

# Gabriel Guidarelli

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## EDUCATION

### ROCHESTER INSTITUTE OF TECHNOLOGY

PHD IN ASTROPHYSICAL SCIENCES  
AND TECHNOLOGY

expected: May 2021 | Rochester, NY

MS IN ASTROPHYSICAL SCIENCES  
AND TECHNOLOGY

May 2018 | Rochester, NY

Total GPA: 3.7 / 4.0

### SUNY GENESEO

BA IN PHYSICS & BA IN  
MATHEMATICS

May 2016 | Geneseo, NY

Total GPA: 3.5 / 4.0

Major GPA: 3.8 / 4.0

## SKILLS

### PROGRAMMING

Over 5000 Lines:

Python • C++ • C • Java • Mathematica  
LaTeX • LabView • FORTRAN

Familiar:

CSS • PHP • MATLAB • Javascript • IDL  
CUDA

Source Control:

Git

### TECHNICAL:

Mathematical Modeling and Optimization

Machine Learning/Artificial Intelligence

Algorithms

High Performance Computing

Regression

## COURSEWORK

### GRADUATE

Advanced General Relativity

Fluid Dynamics

Electrodynamics I&II

Computational Methods

Mathematical Methods

Stellar Astrophysics I&II

### UNDERGRADUATE

Real Analysis

Vector Analysis

Complex Analysis

Abstract Algebra

Classical Mechanics

Quantum Mechanics

Instrumentation & Interfacing

(Research Asst. & Lab instructor 3x)

## RESEARCH

### RIT CENTER FOR COMPUTATIONAL RELATIVITY AND GRAVITATION | GRADUATE RESEARCH ASSISTANT

Aug 2016 – present | Rochester, NY

With Dr. Jason Nordhaus and U of R Astrophysics Department, I create 3D Magneto-Hydrodynamic (MHD) simulations of post-main-sequence stellar interactions to refine and extend current theories about various object formation. Simulations are done with the multi-physics code **Astrobear** and the output is reduced with the visualization software **Visit** as well as Python.

## PROJECTS

### CONNECT4 AI

I wrote an efficient recursive game tree search algorithm with alpha-beta pruning. This was written in LabVIEW and interfaced with a robot arm and camera to physically play Connect4.

### HYDROSTATIC SOLVER FOR 3D NUMERICAL GRIDS

I created an RK4 numerical integrator that shoots mass consistent solutions to modified hydrostatic equations. This was used in publications to map large scale 1D profiles to under-resolved 3D numerical grids.

### 2D BOLTZMANN LATTICE ON GPU

I applied Boltzmann Lattice Method for Computational Fluid Dynamics to a 2D numerical grid simulating a wind tunnel. This simulation was accelerated with an Nvidia GPU. The code was written in C++ with the CUDA library.

## EXPERIENCE

### NEW SCALE TECHNOLOGIES | SOFTWARE ENGINEER/ LABORATORY TECHNICIAN

May 2016 - Sept 2016 | Victor, NY

- Designed and programmed control systems to optimize efficiency of piezoelectric motor modules.
- Created LabView GUIs to control various products.
- Tested and analyzed new products for research and development.

## AWARDED COMPUTATIONAL GRANTS

- |      |                                                                                                                                                                                      |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2019 | XSEDE Computation Time AST180039 Renewal:<br>TACC Dell/Intel Knights Landing, Skylake System (Stampede2): 41,856.4 Nhrs<br>TACC Long-term tape Archival Storage (Ranch): 20,000.0 GB |
| 2018 | XSEDE Computation Time AST180039:<br>TACC Dell/Intel Knights Landing, Skylake System (Stampede2): 34,394.0 Nhrs<br>TACC Long-term tape Archival Storage (Ranch): 20,000.0 GB         |

## PUBLICATIONS

- [1] **Guidarelli, G.**, J. Nordhaus, L. Chamandy, Z. Chen, E. G. Blackman, A. Frank, J. Carroll-Nellenback, and B. Liu. Hydrodynamic simulations of disrupted planetary accretion discs inside the core of an AGB star. , 490(1):1179–1185, Nov. 2019.