Min-Su Shin

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Education

◇ Princeton University, Princeton, NJ, USA.
Ph.D. in astrophysics, Sep., 2009.
Thesis title: *Testing AGN feedback models in galaxy evolution*
Thesis advisors: Michael A. Strauss and Jeremiah P. Ostriker

◇ Yonsei University, Seoul, Republic of Korea.
B.S. in astronomy, Feb., 2005.

Scholarship fellowship research program

◇ Scholarships / Fellowships

- Dennis Sciama Junior Research Fellowship, Wolfson College, University of Oxford (Jan. 2013 – Dec. 2014).
- Charlotte Elizabeth Procter Honorific Fellowship, Princeton University (2008 – 2009).
- First Year Fellowship, Princeton University (2005 – 2006).
- Korean Science and Engineering Foundation Fellowship (KOSEF-2005-215-C00056) (2005 – 2007).
- Yonsei University Alumni Fellowship (2003 – 2005).
- Scholarship of Yonsei University (1998 – 2000).

◇ Grants and Research Programs

- Artificial Intelligence Innovation Hub: Space Observation Intelligence (PI: Jae-Young Shim (UNIST), IITP/KEIT 1711139517)
- Research on cloud-based platforms for R&D purpose with S/W in astronomy and space science (PI: Min-Su Shin, KISTI/K-18-IR-25-01S-1, 2018).
- Application of cloud computing environment for astronomical research (PI: Yong-Ik Byun, KISTI/K-11-SG-57-01R-11, 2011).
- Travel grant for the trip to the Fourth East Asian Numerical Astrophysics Meeting (PI: Min-Su Shin, NSF/NRAO, 2010).

Positions

◇ Staff scientist (**책임연구원**), Korea Astronomy and Space Science Institute (Apr. 2015 –).

◇ Beecroft fellow (postdoctoral researcher), Beecroft Institute of Particle Astrophysics and Cosmology, Department of Physics, University of Oxford, Oxford, UK (Oct. 2012 – Mar. 2015).

◇ Postdoctoral researcher, Department of Astronomy, University of Michigan, Ann Arbor, USA (Sep. 2009 – Aug. 2012).

◇ Carnegie - Princeton Summer graduate program at the Carnegie Observatories (Summer 2006, Advisor: Edo Berger).

Research Interests

Early structure formation of the Universe, stellar evolution and stellar population, gravitational lensing, variability surveys, gamma-ray bursts, cosmic magnetic fields, active galactic nuclei, galaxy evolution, physics of ISM/IGM, meteors, machine learning applications in astronomy, analysis of big astronomical data, and high-performance/high-throughput computing.

Papers to be submitted

◇ Cosmological magnetohydrodynamics galaxy formation simulations. – I. Initial conditions of cosmic magnetic fields
Shin, M.-S., et al.

Refereed Publications

◇ Taxonomic Classification of Asteroids Using the KMTNet Multiband Photometry Data Set
Choi, S.,Moon, H.-K., Roh, D.-G., **Shin, M.-S.**, et al., The Planetary Science Journal, 4, 49 (2023).

◇ Galaxy Morphological Classification with Deformable Attention Transformer
Kang, S., **Shin, M.-S.**, & Kim, T., Machine Learning and the Physical Sciences Workshop, NeurIPS (2022).

◇ A New Approach of Feature-based Asteroid Taxonomy in 3D Color Space: 1. SDSS photometric system
Roh, D.-G., Moon, H.-K., **Shin, M.-S.**, et al., Astronomy & Astrophysics, 664, A51 (2022).

◇ Estimation of Photometric Redshifts. – Estimation of Photometric Redshifts. II. Identification of Out-of-Distribution Data with Neural Networks
Lee, J., & **Shin, M.-S.**, Astronomical Journal, 163, 98 (2022).

◇ Estimation of Photometric Redshifts. – I. Machine Learning Inference for Pan-STARRS1 Galaxies Using Neural Networks
Lee, J., & **Shin, M.-S.**, Astronomical Journal, 162, 297 (2021).

◇ Detecting Variability in Massive Astronomical Time-series Data. III. Variable Candidates in the SuperWASP DR1 Found by Multiple Clustering Algorithms and a Consensus Clustering Method
Shin, M.-S., et al., Astronomical Journal, 156, 201 (2018).

