

Austen Gabrielpillai

CURRICULUM VITAE

Astrophysics Science Division, Code 665, 8800 Greenbelt Rd, Greenbelt, MD, 20771

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Education

Rutgers University - New Brunswick

MASTER OF INFORMATION

- Concentration in Data Science

New Brunswick, NJ

Sep. 2018 - May 2020

University of Illinois at Urbana-Champaign

BACHELOR OF SCIENCE IN ENGINEERING PHYSICS

- Concentration in Computer Science

Urbana, IL

Aug. 2013 - May 2017

Research Interests

I am a trained data scientist transitioning into astrophysical research by applying simulation techniques to study the formation and evolution of galaxies across cosmic time. I have generated galaxy catalogs using a semi-analytic model for galaxy evolution, as well as synthetic wide-field survey images with simulation code built from the ground up. My aim is to use my unique educational and professional background to create and develop tools and data products that will be publicly available to the greater astronomy community.

Professional Appointments

NASA Goddard Space Flight Center / Catholic University of America

RESEARCH ASSISTANT

- Under the supervision of James Rhoads and Sangeeta Malhotra, funded by the CRESST II cooperative agreement.
- Developing instrument simulation and data processing pipelines in Python and Jupyter Notebooks for Roman Space Telescope preparation.
- Optimizing and parallelizing code using multiprocessing and numba for running simulations on high-performance computing clusters.
- Investigating the time evolution of physical properties and their residuals between bijectively matched galaxies in two catalogs.

Goddard, MD

Nov. 2020 - Present

Center for Computational Astrophysics / Flatiron Institute

RESEARCH ANALYST

- Part- / full-time internship under the supervision of Rachel Somerville as a member of the Galaxy Formation group.
- Conducted galaxy formation research comparing Santa Cruz SAM and IllustrisTNG simulation outputs at $z = 0$.
- Developed a Python module for querying and loading partitions of a 180 GB simulation suite.
- Created a browser tool that enables real-time transformations of over 4 million simulated galaxies using Three.js and D3.js graphics.

New York, NY

Jul. 2018 - Aug. 2020

GSI Helmholtz Center for Heavy Ion Research

UNDERGRADUATE RESEARCH ASSISTANT

- Full-time internship under the supervision of Zoran Andelkovic and Wilfried Nörtershäuser as a member of the Atomic Physics group.
- Directed high-energy ion beams along 100 meters of beam line as part of a facility wide development project.

Darmstadt, DE

May 2016 - Aug. 2016

Volunteer & Community Involvement

University of Illinois Black Chorus

GENERAL MEMBER (2015-2017) & SERVICE TEAM (2017)

Urbana, IL

Jan. 2015 - May 2017

Skills

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|------------------------|---|
| Programming | Python (fluent), JavaScript (proficient), HTML & CSS (proficient), C (familiar), C++ (familiar), SQL (familiar) |
| Software | Jupyter Notebook, PyCharm, Microsoft Visual Studio, Adobe Photoshop, Github, Overleaf |
| Linux Computing | System Commands, Vim, Bash, Slurm, MPI |

Collaborations

Simons Collaboration on Learning the Universe

PI: GREG BRYAN

- Contributing to semi-analytic model adaptations, training set generation, and creating synthetic observations working groups

Jan. 2022 - Present

Publications

FIRST AUTHOR

- 2022, *Galaxy Formation in the Santa Cruz semi-analytic model compared with IllustrisTNG – I. Galaxy scaling relations, dispersions, and residuals at $z=0$* In Review
GABRIELPILLAI, AUSTEN; SOMERVILLE, RACHEL S.; GENEL, SHY; RODRIGUEZ-GOMEZ, VICENTE; PANDYA, VIRAJ;
YUNG, L. Y. AARON; HERNQUIST, LARS arXiv:2111.03077
- 2022, *A spectroscopic simulation pipeline emulating Roman Space Telescope instruments* In Preparation
GABRIELPILLAI, AUSTEN; WOLD, ISAK G. B.; MALHOTRA, SANGEETA; RHOADS, JAMES E.; KOEKEMOER, A. M.
- 2022, *Galaxy Formation in the Santa Cruz semi-analytic model compared with IllustrisTNG – II. Galaxy scaling relations and residual evolution from $z = 6$ to 0* In Preparation
GABRIELPILLAI, AUSTEN; SOMERVILLE, RACHEL S.; GENEL, SHY; RODRIGUEZ-GOMEZ, VICENTE; DIEMER, BENEDIKT;
PANDYA, VIRAJ; YUNG, L. Y. AARON; HERNQUIST, LARS
- 2022, *Star Tracks – Cross simulation comparisons of galaxy property evolution tracks influencing the stellar-to-halo mass relationship* In Preparation
GABRIELPILLAI, AUSTEN; CUI, WEIGUANG; SOMERVILLE, RACHEL S.; DAVE, ROMEEEL; DIEMER, BENEDIKT;
YUNG, L. Y. AARON; GENEL, SHY; PANDYA, VIRAJ; ÁNGLES-ALCAZAR, DANIEL

