

## Salman Al Farisi 陳成文

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Astronomy master student and graduate research assistant at National Tsing Hua University working on galactic archaeology with DESI Milky Way Survey. Primarily, my research focuses on understanding the assembly history of the Milky Way through galactic halo substructure in both observations and simulations to constrain dark matter models and galactic formation scenarios. Additionally, I am working at National Taiwan University on fuzzy dark matter simulations to investigate the impact of granular halo fluctuations on stellar streams using GAMER-2. Previously earned a Bachelor of Science in Astronomy from the Bandung Institute of Technology in 2020 with high distinction, winning national robotics competition and being awarded for best academic performance improvement in the second year.

## Research Interest

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- Galactic Archaeology, Dynamics, Formation, and Evolution
- Local-scale Dark Matter
- Computational Astrophysics, Machine Learning, and High Performance Computing

## Education

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**National Tsing Hua University (NTHU).** Hsinchu City, Republic of China

Master of Science in Astronomy, GPA: 4.19/4.30. August 2024 – present

**Supervisor:** Prof. Andrew P. Cooper

**Bandung Institute of Technology (ITB).** Bandung, Indonesia

Bachelor of Science in Astronomy, GPA: 3.03/4.00. July 2016 – October 2020

**Supervisor:** Dr. rer. nat. M. Ikbal Arifyanto

**Thesis:** The Implementation of Convolutional Neural Network for SDSS Apogee to Determine Stellar  $T_{\text{eff}}$ ,  $\log(g)$ , and  $[Fe/H]$

**Summer Schools:**

- **Bandung Institute of Technology.** *Summer School of Galaxies and Cosmology.* September 2020.
- **University of Amsterdam & Telkom University.** *Machine Learning Summer School (MLSS) Indonesia.* August 2020.

## Research Experience

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**Institute of Astrophysics, National Taiwan University.** Taipei, Republic of China

*Heating of Stellar Streams by Fuzzy Dark Matter Fluctuations*

Research supervisor: Prof. Hsi-Yu Schive

Research Assistant under NCTS – TCA summer research. July 2025 - August 2025

I plan to investigate the effects of heating of stellar streams by stochastic density fluctuations in a granular fuzzy dark matter (FDM) halo at the Institute of Astrophysics, National Taiwan University. In this project, I use GAMER-2 for hydrodynamics simulations while contributing to its development. By putting thin and cold stellar streams over the uniform granules of the halo, we expect that interactions with the FDM-induced fluctuations will broaden the streams, increase the velocity dispersion, and produce characteristic density perturbations such as gaps and spurs and provide constraints on the boson mass. The results could help determine whether such FDM signatures are observable with current or future surveys, offering a potential of observational evidence of FDM signatures.

**Institute of Astronomy, National Tsing Hua University.** Hsinchu City, Republic of China

*Finding substructures in Milky Way halo with DESI MWS*

Research supervisor: Prof. Andrew P. Cooper

Research Assistant. September 2024 – present

Identifying substructure in stellar halo from DESI Milky Way Survey based on the simulations of globular cluster and dwarf galaxy stellar tidal disruption. We are currently cataloging substructures from globular cluster stripping within the DESI footprint to explore more detailed analysis for each substructure that might be related to merger and stripping history. This led to improved understanding of how globular clusters and dwarf galaxies could contribute to the formation of the stellar halo and its substructure. The expected

results include mapping new candidates of members and new tidal streams and overdensities, constraining the mass and orbital histories of their progenitors, and providing observational tests of hierarchical galaxy formation models.

**Astronomy Study Program, Bandung Institute of Technology.** Bandung, Indonesia

*B-emission Star Spectral Data Analysis*

Research supervisor: Dr. rer. nat. M. Ikbal Arifyanto

Research assistant. July 2020 – January 2021

Studied and processed the Bosscha Observatory Be Star data to determine the rotational velocity parameter using stellar spectra with various machine learning techniques to predict the parameters and visualize the raw data into spectra plots. By using neural networks, we achieved a mean squared error of 4533 and a mean average percentage error of 19%. The results provide a foundation for automated pipelines in stellar parameter estimation from spectral datasets.