◇ New Photometric Pipeline to Explore Temporal and Spatial Variability with KMTNet DEEP-South Observations
Chang, S.-W., Byun, Y.-I., **Shin, M.-S.**, et al., Journal of the Korean Astronomical Society, 51, 129 (2018).

◇ Implications of Uncertainties in Extragalactic Magnetic Fields for Ultra-High Energy Cosmic Ray Astronomy
Batista, R. A., **Shin, M.-S.**, Devriendt, J., Semikoz, D., & Sigl, G., Physical Review D, 96, 023010 (2017).

◇ Herschel Extreme Lensing Line Observations: [CII] Variations in Galaxies at Redshifts z=1-3
Malhotra, S., et al., Astrophysical Journal, 835, 110 (2017).

◇ Review: Masive Data Analysis in Astronomy
Shin, M.-S., The Korean Journal of Applied Statistics, 29, 1107 (2016).

◇ Ram pressure stripping in elliptical galaxies - II. Magnetic field effects
Shin, Min-Su & Ruszkowski, Mateusz, Monthly Notices of the Royal Astronomical Society, 445, 1997 (2014).

◇ The EPOCH Project. I. Periodic variable stars in the EROS-2 LMC database
Kim, Dae-Won; Protopapas, Pavlos; Bailer-Jones, Coryn A. L.; Byun, Yong-Ik; Chang, Seo-Won; Marquette, Jean-Baptiste; **Shin, Min-Su**, Astronomy & Astrophysics, 566, 43 (2014).

- ◇ Impact of Magnetic Fields on Ram Pressure Stripping in Disk Galaxies
  Ruszkowski, M., Brüggen, M., Lee, D., **Shin, M.-S.**, Astrophysical Journal, 784, 75 (2014).
- ◇ The Quasar-galaxy Cross SDSS J1320+1644: A Probable Large-separation Lensed Quasar
  Rusu, C. E., Oguri, M., Iye, M., Inada, N., Kayo, I., **Shin, M.-S.**, Sluse, D., Strauss, M. A., Astrophysical Journal, 765, 139 (2013).
- ◇ Ram pressure stripping in elliptical galaxies - I. The impact of the interstellar medium turbulence
  Shin, M.-S. & Ruszkowski, M., Monthly Notices of the Royal Astronomical Society, 428, 804 (2013).
- ◇ Astronomical Time Series Data Analysis Leveraging Science Cloud
  Hahm, J., Kwon, O.-K., Kim, S., Jung, Y.-H., Yoon, J.-W., Kim, J., Kim, M.-K., Byun, Y.-I., **Shin, M.-S.**, Park, C., in Lecture Notes in Electrical Engineering, Vol. 181, Embedded and Multimedia Computing Technology and Service, Springer Netherlands, pp.493-500 (2012)
- ◇ The Sloan Digital Sky Survey Quasar Lens Search. VI. Constraints on Dark Energy and the Evolution of Massive Galaxies
  Oguri, M., Inada, N., Strauss, M. A., Kochanek, C. S., Kayo, I., **Shin, M.-S.**, et al., Astronomical Journal, 143, 120 (2012).
- ◇ Efficient Attribute-Based Data Access in Astronomy Analysis
  Ma, B., Shoshani, A., Sim, A., Wu, K., Byun, Y., Hahm, J., **Shin, M.-S.**, High Performance Computing, Networking, Storage and Analysis (SCC), 2012 SC Companion, pp.562-571 (2012).
- ◇ The Sloan Digital Sky Survey Quasar Lens Search. V. Final Catalog from the Seventh Data Release
  Inada, N., Oguri, M., **Shin, M.-S.**, Kayo, I., Strauss, M. A., et al., Astronomical Journal, 143, 119 (2012).
- ◇ Detecting Variability in Massive Astronomical Time-series Data. II. Variable Candidates in the Northern Sky Variability Survey
  Shin, M.-S., Yi, H., Kim, D.-W., Chang, S.-W., & Byun, Y.-I., Astronomical Journal, 143, 65 (2012).
- ◇ New lensed quasars from the MUSCLES survey
  Jackson, N., Rampadarath, H., Ofek, E. O., Oguri, M., **Shin, M.-S.**, Monthly Notices of the Royal Astronomical Society, 419, 2014 (2012).
- ◇ Environmental Effects on the Growth of Supermassive Black Holes and Active Galactic Nucleus Feedback
  Shin, M.-S., Ciotti, L., & Ostriker, J. P., Astrophysical Journal, 745, 13 (2012).
- ◇ Radio emission and active galactic nucleus feedback in post-starburst galaxies
  Shin, M.-S., Strauss, M. A., & Tojeiro, R., Monthly Notices of the Royal Astronomical Society, 410, 1583 (2011).
- ◇ Mid-Infrared Spectroscopy of Two Lensed Star-forming Galaxies
  Fadely, R., Allam, S. S., Baker, A. J., Lin, H., Lutz, D., Shapley, A. E., **Shin, M.-S.**, Smith, J. A., Strauss, M. A., & Tucker, D. L., Astrophysical Journal, 723, 729 (2010).
- ◇ The Sloan Digital Sky Survey Quasar Lens Search. IV. Statistical Lens Sample from the Fifth Data Release
  Inada, N., Oguri, M., **Shin, M.-S.**, et al., Astronomical Journal, 140, 403 (2010).
- ◇ Feedback from Central Black Holes in Elliptical Galaxies. II. Can Purely Mechanical Energy Feedback Models Work?
  Shin, M.-S., Ostriker, J. P., and Ciotti, L., Astrophysical Journal, 711, 268 (2010).

