoemaker, Carlos F Sopuerta, Ulrich Sperhake, Béla Szilágyi, Nicholas W Taylor, Wolfgang Tichy, Petr Tsatsin and Yosef Zlochower, "Addendum to "The NINJA-2 catalog of hybrid post-Newtonian/numerical-relativity waveforms for non-precessing black-hole binaries"", Class. Quantum Grav. **30**, 199401 (2013)

D. Hilditch, S. Bernuzzi, M. Thierfelder, Z. Cao, W. Tichy, B. Bruegmann, "Compact binary evolutions with the Z4c formulation", Phys. Rev. **D88**, 084057, 2013, arXiv:1212.2901 [gr-qc]

W. Tichy, "Constructing quasi-equilibrium initial data for binary neutron stars with arbitrary spins", Phys. Rev. **D86**, 064024, 2012, arXiv:1209.5336 [gr-qc]

G. Reifenberger and W. Tichy, "Alternatives to standard puncture initial data for binary black hole evolution", Phys. Rev. **D86**, 064003, 2012, arXiv:1205.5502 [gr-qc]

P. Ajith et al., W. Tichy [co-author], "The NINJA-2 catalog of hybrid post-Newtonian/numerical-relativity waveforms for non-precessing black-hole binaries", Class. Quant. Grav. **29**, 124001 (2012), arXiv:1201.5319 [gr-qc]

P. Marronetti and W. Tichy, "Recent Advances in the Numerical Simulations of Binary Black Holes", Proceedings of the Department of Energy SciDAC Workshop (2011), arXiv:1107.3703 [gr-qc]

W. Tichy, "Initial data for binary neutron stars with arbitrary spins ", Phys. Rev. **D84**, 024041, 2011, arXiv:1107.1440 [gr-qc]

W. Tichy and É. É. Flanagan, "Covariant formulation of the post-1-Newtonian approximation to General Relativity", Phys. Rev. **D 84**, 044038, 2011, arXiv:1101.0588v1 [gr-qc]

W. Tichy and P. Marronetti, "A Simple method to set up low eccentricity initial data for moving puncture simulations", Phys. Rev. **D 83**, 024012, 2011, arXiv:1010.2936v2 [gr-qc]

B. J. Kelly, W. Tichy, Y. Zlochower, M. Campanelli, B. F. Whiting, "Post-Newtonian Initial Data with Waves: Progress in Evolution", Class. Quant. Grav. **27**, 114005, 2010, arXiv:0912.5311 [gr-qc]

N. K. Johnson-McDaniel, N. Yunes, W. Tichy, and B. J. Owen, "Conformally curved binary black hole initial data including tidal deformations and outgoing radiation", Phys. Rev. **D 80**, 124039, 2009, arXiv:0907.0891 [gr-qc]

W. Tichy, "Long term black hole evolution with the BSSN system by pseudo-spectral methods", Phys. Rev. **D 80**, 104034, 2009, arXiv:0911.0973v2 [gr-qc]

I. Vega, S. Detweiler, P. Diener, and W. Tichy, "Self-force with (3+1) codes: a primer for numerical relativists", Phys. Rev. **D 80**, 084021, 2009, arXiv:0908.2138 [gr-qc]

W. Tichy, "A new numerical method to construct binary neutron star initial data", Class. Quant. Grav. **26**, 175018 (2009), arXiv:0908.0620 [gr-qc]

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

L. Cadonati et al., W. Tichy [co-author], "Status of NINJA: the Numerical INJection Analysis project", Class. Quant. Grav. **26**, 114008 (2009), arXiv:0905.4227 [gr-qc]

W. Tichy and P. Marronetti, "The final mass and spin of black hole mergers", Rapid Communication in Phys. Rev. **D 78**, 081501 (2008), arXiv:0807.2985 [gr-qc]

P. Marronetti, W. Tichy, B. Brügmann, J. Gonzalez, and U. Sperhake, "High-spin binary black hole mergers", Phys. Rev. **D 77**,064010 (2008), arXiv:0709.2160 [gr-qc]

B. Brügmann, J.A. Gonzalez, M. Hannam, S. Husa, U. Sperhake and W. Tichy, "Calibration of Moving Puncture Simulations", Phys. Rev. **D 77**, 024027 (2008), gr-qc/0610128

