Narayan Khadka

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Research Interests

Cosmology - gravitational lensing - synergies between strong and weak lensing - Hubble tension - dark enegy - quasar Hubble diagram

Research Positions

08/2025–present **Rubin OS Postdoctoral Fellow**
SLAC/Stanford University
Advisor: Phil Marshall

07/2024–7/2025 **Pipeline Scientist**
LSST-DESC

06/2023–05/2025 **Postdoctoral Researcher**
Stony Brook University
Department of Physics and Astronomy
Advisor: Simon Birrer

06/2022–05/2023 **Postdoctoral Researcher**
Bellarmine University
Department of Physics

Education

08/2017–05/2022 **PhD in Physics**
Kansas State University, Department of Physics
Advisor: Bharat Ratra

05/2013–12/2016 **M.Sc. in Physics**
Tribhuvan University, Nepal
Advisor: Udayaraj Khanal

05/2010–01/2013 **B.Sc. in Physics**
Tribhuvan University, Nepal

Teaching

2023–2025 **Gravitational lensing course**: Guest lecture, taught strong gravitational lensing simulation to graduate students, Stony Brook University

2020–2021 **General Physics 2 (PHYS 114)**: Teaching assistant, taught lab course, Kansas State University

2019–2020 **General Physics 1 (PHYS 113)**: Teaching assistant, taught lab course, Kansas State University

2018–2019 **Descriptive Physics (PHYS 115)**: Teaching assistant, taught lab course, Kansas State University

2017–2018	**Engineering Physics 1 (PHYS 213)**: Teaching assistant, taught lab course, Kansas State University
2016–2017	**High School Physics Course**: Taught physics course of Higher Secondary Education Board in Nepal

Mentoring

2024–Present	**Paras Sharma:** Stony Brook University, NY, USA, Grad
2025–2025	**Yixuan (Ferro) Shao:** Stony Brook University, NY, USA, Masters student, graduate student at University of Marseille
Summer 2024	**Carly Mistick:** University of Michigan, MI, USA, undergrad, now in Boston University
2023–2025	**Rahul Karthik:** Stony Brook University, NY, USA, Masters student, now data scientist
2023–2025	**Emrecan Sonmez:** Stony Brook University, NY, USA, undergrad
2023–2024	**Xianzhe Tang:** Stony Brook University, NY, USA, undergrad, now in Boston University
Summer 2023	**Ronan Malga:** Stony Brook University, NY, USA, undergrad
Summer 2023	**Maytal Cooper:** Stony Brook University, NY, USA, undergrad
2022–2023	**Matthew D. Golden:** Bellarmine University, KY, USA, undergrad, now in Purdue University
2021–2023	**Prakhar Bansal:** Indian Institute of Technology Bombay, India, undergrad, now in University of Michigan

Technical Skills

Software development, High Performance Computing, Python (professional level), C++ (basic)

Conferences [*Invited talk]

2024	Rubin Community Workshop
2024	*DESC Collaboration Meeting
2024	*LSST Latin American Meeting
2023	DESC Collaboration Meeting
2022	LSST DESC Collaboration Meeting
2022	Rubin Observatory Project and Community Workshop
2022	LSST DESC Sprint week 2022
2021	Marcel Grossmann 16th meeting

Seminar/Talk [*Virtual]

09/2026	Strong Lensing Group, KIPAC, USA
10/2025	Invited talk, UNAB, Chile

09/2025	KIPAC-DESC Cosmo group talk, KIPAC, USA
10/2024	Journal club, SBU, USA
09/2024	Seminar, AMNH, USA
09/2024	Seminar, CUNY, USA
04/2024	*Seminar, UChicago, USA
08/2023	Strong Lensing Group, KIPAC, USA
09/2023	Journal club, SBU, USA
04/2023	Seminar, UofL, USA
04/2023	Invited talk, Astronomy on Tap, Louisville
03/2023	Seminar, BU, USA
02/2023	*Seminar, PAS, Nepal
02/2022	*Journal club, KSU, USA
08/2022	*Seminar, TU, Nepal
08/2021	Seminar, KSU, USA
03/2021	Journal club, KSU, USA
09/2020	Seminar, TU, Nepal

