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

University of Toronto
Toronto, Canada

SURP Researcher/ Research Scholar — *May 2021 - Present*

- 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

HSC-AGN f2f Meeting
Kagoshima, Japan

Contributed Talk — *Dec. 2 2022*

- Presented on going research on the use of **CNNs** to learn galaxy morphology and predict key galactic parameters from it. 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**

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

- **Fluent 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**