B. J. Kelly, W. Tichy, M. Campanelli and B. F. Whiting "Black hole puncture initial data with realistic gravitational wave content", Phys. Rev. **D 76**, 024008 (2007), arXiv:0704.0628 [gr-qc]

W. Tichy and P. Marronetti, "Binary black hole mergers: large kicks for generic spin orientations", Rapid Communication in Phys. Rev. **D 76**, 061502 (2007), gr-qc/0703075

P. Marronetti, W. Tichy, B. Brügmann, J. Gonzalez, M. Hannam, S. Husa, and U. Sperhake, "Binary black holes on a budget: Simulations using workstations", Class. Quant. Grav. **24**, S43-S58 (2007), gr-qc/0701123

B. Brügmann, J. González, M. Hannam, S. Husa, P. Marronetti, U. Sperhake, W. Tichy, "Gravitational Wave Signals from Simulations of Black Hole Dynamics", contribution to the 9th Results and Review Workshop of HLRS Computing Center, Stuttgart, Germany, Oct. 13–14 2006, published in "High Performance Computing in Science and Engineering 2006", Springer, 2006.

N. Jansen, B. Brügmann and W. Tichy, "Numerical stability of the AA evolution system compared to the ADM and BSSN systems", Phys. Rev. **D 74**, 084022 (2006)

W. Tichy, "Black hole evolution with the BSSN system by pseudo-spectral methods", Phys. Rev. **D 74**, 084005 (2006), gr-qc/0609087

N. Yunes, and W. Tichy, "Improved initial data for black hole binaries by asymptotic matching of post-Newtonian and perturbed black hole solutions", Phys. Rev. **D 74**, 064013 (2006), gr-qc/0601046

N. Yunes, W. Tichy, B. J. Owen, and B. Brügmann, "Binary black hole initial data from matched asymptotic expansions", Phys. Rev. **D 74**, 104011 (2006), gr-qc/0503011.

M. Ansorg, B. Brügmann and W. Tichy, "A single-domain spectral method for black hole puncture data", Phys. Rev. **D 70**, 064011 (2004), gr-qc/0404056

B. Brügmann, W. Tichy and N. Jansen, "Numerical simulation of orbiting black holes", Phys. Rev. Lett. **92**, 211101 (2004), gr-qc/0312112

W. Tichy and B. Brügmann, "Quasi-equilibrium binary black hole sequences for puncture data derived from helical Killing vector conditions", Phys. Rev. **D 69**, 024006 (2004), gr-qc/0307027

W. Tichy, B. Brügmann and P. Laguna, "Gauge conditions for binary black hole puncture data based on an approximate helical Killing vector", Phys. Rev. **D 68**, 064008 (2003), gr-qc/0306020

W. Tichy, B. Brügmann, M. Campanelli and P. Diener, "Binary black hole initial data for numerical general relativity based on post-Newtonian data", Phys. Rev. **D 67**, 064008 (2003), gr-qc/0207011

W. Tichy and É. É. Flanagan, "Angular momentum ambiguities in asymptotically flat perturbed stationary spacetimes", Proceedings of the Ninth Marcel Grossmann Meeting on General Relativ-

ity, edited by V.G. Gurzadyan, R.T. Jantzen and R. Ruffini, World Scientific, Singapore, p. 1622, (2002)

W. Tichy and É. É. Flanagan, "Angular momentum ambiguities in asymptotically flat spacetimes which are perturbations of stationary spacetimes", Class. Quant. Grav. **18**, 3995 (2001)

W. Tichy, É. É. Flanagan and E. Poisson, "Can the post-Newtonian gravitational waveform of an inspiraling binary be improved by solving the energy balance equation numerically?", Phys. Rev. D **61**, 104015 (2000), gr-qc/9912075

W. Tichy and É. É. Flanagan, "How unique is the expected stress-energy tensor of a massive scalar field?", Phys. Rev. D **58**, 124007 (1998), gr-qc/9807015

J. von Delft, D. S. Golubev, W. Tichy and A. D. Zaikin, "Parity-Effected Superconductivity in Ultrasmall Metallic Grains", Phys. Rev. Lett. **77**, 3189-3192 (1996), cond-mat/9604072

Grants received:

