Robel Geda

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EDUCATION

Princeton University **Princeton, NJ**
Ph.D. Astrophysics August 2021 - Present

Rutgers University **New Brunswick, NJ**
B.S. Astrophysics. August 2012 - January 2017
B.A. Computer Science.
Minor Mathematics.

EMPLOYMENT

Space Telescope Science Institute (STScI) **Baltimore, MD**
Software Engineer & Research And Instrument Analyst June 2017 – July 2021

- The Space Telescope Science Institute (STScI) is the science operations center for NASA's Hubble Space Telescope (HST) and James Webb Space Telescope (JWST).
- Member of the Mission Engineering and Science Analysis (MESA) branch under Dr. Van Dixon.
- Developer on the James Webb Data Analysis Development Forum (JDADF).
- Developer on the Nancy Grace Roman Space Telescope (formerly WFIRST) mission.
- Help desk lead for the Nancy Grace Roman Space Telescope mission.

RESEARCH

Evolution of Luminous Compact Blue Galaxies **Baltimore, MD**
Dr. Steven Crawford February 2020 – July 2021

- Identification and characterization of luminous compact blue galaxies (LCBGs) in the HST Frontier Fields.
- Used photometry and spectroscopic data to identify LCBGs and measure their dynamical masses. The dynamical mass is then compared to the luminous mass to get an estimate of the dark matter present in the galaxies.
- Developed a new 2D Sersic profile fitting code to remove bright sources for improved photometry.
- Made source catalogs with k-correction.
- Made the first Petrosian radii catalog for the Frontier Fields (to be published).
- **GitHub**: PetroFit/petrofit
- **Paper:** "PetroFit: A Python Package for Computing Petrosian Radii and Fitting Galaxy Light Profiles" ApJ.

Near-Field Cosmology with Gas-Poor Dwarf Galaxies **Baltimore, MD**
Dr. Harry Ferguson November 2018 – July 2021

- Test the efficacy of convolutional neural networks (CNN) in identifying diffuse dwarf galaxies within distances of ~2-30 Mpc.
- Attempt to use the CNN to extract multi-color surface-brightness-fluctuation information to derive distances.
- Wrote a library that uses stellar isochrones to simulate images of diffuse dwarfs with realistic fluctuations and insert them into real images.
- **GitHub**: robelgeda/dsii_dwarfs

Massively Parallel Cosmological N-body Code **New Brunswick, NJ**
Professor Alyson Brooks & Professor Tom Quinn May 2016 – August 2019

- Contributor to ChaNGa (Charm N-body GrAvity solver), a code to perform collisionless N-body simulations.
- Utilized CUDA and C++ to optimize Ewald GPU calculations and data transfers.

Rutgers Compilers Group **New Brunswick, NJ**
Professor Eddy Z. Zhang December 2015 – June 2017

- Research Assistant at the Department of Computer Science, Rutgers University to carry out GPGPU research.
- Research focuses on the GPGPU memory system and program optimization.
- Responsible for writing, testing and analyzing software using CUDA, C, C++ and Python.
- Improved distribution of workloads by using edge partitioning algorithms.
- **Paper:** *"A Simple Yet Effective Graph Model for Locality Enhancement in GPU Programs"* SIGMETRICS '17

Galaxy Formation and Evolution **New Brunswick, NJ**
Professor Alyson Brooks September 2014 – June 2017

- Developed software to analyze and visualize data from N-body simulations.
- Developed software that uses ParaView to visualize massive data (3D volumes, merger trees, simulation movies).
- Developed custom halo tracker + merger tree generator for Amiga Halo Finder.
- **Poster:** *"Comparison of Merging Dark Matter Halo Histories"* NSBP 2015.

Summer R.E.U **Ohio Wesleyan University, OH**
Professor Robert Harmon May – July 2015

- Developed software for use in Light Curve Inversions using CUDA and FORTRAN.
- **Poster:** "Starspots on LO Pegasi, 2006-2015" AAS 2016.

Spectroscopy of Superconductors **New Brunswick, NJ**
Professor Girsh Blumberg September 2014 - May 2015

- Aresty Research Scholar at the Rutgers Laser Spectroscopy Laboratory.
- Investigated the potential use of topological insulators as building blocks of quantum computers.
- Project aimed to characterize the surface vibration modes of Bismuth Selenide using Raman scattering.
- Develops software for analysis on large spectroscopic datasets.
- Collected Raman spectroscopic data.
- **Poster:** "Raman Spectroscopy and Simultaneous Fits" Aresty Research Symposium 2015.

