Muhammad Fahmi Fauzi

Master's Graduate | Black Holes and Compact Objects

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Overview

A master's graduate and research assistant in theoretical physics specializing in numerical simulations, particularly in the observational and phenomenological aspects of black hole and compact object.

My research interests, in general, are in general relativity and gravitation, including *black holes, general relativistic ray tracing, gravitational lensing, geodesics, modified gravity, neutron stars, (ultra)-compact objects,* and *gravitational waves*

Current Position

Research Assistant Feb. 2024 – Present
Department of Physics, University of Indonesia Depok, Indonesia

- Conducting research on observational signatures of black holes and its alternatives, particularly their appearance, gravitational lensing effects, and quasinormal modes.
- Developed ray tracing and geodesics codes in MATLAB, Julia, and Python for arbitrary spherically and axially symmetric spacetime geometries.
- Mentored undergraduate and graduate students in numerical simulations related to black holes, compact objects, gravitational lensing, and ray tracing.

Education

Master's Degree (M.Si.) | ***Theoretical Nuclear-Particle Physics and Astrophysics*** Aug. 2023 – Feb. 2025
Department of Physics, University of Indonesia Depok, Indonesia

- **Grade** : 4.00/4.00 (*Summa Cum Laude*)
- **Thesis** : *Effective Model of Anisotropic Gravastar as Horizonless Regular Black Hole and Their Observational Signature* (Supervised by Prof. Dr. Anto Sulaksono and Dr. Handhika S. Ramadhan)

Bachelor's Degree (S.Si.) | ***Physics*** Aug. 2019 – Feb. 2023
Department of Physics, Padjadjaran University Sumedang, Indonesia

- **Grade** : 3.63/4.00
- **Thesis** : *Simulation of Element Abundance Evolution from Neutron Capture in the 13C-Pocket of Asymptotic Giant Branch (AGB) Stars* (Supervised by Dr. Nowo Riveli)

Publications

[1] **M. F. Fauzi**, H. S. Ramadhan, A. Sulaksono and Hasanuddin, "Imaging the destruction of a rotating regular black hole," *Class. Quant. Grav* **42**, 225012 (2025).

[2] **M. F. Fauzi**, "Comment on 'Strong lensing and shadow of Ayon-Beato-Garcia (ABG) nonsingular black hole'," *Eur. Phys. J. C* **85**, 1246 (2025).

[3] **M. F. Fauzi**, B. N. Jayawiguna, H. S. Ramadhan and A. Sulaksono, "Horizonless star based on regular black hole with finite radius and its observational signatures," *Eur. Phys. J. C* **85**, 903 (2025).

[4] A. Rohim, G. I. B. Darman, **M. F. Fauzi** and A. Sulaksono, "Black hole and minimal length: Thermodynamics, quasinormal modes, and shadow radius," *Int. J. Mod. Phys. D* **34**, 2550047 (2025).

[5] **M. F. Fauzi**, H. S. Ramadhan and A. Sulaksono, "Anisotropic gravastar as horizonless regular black hole spacetime and its images illuminated by thin accretion disk," *Eur. Phys. J. C* **84**, 1145 (2024).

Past Experience

Private Physics Tutor For Undergraduate (Freelance) — Feb. 2023 – Mar. 2024
Beta Belajar — Bandung, Indonesia

Director and Content Creator — Apr. 2020 – Feb. 2024
Pajajaran Physical Society — Sumedang, Indonesia

Fundamental Electronics Laboratory Assistant — Aug. 2021 – Dec. 2022
Department of Physics, Padjadjaran University — Sumedang, Indonesia

Algorithms and Numerical Computation Laboratory Assistant — Feb. 2021 – Jun. 2022
Department of Physics, Padjadjaran University — Sumedang, Indonesia

Conferences and Seminars

[1] **[Poster]** *The 34th Workshop on General Relativity and Gravitation in Japan* (JGRG34) on 19-23 January 2026, Kyoto University, Japan. — Presented a poster titled "Imaging the destruction of a spinning nonsingular black hole."

[2] **[Oral]** *14th International Physics Seminar* (IPS) on 21 June 2025, Universitas Negeri Jakarta (UNJ), Indonesia — Presented a talk titled "Witnessing the destruction of rotating regular black hole."

[3] **[Oral]** *1st International Physics Conference* (IPC) on 9 November 2024, Universitas Pendidikan Indonesia (UPI), Indonesia — Presented a talk titled "Shadow images of regular black hole with a finite boundary."

[4] **[Organizing Committee Member]** *3rd International Powder Technology Conference and Exhibition Indonesia* (ICePTi) on 5 October 2021, organized by JP Global Transtech

Skills

Scientific programming : Proficient in using *Julia, Mathematica, Python (NumPy, SciPy, Matplotlib),* and *MATLAB* for numerical computation and data visualization.

Numerical computation : Skilled in solving mathematical problems using fundamental numerical methods, including *ODEs with adaptive step sizing, PDEs with finite difference method, root finding, numerical differentiation, numerical integration, interpolation, etc.*

Sketching and design : Proficient in using *CorelDraw* for creating illustrations.

Referees

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