María V. García-Alvarado

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Summary

Fifth year Physics undergraduate student and fourth year Engineering student at Universidad de los Andes in Colombia. Beginner researcher in computational Cosmology and Star Formation. Looking forward to pursuing a PhD in Physics or Astrophysics, focusing my research on Galaxy formation and evolution, Star formation or Cosmology.

Education

Universidad de los Andes Bogotá, Colombia
B.S in Physics Jan 2018–Dec 2022 (Expected)

Universidad de los Andes Bogotá, Colombia
B.S in Systems and Computing Engineering Jan 2019–Jun 2023 (Expected)

Universidad de los Andes Bogotá, Colombia
Minor in Astronomy Jan 2020–Dec 2022 (Expected)

Proyects

Study of the properties of molecular cloud filaments in MHD simulations Gothenburg, Sweden
Chalmers Astrophysics & Space Science Summer (CASSUM) Jun 2021 –May 2022

- Advisors: Jonathan Tan, PhD. Chia-Jung Hsu, MsC.
- Filaments are theorized to have a width of 0.1pc. To confirm this, we carry out a deep study of the filaments formed from cloud collisions. We study the dependence of the filament width with the environment magnetic field, the resolution of the simulation and the position of the filament in the cloud. Virial analysis of the filaments and measurement of the magnetic field orientation relative to the filament were also performed.

Structural analysis of massive protoclusters formed from cloud collisions Virtual
Chalmers Astrophysics & Space Science Summer (CASSUM) Jun 2021 –May 2022

- Advisors: Jonathan Tan, PhD. Chia-Jung Hsu, MsC.
- A study of the structure of evolving massive protoclusters using properties of graphs to determine properties of the parent molecular cloud. Applied dendrogram to identify protostellar cores at different stages of evolution and compute its Minimum Spanning Tree. We computed quantities such as the mass segregation of the cluster and analyzed the spatial distribution of the cores.

Analyzing spectra from DESI using UMAP Bogotá, Colombia
Universidad de los Andes 2021

- Advisor: Jaime E. Forero-Romero, PhD
- Finding anomalous spectra coming from DESI to detect failures on the instrument (physical defects in some CCDs), using Umap. Umap is a dimension reduction technique that has shown to be effective in classifying multidimensional objects into groups. Spectra coming from a CCD with failures are grouped differently.

The cosmic web through the lens of graph entropy Bogotá, Colombia
Universidad de los Andes 2018–2020

- Advisor: Jaime E. Forero-Romero, PhD

– An analysis of the cosmic web using properties of graphs. Applied the beta-skeleton graph on simulated dark matter halos and measured its graph entropy. We found the correlation between the entropy and quantities such as the cosmological parameters.

Publications

- M. V. García-Alvarado, X.-D. Li, and J. E. Forero-Romero, "The cosmic web through the lens of graph entropy", Monthly Notices of the Royal Astronomical Society: Letters, vol. 498, no. 1, pp. L145–L149, Aug. 2020, issn: 1745-3925. doi: 10.1093/mnrasl/slaa145.
- M. V. García-Alvarado and Jonathan Tan and Chia-Jung Hsu, "Structural analysis of massive protoclusters", *in prep.*

Conferences

Talks

- **Origins Workshop (Videoconference)** at Salt Lake City, Utah 2022
  Structural analysis of massive protoclusters
- **Astronomy Seminar (Videoconference)** at Universidad de los Andes 2021
  Structural analysis of massive protoclusters
- **Astronomy Seminar (Videoconference)** at Universidad de los Andes 2020
  Finding QSO pairs
- **Cosmology in Colombia** at Bogotá, Colombia 2020
  The cosmic web through the lens of graph entropy
- **Latin American IAU Meeting** at Antofagasta, Chile 2019
  Beta-Skeleton for the analysis of the Large Scale Structure of the universe
- **Congreso Colombiano de Astronomía** at Medellin, Colombia 2019
  Constraining cosmological parameters with the beta-skeleton of the cosmic web
- **Cosmology in Colombia** at Bogotá, Colombia 2019
  Constraining cosmological parameters with the beta-skeleton of the cosmic web

Posters

- **From Stars to Galaxies II** at Gothenburg, Sweden 2022
  Structural analysis of massive protoclusters formed from cloud collisions
- **ICTP-SAIFR Latin American Workshop on Observational Cosmoloy** at São Paulo, Brazil 2020
  The cosmic web through the lens of graph entropy

Scholarships and Awards

- FAMOUS grant for AAS 239 2021 –2022
  Will be used for AAS 241

Schools

- **Escape Summer School** at European Science Cluster of Astronomy & Particle Physics ESFRI Research Infrastructures 2021
- **Mexican Astrocosmostatistics School** at University of Guanajuato, Mexico 2021
- **Astronomy Twinning Program** at Leiden Observatory and University of Antioquia 2020

- **Summer School on Galaxies and Cosmology** at Institut Teknologi Bandung, Indonesia 2020

Teaching

- **Grader** at Universidad de los Andes Aug 2020 –Dec 2022
  Physics I and Physics II
- **Tutor** at Universidad de los Andes Aug 2021 –Dec 2021
  Physics I and Physics II
- **Tutor** at Universidad de los Andes Aug 2019 –Dec 2020
  Python programming

Skills

- **Programming Languages:** Python, Java, C/C++, Git, LaTeX, Bash, HTML, TypeScript, CSS, Javascript, SQL
- **Languages:**

  Spanish: ●●●●● English: ●●●●○ French: ●●●○○
- **Astronomic Software:** IRAF, CASA

Observing Experience

- Support Observer at DESI for 3 nights 2021

Mentorship

- **PENTA by She Speaks Science** 2021
  Mentorship program supported by the University of Cambridge and the IAU. This program aims to create a community of empowered women by giving advice and supporting each other.
- **COMPAS** at Universidad de los Andes 2021
  Mentored students at their first semester.