- NSF Gravitation (PHY-2408903)
  Studies of binary systems in strong gravity
  Award: $210000, 09/01/2024-08/31/2027
  PI: W. Tichy (FAU)

- ACCESS Allocation (PHY230109)
  Neutron star simulations with Nmesh
  Computer time: 1500000 SU, 08/07/2023-08/06/2024
  PI: W. Tichy (FAU)

- ACCESS Allocation (PHY220018)
  Improving the Nmesh code to simulate compact-object binary inspirals
  Computer time: 100000 SU, 02/21/2022-02/20/2023
  PI: W. Tichy (FAU)

- NSF Gravitation (PHY-2136036)
  RAISE: Creation of an Advanced Public Binary Neutron Star Initial Data Code for the Einstein Toolkit
  Award: $300000, 09/01/2021-08/31/2024
  PI: W. Tichy (FAU)

- NSF Gravitation (PHY-2011729)
  Numerical Relativity simulations with the new Nmesh code
  Award: $60000, 09/01/2020-08/31/2021
  PI: W. Tichy (FAU)

- NSF Gravitation (PHY-1707227)
  DFG-NSF: Gravitational Waves from Neutron Star and Black Hole Mergers
  Award: $210000, 09/01/2017-08/31/2021
  PI: W. Tichy (FAU)

- NSF Gravitation (PHY-1305387)
  Studies of General Relativistic Compact-Object Binaries
  Award: $126000, 09/01/2013-08/31/2017
  PI: W. Tichy (FAU)

- NSF Gravitation (PHY-1204334)
  General Relativistic Simulations of binary compact Objects
  Award: $30000, 05/01/2012-04/30/2014
  PI: W. Tichy (FAU)

- NSF Gravitation (PHY-0855315)
  Numerical Studies of Compact-Object Binaries
  Award: $200000, 08/01/2009-07/31/2013
  PI: W. Tichy (FAU)

- NSF Gravitation (PHY-0652874)
  Numerical studies of binary black hole dynamics and waveforms
  Award $120000, 08/01/2007-07/31/2009
  PI: W. Tichy (FAU), Co-PI: P. Marronetti (FAU)

- NSF Gravitation (PHY-0555644)
  Orbiting binary black holes
  Award: $60000, 08/01/2006-07/31/2007
  PI: W. Tichy (FAU), Co-PI: P. Marronetti (FAU)

- XSEDE Allocation Account (PHY140019)
  Spinning Binary Neutron Star Simulations
  Computer time: 2898515 SU, 04/01/2014-03/31/2016
  PI: W. Tichy (FAU)

- XSEDE Allocation Account (TG-PHY140017)
  Simulations of binary neutron stars and black holes
  Computer time: 150000 SU, 12/20/2013-12/19/2014
  PI: W. Tichy (FAU)

- NCSA Teragrid Allocation Account (PHY100051)
  Binary Black Hole Simulations: Creation of a public Gravitational Wave Repository at FAU
  Computer time: 2500000 SU, 10/01/2010-9/30/2011
  PI: P. Marronetti (FAU), Co-PI: W. Tichy (FAU)

- NCSA Teragrid Allocation Account (PHY090095)
  Simulations of binary black holes
  Computer time: 200000 SU, 06/10/2009-06/09/2010
  PI: W. Tichy (FAU)

- NCSA Teragrid Allocation Account (PHY080019)
  Binary Black Hole Simulations
  Computer time: 30000 SU, 02/01/2008-01/31/2009
  PI: W. Tichy (FAU)

- NCSA Teragrid Allocation Account (PHY060052)
  Orbiting Black Holes
  Computer time: 30000 SU, 09/08/2006-09/30/2007
  PI: W. Tichy (FAU)

- NCSA Teragrid Allocation Account (PHY050012)
  Constructing astrophysically realistic binary black hole initial data
  Computer time: 30000 SU, 01/2005-01/2006
  PI: W. Tichy (FAU)

- NCSA Teragrid Allocation Account (PHY050018)
  Relativistic Astrophysics: Compact-Object Binaries
  Computer time: 105000 SU, 05/01/2005-04/30/2006
  PI: P. Marronetti (FAU), Co-PI: W. Tichy (FAU)

Invited Talks:

