Juan Pablo **Alfonzo**

ASTROPHYSICS GRADUATE STUDENT · 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 and computer science**, specifically **machine learning and data science**. 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.

Research Experience

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

GRADUATE STUDENT RESEARCHER   *Oct 2022- Present*

- Working on applying **machine 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）

University of Toronto   *Toronto, Canada*

SURP RESEARCHER/ RESEARCH SCHOLAR   *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   *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**
- **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)

Presentations and Talks

ART (Astrostats) Meeting   *Toronto, Canada*

SEMINAR TALK   *Mar. 30 2023*

- Presented on going research on the use of **CNNs** to explore the link between galaxy morphology and star formation history at the bi-weekly meeting for astrostatics at the University of Toronto.

9th Galaxy Evolution Workshop   *Kyoto, Japan*

CONTRIBUTED TALK   *Feb. 21 2023*

- Presented on going research on the use of **CNNs** to explore the link between galaxy morphology and star formation history. Conference was run by ASIAA and hosted by Kyoto University, conference details can be seen **here**

HSC-AGN f2f Meeting   *Kagoshima, Japan*

CONTRIBUTED TALK   *Dec. 2 2022*

- Presented on going research on the use of **CNNs** to explore the link between galaxy morphology and key galactic parameters. Hosted by Kagoshima University, conference details can be seen **here**

SURP Poster Fair   *Toronto, Canada*

SCIENCE POSTER PRESENTATION   *Aug. 13 2021*

- Presented poster that summarized summer research in fair were all members of the astronomy department at the University of Toronto were invited to attend. **Won top poster award**
- Project poster can be seen by clicking **here**

SDSS Collaboration Meeting 2021   *Baltimore, USA*

PRESENTER IN DATA 1 SERIES AND LIGHTING TALK 1 SERIES   *Aug. 11 2021*

- Presented research that was in the paper preparation stage. Talk title: **Exploring the Link Between the Star Formation History and the Morphology of Galaxies in SDSS-IV MaNGA**. Hosted by John Hopkins University, for conference details click **here**

Undergraduate Thesis Presentation   *Toronto, Canada*

PROJECT PRESENTER   *Apr. 12 2021*

- Presented research conducted during undergraduate thesis project. Talk title: **Internal Kinematics of Galaxies in Relation to their Morphological Evolution Using MaNGA Survey**. Presentation slides can be found **here**

Awards

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 Research Embassy MEXT Scholar   *Sendai, Japan*

GRADUATE STUDENT   *Oct 2022 - Present*

- 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. ($\approx$ ¥12,000,000)

2021 SURP Top Poster Award   *Toronto, Canada*

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 in the summer of 2021 ($50)

Education

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

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

- Supervisor: Prof. Masayuki Akiyama（秋山正幸教授）
- **IGPAS Program**

University of Toronto   *Toronto, Canada*

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

- Math minor and Philosophy Minor
- Achieved cGPA of 3.60 (A-) across all astrophysics based courses, including 4.0 GPA in undergraduate thesis

Extracurricular

Languages

- **Bilingual Native in English and Spanish**. Rudimentary ability to speak and read French. Currently learning Japanese, very basic ability to understand and read.

Technology

- Take joy in playing around with various software applications/code on computers and other devices to optimize my experience
- Enjoy **understanding computer hardware** and how it functions, **built my own desktop computer**