*The Application of Convolutional Neural Network into APOGEE Spectra to Determine Stellar Parameters  $T_{\text{eff}}$ ,  $\log(g)$ , and  $[Fe/H]$*

Research Supervisor: Dr. rer. nat. M. Ikbal Arifyanto

*Thesis Research.* July 2019 – October 2020

Conducted analysis of SDSS APOGEE spectra and stellar parameters for 16 million data points, achieving an average percentage error of 0.41% for surface temperature, 2.32% for surface gravity, and 0.44% for metallicity. Motivated by the need for efficient and accurate parameter determination in large spectroscopic survey pipelines, this project explored the potential of neural networks as a tool for stellar classification and parameter estimation. The method offers the possibility of integration as a pipeline component for surveys, providing fast and high-precision stellar parameter estimation to support studies of observational astronomy. The research poster was presented at the Machine Learning Summer School (MLSS) Indonesia 2020.

## Industrial Experience

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**Ajari Technologies.** Jakarta, Indonesia

*Senior Machine Learning Engineer.* April 2024 - July 2024

Developed facial recognition system for government training platform based on the convolutional neural network (CNN) and spatial embedding using vector database.

**MicroSec.** Singapore, Singapore

*Security Software Engineer.* February 2023 - April 2024

Developed the infrastructure for a machine learning-based IoT agent for advanced threat detection and anomaly identification and integrated post-quantum cryptography algorithms into certificate authority for an UK-based autonomous marine vehicle company.

**Allure AI.** Jakarta, Indonesia

*Machine Learning Engineer.* December 2020 - February 2023

Coordinated machine learning research for skin analyzer and recommendation system for skincare products. Successfully reduced costs by 80% and delivery time by 50% by optimizing AWS machine learning infrastructure.

## Teaching Assistant Experience

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**Computational Science Program, Institut Teknologi Bandung.** Bandung, Indonesia

*Teaching Assistant for Data Mining in Science.* July 2020 - July 2021

Lecturer: Dr. rer. nat. Mochamad Ikbal Arifyanto and Dr. Finny Oktariani

**Astronomy Program, Institut Teknologi Bandung.** Bandung, Indonesia

*Teaching Assistant for Physics of Galaxy.* January 2020 - July 2020

Lecturer: Dr. rer. nat. Mochamad Ikbal Arifyanto

*Teaching Assistant for Computational Astrophysics.* July 2019 - December 2019

Lecturer: Dr. Mohammad Irfan Hakim

## Publication

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Yusuf, Hisham L., et al., 2018. Dago Hoogeschool dalam Kontes Robot Sepak Bola Indonesia Humanoid 2018 [Dago Hoogeschool in Indonesian Humanoid Soccer Robot Contest 2018]. The 6th Indonesian Symposium on Robotics Systems and Control (ISRSC): 171-175.

## Presentation

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**University of Amsterdam & Telkom University.** Online

*Machine Learning Summer School 2020 poster presentation.* August 2020

Poster title: The Utilization of Deep Learning in Spectroscopic Survey for Astrophysical Parameter Determination.

Presented the research progress and machine learning application in astronomy to audiences from the computer science field in MLSS.

**Bandung Institute of Technology.** Bandung, Indonesia

*Workshop on Utilization of Virtual Observatory and Data Analysis (WUVODA) instructor.* November 2019

Presented the workshop hands-on of machine learning in astronomy using scikit-learn library on Gaia observation data (co-instructor with M. Rafiul Ilmi) to 20 students from various universities as preparation for the hackathon session for participants.

## Honors and Awards

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National Tsing Hua University outstanding international scholarship awardee. September 2024 - present

Second prize of Intel computer vision hackathon. December 2020

Indosat Ooredoo machine learning track scholarship awardee. April - June 2020

Final participant of National University of Singapore (NUS) Hack&Roll hackathon 2020. January 2020

Google Cloud Platform computing grant, accumulated to \$600. July 2019 - July 2020

Karya Salemba Empat academic scholarship awardee 2019. January - July 2019

Third prize in the National Robotics Competition 2018. July 2018

Third prize in the Regional Robotics Competition 2018. April 2018

The Rising Star Award for best academic improvement 2018, Astronomy Study Program, ITB. April 2018

## Skills

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Astronomical simulations, machine learning, distributed programming, cloud computing, numerical simulations, observational data analysis.

Astronomy tools: Astropy, Gala, Galpy, AGAMA, GAMER, GADGET

Survey data: DESI, SDSS, Gaia

Programming languages: C, C++, Python, Javascript, Fortran, R, Go, Julia, SQL, Shell script.

Distributed computing: Slurm, GPU architecture, CUDA

## Languages

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English: Proficient user. CEFR level C1.

Bahasa Indonesia: Native proficiency

Mandarin Chinese: Elementary proficiency

Japanese: Elementary proficiency

## Open Source Participations

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GAMER – Open source development contributor. January 2025 – present

Astropy – Open source development contributor. January 2023 – present