07/2024	"The Nmesh code" Computational Relativistic Astrophysics Department, Albert Einstein Institut, Golm, Germany
07/2024	"The numerical relativity code Nmesh" Physikalisch-Astronomische Fakultät, Friedrich-Schiller-Universität Jena, Germany
07/2022	"The Nmesh code" Frontiers in Numerical Relativity 2022, Friedrich-Schiller-Universität Jena, Germany
07/2022	"The SGRID initial data code" North American Einstein Toolkit Summer School 2022, University of Idaho, Moscow, ID
10/2021	"Binary neutron star mergers and gravitational waves" Department of Physics, Florida International University, Miami, FL
09/2020	"Research in astrophysics: neutron stars, black holes and gravitational waves" 2 lectures for the Introduction to Research class, FAU High School, Boca Raton, FL
07/2019	"Simulations of binary neutron stars" Physikalisch-Astronomische Fakultät, Friedrich-Schiller-Universität Jena, Germany
06/2019	"Evolving binary neutron stars using BAM" North American Einstein Toolkit workshop 2019, Rochester Institute of Technology, Rochester, NY
11/2018	"Gravitational waves from binary neutron star simulations" Department of Physics, University of Florida, Gainesville, FL
07/2018	"Improved initial data for binary neutron stars" Physikalisch-Astronomische Fakultät, Friedrich-Schiller-Universität Jena, Germany
05/2018	"Black holes and what we can learn from them" ILIR lecture, Institute For Learning In Retirement, Boca Raton, FL

03/2018   "Black holes, dark but illuminating"
            Special Frontiers in Science Lecture,
            Florida Atlantic University, Boca Raton, FL

11/2017   "Gravitational waves from neutron star and black bole binaries"
            Lecture to the Journal Club of the Computer and Electrical Engineering
            and Computer Science Department,
            Florida Atlantic University, Boca Raton, FL

03/2017   "General Relativistic simulations of neutron stars"
            Physics Seminar,
            Wichita State University, Wichita, KS

12/2016   "Neutron stars, black holes and gravitational waves"
            Presentation about research to high school students,
            FAU High School, Boca Raton, FL

03/2016   "Einstein's Legacy: Black Holes and Gravitational Waves"
            $M A \Theta$ lecture to high school students,
            Florida Atlantic University, Davie, FL

02/2016   "Einstein's Legacy: Black Holes and Gravitational Waves"
            Special Frontiers in Science Lecture,
            Florida Atlantic University, Boca Raton, FL

05/2015   "Numerical simulations of binary neutron stars with spin"
            Graduiertenkolleg Quantum and Gravitational Fields,
            Friedrich-Schiller-Universität Jena, Germany

05/2015   "Isometric embedding of 2-metrics in $\mathbb{R}^3$ and some comments on quasi-local mass"
            Physikalisch-Astronomische Fakultät, Friedrich-Schiller-Universität Jena, Germany

02/2014   "Numerical Relativity"
            Sunshine State Education & Research Computing Alliance summit,
            Florida Atlantic University, Boca Raton, FL

07/2013   "Binary black hole evolutions with improved initial data"
            Physikalisch-Astronomische Fakultät, Friedrich-Schiller-Universität Jena, Germany

05/2013   "General Relativistic simulations of compact binaries"
            Department of Physics and Atmospheric Science, Dalhousie University, Halifax,
            Canada

03/2013   "Constructing initial data for binary neutron stars with spins"
            Department of Mathematics, Harvard University, Cambridge MA

11/2012   "Simulations of compact-object binaries"
            Department of Physics, Florida Atlantic University, Boca Raton, FL

07/2012   "Neutron star binaries with spin"
            Physikalisch-Astronomische Fakultät, Friedrich-Schiller-Universität Jena, Germany

11/2011   "Initial data for spinning binary neutron stars"
Department of Physics, University of Florida, Gainesville, FL

11/2011   "Binary neutron stars with spin"
Department of Physics, Florida Atlantic University, Boca Raton, FL

07/2010   "Long term black hole evolutions with the BSSN system by pseudospectral methods"
Physikalisch-Astronomische Fakultät, Friedrich-Schiller-Universität Jena, Germany

08/2009   "Neutron star initial data"
Physikalisch-Astronomische Fakultät, Friedrich-Schiller-Universität Jena, Germany

10/2008   "Pseudo-spectral methods"
FAU SpaceTime seminar, Department of Physics, Florida Atlantic University, Boca Raton, FL

