

Eugene (Yoogeun) Song

Date of birth: 27 November 1997 | **Nationality:** Korean (Republic of Korea)

Gender: Male (he/him/his) | **Location:** London, UK

LinkedIn: www.linkedin.com/in/yoogeunsong | **Website:** yoogeunsong.com

Email: yoogeun.song24@imperial.ac.uk & ygsong1004@gmail.com

Education & Key Qualifications

Imperial College London <i>PhD Student in High-Energy Physics at Imperial</i>	2026 – 2030 London, UK
Imperial College London <i>Masters degree with the Distinction-awarded thesis project</i>	2024 – 2025 London, UK
University of Science and Technology <i>Graduate studies program in Astronomy and Space Science (Started in 2009 at 11 years of age: "Song Yoo-geun" project)</i>	2009 – 2018 Daejeon, Korea
National Institute for Lifelong Education <i>B.Sc. in Computer Science</i>	2006 – 2009 Seoul, Korea
Inha University <i>B.Sc. in Physics</i>	2006 – 2009 Incheon, Korea

Experience

Graduate Researcher <i>Imperial College London</i>	Apr 2025 – Present London, UK
• Architected and developed <i>AtriPINN</i>, an end-to-end physics-informed machine learning framework (Python/PyTorch) that reconstructs atrial fibrillation wavefronts in real time from 4×4 grid electrograms, leveraging integrated geometric frameworks to advance Afib mapping and treatment and elucidate the electrical mechanisms underlying irregular heartbeats. • Engineered switchable physics back-ends (wave, eikonal and monodomain Aliev-Panfilov) within a single shared data $\rightarrow$ train $\rightarrow$ visualisation pipeline, with adaptive collocation, mixed-precision training and Adam $\rightarrow$ L-BFGS optimisation; shipped versioned releases v1–v11.2 with CLI tooling and reproducible configurations. • Achieved ~ 78 ms end-to-end latency, ~ 1.6 mm RMS localisation error and ≥ 0.99 channel cross-correlation on clinical electrophysiology data from Hammersmith Hospital, against the 4–6 mm projection error typical of conventional electroanatomic mapping. • Working with Prof. David Colling (Imperial HEP group) and Dr. Nick Linton (Imperial Department of Bioengineering), on clinical datasets from Hammersmith Hospital. • MSc thesis on this work, <i>Physics-Informed Machine Learning for Real-Time Atrial Fibrillation Mapping from Grid Electrograms</i>, awarded the highest grade.	
Quantitative Researcher <i>Independent Research Practice</i>	Oct 2025 – Aug 2026 London, UK
• Independent research on alpha generation under non-stationary market dynamics across futures, derivatives and equities, treating structural constraints (market impact, inventory, liquidity, latency) as explicit modelling anchors rather than post-hoc frictions. • Studied agent adaptation and regime shifts, prioritising signals whose derivation survives a change in the data-generating process over in-sample backtest performance. • Applied physics-inspired signal/noise separation, stochastic control (HJB), Monte Carlo methods and time-series modelling in Python.	

UCL - MSSL visiting researcher

Jan 2023 – Mar 2024

*MSSL, University College London**London, UK*

- Modelling Event Horizon Telescope images and multi-wavelength variability of Sgr A* using GRMHD simulations and GR radiative transfer post-processing, paper in prep.
- Working with Dr. Ziri Younsi and Prof. Kinwah Wu.

Independent Researcher

Sep 2020 – Dec 2022

*In collaboration with the National Astronomical Observatory of Japan**Remote*

- During the COVID-19 pandemic, to maintain research momentum, despite pandemic-induced changes, I also collaborated remotely with Dr. Isao Okamoto (NAOJ) to develop modified Blandford-Znajek energy-extraction models for Kerr black holes (see arXiv:1904.11978 & 2401.12684).
- I also attended multiple conferences across Europe, including the key events in Spain, e.g. EAS 2022. Held discussions with various researchers in Europe while I was there, including Prof. Francisca Kemper, Dr. Frank M. Rieger, Dr. Benoît Cerutti, Prof. Bożena Czerny, Dr. Oliver Porth, and Dr. Ziri Younsi.

National service

December 2018 – August 2020

*7th Engineer Brigade, VII Corps, Republic of Korea Army**Icheon, Korea*

- Served as a soldier (final rank: Sergeant).
- Started as a Private, later promoted and finished as a Sergeant.
- As an Army driver, I was part of the brigade's transportation team.

Graduate/Postgraduate studies

2009 – 2018

*University of Science and Technology**Daejeon, Korea*

- Enrolled in the University of Science & Technology (UST) / Korea Astronomy and Space Science Institute (KASI) as a Master's student in 2009 (at age 11).
- Researching "High-Energy & Very-High-Energy Radiation from Black Hole Magnetospheres" under the guidance of Dr. Seok Jae Park at KASI.

Visiting Student

2017 – 2018

*Academia Sinica, Institute of Astronomy and Astrophysics**Taipei, Taiwan*

- Invited as a visiting researcher at the Academia Sinica Institute of Astronomy and Astrophysics from April 2017 to May 2018 to collaborate with Dr. Kouichi Hirotani, with whom I have published two peer-reviewed scientific papers.

