Monica Rizzo

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GitHub: github.com/mrizzo25

RESEARCH

Interests: Multimessenger astronomy, data mining, code development, gravitational wave astronomy, physics education and outreach

Graduate Research Assistant

Evanston, IL

CIERA at Northwestern University

September 2018 - Current

Currently, supervised by Shane Larson, I work on characterizing the spectral structure of gravitational waveforms from extreme mass ratio inspirals. As a member of Dr. Vicky Kalogera's LIGO group, I developed, ran, and tested various gravitational wave data analysis codes.

Undergraduate Research Assistant

Rochester, NY

RIT Center for Computational Relativity and Gravitation

August 2017 - May 2018

Supervised by Dr. Richard O'Shaughnessy, I tested, improved, and optimized rapid parameter estimation techniques for use on gravitational wave data from LIGO. Additionally, I participated in the prelimary analysis of GW170817, and contributed to developing the set of tools used to produce the results presented in the GW170817 companion paper on dynamical ejecta contributions to the associated kilonova.

REU Student

Evanston, IL

CIERA at Northwestern University

June 2017 - August 2018

Under Dr. Vicky Kalogera and Dr. Chris Pankow, I created a set of routines based on existing literature to calculate the amount of ejected matter and resulting kilonova light curve for neutron star-black hole and binary neutron star merger events. I then assessed the effect of different nuclear equations of state on the ejecta mass distributions and light curves.

Undergraduate Research Assistant

Rochester, NY

RIT Center for Computational Relativity and Gravitation

May 2016 - August 2016

Under Dr. Joshua Faber I modelled inspiralling binary neutron stars using a smoothed-particle hydrodynamics code (Starcrash) to study how the amount of matter they eject is affected by their physical parameters.

Undergraduate Research Assistant

Rochester, NY

RIT Center for Computational Relativity and Gravitation

May 2015 - August 2016

With Dr. Richard O'Shaughnessy, I modelled gravitational waveforms from inspiralling binary neutron stars using two different approximants to compare their robustness.

Work Experience

Grader Evanston, IL

Northwestern University Department of Physics and Astronomy

September 2019 - December 2019

Graded homeworks for PHYS-441 (Statistical Methods for Physicists and Astronomers)

Freelance Data Analyst

Upwork May 2018 - June 2018

Developed Python code to fulfill a data wrangling contract

Note Taker Rochester, NY

RIT Disability Services Office

March 2016 - May 2016

Took clear and detailed notes in Numerical Linear Algebra (MATH 412) and provided notes to the Disability Services Office for use by other students.

Cashier Rochester, NY

Home Depot July 2016 - December 2016

Assisted customers at item checkout and operated point-of-sale system.

EDUCATION

Northwestern University

Evanston, IL

Ph.D. in Astronomy, Advisor: Shane Larson

September 2018-Current

Northwestern University

Evanston, IL

M.S. in Astronomy, GPA: 3.80/4.00 September 2018–September 2020

Rochester Institute of Technology

Rochester, NY

B.S. in Physics, GPA: 3.57/4.00

August 2014–May 2018

- Thesis: "Inferring Neutron Star Equation of State Parameters from Gravitational Wave Observations"

TEACHING

CIERA High School Summer Research Mentor/Instructor

Evanston, IL

Northwestern CIERA

June-August 2019

- Lectured summer research students on using various regression and interpolation functions in SciPv
- Mentored two high school students and supervised their completion of a research project on gravitational wave data analysis

Teaching Assistant

Rochester, NY

RIT Physics/Math Department

September 2015-December 2017

- PHYS-211: Assisted in teaching and grading (September-December 2017)
- MATH-171: Assisted in teaching and grading weekly workshops (September-December 2016)
- PHYS-211/PHYS-216: Assisted in teaching and grading weekly quizzes (September 2015-May 2016)

Presentations

Conference Talks

- Mapping Astrophysical Parameter Space with EMRI Spectroscopy, LISA Symposium XIII, Hosted Virtually, September 2020
- Placing Constraints on a Neutron Star Equation of State using Heirarchical Population Inference, APS April Meeting, Columbus, OH, April 2018
- Measuring Ejecta from Inspiralling Binary Neutron Stars using Smoothed-particle Hydrodynamics, RIT Undergraduate Research Symposium, Rochester, NY, August 2016
- Parameter Estimation of Binary Neutron Star Gravitational Wave Signals using Effective One Body Model, RIT Undergraduate Research Symposium, Rochester, NY, August 2015

Conference Posters

- Equation of State Effects on Binary Neutron Star and Neutron Star-Black Hole Merger Ejecta, AAS Meeting, National Harbor, MD, January 2018
- Measuring Ejecta from Inspiralling Binary Neutron Stars using Smoothed-particle Hydrodynamics, APS April Meeting, Washington, DC, January 2017
- Parameter Estimation of Binary Neutron Stars using an Effective One Body Model Including Tidal Interactions,
 APS April Meeting, Salt Lake City, UT, April 2016

PUBLICATIONS

- [1] C. Pankow, M. Rizzo, K. Rao, C. P. L. Berry, and V. Kalogera, Localization of compact binary sources with second generation gravitational-wave interferometer networks, 2019. eprint: arXiv:1909.12961.
- [2] J. Lange, R. O'Shaughnessy, and M. Rizzo, Rapid and accurate parameter inference for coalescing, precessing compact binaries, 2018. eprint: arXiv:1805.10457.

AWARDS

• IDEAS NSF Fellow 2019 –2020, 2020–2021

• RIT Undergraduate Research Scholar

2018

Public Outreach

CUWiP Panelist Rochester, NY

2018 Conference for Undergraduate Women in Physics

December 2018

- Lead discussion in panels on starting undergraduate research and current topics in physics

Imagine RIT Exhibitor

Rochester, NY

Imagine RIT Festival

April 2015 - 2018

- April 2018, 2017: Participated in the RIT Society of Physics Students' exhibit featuring various physics demonstrations. Presented a handmade brachistochrone curve demonstration and Van de Graaff generator
- April 2016: Participated in the Center for Computational Relativity and Gravitation's exhibit on gravitational waves
- April 2015: Presented a home-made Van de Graaff generator as a member of Computer Science House's group exhibit

ORGANIZATIONS

• Northwestern Center for Interdisciplinary Exploration and Research in Astrophysics	2018 -Current
• Northwestern IDEAS Program	2018 –Current
• LIGO Scientific Collaboration	2015 - 2020
• Society of Physics Students, Executive Board: Webmaster	2015 - 2018
• RIT Center for Computational Relativity and Gravitation	2015 - 2018
• RIT Computer Science House	2014 - 2016

COMPUTATIONAL SKILLS

- Languages: <u>Proficient</u>: Python, C#, C++, Mathematica, Bash, LaTex, HTML/CSS <u>Familiar</u>: Javascript, Matlab, Visual Basic, Fortran, C
- Software: Microsoft Office, Starcrash (J. Faber et. al.), Autodesk Maya, Photoshop, Gimp, Creo Parametric, MESA (B. Paxton et. al.), Gnuplot, SpecTECH
- Code Packages: BILBY (Ashton et. al.), LALSuite (LIGO Scientific Collaboration), Scikit-Learn (Pedregosa et. al.), Keras (Chollet et. al.)