- ◇ Detecting variability in massive astronomical time series data - I. Application of an infinite Gaussian mixture model
  Shin, M.-S., Sekora, M., and Byun, Y.-I., Monthly Notices of the Royal Astronomical Society, 400, 1897 (2009).
- ◇ Five New High-Redshift Quasar Lenses from the Sloan Digital Sky Survey
  Inada, N., Oguri, M., **Shin, M.-S.**, et al., Astronomical Journal, 137, 4118 (2009).
- ◇ The Spatial Distributions of Red and Blue Globular Clusters in Major Dry Merger Remnants
  Shin, M.-S., & Kawata, D., Astrophysical Journal, 691, 83 (2009).
- ◇ Mass models and environment of the new quadruply lensed quasar SDSS J1330+1810
  Oguri, M., Inada, N., Blackburne, J. A., **Shin, M.-S.**, Kayo, I., Strauss, M. A., Schneider, D. P., & York, D. G., Monthly Notices of the Royal Astronomical Society, 391, 1973 (2008).
- ◇ Cosmological H II Bubble Growth during Reionization
  Shin, M.-S., Trac, H., & Cen, R., Astrophysical Journal, 681, 756 (2008).
- ◇ The Sloan Digital Sky Survey Discovery of a Strongly Lensed Post-Starburst Galaxy at z = 0.766
  Shin, M.-S., Strauss, M. A., Oguri, M., Inada, N., Falco, E. E., Broadhurst, T, Gunn, J. E, Astronomical Journal, 136, 44 (2008).
- ◇ The Magnetohydrodynamics of Shock-Cloud Interaction in Three Dimensions
  Shin, M.-S., Stone, J. M., & Snyder, G. F., Astrophysical Journal, 680, 336 (2008).
- ◇ Discovery of Four Gravitationally Lensed Quasars from the Sloan Digital Sky Survey
  Oguri, M., Inada, N., Clocchiatti, A., Kayo, I., **Shin, M.-S.**, Hennawi, J. F., Strauss, M. A., Morokuma, T., Schneider, D. P., York, D. G., Astronomical Journal, 135, 520 (2008).
- ◇ The Sloan Digital Sky Survey Quasar Lens Search. III. Constraints on Dark Energy from the Third Data Release Quasar Lens Catalog
  Oguri, M., et al., Astronomical Journal, 135, 512 (2008).
- ◇ The Sloan Digital Sky Survey Quasar Lens Search. II. Statistical Lens Sample from the Third Data Release
  Inada, N., et al., Astronomical Journal, 135, 496 (2008).
- ◇ Cataclysmic Variables from Sloan Digital Sky Survey. VI. The Sixth Year (2005)
  Szkody, P., et al., Astronomical Journal, 134, 185 (2007).
- ◇ Galaxy Clusters Associated with Short GRBs. II. Predictions for the Rate of Short GRBs in Field and Cluster Early-Type Galaxies
  Shin, M.-S., & Berger, E., Astrophysical Journal, 660, 1146 (2007).
- ◇ Galaxy Clusters Associated with Short GRBs. I. The Fields of GRBs 050709, 050724, 050911, and 051221a
  Berger, E., **Shin, M.-S.**, Mulchaey, J. S., & Jeltema, T. E., Astrophysical Journal, 660, 496 (2007).
- ◇ SDSS J1029+2623: A Gravitationally Lensed Quasar with an Image Separation of 22.5"
  Inada, N., et al., Astrophysical Journal Letters, 653, 97 (2006).
- ◇ Efficient Period Search for Time Series Photometry
  Shin, M.-S., & Byun, Y.-I., Journal of Korean Astronomical Society, 37, 79 (2004).