PAPERS

Astropy Collaboration et al. (2022). The Astropy Project: Sustaining and Growing a Community-oriented Open-source Project and the Latest Major Release (v5.0) of the Core Package. The Astrophysical Journal.

Geda, R., Crawford S., Hunt L.R., Bershady, M.A., Tollerud, E.J., & Randriamampandry, S.M. (2022). PetroFit: A Python Package for Computing Petrosian Radii and Fitting Galaxy Light Profiles. The Astronomical Journal.

Li, L., **Geda, R.**, Hayes, A.B., Chen, Y., Chaudhari, P., Zhang, E.Z., & Szegedy, M. (2017). A Simple Yet Effective Balanced Edge Partition Model for Parallel Computing. ACM SIGMETRICS 2017.

FUNCTIONAL PROJECTS

James Webb Data Analysis Tools **Baltimore, MD**

Dr. Susan Kassin & Dr. Harry Ferguson July 2017 – July 2021

- Worked on developing visualization tools for post pipeline James Webb (JWST) data.
- Lead developer and maintainer for the Multi Object Spectroscopy Visualization Tool (MOSViz).
- Deputy lead developer for CubeViz, a tool to visualize IFU data and offers analysis tool for 3D cubes.
- Developed SpecUtils and SpecViz, used for the analysis and visualization of spectra.
- Contributed to GlueViz, Spectral-Cube, PhotUtils and AstroPy packages.
- Contributed to the JWST pipeline and generated synthetic data for testing the visualization tools.
- Lead liaison and deputy maintainer for STScI Science Notebooks. Pair programed with numerous scientists to develop example workflows utilizing the JWST analysis tools.
- Worked under agile software development paradigm participating in two-week sprints.

WebbPSF **Baltimore, MD**

Dr. Marshall Perrin July 2017 – July 2021

- WebbPSF is a Python package that computes simulated point spread functions (PSFs) for NASA's James Webb Space Telescope (JWST) and Nancy Grace Roman Space Telescope.
- Developed, implemented and maintains the optical components for the Nancy Grace Roman Space Telescope.
- Responsible for updating optical components and layouts according to the latest NASA reference data.
- Improved Zernike polynomial estimation for JWST instruments.

Roman-Tools **Baltimore, MD**

Dr. Karoline Gilbert July 2017 – July 2021

- Lead developer and maintainer of the Roman Tools repository which holds instructions and tutorials for Nancy Grace Roman Space Telescope software tools distributed by STScI for the science community.
- Simulation tools include Pandeia exposure time calculator, WebbPSF (PSF simulator) and STIPS (post-pipeline scene simulator).
- Generated docker files and scripts for easy distribution of STScI simulation tools.
- Hosted simulation tools on a mybinder server replacing the STScI "WFIRST" Server.

S.T.I.P.S **Baltimore, MD**

Dr. Karoline Gilbert & Brian York July 2017 – July 2021

- Deputy lead developer of the STIPS (Space Telescope Image Product Simulator) software which produces simulated imaging data for complex wide-area astronomical scenes, based on user inputs, instrument models and library catalogs for a range of stellar and/or galactic populations.
- Modernized the software, documentation, distribution infrastructure and the GitHub repository.
- Contributed components and wrote tests.

LEADERSHIP AND TEACHING

Software Carpentry **Baltimore, MD**

Certified Instructor August 2020 – Present

- Software Carpentry is a volunteer project dedicated to teaching basic computing skills to researchers.

AstroPy Inclusion, Diversity, Empowerment **Baltimore, MD**

Ambassador July 2020 – Present

- Ongoing effort to make AstroPy a diverse and inclusive community.
- Organizing outreach and empowerment activities during conferences.
- Developing training material for early career underrepresented communities.

L.S.A.M.P Rutgers **New Brunswick, NJ**

Scholar, Ambassador (2015-2017) August 2012 – January 2017

- LSAMP Ambassadors contribute by planning and implementing LSAMP Peer Mentoring Programs.
- Organizing tutorial sessions for underrepresented students in STEM.
- Reviewed grant funding applications for research projects as an LSAMP Ambassador.

Academic Liaison **New Brunswick, NJ**

Rutgers Residence Life April 2013- May 2015

- Advertising and promoting events in and outside of Rutgers.
- Networking between academic departments, sponsors, and Rutgers residents.