Co-AUTHOR

- 2021, *Galaxy assembly bias and large-scale distribution: a comparison between IllustrisTNG and a semi-analytic model* MNRAS, 508, 698
HADZHIYSKA, BORYANA; LIU, SONYA; SOMERVILLE, RACHEL S.; **GABRIELPILLAI, AUSTEN**; BOSE, SOWNAK;
EISENSTEIN, DANIEL; HERNQUIST, LARS arXiv:2108.00006
- 2022, *Constraining cosmology with machine learning and galaxy clustering: the new CAMELS-SAM suite* Submitted to ApJ
PEREZ, LUCIA A.; GENEL, SHY; SOMERVILLE, RACHEL S.; VILLAESCUSA-NAVARRO, FRANCISCO; **GABRIELPILLAI, AUSTEN**;
ÁNGLES-ALCÁZAR, DANIEL; WANDELT; BENJAMIN D.; YUNG, L. Y. AARON arXiv:2204.02408
- 2022, *Finding Peas in the Early Universe with JWST* Submitted to ApJ
RHOADS, JAMES E.; WOLD, ISAK G. B.; HARISH, SANTOSH; KIM, KEUNHO J.; PHARO, JOHN; MALHOTRA, SANGEETA;
GABRIELPILLAI, AUSTEN; JIANG, TIANXING; YANG, HAUN arXiv:2207.13020
- 2022, *Mangrove: Learning Galaxy Properties from Merger Trees* Submitted to ApJ
JESPERSEN, CHRISTIAN KRAUGH; KRANMER, MILES; MELCHIOR, PETER; HO, SHIRLEY; SOMERVILLE, RACHEL S.;
GABRIELPILLAI, AUSTEN

Talks, Posters, & Presentations

CONFERENCE TALKS

- "Roman Grism Simulations with Multiple Orders and Distortions" Virtual
ROMAN SCIENCE TEAM COMMUNITY BRIEFING – SELECTED TALK Nov. 2021
- "Mock Grism Simulations for Roman Space Telescope" Virtual
THE 238TH AAS MEETING – RESEARCH CONTRIBUTED TALK Jun. 2021

CONFERENCE POSTERS

- "A High Fidelity Spectroscopic Simulation for Roman Space Telescope Grism Data" Pasadena, CA
THE 240TH AAS MEETING – POSTER #302.02 Jun. 2022
- "Emulating IllustrisTNG with the Santa Cruz SAM – comparing galaxy properties at $z = 0$ " Virtual
POSTER 2022 - GALAXY EVOLUTION – POSTER #610 May 2022

DEPARTMENT TALKS

- "Roman Grism Simulations with Multiple Orders and Distortions" Virtual
NASA GODDARD EARLY CAREER SCIENTIST FORUM – SELECTED TALK Nov. 2021
- "Comparing galaxy properties between IllustrisTNG and the Santa Cruz SAM at $z=0$ " Virtual
NASA GODDARD EARLY CAREER SCIENTIST FORUM – LIGHTNING TALK Nov. 2021

EXTERNAL TALKS

"Simulating Roman Spectroscopic Instruments"

PRINCETON UNIVERSITY - ASTRO DATA LAB GROUP MEETING – INVITED TALK

Virtual

May 2022

References

Sangeeta Malhotra

sangeeta.malhotra [a] nasa.gov

- Research Astronomer at NASA Goddard Space Flight Center's Astroparticle Physics Laboratory
- Collaborator on Roman Space Telescope preparatory work

James Rhoads

james.e.rhoads [a] nasa.gov

- Research Astronomer at NASA Goddard Space Flight Center's Observational Cosmology Laboratory
- CRESST II sponsor
- Collaborator on Roman Space Telescope preparatory work

Rachel Somerville

rsomerville [a] flatironinstitute.org

- Galaxy Formation Group Leader at Center of Computational Astrophysics, Flatiron Institute
- Internship advisor
- Main collaborator for the Santa Cruz Semi-analytic model vs. IllustrisTNG paper series

Shy Genel

sgenel [a] flatironinstitute.org

- Associate Research Scientist at Center of Computational Astrophysics, Flatiron Institute and Adjunct Associate Research Scientist at Columbia University
- Collaborator on projects related to IllustrisTNG