Call for applications to doctoral program 2022A in UST-KASI

Korea Astronomy and Space Science Institute (KASI) via the University of Science and Technology (UST) is offering doctoral scholarships (direct and integrated) starting from March 2022. PhD scholarships are provided with a competitive salary of about $1500-$2000 per month. KASI is located in Daejeon, a high tech, educational and research oriented city. Convenient accommodation would be provided to students for the first 3 years in the campus.

KASI is actively involved in various fields of astronomy and astrophysics, from astronomical instrumentation to observation and theory, and participates in international collaborative and stand-alone projects including GMT, ALMA, SDSS4, DESI, LSST, KMTNet, and KVN. This semester KASI is accepting applications for the following research areas:

- Space Science I (supervisor: Prof. Young-Sil Kwak (yskwak@kasi.re.kr)
- Space Science II (supervisor: Prof. Yukinaga Miyashita (miyasita@kasi.re.kr)
- Cosmology (supervisor: Prof. David Parkinson (davidparkinson@kasi.re.kr)
- Astrophyscis I (supervisor: Prof. Thiem Hoang (thiemhoang@kasi.re.kr)
- Astrophysics II (supervisor: Prof. Bindu Rani (brani@kasi.re.kr)

and for the detailed description of the specific research topics, see the list attached or in our major homepage (https://kasi.re.kr/eng/pageView/140).

We encourage qualified international students to apply. Competent students with BSc degrees can apply for an MSc program or an integrated PhD program. Students with MSc degrees may apply directly to the PhD program.

Questions on each research area should be sent to each assigned professor, while other questions are sent to the Chief Major Professor (Sang-Sung Lee, sslee@kasi.re.kr). For more information of application, please see the UST web page (https://ust.ac.kr/admission_eng.do). **Applications are considered only if they are submitted during October 5 to October 25 (17:00 KST).**

Best regards,
Sang-Sung Lee
Chief Major Professor

1. **Prof. Young-Sil Kwak (yskwak@kasi.re.kr)**

   This project is for a PhD or integrated PhD student.

   In Space Science Division, we are looking for an enthusiastic PhD candidate in the area of ionospheric research using Global Navigation Satellite System (GNSS) data. A successful candidate will be involved in the project developing a near real-time ionospheric monitoring system using GNSS data. Dissertation research will focus on the analysis of ionospheric variation using ground/space-born GNSS observations and predicting the ionosphere using a deep learning or machine learning approach. The student will work closely with a team of experts from the area of GNSS applications and ionospheric research to learn the data processing and analysis of the results.

2. **Prof. Yukinaga Miyashita (miyasita@kasi.re.kr)**

   This project is for a PhD or integrated PhD student.

   In Space Weather Research Group, Space Science Division, we are looking for competent and enthusiastic PhD candidates to undertake research in the area of magnetospheric physics and space plasma physics. A successful candidate will be involved in a project to study space weather (near-Earth space environment) and solar wind–magnetosphere–ionosphere coupling, including onset and development mechanisms of space storms and substorms, and associated dynamic auroras. This project will involve analyzing various kinds of in situ and remote-sensing observation data from multiple satellites (e.g., MMS, THEMIS, ERG, and upcoming SNIPE) and ground-based instruments (e.g., auroral cameras, magnetometers, and radars).

3. **Prof. David Parkinson (davidparkinson@kasi.re.kr)**

   This project is for a PhD or integrated PhD student.

   In the cosmology group we are looking for enthusiastic and competent PhD candidates to undertake research in the area of cosmological and theoretical astrophysics. The next generation of large-area astronomical surveys will provide new and accurate data for answering such important questions as "what is the nature of the mysterious dark energy?" and "what were the initial conditions of the Universe?" A successful candidate will have the opportunity to become involved in two of these surveys, DESI (Dark Energy Spectroscopic Instrument) in the optical, and EMU (the Evolutionary Map of the Universe) in the radio. The project will involve analysing data from these surveys and testing these cosmological models (such as dark energy theories and alternative models of gravity) against this data. The project will also involve developing advanced

statistical methods of data analysis (such as Bayesian methods, and machine learning approaches), providing training in the area of big data analysis, which will be useful both inside astrophysics and external industrial sectors.

4. **Prof. Thiem Hoang (thiemhoang@kasi.re.kr)**

   This project is for a MSc student.

   We are looking for strongly motivated candidates for a Master student position in Theoretical Astrophysics group at Korea Astronomy and Space Science Institute (TagKASI) under supervision of Prof. Thiem Hoang. The successful candidate will work with Prof. Hoang to study the interaction of stellar radiation from evolved stars with circumstellar dust. She/he will perform numerical modeling of dust polarization by grain alignment and rotational disruption, and use the modeling results to interpret multi-wavelength dust polarization observational data. Students will be trained to master a wide range of research skills, including analytical and theoretical ability, numerical modeling, and observational data analysis.

5. **Prof. Bindu Rani (brani@kasi.re.kr)**

   This project is for a PhD or integrated PhD student.

   A wide variety of astrophysical sources, from young stellar objects to white dwarfs, neutron stars, stellar-mass, and supermassive black holes (SMBHs), produce collimated outflows, or jets. One of the most intriguing and challenging quests of modern astrophysics is to reveal the formation mechanism of jets. Understanding jets from SMBHs in the context of active galactic nuclei (AGN) is a particularly crucial question because the jets are one of the main ways in which accreting SMBHs provide kinetic feedback on their surroundings and affect star formation, galaxy evolution, and the growth of SMBHs themselves. Different components of an AGN dominate the observed radiation at different wavelengths, making multi-frequency observations one of the most powerful approaches to probe how the central engine of an AGN feeds and regulates the jets.

   Studying the temporal behavior of astrophysical objects in systematic ways and over wide ranges of the electromagnetic spectrum enable us to discover new and unexpected phenomena. Time-domain astrophysics is one of the most promising discovery areas of the decade. Variability is a peculiar characteristic of blazars. Thanks to relativistic beaming, even small modes of variations are detectable. The multi-frequency variations of AGN carry key characteristic signatures of physical processes happening several billions of light-years away from us. The research project will focus on time-domain analysis using multi-wavelength observations of AGN detailing the variability properties and the underlying physics.