Scientific Publications

1. **Yoogeun Song**, Hung-Yi Pu, Kouichi Hirotani, Satoki Matsushita, Albert K. H. Kong, Hsiang-Kuang Chang, "Enhanced gamma radiation towards the rotation axis from the immediate vicinity of extremely rotating black holes", MNRAS Letters, 471, 1 (2017), [10.1093/mnrasl/slx119](https://doi.org/10.1093/mnrasl/slx119)
2. Kouichi Hirotani, Hung-Yi Pu, Sabrina Outmani, Hsinhao Huang, Dawoon Kim, **Yoogeun Song**, Satoki Matsushita, Albert K. H. Kong, "High-energy and Very High Energy Emission from Stellar-mass Black Holes Moving in Gaseous Clouds", ApJ, 867, 2 (2018), [10.3847/1538-4357/aae47a](https://doi.org/10.3847/1538-4357/aae47a)
3. Isao Okamoto, **Yoogeun Song**, "Gravito-thermo-electrodynamic extraction of energy from Kerr black holes" (2019), [arXiv:1904.11978v1](https://arxiv.org/abs/1904.11978v1)
4. Isao Okamoto, Toshio Uchida, **Yoogeun Song**, "Energy self-extraction of a Kerr black hole with the force-free magnetosphere frame-dragged" (2024), [arXiv:2401.12684](https://arxiv.org/abs/2401.12684)
5. **Yoogeun Song**, Ziri Younsi, Yosuke Mizuno, Kinwah Wu, Christian M. Fromm, "Multi-wavelength variability of Sgr A* from GRMHD simulations with electron heating", in preparation (2024)

Notable Scientific Presentations and Conference Participation

- **The 7th Heidelberg International Symposium on High - Energy Gamma-Ray Astronomy**
Barcelona, Spain July 4 - 8, 2022
- **European Astronomical Society Annual Meeting 2022**
Valencia, Spain June 27 - July 1, 2022
- **"Theoretical Models of the Black Hole Magnetospheres and Jets"** in "Black Hole Astrophysics with VLBI: Past, Present, and Future."
NAOJ, Mitaka, Japan (1st author poster presentation) March 27 - 29, 2017
- **Future Sky Surveys and Big Data**
KASI, Daejeon, Korea April 25 - 29, 2016
- **3rd Korea - Japan Workshop on Dark Energy**
KASI, Daejeon, Korea April 4 - 8, 2016
- **The Korean Astronomical Society 50th Anniversary Meeting 2015**
Seoul, Korea April 15 - 17, 2015

Awards and Honors

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| Special Award | For undergraduate degree at age 11 |
| <i>The National Assembly of the Republic of Korea</i> | February 2009 |
| Child Prodigy Sponsorship Program | 24,000,000 KRW (~ \$18,500) |
| <i>Samil PricewaterhouseCoopers (Korean branch of PwC)</i> | 2014 - 2015 |
| Super Child Prodigy Project | 100,000,000 KRW (~ \$77,000) (KASI) |
| "Song Yoo-geun Project" | 2009 - 2015 |
| <i>The Government of the Republic of Korea</i> | |
| Special (Pre-College) Scholarship & Monthly Subsidy | 64,780,000 KRW (~ \$50,000) |
| <i>Inha University</i> | 2006 - 2008 |

Professional Certification

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| Craftsman Information Processing certificate | |
| <i>Ministry of Science, ICT and Future Planning, Korea</i> | 2004 (at age 6) |
| Craftsman Information Equipment Operation | |
| <i>Ministry of Science, ICT and Future Planning, Korea</i> | 2004 (at age 6) |
| Computer Specialist in Spreadsheet & Database Level - 2 certificate | |
| <i>Ministry of Employment and Labor, Korea</i> | 2008 (at age 10) |
| Securities Education Certificate (Distinction) | |
| <i>Imperial College Investment Society</i> | 2025 |
| Finance Accelerator | |
| <i>AmplifyME</i> | 2024 |

Scientific Public Engagement

- **500+ Korean and Japanese media appearances:** Various television, radio, and newspaper interviews. Since 2004, my achievements have been extensively documented in mainstream Korean media outlets, including the Kyunghyang Shinmun, Hankyoreh, Chosun Ilbo, Joongang Ilbo, Donga Ilbo, Seoul Broadcasting System (SBS), and Korean Broadcasting System (KBS). 2004 - 2023
- **SBS Special:** Documentary about my life in academia right before being enlisted in the Republic of Korea Army.
[YouTube](http://tinyurl.com/4atzjwx5) (<http://tinyurl.com/4atzjwx5>) October 2018
- **Seoul Digital Forum 2015:** Interview with Dr. Kip Thorne about the LIGO project.
[YouTube](http://tinyurl.com/mrxaz5n7) (<http://tinyurl.com/mrxaz5n7>) May 2015
- **EBS DocuPrime "Wonderful Science":** Documentary titled "*The secret of the birth of the universe – Big Bang*," with me as presenter and narrator.
[Article](http://tinyurl.com/3z6sktun) (<http://tinyurl.com/3z6sktun>)
[Video](http://tinyurl.com/2p8w6em5) (<http://tinyurl.com/2p8w6em5>) May 2011
(originally) November 2005
- **KBS "Screening Humanity":** Two five-episode documentary series about my life in elementary and high schools as a prodigy.
[Article](http://tinyurl.com/yc5mxwef) (<http://tinyurl.com/yc5mxwef>) January and June 2005

Skills

Languages: English (*proficient*), Korean (*native*), French (*intermediate*), Italian (*A2*)

- **IELTS Academic:** Band 8.5 (L:9.0, R:8.5, W:7.0, S:8.5)
- **TOEFL iBT:** Score 106 (L:29, R:27, W:27, S:23)

Programming Languages: LaTeX, Python, Fortran, C/C++, Mathematica, MATLAB

Other Interests

Musical Instruments: Guitar (Acoustic & Electric), Drums, Bass, Piano, Violin

Sports: Brazilian Jiu-Jitsu, Soccer, Golf, Tennis, Skiing/Snowboarding, Triathlon