Observer Experience

2025–present	Serving as an Observation Specialist for the Vera C. Rubin Observatory, gaining hands-on experience with observatory operations and survey observing processes
2023–2025	14-inch telescope (Stony Brook University) — Voluntary Astronomy Laboratory instruction

Observing Proposals

10/2026	Co-I, Building the Rubin LSST Lensed AGN Sample — Magellan Telescope Observing Proposal (Pending)

Community Contribution

Scientific Collaboration and Membership

2023-present	Member of the Rubin Observatory's strong lensing science verification team
2022–present	Member of the LSST Dark Energy Science Collaboration (LSST-DESC)
2022–present	Member of the Strong Lensing Science Collaboration (LSST-SLSC)
2022–present	Member of the `Lenstronomy` Collaboration
2021–present	Member of Deep Skies Lab

Scientific Software and Community Development

2023–present Developed the strong-lensing simulation pipeline for LSST-DESC and the LSST-SLSC, supporting the development and validation of strong-lens discovery and characterization methods.

2023–present Led the development of `SLSim`, an open-source Python package for simulating realistic strong-lensing populations and images for the broader astronomical community

2023–present Contributed to the development of `lenstronomy`, multi-purpose software package to model strong gravitational lenses

Scientific Community Activities

2023–2025 Organized and participated in the Cosmology Journal Club at Stony Brook University (SBU), facilitating scientific discussions and knowledge exchange among researchers and students

Professional Service

2020–present Referee for Monthly Notices of the Royal Astronomical Society (MNRAS)

Publication List

Overview Publications: 25 (12 first-author)
Bibliometrics: 900+ total citations, h-index of 16

First-authored

Khadka et al. 2026, SLSim: a strong lensing population simulation package , arXiv:2603.17138

Khadka, N., Birrer S., Leauthaud A., Nix H., Breaking the mass-sheet degeneracy in strong lensing mass modelling with weak lensing observations, Mon.Not.Roy.Astron.Soc. 533 (2024) 1, 795

Khadka, N., Zajaček M., Swayamtrupta Panda, Bozena Czerny, Mary Loli Martínez-Aldama, Vikram Kumar Jaiswal, Bharat Ratra, Quasar UV/X-ray relation luminosity distances are shorter than reverberation-measured radius-luminosity relation luminosity distances, Mon.Not.Roy.Astron.Soc. 522 (2023) 1, 1247

Khadka, N., Zajazek M., MartinezAldama M. L., Swayamtrupta Panda, Ratra, B., Consistency study of high and lowaccreting Mg ii quasars: No significant effect of the Fe ii to Mg ii flux ratio on the radius-luminosity relation dispersion, Mon.Not.Roy.Astron.Soc. 515 (2022) 3, 3729

Khadka, N., Martinez-Aldama M. L., Zajaček M., Czerny B., Ratra, B., Do reverberation-measured Hβ quasars provide a useful test of cosmology?, Mon.Not.Roy.Astron.Soc. 513 (2022) 2, 1985

Khadka, N., Ratra, B., Do quasar X-ray and UV flux measurements provide a useful test of cosmological models?, Mon.Not.Roy.Astron.Soc. 510 (2022) 2, 2753

Khadka, N., Yu Z., Zajaček M., Martinez-Aldama M. L., Czerny B., Ratra, B., Standardizing reverberation-measured Mg II time-lag quasars, by using the radius-luminosity relation, and constraining cosmological model parameters, Mon. Not. Roy. Astron. Soc. 508 (2021) 4, 4722–4737

Khadka, N., Luongo, O., Muccino, M., Ratra, B., Do gamma-ray burst measurements provide a useful test of cosmological models?, J. cosmology Astropart. Phys., 2021, 042

Khadka, N. & Ratra, B., Determining the range of validity of quasar X-ray and UV flux measurements for constraining cosmological model parameters, Mon. Not. Roy. Astron. Soc. 502 (2021) 4, 6140-6156