06/2008   "Using Post-Newtonian theory to build binary black hole initial data for numerical relativity"
Post Newton 2008 International Workshop, Friedrich-Schiller-Universität Jena, Germany

05/2008   "Black hole evolution by pseudo-spectral methods"
Department of Physics, University of Florida, Gainesville, FL

04/2008   "Binary black holes with spin: predicting the spin of the final black hole"
FAU SpaceTime seminar, Department of Physics, Florida Atlantic University, Boca Raton, FL

08/2007   "Black holes and gravitational waves"
Public Lecture
Astronomical Society of the Palm Beaches, West Palm Beach, FL

05/2007   "Binary black hole initial data with realistic gravitational wave content"
Institute for Gravitational Physics and Geometry, Penn State University, State College, PA

02/2007   "Binary black hole initial data at the interface between PN theory and numerical relativity"
NR meets 3PN: A Workshop on the Interface between Post-Newtonian Theory
and Numerical Relativity, Washington University, St. Louis, MO

07/2006   "Approximate binary black hole initial data from matched asymptotic expansions"
New Frontiers in Numerical Relativity, Albert Einstein Institut, Golm, Germany

07/2006   "Constructing binary black hole initial data from approximations"
Physikalisch-Astronomische Fakultät, Friedrich-Schiller-Universität Jena, Germany

05/2006   "Binary black hole evolutions with moving punctures"
Astrophysical Applications of Numerical Relativity Workshop, Guanajuato, Mexico

05/2006   "A gentle introduction to the method of moving punctures"
FAU SpaceTime seminar, Department of Physics, Florida Atlantic University, Boca Raton, FL

03/2006   "Approximate binary black hole initial data from matched asymptotic expansions"
2nd Annual Gulf Coast Gravity Meeting, Florida Atlantic University, Boca Raton, FL

11/2005   "Simulations of orbiting black holes"
Numerical Relativity 2005: Compact Binaries, NASA Goddard Space Flight Center

07/2005   "Towards realistic binary black hole initial data"
           Physikalisch-Astronomische Fakultät, Friedrich-Schiller-Universität Jena, Germany

02/2005   "On the construction of realistic initial data for binary black hole systems"
           Department of Physics, Florida Atlantic University, Boca Raton, FL

11/2004   "Constructing Realistic Initial Data for Binary Black Hole Systems"
           IGPG Seminar at the Institute for Gravitational Physics and Geometry,
           Penn State University, State College, PA

05/2004   "Binary black hole initial data and approximate helical Killing vectors"
           Center for Gravitational Wave Astronomy, University of Texas at Brownsville, Brownsville, TX

11/2003   "Binary black hole initial data sequences derived from helical Killing vector conditions"
           Department of Physics, University of Florida, Gainesville, FL

06/2003   "Binary black hole initial data based on post-Newtonian data"
           Gravitation: A Decennial Perspective
           Center for Gravitational Physics and Geometry, Penn State University, State College, PA

05/2003   "Post-Newtonian initial data for black hole collisions"
           Department of Physics & Astronomy, University of Texas at Brownsville, Brownsville, TX

12/1999   "On the uniqueness of the expected stress-energy tensor of a massive scalar field"
           Max-Planck-Institut für Gravitationsphysik, Albert-Einstein-Institut, Golm, Germany

Talks given at International Conferences:

04/2024   "Combining discontinuous Galerkin and finite volume methods within the Nmesh code"
           APS April Meeting, Sacramento, CA

04/2023   "The discontinuous Galerkin method in the Nmesh program"
           APS April Meeting, Minneapolis, MN

04/2022   "The current status of the Nmesh code"
           APS April Meeting, New York, NY

04/2021   "Evolving neutron stars with the Nmesh code"
           Virtual APS April Meeting

04/2020   "Numerical relativity with the new Nmesh code"
           Virtual APS April Meeting

04/2019   "Binary neutron stars with high compactness and spin"
           APS April Meeting, Denver, CO

04/2015   "Simulations of binary neutron stars with reduced eccentricity"
           APS April Meeting, Baltimore, MD

04/2014   "Binary neutron stars with realistic spin"
           APS April Meeting, Savannah, GA

04/2012	"Binary neutron stars with spin"
	APS April Meeting, Atlanta, GA

05/2012 reference:

