Tri Nguyen

Contact Information

University of Rochester
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Education

University of Rochester, Rochester, NY

B.S. in Physics & Astronomy — **Expected: May 2019**
GPA: 3.95. Major GPA: 3.98

Research Interests

Primary Interests:

- **Gravitational waves**: detector characterization, nonlinear noise regression, glitches, compact binaries, stochastic sources, continuous sources, burst sources
- **Computational astrophysics, astronomy, cosmology**: multi-messenger astronomy, photometric and spectroscopic astronomy, transients and variables classification, early-stage universe, cosmic microwave background, baryon acoustic oscillations, large-scale structure
- **High-energy, particle physics**: neutrino oscillation and detection, flavor tagging, CP-violation, matter/anti-matter asymmetry, top quark, Higgs mechanism, jet physics

Secondary Interests:

- **Machine learning, deep learning, data science**: artificial neural networks, convolutional networks, recurrent networks, generative adversarial networks, data structures and algorithm

Honors and Awards

California Institute of Technology

- LIGO Summer Undergraduate Research Fellowship, 2018

University of Rochester

- Dean's List Recognition, 2015-2018
- Department of Physics Honorary Award, 2017: Awarded to one student with the highest GPA in the introductory physics courses
- Rush Rhees Scholarship, 2015-2019

Research Experiences

California Institute of Technology, Pasadena, CA

Research Assistant — **Jun. 2018 - Present**
Adviser: Dr. Michael Coughlin

- Project: Extending the reach of gravitational-wave detectors at LIGO with machine learning
- Develop models for non-linear noise coupling mechanisms in gravitational-wave detectors
- Develop and apply Long Short-Term Memory (LSTM) Neural Network models to nonlinear noise regression problems

Research Assistant — **Oct. 2018 - Nov. 2018**
Adviser: Dr. Michael Coughlin

- Project: Developing machine learning algorithms to classify astronomical transients and detect anomalous sources from LSST photometric simulation PLAsTiCC

University of Rochester, Rochester, NY

Research Assistant **May. 2018 - Present**
Adviser: Prof. Segev BenZvi

- Project: Searching for Type Ia Supernovae and other transients with machine learning
- Develop and apply Convolutional Neural Network (CNN) models to classify Type Ia Supernovae spectra and galaxy spectra

Research Assistant **Dec. 2016 - Dec. 2018**
Adviser: Prof. Regina Demina and Prof. Segev BenZvi

- Project: Extracting the Baryon Acoustic Oscillations (BAO) peak from SDSS-III BOSS survey data and DESI simulations
- Develop a multiprocessing algorithm to calculate the galaxy spatial correlation function independently of cosmological parameters
- Analyze the sensitivity of the BAO peak to different cosmologies and conduct statistical simulations of mock survey catalogs

Research Assistant **Dec. 2016 - May. 2018**
Adviser: Prof. Segev BenZvi

- Project: Finding an upper limit on the rate of supernovae in the Milky Way with the IceCube Neutrino Observatory simulation
- Analyze IceCube's sensitivity to outbursts of MeV neutrinos from galactic core-collapse supernovae by varying supernova flux and neutrino properties
- Develop a robust shape analysis method to discriminate between supernova models
- Develop a two-sided hypothesis test to identify the signature of axion production in the neutrino emission from a core collapse supernova

Research Assistant **Sep. 2016 - Dec. 2016**
Adviser: Prof. Segev BenZvi

- Project: Designing a non-imaging luminescent concentrator to increase the photomultiplier tube detection area in water-Cherenkov detectors
- Characterize the gain of a silicon photomultiplier (SiPM) array for use in cosmic-ray detectors

Teaching Experiences

University of Rochester, Rochester, NY

Teaching Assistant **Aug. 2016 - Dec. 2018**

- PHY 235 Classical Mechanics, Fall 2018
- PHY 121 Mechanics Lab, Spring 2018
- AST 111 The Solar System & Its Origin, Fall 2017
- PHY 121 Mechanics Lab, Spring 2017
- PHY 113 Mechanics Lab, Fall 2016

Volunteer Physics Tutor **Aug. 2017 - Dec. 2018**

- Society of Physics Students (SPS): Tutoring for introductory physics courses on problem solving skills and various physical concepts

Leadership & Service Position

President, The Kapitza Society, **University of Rochester**, Rochester, NY, Fall 2018

Professional Development Committee, Society of Physics Students, **University of Rochester**, Rochester, NY, Fall 2018

Vice President, Astronomy Club, **University of Rochester**, Rochester, NY, Spring 2018

Student Tutor Guide, **C.E.K. Mees Observatory**, Naples, NY, Summer 2017

Computer and Technical Skills

Computer Programming & Data Analysis:

- Operating system: Linux
- Languages: C, C++, Python, Java, Mathematica
- UNIX shell scripting: Bash
- Proficient in machine learning: Tensorflow, PyTorch, Keras, Scikit-Learn
- Proficient in computational statistical data analysis: CERN ROOT, NumPy, SciPy, etc.
- Design and Analysis Software: FreeCAD, Igor Pro
- Astronomical Imaging: TheSky6, CCDSoft, SAOImage DS9
- Knowledge in multi-processor programming: HTCondor, SLURM

Technical Skills:

- Trained to operate the University of Rochester's C.E.K. Mees Observatory's 24-inch computerized Cassegrain telescope
- Proficiency in astronomical imaging with 4k CCD camera
- Knowledge in working with oscilloscope and pulse generator

Refereed Journal Publications

[1] Ormiston et al. *Extending the reach of gravitational-wave detectors with machine learning* (in-preparation)

[2] Powell et al. *Enhancing Gravitational-Wave Science with Machine Learning* (in-preparation)

Conference Proceedings

[1] S. BenZvi, R. Cross, **T. Nguyen**. *Estimating the Sensitivity of IceCube to Signatures of Axion Production in a Galactic Supernova*, in *Proceedings of 35th ICRC*, 2017, arXiv:1710.01201

Public Talks

[1] **T.Nguyen**, M. Coughlin, R. Ormiston, R. Adhikari. *Nonlinear noise regression with machine learning at LIGO*, AAS Meeting 233, Abstract 210.05, Seatle, WA January 8, 2019

[2] **T.Nguyen**. *Applying machine learning to nonlinear noise regression at LIGO*, Society of Physics Students Research Symposium, Rochester, NY, September 16, 2018

[3] **T.Nguyen**. *Extending the reach of gravitational-wave detectors with machine learning*, Caltech SURF Presentation, Pasadena, NY, August 23, 2018

[4] **T. Nguyen**. *Baryon Acoustic Oscillations - The Study of Large-Scale Structure of the Universe*, University of Rochester Summer REU Presentation, Rochester, NY, August 4, 2017

[5] P. Tanouri, **T. Nguyen**. *IceCube Neutrino Observatory*, University of Rochester Summer REU Presentation, Rochester, NY, August 4, 2017

Professional Memberships

American Physical Society (APS)
American Astronomical Society (AAS)
Society of Physics Students (SPS)
Sigma Pi Sigma (ΣΠΣ)