

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 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

Statistical Challenges in Modern Astronomy VIII

State College, USA

POSTER PRESENTATION

June 12-16 2023

- Presented on going research on the use of **CNNs** to explore the link between galaxy morphology and star formation history in poster format at Penn State. Conference details can be seen [here](#). The poster can be seen [here](#)

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 astrostatistics 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](#). Presentation slides 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](#). Presentation slides 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

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 a astrostats conference in Penn State. (¥761,154)

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 - 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. Information can be found [here](#) (≈ ¥7,500,000)

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)

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**