Qi Feng

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Education

2015 • Ph.D. Physics, Purdue University.

2009 • B.S. Physics, University of Science & Technology of China.

Experience

Starting 2024 • Assistant Professor, Department of Physics and Astronomy, University of Utah

2022–2023 • Astrophysicist, Center for Astrophysics | Harvard & Smithsonian

- Leading a multi-messenger/multiwavelength program to investigate TeV blazars as candidate neutrino emitters. Principle scientific investigator of a NuSTAR proposal ($89 k).
- Continuing to investigate the gamma-ray spectral curvature and variability in TeV blazars.
- Ensuring the normal operation of the VERITAS experiment, with $< 5\%$ downtime due to hardware/computing problems and 100% of the on-site computing systems meeting specifications.
- Upgraded the next-day analysis of all VERITAS data with an up to 40% improvement in sensitivity.
- Serving on the VERITAS time allocation committee (2022–2023, co-charing 2023–2024).
- Leading the effort of calibration and data quality monitoring of the VERITAS experiment.
- Providing direction to project staff and visitors, who restored a hardware testing station and provided the diagnosis of pixel problems that affected $\sim 5\%$ of the camera of a telescope.
- Continuing to improve the alignment of the optical system of the novel prototype 9.7m Schwarzschild-Couder Telescope (pSCT) for the Cherenkov Telescope Array (CTA).
- Serving as the VERITAS representative in the Multi-messenger Diversity Network (2022–).

2017–2022 • Postdoctoral Research Scientist at Nevis Laboratories / Department of Physics, Columbia University (2017–2019) / Department of Physics & Astronomy, Barnard College (2019–2022).
Supervisors: Prof. Reshmi Mukherjee, Prof. Brian Humensky

- Major contribution to the optical alignment of the pSCT. Participated in the commissioning, calibration, and operation of the pSCT.
- Receipient of the Trevor Weekes Outstanding Contribution Awards from the VERITAS Collaboration in 2021.
- Co-led the VERITAS blazar science working group (2018–2020).
- Led multiwavelength/multi-messenger programs to search for neutrino-emitting blazars and characterize the γ-ray emitting regions in TeV blazars. Principle investigators of a NuSTAR proposal ($77 k), an XMM proposal ($48 k), and a Fermi/VLBA proposal ($70 k).
- Investigated the spectral curvature in TeV blazars using VERITAS data to study relativistic particles in jets and extragalactic background light.
- Co-developed a deep learning package, CTLearn, using convolutional and recurrent neural networks for event classification of gamma-ray data and simulations with Python.
- Served on the VERITAS time allocation committee (2018–2020; 2021–2022).

2015–2017 • Postdoctoral Research Fellow at the Department of Physics, McGill University.
Supervisor: Prof. David Hanna

- Used different machine learning algorithms (e.g. gradient boosting, boosted decision trees, and convolutional networks) to classify signal/background events in astronomical data with Python.
- Principle investigator of a program that focuses on variable AGN time series with coordinated observations from multiple instruments, eligible for a NASA grant of $40 k.
- Led the effort of the data quality monitoring of the VERITAS experiment, working with Python and ROOT, a C++-based analysis/visualization package similar to R.
- Searched for gamma-ray signals from primordial black hole evaporation events in the VERITAS archival data, setting an upper limit on the rate of such evaporation events.
- Built a citizen science project "Muon Hunter" with a team to obtain reliably labeled data sets for the training of convolutional neural networks, and to advertise gamma-ray astrophysics.

2011–2015 • Graduate Research Assistant at the Department of Physics & Astronomy, Purdue University.
Advisor: Prof. Wei Cui

- Led the studies of multivariate astronomical time series of two TeV blazars, using e.g., power spectrum, cross-correlation, and spectrogram.
- Improved the sensitivity of the real-time analysis by 15% for observations taken in special modes under the moonlight through parameter optimization.
- Produced Monte Carlo simulations of cascades of particles in the atmosphere to improve the calibration of the VERITAS experiment.

