Hyerin Cho (조혜린)

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EDUCATION

Center for Astrophysics | Harvard & Smithsonian Sep. 2020 - Present
Ph.D. Candidate

GIST(Gwangju Institute of Science and Technology), *cum laude*
B.S. Physics Major/Math Minor Mar. 2015 - Feb. 2020
Total GPA: 4.0/4.5 (3.7/4.0 U.S. scale)
Major GPA: 4.4/4.5 (4.0/4.0 U.S. scale) [1]

California Institute of Technology Sep. 2017 - Dec. 2017
Study Abroad Program
Total GPA: 3.9/4.3

University of California, Berkeley Jun. 2016 - Aug. 2016
Summer Session

RESEARCH EXPERIENCE

Seoul National University Mar. 2020 - Aug. 2020
Visiting Student Intern
Supervisor: Prof. Ji-hoon Kim

Impacts of galactic perturbers on fueling the MBH with a resolution appropriate accretion model

The project investigated the impacts of various galactic perturbers such as minor galactic mergers or colliding gas clumps on fueling the central massive black holes in galaxies. For this project, an isolated galaxy was constructed and simulated as a test object to conduct such experiments on. We were able to achieve subparsec resolution with the adaptive mesh refinement cosmological simulation code Enzo and we employed a resolution appropriate accretion model for the central black hole corresponding to such extremely high resolution of the simulation.

OzGrav, Swinburne University of Technology Mar. 2019 - Jun. 2019
Visiting Student Intern
Supervisors: Prof. Matthew Bailes, Prof. Adam Deller, Prof. Ryan Shannon

Localized ASKAP FRBs' high time resolution and their analysis.

The work is continued from the previous project from CIRA, which is improving my software that recovers full time resolution of localized ASKAP FRB voltage data. I have generalized this software for any localized sources for ASKAP and have done high time resolution analysis. This has opened up new ways to study both FRBs and the matter that their radiation encounters on its trek through the Universe. My software and analysis led to new results about the properties of matter in the outer parts of galaxies (its "halo"), as probed by an FRB. Therefore, I am a co-author of a paper on these results, published in the journal *Science* in October 2019.

[1] The courses with PS(Physics) course code in GIST transcript, including courses taken at Caltech.

Curtin Institute of Radio Astronomy (CIRA) Dec. 2018 - Feb. 2019
Visiting Research Associate / Summer Studentship
Supervisors: Prof. Jean-Pierre Macquart, Dr. Clancy James, Dr. Ian Morrison

Recovering the full time resolution of ASKAP FRB voltage data.
As a member of The Commensal Real-time ASKAP Fast Transients Survey (CRAFT) collaboration, I worked on inverting channelization of voltage data (a data processing method called polyphase filterbank inversion) to retrieve its full time resolution. Having access to ASKAP's highly resolved voltage data is expected to reveal significant information including the source's emission properties and FRBs' fine temporal and spectral structure.

Caltech Theoretical Astrophysics Jun. 2018 - Aug. 2018
Summer Undergraduate Research Fellow
Supervisor: Prof. Sterl Phinney

Numerical modeling of time-independent accretion discs with instabilities.
I wrote Python scripts from scratch that solves the time-independent accretion disc equations numerically. These included OPAL and Ferguson opacities, equations of state, and treatment of convection. The purpose of the project was to make realistic and general models of accretion discs covering a wide parameter space from Cataclysmic Variables to Active Galactic Nuclei and to investigate instabilities caused by the onset of convection and hydrogen recombination.

GIST General Intelligence and Smart Environment Laboratory
Student Intern Oct. 2015 - Aug. 2017
Supervisor: Prof. Kin Choong Yow

Studying deep learning and its applications to physics problems.
I learned object oriented programming with C++, and deep learning with Google's Tensorflow. Also, I worked on a project to derive physical formulae from data based on Google's TensorFlow Python scripts.

PUBLICATIONS

arXiv, ads

1. Articles published or accepted in refereed journals

- J. X. Prochaska et. al. 2019 Science, 366, "*The low density and magnetization of a massive galaxy halo exposed by a fast radio burst*"
- **Hyerin Cho** et. al. 2020 ApJL, 891, "*Spectropolarimetric analysis of FRB 181112 at microsecond resolution: Implications for Fast Radio Burst emission mechanism*"
- M. W. Sammons et. al. 2020 ApJ, 900, "*First constraints on compact dark matter from Fast Radio Burst microstructure*"
- S. Bhandari et. al. 2020 ApJL, 901, "*Limits on precursor and afterglow radio emission from a fast radio burst in a star-forming galaxy*"

AWARDS & FELLOWSHIPS

Ilju Foundation Study Abroad Scholarship Aug. 2020 - Jul. 2024
A very competitive scholarship granting 30,000 USD per year for four years during a Ph.D. program. The foundation selected 6 distinguished students from all majors out of 184 applicants.