Non-refereed Publications

- ◇ HII Bubble Growth during Reionization
  Shin, M.-S., Trac, H., & Cen, R., The First Stars III Conference.
- ◇ Stellar Variability Detection in the Era of Virtual Observatories
  Shin, M.-S., & Byun, Y.-I. 2007, The Seventh Pacific Rim Conference on Stellar Astrophysics, 362, 255.

◇ High-Resolution Spectroscopy of GRB030226: Features of a Massive Star Progenitor or Intervening Absorption Systems?
Shin, M.-S., et al. 2006, ArXiv Astrophysics e-prints, arXiv:astro-ph/0608327.

CONFERENCE PRESENTATIONS

◇ Development of virtual observatory and public data archive services in KASI (East Asia ALMA Development Workshop 2022, March 9 - 10, 2022, virtual)

◇ Usage of Machine Learning and Variational Inference in the Big Data Era (Galaxy Evolution Workshop 2021, February 7 - 10, 2022, virtual)

◇ Application of Machine Learning for Big Data Analysis in Astronomy (XAIENCE: Crossing-over the AI and Science 2019, November 7 - 8, 2019, Seoul, Korea)

◇ Applications of multiple DBMSs and algorithms for time-domain astronomy (ADASS XXIX, October 6 - 10, 2019, Groningen, the Netherlands).

◇ Transient alert message processing system for the Large Synoptic Survey Telescope era (the Korean Astronomical Society Meeting, April 10 - 12, 2019, Korea).

◇ Applications of the in-memory database Redis in processing transient event alerts (ADASS XXVIII, November 11 - 15, 2018, Maryland, USA).

◇ Application environments of cloud computing in astronomy and space science research (Korea Supercomputing Conference 2018, October 4 - 5, Seoul, Korea).

◇ Applications of Open-source NoSQL Database Systems for Astronomical Spatial and Temporal Data (ADASS XXVII, October 22 - 26, 2017, Santiago, Chile).

◇ Open data and research in astronomy (Korea Supercomputing Conference 2017, October 31 - November 1, Seoul, Korea).

◇ Cloud computing in astronomy and space science research (Korea Supercomputing Conference 2017, October 31 - November 1, Seoul, Korea).

◇ The Cost-Effective and Efficient Asteroid Taxonomy for Classification Using Johnson-Cousins BVRI Colors (European Planetary Science Congress 2017, September 17 - 22, 2017, Riga, Latvia).

◇ DEEP-SOUTH: A New Approach of Feature-based Asteroid Taxonomy in 3D Parameter Space (ACM 2017, April 10 - 14, 2017, Montevideo, Uruguay).

◇ DEEP-South: A New Taxonomic Classification Scheme of Asteroids (DPS 48 / EPSC 11, October 16 - 21, 2016, Pasadena, USA).

◇ Application of Open-source Spatio-Temporal Database Systems in Wide-Field Time-domain Astronomy (ADASS XXVI, October 16 - 20, 2016, Trieste, Italy).

◇ Introduction to Korean involvement in the Large Synoptic Survey Telescope Project (the Korean Astronomical Society Meeting, April 14 - 15, 2016, Korea).

◇ Operation of StarDB web services and its Virtual Observatory supports (the Korean Astronomical Society Meeting, October 15 - 16, 2015, Korea).

◇ Applications of Multiple Machine Learning Algorithms for Reliable Detection of Variable Sources (ADASS XXV, October 25 - 29, 2015, Sydney, Australia).