Khadka, N. & Ratra, B., Constraints on cosmological parameters from gamma-ray burst peak photon energy and bolometric fluence measurements and other data, Mon. Not. Roy. Astron. Soc. 499 (2020) 1, 391-403

Khadka, N. & Ratra, B., Using quasar X-ray and UV flux measurements to constrain cosmological model parameters, Mon. Not. Roy. Astron. Soc. 497 (2020) 1, 263-278

Khadka, N. & Ratra, B., Quasar X-ray and UV flux, baryon acoustic oscillation, and Hubble parameter measurement constraints on cosmological model parameters, Mon. Not. Roy. Astron. Soc. 492 (2020) 3, 4456-4468

Collaborative

Paras Sharma, Simon Birrer, **Narayan Khadka**, Timo Anguita, Adam Bolton, Sydney Erickson, Phil Holloway, Tian Li, Phil Marshall, Dieu D. Nguyen, Graham P. Smith, Crescenzo Tortora, Bryce Wedig, the Strong Lensing Science Collaboration, the LSST Dark Energy Science Collaboration, Analyzing Line-of-sight selection biases in galaxy-scale strong lensing with external convergence and shear, arXiv:2607.01005

Sean Patrick MacBride, R. Lynne Jones, Peter Yoachim, Tiago Ribeiro, Leanne P. Guy, Shreya Anand, Erin Leigh Howard, Ian S. Sullivan, Daniel L. Wang, Eric C. Bellm, Robert Armstrong, W. M. Wood-Vasey, Alex Drlica-Wagner, Kenneth Herner, Gautham Narayan, Tatiana Acero-Cuellar, Federica Bettina Bianco, Igor Andreoni, Bruno O. Sánchez, John Banovetz, Anastasia Alexov, Erik Dennihy, Robert D. Blum, Yousuke Utsumi, Marcelle Soares-Santos, Robert H. Lupton, Keith Bechtol, Željko Ivezić, Kris Mortensen, Paulina Venegas, Yijung Kang, Alysha B. Shugart, **Narayan Khadka**, Kshitija Kelkar, Danica Žilková, Kevin Fanning, Christopher W. Walter, Chris Weaver, Fabian Araneda-Baltierra, Andreja Gomboc, J. Anthony Tyson, Colin Orion Chandler, Pedro H. Bernardinelli, Devanshi Singh, The Rubin Observatory Target-of-Opportunity System in the First Year of Operations, arXiv:2607.00217

Gabriele Rodeghiero, Alex Drlica-Wagner, Alessio Taranto, Luca Rosignoli, Hannah Pollek, Aashay Pai, Lynne Jones, Erin Howard, Sean MacBride, John Andrew, Douglas Neill, Travis Lange, Andrew Rasmussen, Aaron Roodman, Brian Johnson, Elana Urbach, Parker Fragelius, Eli Rykoff, Tomislav Vucina, Christopher Stubbs, Robert Lupton, Charles Claver, Joshua Meyers, Anastasia Alexov, Keith Bechtol, Lee Kelvin, Brian Stalder, Pierre Antilogus, Alexandre Boucaud, Aurelien Marini, Alexander Broughton, Leanne Guy, Tiago Ribeiro, Erik Dennihy, Bruno Quint, Aaron Watkins, Alysha Shugart, Lukas Eisert, Kevin Fanning, Marina Pavlovich, Yijung Kang, Hye Park, Paulo Lago, Kristopher Mortensen, Paulina Venegas Salas, Minhee Hyun, Karla Peña Ramírez, David Sanmartim, Shuang Liang, Gonzalo Aravena, Kshitija Kelkar, Kate Napier, Jacqueline Seron Navarrete, Carlos Morales Marín, Danica Žilková, **Narayan Khadka**, Eric Christensen, Yousuke Utsumi, Merlin Fisher-Levine, Yusra Alsayyad, Colin Slater, Fritz Müller, William O'Mullane, Enrico Giro, Rodolfo Canestrari, Guillem Homar Megias, Sandrine Thomas, Kevin Reil, Roberto Tighe, Mario Rivera, Juan Lopez, Claudio Araya Cortes, David Jiménez Mejías, Hernán Herrera, Freddy Muñoz Arancibia, Dimitri Buffat, Johan Bregeon, Jacques Sebag, Holger Drass, Pablo Zorzi, Massimo Brescia, An overview of stray light findings and interpretation during on-sky commissioning of LSSTCam, arXiv:2606.31945