Talent Award of Korea (대한민국인재상) Dec. 2020
An award bestowed by the Minister of Education of Korea. It recognizes those individuals who are likely to become Korea's future leaders and have performed exemplary talents.

GIST Outstanding Thesis Award (우수논문상) Feb. 2020
GIST Future Research Talent Award (미래인재상) Feb. 2020
Korea National Science and Engineering Scholarship Mar. 2015 - Feb. 2020
A scholarship to fund full tuition for 8 semesters from Korea Student Aid Foundation, Ministry of Education (국가이공계장학금)

CIRA Summer Studentship Dec. 2018 - Feb. 2019
Caltech Summer Undergraduate Research Fellowship Jun. 2018 - Aug. 2018

TALKS

GIST SNL ("Science" Night Live) talk on my FRB research Oct. 2019
ICRAR Summer Student Talk Feb. 2019
Caltech SURF Seminar Day Aug. 2018

TEACHING EXPERIENCE

Teaching Assistant Sep. 2019 - Dec. 2019
GIST MM4016 Introduction to Topology (4th-year course)

Teaching Assistant Mar. 2018 - Jun. 2018
GIST PS3101 Electromagnetism II (3rd-year course)

COURSES

The courses taken at Caltech are denoted with †.

Physics

General Physics I (B+) II (A)

Classical Mechanics (B), Electromagnetism I (B+) II (A+), Mathematical Methods of Physics (A+), Quantum Physics I (A+) II (A+), Statistical Physics† (A+)

Introduction to Optics (A+), Advanced Quantum Physics (A+), Solid State Physics (A+), Basic Astronomy and the Galaxy† (B+)

General Physics Experiment I (A) II (A), Advanced Physics Laboratory† (A), Experimental Physics II (A+)

Mathematics

Single Variable Calculus (A+), Multivariable Calculus (A+), Introduction to Linear Algebra (A), Differential Equations (A+)

Introduction to Probility Models† (A), Abstract Algebra (A), Complex Analysis (A)

TECHNOLOGY SKILLS

Programming Languages:
Working knowledge of: Python, MATLAB, bash
Familiar with: C++, C, C shell, Mathematica
Basic knowledge of: Fortran
Operating Systems: Linux, Windows
Others: MESA, TensorFlow

LANGUAGE PROFICIENCY

Korean (native)
English (fluent[2])

[2]Cumulative 3 years living in the U.S. during middle school and university. 6 months living in Australia during research internships.

Japanese, Chinese (basic knowledge)

OTHER ACTIVITIES

Overseas graduate program preparation seminar — Sep. 2020
I hosted a student-led seminar for GIST students who are interested in applying for graduate schools overseas but have difficulties accessing relevant information. I gathered a total of 132 students as an audience and invited more than nine GIST alums as panelists who are studying/have studied abroad at Stanford, Caltech, UCSB, etc.

Student-led study group — Sep. 2019 - Dec. 2019
I taught General Relativity and in return was taught Fluid Dynamics. My study plan and notes can be found here

2019 CASPER Workshop & PIRE DSP School, *Student* — Aug. 2019
Accepted to get student travel/accommodation support from Harvard

CTPU[3] Summer School on Cosmology and Particle Physics, *Student* — Jul. 2019
APCTP[4]-NIMS-KISTI-UNIST-KASI Summer School on Numerical Relativity and Gravitational Waves, *Student* — Jun. 2019
Palomar Observatory observing proposal accepted for one night — Aug. 2018
Spectroscopic follow-up observation of several short period binaries discovered with ZTF

MESA[5] Summer School, *Student* — Aug. 2018
GIST student ambassador, *Vice President* — Dec. 2015 - Dec. 2016
GIST student council, *Member* — Jun. 2015 - Feb. 2016
GIST student ambassador, *Member* — Mar. 2015 - Dec. 2015

TEST SCORES

Physics GRE 990/990
General GRE Verbal(158/170), Quantitative(169/170), Analytical Writing(4/6)
TOEFL 111/120

HOBBIES

Hiphop dance
I was a practice director of a dance club in GIST, and I was also an instructor for a hiphop class in Caltech.

Yoga, especially aerial yoga or pilates

[3] Center for Theoretical Physics of the Universe, Institute for Basic Science, Korea
[4] Asia Pacific Center for Theoretical Physics
[5] Modules for Experiments in Stellar Astrophysics