Austen **Gabrielpillai** iD
Curriculum Vitae

Graduate Center, City University of New York, 365 5th Ave, New York, NY 10016

☐ (+1) 732-284-6854 | ✉ a.gabrielpillai [@] gmail.com | ⌂ aust427.github.io | 🎓 Austen Gabrielpillai

Education

The City University of New York	*New York, NY*
MASTER OF SCIENCE IN ASTROPHYSICS	*Aug. 2023 - Present*

- Advisors: Viraj Pandya & Ari Maller
- Thesis: "Constraining satellite-host galaxy co-evolution with next-generation semi-analytic models"

Rutgers University - New Brunswick	*New Brunswick, NJ*
MASTER OF INFORMATION	*Sep. 2018 - May 2020*

- Concentration in Data Science

University of Illinois at Urbana-Champaign	*Urbana, IL*
BACHELOR OF SCIENCE IN ENGINEERING PHYSICS	*Aug. 2013 - May 2017*

- Concentration in Computer Science

Professional Appointments

NASA Goddard Space Flight Center / Catholic University of America	*Goddard, MD*
SCIENCE RESEARCHER (FULL-TIME APPOINTMENT)	*Nov. 2020 - Aug. 2023*

- Sponsors: James Rhoads & Sangeeta Malhotra
- CRESST II Task 665.018: "Preparing for *Roman Space Telescope* Wide Field Instrument spectroscopic"

Center for Computational Astrophysics, Flatiron Institute	*New York, NY*
RESEARCH ANALYST (PART-/FULL-TIME INTERNSHIP)	*Jul. 2018 - Aug. 2020*

- Advisor: Rachel Somerville
- Project: "Galaxy formation in the Santa Cruz semi-analytic model compared with IllustrisTNG"

GSI Helmholtz Center for Heavy Ion Research / Technischen Universität Darmstadt	*Darmstadt, DE*
UNDERGRADUATE RESEARCH ASSISTANT (FULL-TIME INTERNSHIP)	*May 2016 - Aug. 2016*

- Advisors: Zoran Andelkovic & Wilfried Nörtershäuser
- Project: "Ion beam cross-section quality analysis for FAIR pre-development"

Research Interests

I am an astrophysics graduate student and formerly trained data scientist applying computational techniques toward studying the formation and evolution of galaxies across cosmic time. I have generated galaxy catalogs using a semi-analytic model for galaxy formation and created synthetic wide-field survey images with simulation code built from the ground up. I have contributed to one first authored and three co-authored peer reviewed publications, resulting in an h-index of 5 and a total of 93 citations (to date on NASA ADS). My aim is to use my unique educational and professional background to create and develop tools as well as data products that will be publicly available to the greater astronomy community.

Grants Awarded as Co-Investigator

Spectroscopic Probes of Quantitative Reionization (SPQR)	*Roman ROSES 2022*
PI: JAMES RHOADS	*Sep. 2023 - Sep. 2027*

- Wide field science (large) program

Publications

FIRST AUTHOR

[1] Galaxy formation in the Santa Cruz semi-analytic model compared with IllustrisTNG – I. Galaxy scaling relations, dispersions, and residuals at $z = 0$	*MNRAS, 517, 6091*
GABRIELPILLAI, AUSTEN; SOMERVILLE, RACHEL S.; GENEL, SHY; RODRIGUEZ-GOMEZ, VICENTE; PANDYA, VIRAJ; YUNG, L. Y. AARON; HERNQUIST, LARS	*arXiv:2111.03077*

[2] ESpRESSO - forward modeling *Roman Space Telescope*'s spectroscopic instruments	*ApJ, In prep.*
GABRIELPILLAI, AUSTEN; WOLD, ISAK G. B.; MALHORTRA, SANGEETA; RHOADS, JAMES E.; GAO, GUANGJUNG; KOEKEMOER, A. M.	

[3] Galaxy formation in the Santa Cruz semi-analytic model compared with IllustrisTNG – II. Galaxy scaling relations and residual evolution from z = 6 to 0 — *MNRAS, In prep.*

Gabrielpillai, Austen; Somerville, Rachel S.; Genel, Shy; Rodriguez-Gomez, Vicente; Diemer, Benedikt; Pandya, Viraj; Yung, L. Y. Aaron; Hernquist, Lars

[4] Semi-analytic bubbbles - probing high redshift reionization with mock surveys — *ApJ, In prep.*

Gabrielpillai, Austen; Yung, L. Y. Aaron; Rhoads, James; Malhotra, Sangeeta; Somerville, Rachel S.; Wold, Isak

Co-Author

[1] 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*

[2] Mangrove: Learning Galaxy Properties from Merger Trees — *ApJ, 941, 7*

Jespersen, Christian Kragh; Kranmer, Miles; Melchior, Peter; Ho, Shirley; Somerville, Rachel S.; **Gabrielpillai, Austen** — *arXiv:2210.13473*

[3] Finding Peas in the Early Universe with *JWST* — *ApJL, 942, 1*

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*

[5] Lyα at Cosmic Dawn with a Simulated *Roman* Grism Deep Field — *ApJ, Submitted*

Wold, Isak; Tilvi, Vithal; Malhortra, Sangeeta; Rhoads, James; **Gabrielpillai, Austen** — *arXiv:2305.01562*

[6] The relationship between galaxy size and halo properties: Insights from IllustrisTNG — *In prep.*

Somerville, Rachel S.; **Gabrielpillai, Austen**; Hadzhiyska, Boryana; Genel, Shy