04/2012 "Binary neutron stars with spin"
APS April Meeting, Atlanta, GA

05/2011 "Binary neutron star initial data with spin"
APS April Meeting, Anaheim, CA

05/2011 "Initial data for binary neutron stars with arbitrary spin"
Gulf Gravity Meeting 2011, Florida Atlantic University, Boca Raton, FL

05/2009 "A new numerical method for the construction of binary neutron star initial data"
APS April Meeting, Denver, CO

04/2008 "Binary black holes with spin: predicting the spin of the final black hole"
APS April Meeting, St. Louis, MO

07/2007 "Kicks due to mergers of spinning black holes"
GR18/Amaldi 7 conference, Sydney, Australia

04/2007 "Efficient binary black hole simulations: large kicks for generic spin orientations"
APS April Meeting, Jacksonville, FL

04/2006 "Binary Black Hole Evolutions with Moving Punctures: Progress report on final orbits and merger"
APS April Meeting, Dallas, TX

03/2006 "Improved initial data for black hole binaries by asymptotic matching"
Gulf Gravity Meeting 2006, Florida Atlantic University, Boca Raton, FL

04/2005 "Approximate binary black hole initial data from matched asymptotic expansions"
APS April Meeting, Tampa, FL

06/2004 "Simulations of orbiting black holes"
Seventh Eastern Gravity Meeting, Bowdoin College, Brunswick, ME

09/2003 "Gauge conditions for binary black hole puncture data based on an approximate helical Killing vector"
Advanced School Conference on Gravitational Waves, ICTP, Trieste, Italy

04/2003 "Binary black hole initial data based on post-Newtonian data"
APS April Meeting, Philadelphia, PA

01/2002 "Constructing initial data for black hole inspirals based on post-Newtonian data"
Third EU Network meeting on sources of gravitational waves,
Southampton University, Southampton, UK

07/2000 "General orbits of test particles around a Kerr black hole with radiation reaction"
Ninth Marcel Grossmann Meeting
University of Rome *La Sapienza*, Rome, Italy

07/2000 "General orbits of test particles around a Kerr black hole with radiation reaction"
Third International LISA Symposium, Albert-Einstein-Institut, Golm, Germany

11/1999   "Can the post-Newtonian gravitational waveform of an inspiraling binary be improved by solving the energy balance equation numerically?"
Ninth Midwest Relativity Meeting, University of Illinois, Urbana-Champaign, IL

03/1999   "Coordinate independent formulation of post-1-Newtonian general relativity"
Third Eastern Gravity Meeting, Cornell University, Ithaca, NY

03/1998   "How unique is the expected stress-energy tensor of a massive scalar field?"
Second Eastern Gravity Meeting, University of Syracuse, Syracuse, NY

Other Science related Activities:

- Developed the Nmesh code for numerical simulations using discontinuous Galerkin methods, that will be made open source

- Co-developed and refined the BAM code for the numerical simulation of the Einstein Equations

- Developed the SGRID code to simulate the Einstein Equations using pseudo-spectral methods

- Developed the open source TGRAPH program (https://github.com/wofti/tgraph) to plot and animate data from files that contain multiple time frames

- Member of the Florida Atlantic University SpaceTime (FAUST) group

- Member of the American Physical Society (APS)

- Collaboration with Bernd Brügmann and Sebastiano Bernuzzi at Friedrich-Schiller-Universität Jena on binary black hole and neutron star evolutions, as well as BAM code development

- Collaboration with Tim Dietrich at Universität Potsdam Jena on neutron star initial data and neutron star evolutions

Teaching Experience:

since 2005   Lectures at Florida Atlantic University (FAU):
Undergraduate Level: General Physics I (2009), Intermediate Mechanics (2006), Undergraduate Research (2014), Computational Physics (2022)
Graduate Level: Mechanics (2009-2021, 2023), Quantum Mechanics I & II (2005-2014), General Relativity (2011, 2016, 2023), Numerical Relativity (2015, 2017, 2019), Computational Physics (2018, 2020-2022)

1996-2000   Teaching assistant at Cornell University:
Honors Physics Sequence: Modern Physics, Quantum Mechanics
Engineering Physics Sequence: Mechanics, Optics, Waves and Particles
Non-Major Sequence: Fundamentals of Physics, General Physics