2008–2009 • Undergraduate research at Center for Astrophysics, Univ. of Science & Technology of China.
Advisor: Prof. Junxian Wang

- Measured the black hole mass of AGN using narrow Fe K_α line reverberation mapping.

Teaching

Teaching Assistant at Department of Physics & Astronomy, Purdue University:

2011 Spring • Intermediate Astronomy II (ASTR364).
2010 Fall • Intermediate Astronomy I (ASTR363).
2010 Spring • Descriptive Astronomy: Stars and Galaxies Lab (ASTR264).
2009 Fall • Intermediate Astronomy I (ASTR363) and Cosmology (ASTR370).

Students Co-mentored

Graduate Students:

Colin Adams (2018-present, Columbia University), on gamma-ray blazars, axion-like particles, and pSCT instrumentation (VERITAS/CTA)

Deivid Ribeiro (2017-2021, Columbia University), on transients and pSCT instrumentation (VERITAS/CTA)

Ari Brill (2017-2021, Columbia University), on gamma-ray blazars (VERITAS/CTA)

Andriy Petrashyk (2017-2019, Columbia University), on pSCT instrumentation (VERITAS/CTA)

Tony Lin (2016-2017, McGill University), on machine learning (VERITAS)

Undergraduate Students:

Leela Chari (2022 Summer, Barnard College), on gamma-ray blazars (VERITAS)
Daniela Hikari Yano (2020-2022, Barnard College), on gamma-ray blazars (VERITAS)
Gwendolyn LaPlante (2019-2020, Barnard College), on gamma-ray blazars (Fermi)
Isabella Guilherme (2020 Summer, Barnard College), on gamma-ray blazars (Fermi)
Kathryn (Katie) Brady (2019 Summer, Barnard College), on analysis software (VERITAS)
Pazit Rabinowitz (2019 Summer, Barnard College), on transients (SLSN) (Fermi/VERITAS)
Meg Houck (2018 Summer REU, Davidson College), on gamma-ray blazars (VERITAS)
Emily Harris (2018 Summer REU, Univ. of Pittsburgh), on Galactic SNR (VERITAS)

Academic Services

- Reviewer for multiple NASA programs.
- Referee for *ApJ*, *MNRAS*, *A&A*, *PRD*, *Galaxies*, *JHEAP*, *RMxAA*, *CPC*, *RDTM*.
- Convener for the gamma-ray sessions for TeVPA 2021.

Publications

Selected journal articles

(Authors of VERITAS and CTA publications are listed alphabetically)

2023 • *Multiwavelength Observations of the Blazar PKS 0735+178 Contemporaneous with the IceCube Neutrino Candidate IceCube-211208A*, The VERITAS and H.E.S.S. Collaborations, et al. 2023, ApJ 954, 70.
• *VERITAS and Fermi-LAT Constraints on the Gamma-Ray Emission from Superluminous Supernovae SN2015bn and SN2017egm*, Acharyya, A., et al. 2023, ApJ 945, 30A.
2022 • *Multiwavelength Observations of the Blazar VER J0521+211 during an elevated TeV gamma-ray state*, The VERITAS and MAGIC Collaborations, 2022, ApJ, 932, 129.
• *Variability and Spectral Characteristics of Three Flaring Gamma-Ray Quasars Observed by VERITAS and Fermi-LAT*, Adams, C. B., et al. 2022, ApJ 924, 95.
• *Design and Performance of the Prototype Schwarzschild-Couder Telescope Camera*, the CTA pSCT project, 2022, Journal of Astronomical Telescopes, Instruments, and Systems, 8, 014007.
2020 • *A decade of multi-wavelength observations of the TeV blazar 1ES 1215+303: Extreme shift of the synchrotron peak frequency and long-term optical-gamma-ray flux increase*, The *Fermi* and VERITAS Collaborations, 2020, ApJ, 891, 2.
• *Detection of the Crab Nebula with the 9.7 m Prototype Schwarzschild-Couder Telescope*, Adams, C.B., et al. 2020, arXiv:2012.08448.
• *Multiwavelength Observations of 2HWC J1928+177: Dark Accelerator or New TeV Gamma-Ray Binary?*, Mori, K., An, H., Feng, Q., et al. 2020, ApJ, 897, 129.
• *The Great Markarian 421 Flare of February 2010: Multiwavelength variability and correlation studies*, the VERITAS collaboration and MWL partners, 2020, ApJ 890, 97.
2019 • *Measurement of the extragalactic background light spectral energy distribution with VERITAS*, VERITAS collaboration, Abeysekara, A. U., Archer, A., et al. 2019, ApJ, 885, 150
2018 • *MWL observations of the blazar BL Lacertae: a new fast TeV gamma-ray flare*, Abeysekara, A. U., et al. 2018, ApJ 856, 95.
2017 • *A search for spectral hysteresis and energy-dependent time lags from X-ray and TeV gamma-ray observations of Mrk 421*, Abeysekara, A. U., et al. 2017, ApJ, 834, 2
2016 • *Multi-wavelength Study of Quiescent States of Mrk 421 with Unprecedented Hard X-ray Coverage Provided by NuSTAR in 2013*, Baloković, et al. 2016, ApJ, 819, 156