Sydney Erickson, Martin Millon, Padmavathi Venkatraman, Tian Li, Philip Holloway, Phil Marshall, Anowar Shajib, Simon Birrer, Xiang-Yu Huang, Timo Anguita, Steven Dillmann, **Narayan Khadka**, Kate Napier, Aaron Roodman, The LSST Dark Energy Science Collaboration, Investigating the Dark Energy Constraint from Strongly Lensed AGN at LSST-Scale, arXiv:2511.13669

Padmavathi Venkatraman, Sydney Erickson, Phil Marshall, Martin Millon, Philip Holloway, Simon Birrer, Steven Dillmann, Xiangyu Huang, Sreevani Jaragula, Ralf Kaehler, **Narayan Khadka**, Grzegorz Madejski, Ayan Mitra, Kevin Reil, Aaron Roodman, the LSST Dark Energy Science Collaboration, Lens Model Accuracy in the Expected LSST Lensed AGN Sample, Astron.J. 172 (2026) 4, 223

Xianzhe TZ Tang, Simon Birrer, Anowar J. Shajib, **Narayan Khadka**, LSST Strong Gravitational Lensing Science and LSST Dark Energy Science Collaborations, Analyzing Line-of-sight selection biases in galaxy-scale strong lensing with external convergence and shear, arXiv:2506.04201

Bryce Wedig, Tansu Daylan, Simon Birrer, Francis-Yan Cyr-Racine, Cora Dvorkin, Douglas P. Finkbeiner, Alan Huang, Xiaosheng Huang, Rahul Karthik, **Narayan Khadka**, Priyamvada Natarajan, Anna M. Nierenberg, Annika H.G. Peter, Justin D.R. Pierel, Xianzhe TZ. Tang, Risa H. Wechsler, The Roman View of Strong Gravitational Lenses, Astrophys.J. 986 (2025) 1, 42

Katsuya T. Abe, Masamune Oguri, Simon Birrer, **Narayan Khadka**, Philip J. Marshall, Cameron Lemon, Anupreeta More, the LSST Dark Energy Science Collaboration, A halo model approach for mock catalogs of time-variable strong gravitational lenses, arXiv:2411.07509

Zajaček M., Bozena Czerny, **Khadka,N.**,RajPrince,SwayamtruptaPanda, Martínez-Aldama, Bharat Ratra, Extinction biases quasar luminosity distances determined from quasar UV and X-ray flux measurements, ApJ, 961, 229

Bozena Czerny, Shulei Cao, Vikram Kumar Jaiswal, Vladimír Karas, **Narayan Khadka**, Mary Loli Martínez-Aldama, Mohammad Hassan Naddaf, Swayamtrupta Panda, Francisco Pozo Nuñez, Raj Prince, Bharat Ratra, Marzena Sniegowska, Zhefu Yu, Michal Zajaček, Accretion disks, quasars and cosmology: meandering towards understanding, Astrophys.Space Sci. 368 (2023) 2, 8

Cao S., **Khadka, N.**, Ratra, B., Standardizing Dainotti-correlated gamma-ray bursts, and using them with standardized Amati-correlated gamma-ray bursts to constrain cosmological model parameters, Mon.Not.Roy.Astron.Soc. 510 (2022) 2, 2928

Cao S., Ryan J., **Khadka, N.**, Ratra, B., Cosmological constraints from higher redshift gamma-ray burst, H ii starburst galaxy, and quasar (and other) data, Mon. Not. Roy. Astron. Soc. 501 (2021) 1, 1520-1538

References

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