1995-1996   Tutor in Physik an der Universität Karlsruhe:
Quantenmechanik, Klassische Mechanik

Supervision of Postdocs:

- Liwei Ji, Research about black hole and neutron star simulations with Nmesh (2019-2021)

- Michal Pirog, Research about neutron star initial data and simulations with the Einstein Toolkit (2022-2023)

Supervision of Graduate Students:

- as Ph.D. thesis advisor

  - Faezeh Faghihnia Torshizi, Ph.D. 2028 (expected), thesis title to be determined
  - Yingjie Wang, Ph.D. 2027 (expected), thesis title to be determined
  - Ananya Adhikari, Ph.D. 2024 (expected), thesis title: "General Relativistic Simulations of Compact Object Binaries"
  - Mahsa Alemrajabi Firouzabad, Ph.D. 2024, thesis title: "From DNA to Gravitational Waves: Applications of Statistics and Machine Learning"
  - Alireza Rashti, Ph.D. 2022, thesis title: "Improved simulations of binary neutron stars"
  - Amit Poudel, Ph.D. 2019, thesis title: "Increasing the accuracy of Binary Neutron Star Simulations with an improved Vacuum treatment"
  - George Reifenberger, Ph.D. 2013, thesis title: "Binary Black Hole Mergers: Alternatives to Standard Puncture Initial Data and the Impact on Gravitational Waveforms"

- as Ph.D. thesis co-advisor

  - Jeremy Martinon, Ph.D. 2027 (expected), thesis title to be determined
  - Chen-Hung Hsiao, Ph.D. 2024, thesis title: "Quantization of constantly curved tetrahedron"
  - Ruben D. Tejedor, Ph.D. 2023, thesis title: "An Improved Neutrino Transport Algorithm for the CHIMERA Supernova Code"
  - Dongxue Qu, Ph.D. 2022, thesis title: "Computational Aspects of Quantum Gravity: Numerical Methods in Spinfoam Models"
  - Vahid Tayefeh, Ph.D. 2018, thesis title: "Spatio-temporal dynamics of neural system in cortical surface and brain connectivity"
  - Shannon Ray, Ph.D. 2017, thesis title: "Quasi-local energy of rotating black hole spacetimes and isometric embeddings of 2-surface in Euclidean 3-space"
  - Atousa Chaharsough Shirazi, Ph.D. 2015, thesis title: "Spin Foam Dynamics of General Relativity"
  - Petr Tsatsin, Ph.D. 2013, thesis title: "Binary neutron star mergers: simulations with arbitrary spinning stars"
  - Ruslan Vaulin, Ph.D. 2006, thesis title: "Hamiltonian Methods in the Quantization of Gauge Systems"

- as MS thesis co-advisor

  - Anastasija Cabolova, MS 2010, thesis title: "Biogenic Gas Dynamics in Peat Soil Blocks using Ground Penetrating Radar: a Comparative Study in the Laboratory between Peat Soils from the Everglades and from two Northern Peatlands in Minnesota and Maine"

- as advisor on research projects (other than MS and Ph.D. thesis)

  – Touhid Feghhi (2019-2021), project: "Pulling a Harmonically Bound Particle Subjected to Coulombic Friction: a Non-Equilibrium Analysis"

  – Reetika Dudi (2018-2021), project: "High-accuracy simulations of highly spinning binary neutron star systems"

  – Soham Mukherjee (2016-2019), project: "Conformally curved initial data for charged, spinning black hole binaries on arbitrary orbits"

  – Swami Vivekanandji Chaurasia (2017-2018), project: "Gravitational waves and mass ejecta from binary neutron star mergers: Effect of large eccentricities"

  – Tim Dietrich (2013-2015), project: "Binary Neutron Stars with Generic Spin, Eccentricity, Mass ratio, and Compactness - Quasi-equilibrium Sequences and First Evolutions"

  – Niclas Moldenhauer (2013-2015), project: "Initial data for binary neutron stars with adjustable eccentricity"

  – Md Mushfiqur Rahman (2013-2015), project: "Binary neutron star simulations with the BAM code"

  – AmirAli Farokhniaee, (2012-2013), project: "Simulation and Analysis of Gradient Frequency Neural Networks"