Course TA **New Brunswick, NJ**

Astronomy Assistant Instructor September – December 2014

- Leads online recitations and review sessions.

PROGRAMMING AND SCRIPTING

Python Libraries

- *Pandas*, *NumPy* and *SciPy*: The fundamental packages for data frames and scientific computing with Python.
- *AstroPy* [Contributor]: Astronomical python library.
- *SpecUitls* [Developer]: AstroPy affiliated library for manipulating and analyzing astronomical spectroscopic data.
- *WebbPSF* [Developer & Maintainer]: PSF simulator for JWST and the Nancy Grace Roman Space Telescope.
- *STIPS* [Developer & Maintainer]: Post pipeline image simulator for the Nancy Grace Roman Space Telescope.
- *PhotUtils* [Contributor]: AstroPy affiliated package for detecting sources and performing photometry.
- *JWST* [Contributor]: James Webb pipeline.
- *Synphot*: Simulates photometric data and spectra, observed or otherwise.
- *Mirage*: Simulator for science observing modes of NIRCam and NIRISS.
- *Jupyter Notebook*: Documents that contain live code, equations, visualizations and narrative text.
- *Ipywidgets*: Interactive library for Jupyter notebooks.
- *PyQt*: One of the most popular Python bindings for the Qt GUI.
- *Conda* and *PyPi* (pip): Distribution infrastructure for python packages.
- *Matplotlib* and *bqplot*: Plotting libraries for Python.

C and C++

- *CUDA* (C): A parallel computing platform and programming model invented by NVIDIA for graphics processing units (GPU). It enables dramatic increases in computing performance by harnessing the power of the GPU.
- *Amiga* and *ROCKSTAR:* Code for finding gravitationally bound objects and merger trees in simulations.

Git and GitHub

- Creating and maintaining repositories.
- Collaborating with large groups and solving merge conflicts.
- Building automated testing infrastructure.
- Building documentation infrastructure.

Mathematica

- Solving equations and fitting large datasets.
- Plotting functions and large datasets.

Experienced

- LaTex, IDL, FORTRAN, Prolog, HTML and Java.
- Willing to learn new programming paradigms.

CONFERENCES

2021 N.S.B.P, Talk: *PetroFit*. **Virtual**
2020 N.S.B.P, STScI outreach representative and exhibitor. **Virtual**
2020 SACNAS AstroPy outreach representative and STScI exhibitor. **Virtual**
2019 N.S.B.P, STScI outreach representative and exhibitor. **Providence, RI**
2019 SciPy, STScI attendee. **Austin, TX**
2016 AAS 227, Poster: *Starspots on LO Pegasi, 2006-2015.* **Kissimmee, FL**
2015 Aresty Research Symposium, Poster: *Raman Spectroscopy and Simultaneous Fits*. **New Brunswick, NJ**
2015 N.S.B.P, Poster: *Comparison of Merging Dark Matter Halo Histories.* **Baltimore, MD**
2015 Astro Hack Week 2015, Collaborated on Automated Voigt Profile Fitter. **New York, NY**

CERTIFICATIONS

2021 CITI Program, Responsible Conduct of Research. **Princeton, NJ**
2020 Software Carpentry, Instructor Certification. **Baltimore, MD**
2018 Advanced Python Training, Advanced Python Certification. **Baltimore, MD**
2014 Rutgers Laser Safety, Laser Safety Certification. **New Brunswick, NJ**
2014 Rutgers Lab Safety, Lab Safety Certification. **New Brunswick, NJ**

AWARDS

2021 STScI Bravo Award, Delivery of Data Analysis Tools, build D. **Baltimore, MD**
2021 STScI Achievement Award, JDAT Notebooks. **Baltimore, MD**
2020 STScI Achievement Award, Roman PDR-2 Team. **Baltimore, MD**
2020 STScI Bravo Award, Delivery of Jupyter Notebooks, build C. **Baltimore, MD**
2020 STScI Bravo Award, Delivery of Data Analysis Tools, build C. **Baltimore, MD**
2020 STScI Bravo Award, Delivery of Data Analysis Tools, build B. **Baltimore, MD**
2020 STScI Bravo Award, Major improvements to S.T.I.P.S. **Baltimore, MD**
2018 STScI Bravo Award, Developing WFIRST (Roman) simulation and science planning tools. **Baltimore, MD**