

LEONARDO (LEO) ROSA WERNECK

Postdoctoral researcher

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BIOGRAPHICAL DATA

Birth date: September 24, 1991
Birth place: São Paulo, Brazil
Citizenship: Brazil
Languages: English (fluent), Portuguese (native), Spanish (basic)

WORK EXPERIENCE

University of Idaho, USA 2021 – Present
Postdoctoral researcher

West Virginia University, USA 2020 – 2021
Postdoctoral researcher

EDUCATION

University of São Paulo, Brazil 2016 – 2020
Ph.D. in Physics

University of São Paulo, Brazil 2013 – 2016
M.Sc. in Physics

University of São Paulo, Brazil 2009 – 2013
Physics Teaching Degree

RESEARCH INTERESTS

Compact object binaries in fully dynamical spacetimes

- Black hole-black hole (Pubs. [3]).
- Neutron star-neutron star.
- Black hole-neutron star.

Black hole accretion (Pubs. [2]).

Critical phenomena in gravitational collapse (Pubs. [1], [4])

SOFTWARE DEVELOPMENT

NRPy+* 2019 – Present
Developer
Python-based C-code generator for Numerical Relativity and beyond.
– Contributed several modules & tutorial notebooks.

NRPyCritCol* 2019 – Present
Lead developer
User-friendly, well-documented NRPy+-based code to study critical phenomena.

SFcollapse1D* 2018 – Present
Lead developer
User-friendly, well-documented C++ code to study critical phenomena of a massless scalar field in 1D.

NRPyElliptic[†]

2021 – Present

Developer

Easily extensible, NRPy+-based elliptic solver for Numerical Relativity initial data.

- Lead developer of Einstein Toolkit thorn version of the code, NRPyEllipticET.

IllinoisGRMHD*

2019 – Present

Developer

GRMHD for dynamical spacetimes.

- Documented entire code in pedagogical Jupyter notebooks.
- Added advanced, tabulated equation of state support.[†]
- Added new conservative-to-primitive routines.[†]

Einstein Toolkit*

2019 – Present

Contributor

A community-driven software platform of core computational tools to support research in relativistic astrophysics and gravitational physics.

- Contributed documentation, optimizations, and extensions to several of the thorns in WVUThorns.

*: open-source, [†]: closed-source**MENTORING****2021**

Mentored two undergraduate students on how to use SFcollapse1D for their senior thesis & one graduate student in the development of NRPyElliptic.

2020

Mentored two undergraduate students on how to use SFcollapse1D for their senior thesis.

FELLOWSHIPS**CAPES (Brazil) Ph.D. fellowship**

2016 – 2020

CAPES (Brazil) M.Sc. fellowship

2013 – 2016

CNPq (Brazil) undergraduate research fellowship

2011 – 2013

PUBLICATIONS**2021 peer-reviewed publications**

- [1] **L.R. Werneck**, Z.B. Etienne, E. Abdalla, B. Cuadros-Melgar, and C. E. Pellicer, *NRPyCritCol & SFcollapse1D: an open-source, user-friendly toolkit to study critical phenomena*. *Class. Quantum Grav.*, **38** 245005 (20pp). (2021).
- [2] A. Murguia-Berthier, S.C. Noble, L.F. Roberts, E. Ramirez-Ruiz, **L.R. Werneck**, *et al.*, *HARM3D+NUC: A New Method for Simulating the Post-merger Phase of Binary Neutron Star Mergers with GRMHD, Tabulated EOS, and Neutrino Leakage*. *Astrophys. J.*, **919** 95. (2021).

2021 preprints

- [3] T. Assumpcao, **L.R. Werneck**, T.P. Jacques, Z.B. Etienne, *NRPyElliptic: A Fast Hyperbolic Relaxation Elliptic Solver for Numerical Relativity, I: Conformally Flat, Binary Puncture Initial Data*. arXiv: [2111.02424v1](https://arxiv.org/abs/2111.02424v1). Submitted to *Phys. Rev. D*. (2021).

Dissertations & Theses

- [4] **L.R. Werneck**, *Aspects of Numerical Relativity: Scalar Fields & Neutron Stars*. Ph.D. Thesis, University of São Paulo (Brazil). DOI: [10.11606/t.43.2020.tde-01092020-014914](https://doi.org/10.11606/t.43.2020.tde-01092020-014914). (2020).
- [5] **L.R. Werneck**, *A gauge theory for continuous spin particles*. M.Sc. Dissertation, University of São Paulo (Brazil). DOI: [10.11606/d.43.2016.tde-07062016-114220](https://doi.org/10.11606/d.43.2016.tde-07062016-114220). (2016).