Juan Pablo **Alfonzo**

ASTROPHYSICS GRADUATE STUDENT · ASTROSTATISTICS · GALAXY FORMATION & EVOLUTION

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Summary

My research lies in the area of **galaxy evolution and formation** within astrophysics. My research in particular is very programming/computationally heavy. I like describing my area of research as an **intersection between astronomy, statistics, and computer science**, specifically **machine learning and deep learning**. My research has a heavy emphasis on machine learning and **artificial neural networks** to help answer research questions associated with galaxy evolution and formation. Currently most of my research is focused on trying to understand how galaxy structures are formed, and how they change with time.

Education

Tohoku University (東北大学)   *Sendai, Japan*

PHD IN ASTRONOMY   *Oct. 2022 - Oct. 2027*

- Supervisors: Prof. Masayuki Akiyama & Dr. Kartheik Iyer (Columbia University/Flatiron Institute)

University of Toronto   *Toronto, Canada*

HONS. BSC. IN ASTRONOMY AND PHYSICS   *Sept. 2017 - Jun. 2021*

- Math minor and Philosophy minor
- Thesis Supervisor: Dr. Mubdi Rahman

Research Experience

Tohoku University (東北大学)   *Sendai, Japan*

GRADUATE STUDENT RESEARCHER   *Oct 2022- Present*

- Working on applying **machine learning and deep learning techniques** to problems in various areas of astronomy
- Primarily interested in extra-galactic astronomy
- Supervisor: Prof. Masayuki Akiyama & Dr. Kartheik Iyer (Columbia University/Flatiron Institute)

Columbia University   *New York, USA*

VISITING RESEARCHER   *Feb 2025 - April 2025*

- Working with Dr. Kartheik Iyer to understand the morphology of galaxies in the Illustris-TNG50 simulation suite

Center for Computational Astrophysics (The Flatiron Institute)   *New York, USA*

VISITING RESEARCHER   *Feb 2025 - April 2025*

- Working with Dr. Francisco Villaescusa-Navarro to understand how dark matter models and cosmological models in the DREAMS project effect galaxy morphology

University of Toronto   *Toronto, Canada*

VISITING RESEARCHER   *Nov 2024 - Feb 2025*

- Working with Dr. Mike Walmsley and Prof. Josh Speagle to study the morphology of galaxies targeted by the Euclid space telescope

University of Toronto   *Toronto, Canada*

SURP RESEARCHER/ RESEARCH SCHOLAR   *May 2021 - Sept 2022*

- Working on **training a convolutional neural network (CNN) to predict the star forming history of the galaxies in the SDSS-IV MaNGA survey from their visual image and photometric information**, while studying what features of the galaxies the neural network is focusing on to make the predictions with the use of **CAM methods**.
- Project Supervisor: Dr. Kathreik Iyer (Dunlap Institute)

University of Toronto   *Toronto, Canada*

UNDERGRADUATE RESEARCHER   *Aug. 2020 - Apr. 2021*

- Investigated morphological changes in galaxies as they evolve in time, by studying their internal kinematics using the MaNGA survey.
- Analysis being done using Python based code with **heavy use of machine learning algorithms such as DB scan and PCA** from the **sci-kit learn** library. Full write up of project can be found **here**
- Project Supervisor: Dr. Mubdi Rahman (Dunlap Institute)

First-Author Publications

2024 **Katachi (形): Decoding the Imprints of Past Star Formation on Present Day Morphology in Galaxies with Interpretable CNNs**, Alfonzo J., Iyer K., Akiyama M., et al., ApJ 967 152

Full Publication List, Reviewer for *Astronomy & Astrophysics (A&A)*

Selected Presentations and Talks

11th Galaxy Evolution Workshop
Contributed Talk
Nagoya, Japan
Aug. 25-29, 2025

Cosmology and Galaxy Astrophysics with Simulations and Machine Learning 2024
Poster Presentation
New York, USA
Dec. 9-12, 2024

10th Galaxy Evolution Workshop
Contributed Talk
Taipei, Taiwan
Aug. 6-9, 2024

SUPER-IRNET Workshop 2024
Contributed Talk
Beppu, Japan
Jul. 23-26, 2024

IPMU Astrophysics Lunch Talk
Invited Talk
Kashiwa, Japan
Jun. 18, 2024

ELT Science in Light of JWST
Poster Presentation
Sendai, Japan
Jun. 3 - Jun. 7, 2024

Recipes to Regulate Star Formation at All Scales
Poster Presentation
Baltimore, USA
Apr 15-19, 2024

East Asian Young Astronomers Meeting 2024
Poster Presentation
Chiang Mai, Thailand
Jan 30 - Feb 2, 2024

AI-Driven Discovery in Physics and Astrophysics
Flash talk Presenter
Kashiwa, Japan
Jan 22-26, 2024

Machine Learning in Astronomical Surveys (IAP/CCA 2023)
Poster Presentation (Remote)
Paris, France & New York, USA
Nov 27 - Dec 1, 2023

Resolving Universe
Poster Presentation
Tokyo, Japan
Nov 5-10, 2023

Statistical Challenges in Modern Astronomy VIII
Poster Presentation
State College, USA
June 12-16, 2023

ART (Astrostats) Meeting
Seminar Talk
Toronto, Canada
Mar. 30, 2023

9th Galaxy Evolution Workshop
Contributed Talk
Kyoto, Japan
Feb. 21, 2023

HSC-AGN Meeting 2022
Contributed Talk
Kagoshima, Japan
Dec. 2, 2022

SDSS Collaboration Meeting 2021
Presenter in Data 1 Series and Lighting Talk 1 Series
Baltimore, USA
Aug. 11, 2021

Awards

SUPER-IRNET Travel Funding   *Baltimore, USA*

Poster Presenter   *Apr 15 - Apr 19, 2024*

- Secured full travel and accommodation funding to present a poster at a star-formation conference at STScI. (¥550,000)

Graduate Program on Physics and the Universe (GPPU) Fellowship   *Sendai, Japan*

GPPU Student   *April 2024 - Oct 2027*

- Fellowship for the graduate program at Tohoku University for Physics and Astronomy PhD students. The fellowship provides full financial funding to students, and includes travel funding. ($\approx$ ¥11,500,000)

SUPER-IRNET Travel Funding   *Tokyo, Japan*

Poster Presenter   *Nov 5 - Nov 10, 2023*

- Secured full travel and accommodation funding to present a poster at an ALMA and JWST conference at Waseda University. (¥76,940)

SUPER-IRNET Travel Funding   *State College, USA*

Poster Presenter   *June 4- June 17, 2023*

- Secured full travel and accommodation funding to attend an astrostats summer school and to do a poster presentation at an astrostats conference at Penn State. (¥734,525)

2022 Embassy Recommended Research MEXT Scholar   *Sendai, Japan*

Graduate Student   *Oct 2022 - Oct 2024*

- The Japan Ministry of Education, Culture, Sports, Science and Technology (in Japanese: Monbukagakusho, English acronym: MEXT) offers scholarships to Canadian students wishing to pursue their studies at a Japanese university. For graduate studies (non-degree, masters or doctorate) in any university subjects. Scholarship provides: full tuition coverage, monthly allowance, round-trip between Canada and Japan, and Japanese language training. Information can be found **here** ($\approx$ ¥10,000,000)
- Offered extension to PhD course, but declined due to a fellowship being awarded

2021 SURP Top Poster Award   *Toronto, Canada*

Poster Presenter   *Aug 13, 2021*

- Won top poster award for poster conference that was held to summarize all research projects carried out in the SURP program at the University of Toronto in the summer of 2021 ($50)