

Juan Pablo Alfonso

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 area 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**. A lot of the work I have done and hope to continue doing heavily involves programming and using Python based algorithms. These algorithms have a heavy emphasis on machine learning and **artificial neural networks** to help answer research questions associated with galaxy evolution and formation.

Education

Tohoku University (東北大学)

PHD IN ASTRONOMY

Sendai, Japan

Oct. 2022 - Oct. 2027

- Supervisors: Prof. Masayuki Akiyama (秋山正幸教授) & Dr. Kartheik Iyer (Columbia University)

University of Toronto

HONS. BSC. IN ASTRONOMY AND PHYSICS

Toronto, Canada

Sept. 2017 - Jun. 2021

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

Research Experience

Tohoku University (東北大学)

GRADUATE STUDENT RESEARCHER

Sendai, Japan

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 (秋山正幸教授) & Dr. Kartheik Iyer (Columbia University)

University of Toronto

SURP RESEARCHER/ RESEARCH SCHOLAR

Toronto, Canada

May 2021 - Sept 2022

- Working on **training a convolutional neural network (CNN) to classify galaxies in the MaNGA survey**, while studying what features of the galaxies the neural network is focusing on to make the classification with the use of **CAM methods**.
- Network being created and trained using the **pytorch** Python package and working in a **Linux based environment** and using **Google Colab**
- Final goal is to have the CNN be able to predict the star forming history of the galaxies from their visual image and spectral information. Aim to **not only having a working CNN but to be able to pick it apart to understand how it is making decisions and extract relevant physics**
- Project Supervisor: Dr. Kathreik Iyer (Dunlap Institute)

University of Toronto

UNDERGRADUATE RESEARCHER

Toronto, Canada

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](#)
- Unique use of PCA** which focused more on using the actual PC vectors rather than using them as the basis in a PC profile plot
- Project Supervisor: Dr. Mubdi Rahman (Dunlap Institute)

Publications

2024 **Katachi (形): Decoding the Imprints of Past Star Formation on Present Day Morphology in Galaxies with Interpretable CNNs**, Alfonso J., Iyer K., Akiyama M., et al., Accepted to ApJ, [arxiv 2404.05146](#)

Presentations and Talks

10th Galaxy Evolution Workshop

CONTRIBUTED TALK

Taipei, Taiwan

Aug. 6-9, 2024

The Physical Processes Shaping the Stellar and Gaseous Histories of Galaxies (Declined)

POSTER PRESENTATION

Pisa, Italy
May 27 - May 31, 2024

Recipes to Regulate Star Formation at All Scales

POSTER PRESENTATION

Baltimore, USA
Apr 15 - Apr 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 - Jan 26, 2024

Machine Learning in Astronomical Surveys (IAP/CCA 2023)

POSTER PRESENTATION

Paris, France & New York, USA
Nov 27 - Dec 1, 2023

Resolving Universe

POSTER PRESENTATION

Tokyo, Japan
Nov 5-10, 2023

GPPU School

POSTER PRESENTATION

Sendai, Japan
Sept 28, 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

POSTER PRESENTER

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

Baltimore, USA
Apr 15 - Apr 19, 2024

Graduate Program on Physics and the Universe (GPPU) Fellowship

GPPU STUDENT

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

Sendai, Japan
April 2024 - Oct 2027

GPPU Applicant Travel Funding

POSTER PRESENTER

- Secured full travel and accommodation funding to present a poster at East Asia Young Astronomers Meeting 2024 hosted by NARIT (¥237,540)

Chiang Mai, Thailand
Jan 29 - Feb 3, 2024

AI-Driven Discovery in Physics and Astrophysics Travel Funding

WORKSHOP ATTENDEE & PRESENTER

- Secured full travel and accommodation funding to attend and present at an AI/ML x Physics/Astrophysics workshop at Kavli IPMU (¥50,000)

Kashiwa, Japan
Jan 22 - Jan 26, 2024

SUPER-IRNET Travel Funding

POSTER PRESENTER

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

Tokyo, Japan
Nov 5 - Nov 10, 2023

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)

9th Galaxy Evolution Workshop Travel Funding

Kyoto, Japan

CONTRIBUTED TALK SPEAKER

Feb 19-25, 2023

- Secured full travel and accommodation funding from the conference (¥66,004)

HSC-AGN f2f Meeting Travel Funding

Kagoshima, Japan

CONTRIBUTED TALK SPEAKER

Nov 29-Dec 3, 2022

- Secured full travel and accommodation funding from the conference (¥98,623)

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)