

# Juan Pablo Alfonso

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 - 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

### 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

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

## Extracurricular

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### 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**