[7] Red galaxies in TNG — *In prep.*

Gebek, Andrea; Diemer, Benedikt; **Gabrielpillai, Austen**

[8] constraining galaxy size relationships via machine learning — *In prep.*

Maller, Ari; Acquaviva, Viviana; Somerville, Rachel S.; **Gabrielpillai, Austen**

Conferences Talks & Posters

Conference Talks

"Mock Grism Simulations for *Roman Space Telescope*" — *Virtual*

The 238th AAS Meeting – research contributed talk — *Jun. 2021*

"*Roman* Grism Simulations with Multiple Orders and Distortions" — *Virtual*

Roman Science Team Community Briefing – selected talk — *Nov. 2021*

"ESpRESSO - mock *Roman Space Telescope* spectroscopic foreground simulations" — *Seattle, WA*

The 241th AAS Meeting – hyperwall talk — *Jan. 2023*

"ESpRESSO - high-fidelity realistic grism simulations for *Roman Space Telescope*" — *Baltimore, MD*

Roman Science Inspired by Emerging *JWST* Results – selected talk — *Jun. 2023*

Conference Posters

"Emulating IllustrisTNG with the Santa Cruz SAM – comparing galaxy properties at z = 0" — *Virtual*

Astro PoSTER 2022 - Galaxy Evolution – Poster #610 — *May 2022*

"A High Fidelity Spectroscopic Simulation for *Roman Space Telescope* Grism Data" — *Pasadena, CA*

The 240th AAS Meeting – Poster #302.02 — *Jun. 2022*

"Emulating hydrodynamic simulations with semi-analytic modeling: comparing the evolution of global quantities in the Santa Cruz SAM and IllustrisTNG" — *Seattle, WA*

The 241th AAS Meeting – Poster #406.03 — *Jan. 2023*

Conference Outreach

"NASA Exhibition at the 241st American Astronomical Society Meeting" — *Seattle, WA*

The 241th AAS Meeting – *Roman Space Telescope* Booth (Volunteer) — *Jan. 2023*

External Talks

"Simulating *Roman* Spectroscopic Instruments"   *Virtual*

Princeton University - Astro Data Lab Group Meeting – Invited Talk   *May 2022*

"Revealing the subtle differences in the stellar-to-halo mass relationship between different models   *New York, NY*
through subhalo tracking"

SIMBA Collaboration Meeting 2023 – Selected Talk   *May 2023*

Internal Talks

"An introduction to FlatHUB – an open source web-based query-able database for astrophysics"   *New York, NY*

Flatiron Institute CCA Group Meeting   *Oct. 2018*

"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*

Collaborations

Roman Space Telescope Cosmic Dawn Science Investigation Team

PI: James Rhoads   *Nov. 2020 - Nov. 2021*

NASA-funded Science Investigation Team conducting studies of the epoch of "Cosmic Dawn" with Roman Space Telescope.

• Post-baccalaureate member

Simons Collaboration on Learning the Universe (LtU)   *learning-the-universe.org*

Director: Greg Bryan   *Jan. 2022 - Present*

Collaboration dedicated towards constraining the initial conditions of the universe utilizing machine learning and forward modeling processes.

• Synthetic Observations Working Group member

The CAMELS project: Cosmology and Astrophysics with MachinE Learning Simulations   *camel-simulations.org*

PIs: Francisco Villaescusa-Navarro, Daniel Angles-Alcazar, Shy Genel   *Jun. 2023 - Present*

Collaboration dedicated towards bridging astrophysics and cosmology through machine learning and numerical simulations.

• Graduate student & CAMELS-CGM affiliate member

Roman Space Telescope Wide Field Science Investigation Team

PI: James Rhoads   *Sep. 2023 - Present*

NASA-funded Wide Field Science (large) investigation team conducting studies of the epoch of "Reionization" with Roman Space Telescope.

• Co-investigator and Computational-PI
• Slitless Spectroscopy Tools & Big Data Working Groups member

Satellites in Sapphire

PI: Greg Bryan, Viraj Pandya   *Oct. 2023 - Present*

NSF-funded investigation on galaxy co-evolution with models of subhalo dynamical evolution via unified models of the CGM

• Graduate Student Member

Membership & Involvement

University of Illinois Black Chorus

General Member (2015-2017) & Service Team (2017)   *Jan. 2015 - May 2017*

American Astronomical Society (AAS)

Graduate Student Member   *May 2021 - present*

New Great Observatories Science Analysis Group

Volunteer Member   *Feb. 2023 - Present*

Skills & Background

Programming	Python (fluent), JavaScript (proficient), HTML & CSS (proficient), C (familiar), C++ (familiar), SQL (familiar)
Software	Jupyter Notebook, PyCharm, Microsoft Visual Studio, Adobe Photoshop, Github, LaTeX
Nationalities	Canada, United States

References

James Rhoads *james.e.rhoads [@] nasa.gov*

- Research Astronomer at NASA Goddard Space Flight Center, Observational Cosmology Laboratory
- CRESST II sponsor (Nov. 2020 - Aug. 2023)
- Collaborator on Roman Space Telescope preparatory work

Sangeeta Malhortra *sangeeta.malhotra [@] nasa.gov*

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

Rachel Somerville *rsomerville [@] flatironinstitute.org*

- Galaxy Formation Group Leader at Center of Computational Astrophysics, Flatiron Institute
- Internship advisor (Jul. 2018 - Aug. 2020)
- Main collaborator and supervisor for the Santa Cruz Semi-analytic model vs. IllustrisTNG paper series

Shy Genel *sgenel [@] flatironinstitute.org*

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