◇ Simulations with cosmic magnetic fields ranging from galactic and intergalactic effects to cosmological galaxy formation (Mind the Gap: from microphysics to large-scale structure in the Universe, July 8 - July 12, 2013, Cambridge, UK).

◇ Detecting variability in astronomical time series data: applications of clustering methods in cloud computing environments (IAU Symposium 285: New Horizons in Time Domain Astronomy, September 19 - 23, 2011, Oxford, UK).

◇ Rethinking ram pressure stripping of elliptical galaxies in galaxy clusters (Monsters, Inc.: Astrophysics and Cosmology with Galaxy Clusters, March 14 - 18, 2011, Santa Barbara, USA).

- ◇ Hydrodynamical and gravitational effects on the evolution of elliptical galaxies in dense environments (The Fourth East Asian Numerical Astrophysics Meeting, November 2 - 5, 2010, Taipei, Taiwan).
- ◇ Two different environmental effects on SMBH growth and feedback effects (Evolution of galaxies, their central black holes and their large-scale environment, September 20 - 24, 2010, Potsdam, Germany).
- ◇ Two different environmental effects on SMBH growth and feedback effects (The Physics of the Intracluster Medium: Theory & Computation, August 23 - 25, 2010, Ann Arbor, Michigan, USA).
- ◇ Detecting variability in astronomical time series data : machine learning, databases, VO services, and challenges (AstroInformatics 2010, June 16 - 19, 2010, Pasadena, California, USA).
- ◇ What Kind of AGN Feedback Modes Can Explain The Evolution of Elliptical Galaxies? (the Monster's Fiery Breath: Feedback in Galaxies, Groups, and Clusters, June 1 - 5, 2009, Madison, Wisconsin, USA).
- ◇ What Kind of AGN Feedback Modes Can Explain The Evolution of Elliptical Galaxies? (the American Astronomical Society Meeting, January, 2009).
- ◇ Cosmological H II Bubble Growth During Reionization (First Stars III, July 16 - 20, 2007, Santa Fe, New Mexico, USA).
- ◇ Direct Detection of Strong Galaxy-Galaxy Lensing in the SDSS: usage of photometry catalogs (Searching For Strong Lenses in Large Imaging Surveys, June 14 - 15, 2006, FNAL, USA).
- ◇ Variability Detection of Time Series Data in the Virtual Observatory Era (7th Pacific Rim Conference on Stellar Astrophysics, 2005).
- ◇ Gamma-Ray Burst Observations of YSTAR (the Korean Space Science Society Meeting, April, 2005).
- ◇ YSTAR Approach for Period Analysis of Variable Stars (the Korean Astronomical Society Meeting, April, 2004).

Observation Experience and Time Allocation

- ◇ Gemini - South telescope: imaging, MOS, and long-slit spectroscopy (PI: Jae-Woo Kim).
- ◇ Gemini - North telescope: imaging, MOS, and IFU spectroscopy (PI: Min-Su Shin).
- ◇ Herschel Space Telescope: Herschel Extreme Lensing Line Observations (HELLO) (PI: Sangeeta Malhotra).
- ◇ CARMA telescope: A search for CO(3-2) in a strongly lensed type II quasar, c0851 (PI: Andrew Baker).
- ◇ IRAM 30m telescope: A Fairly Short Proposal to Observe a Very Interesting Object, IRAM 121-10 (PI: Andrew Baker).
- ◇ Spitzer Space Telescope: Doubling the Sample of Bright Lensed LBGs Observed by Spitzer, Spitzer GO-50086 (PI: Sahar Allam).
- ◇ Hubble Space Telescope: A Unique High Resolution Window to Two Strongly Lensed Lyman Break Galaxies, HST GO-11167 (PI: Sahar Allam).
- ◇ Magellan telescope: multi-object spectroscopy and optical imaging.
- ◇ Apache Point Observatory 3.5m telescope: optical/NIR imaging and spectroscopy.

Computing Time Allocation

- ◇ XSEDE Resources: The Fermi Bubbles – Simulation of Cosmic Raysil in the Galaxy (PI: Hsiang-Yi Yang; XSEDE-AST120065).
- ◇ TeraGrid Resources: MHD Simulations of Ram Pressure Stripping of Early-type Galaxies (PI: Min-Su Shin; TG-AST110039).