  – Petr Tsatsin (since 2008-2009) project: "Post-Newtonian trajectories of particles with spin"

  – Anastasija Cabolova (2008), project: "Introduction to numerical relativity"

  – Bereket Ghebremichael (Summer 2008), project: "Introduction to numerical methods"

  – Nico Yunes (2004-2006) project: "Construction of realistic initial data for binary black holes"

  – Matthew Deluca (2005), project: "Spectral methods to solve partial differential equations"

- as graduate advisor of Physics Department

  – advising all physics graduate students on what courses to take

  – helping physics graduate students with filling in Graduate College forms

  – advising physics graduate students on qualifying exam preparation

Supervision of Undergraduate Students:

- Quent Herschelman, running neutron star simulations (2022-2023), general relativity (2023)

- Thomas Dombrowski, visualization of data (Summer 2015)

- Wen-Chung Cheng, C programming (Summer 2014)

- Joseph Triana (Fall 2008)

- Sean Goldberg (Fall 2007)

Supervision of FAU High School Students:

- Alexa Ernce, C programming (2021-2022)

Service to FAU:

- Service to Physics Department

  - Graduate Advisor (2010-present)
  - Graduate Qualifying Exam Committee (2005-present)
  - Expert support for physics computers (2005-present)
  - Chair of 2021 Physics SPE committee
  - Award Selection Committee for Excellence in Physics, and Nathan Dean Awards
  - Organizer of Physics Colloquium (2007, 2010, 2013, 2014)
  - Organizer of FAUST seminar series (2007-2011, 2013, 2014)
  - Chair of Physics Department hiring committee 2014
  - Curriculum Committee (2005-2010)
  - Undergraduate Advisor (2006-2010)

- Service to the College of Science

  - Physics member in College of Science Promotion and Tenure Committee (2015-present)
  - Physics member in College Scholarship Committee (2022-2023)
  - Reviewer for College of Science Seed Funding proposals (2019)
  - Master Researcher in physics (2011-2013)
  - Search Committee for Computer Specialist (2006)
  - Help with Boca5 computer cluster setup (2006)

- Service to the University

  - Science member of Academic Freedom and Due Process Committee (2019-present)
  - Discussion group about high performance computing (2012-2013)
  - Co-chair of FAU's High Performance Computing governance committee (2013-2015)
  - Help with debugging issues regarding MPI and slurm queues on FAU's supercomputer (Koko)
  - Successful Grant Proposal Writer (2004-present)

Service to Profession:

- Referee for the following journals:
  Physical Review Letters, Physical Review D, Classical & Quantum Gravity

- Reviewer for NSF of proposals in the areas of Gravity Theory, Major Research Instrumentation, Computational Physics, as well as CAREER awards

- Member on 2024 NSF panel

- Member on 2023 NSF panel

- Member on 2019 NSF panel

- Member of the 2012 NSF Computational Physics Program panel

- Member of Nominating Committee for the APS Topical Group on Gravitation Executive Committee 2015

- Chairman of session on "Numerical Analysis of Black Hole Binary Systems" at APS April Meeting 2009 in Denver

- Chairman of session on "Numerical Relativity" at the 2019 APS April Meeting

- Reviewer for Foundation for Polish Science (2013)

- Session Chair of 2006 & 2011 Gulf Coast Gravity Meetings

Service to Community:

- Pumpkin dropper in Pumpkin Drop Festival (whenever there is no pandemic)

- Special Frontiers in Science Lecture about black holes (2018)

- Special Frontiers in Science Lecture about the first direct Gravitational detection (2016)

- Lectures in FAU High School about research (2016, 2020)

- Presentations about relativity and black holes at the Institute For Learning In Retirement, Boca Raton (2018)

- Lecture to high school students in Davie (2016)

- Public lecture to Astronomical Society of the Palm Beaches, West Palm Beach (2007)

- Supervisor of summer internship of high-school student Shawn Westerdale (2007)

- Broward Science Fair judge (2005)

Awards:

- 2024 College of Science Choice to be highlighted at the Authors & Artists Recognition Event sponsored by the FAU Provost Office and University Libraries

- 2014 FAU Researcher of the Year Award in the category of Associate Professor at FAU

- 2006 College of Science Researcher of the Year Award in the category of Assistant Professor at FAU

- 1993 Baden-Württemberg Austauschstipendium