◇ TeraGrid Resources (Startup allocation): Realistic MHD Simulations of Ram Pressure Stripping in Galaxies (PI: Min-Su Shin; TG-AST100026).

◇ TeraGrid Resources: Nonlinear Evolution of the Universe (PI: Renyue Cen; TG-MCA04N012).

◇ TeraGrid Resources: Evolution of the Intergalactic Medium and Formation of Galaxies (PI: Renyue Cen; TG-MCA04T012).

Computer Skills

◇ Languages: Fortran, C, C++, Java, Python, Perl, PHP, Java script, IDL, R, Matlab.

◇ Parallel programming with OpenMP, POSIX threads, MPI, and Apache Hadoop.

Teaching

◇ Advisor for undergraduate internship programs in KASI
Sunyoung Kim (Summer 2016), Nayeon Kim (Fall 2016), and Minchang Sung (Summer 2017).

◇ Advisor for a summer research undergraduate in University of Oxford
Ben Woodhams (from University of Cambridge, Summer 2013), Richard Fern (from University of Oxford, Summer 2013), and Susan Wright (from University of Cambridge, Summer 2014).

◇ 4th-year MPhys C1 Astrophyics (2012/2013, University of Oxford)
Tutor for the class.

◇ Advisor for a summer research undergraduate in The University of Michigan.

◇ AST203 The Universe (Spring 2008, Princeton University)
Assistant instructor for review and observing sessions.

Public Outreach

◇ Talk: Introduction to Research on the Universe and Astronomical Objects (Andong Municipal Library, Oct 27, 2023, Korea).

◇ Talk: Astronomy in the Big Data Era (Seochogu Banpo Library, May 15, 2021, Korea).

◇ Magazine article: Astronomy and Open Science in The Science and Technology (Issue of April, 2021; https://ebook.kofst.or.kr/book/202104).

◇ Talk: Machine Learning and Applications in Astronomy (Chungnam Science High School, September 2, 2019, Korea).

◇ Talk: Dark Energy (/Dark Matter) and Cosmic Expansion (/Contraction) in The Korean Amateur Astronomical Society training program (May 18, 2019, KASI, Korea).

◇ Talk: Introduction to Research on the Universe and Astronomical Objects (Rainbow Yeongdong Library, Oct 27, 2018, Korea).

◇ Talk: Structure formation in the Universe in the KASI/ARKO (Arts Council Korea) aPD workshop (September 21 - 22, 2017, SOAO, Korea)

◇ Magazine article: Machine learning in Goraeya (Issue of April, 2017; http://naver.me/5rTJHVwR).

◇ Coffee with Astronomers and Public Talk: Dynamical Universe explored by the LSST in the annual Star Party (April 8, 2017, Daejeon, Korea).

◇ Magazine article: Green galaxies under transformation? in Donga Science (Issue of August, 2016; https://www.dongascience.com/news.php?idx=13167).

◇ Talk: Gravity (Jecheon Miracle Library, Oct 29, 2016, Korea).

◇ Talk: Cosmic Magnifier - Strong Gravitational Lensing in the KASI/APCTP Science and Culture workshop (September 28 - 30, 2016, SOAO, Korea).

◇ Talk: Dynamical Universe explored by the LSST (April 30, 2016, Dong-A Science building, Seoul, Korea).

◇ Talk: How do spam filters help astronomers? - the Universe investigated by Machine Learning in the KASI/APCTP Science and Culture workshop (October 21 - 23, 2015, SOAO, Korea).

- ◇ Talk: The Simulated Universe - its role and limitation in the APCTP/KASI Science and Culture workshop (July 8 - 10, 2015, SOAO, Korea).
- ◇ Stargazing Oxford 2014 (January 11, 2014, Oxford, UK).
- ◇ Stargazing Oxford 2013 (January 12, 2013, Oxford, UK).

ETC.

- ◇ Advisory panel for the STEPI report: Enhancing the Effectiveness of Public Research with Open Science Practices (Shin et al., 2018).
- ◇ Programs Advisory Group (PAG) for Office of Research Cyberinfrastructure (ORCI) in The University of Michigan (2010 – 2012)
- ◇ Military service in the Republic of Korea Air Force (Mar. 2000 – Sep. 2002, ROK/US Combined Weather Office, Osan Air Base, Korea)