2013 • *Rapid TeV Gamma-Ray Flaring of BL Lacertae*, Arlen, T., et al. 2013, ApJ, 762, 92

2011 • *Multiwavelength Observations of the Previously Unidentified Blazar RX J0648.7+1516*, Aliu, E., Aune, T., Beilicke, M., et al. 2011, ApJ, 742, 127

• *Multiwavelength Observations of the Radio Galaxy NGC 1275 during a flare*, The VERITAS Collaboration and MWL partners, in prep.

• 80 co-signed publications within the VERITAS Collaboration and the CTA Consortium *(link to ADS)*

Conference Proceedings

2022 • *Snowmass2021 Cosmic Frontier White Paper: Primordial Black Hole Dark Matter*, Bird, S., Albert, A., Dawson, W., et al. 2022, arXiv:2203.08967

2021 • *Exploring the High-Energy Gamma-Ray Spectra of TeV Blazars*, Feng, Q., et al., for the VERITAS Collaboration, 2021, ICRC, 37, 802 PoS(ICRC2021)802

2020 • *Verification of the optical system of the 9.7-m prototype Schwarzschild-Couder Telescope*, Adams, C., et al., for the CTA SCT Project, Proc. SPIE 11488, Optical System Alignment, Tolerancing, and Verification XIII, 1148805 (20 August 2020); doi.org/10.1117/12.2568134

2019 • *Prototype Schwarzschild-Couder Telescope for the Cherenkov Telescope Array: Commissioning Status of the Optical System*, Feng, Q., et al., for the CTA SCT Project, 2019, ICRC, 36, 672 PoS(ICRC2019)672

2017 • *Multiwavelength Observations of the Blazar BL Lacertae: a new fast TeV gamma-ray flare*, Feng, Q., for the VERITAS Collaboration, Jorstad, S. G., et al. 2017, arXiv:1708.06386

• *A citizen-science approach to muon events in imaging atmospheric Cherenkov telescope data: the Muon Hunter* Feng, Q., for the VERITAS Collaboration, & Jarvis, J. 2017, arXiv:1708.06393

• *The analysis of VERITAS muon images using convolutional neural networks*, Feng, Qi, & Lin, T. Y., for the VERITAS Collaboration, 2017, Astroinformatics, 325, 173

Conference presentations

2023 • *X-ray and Gamma-ray Follow-ups of IceCube Neutrino Alerts: The Case of PKS 0735+178*
Feng, Q., for the VERITAS and H.E.S.S. Collaborations, 20th Meeting of the High Energy Astrophysics Division of the AAS (HEAD 20), March 26th - 30th, 2023, Waikōloa, Hawai'i.

• *CTA and IceCube: the prospects of multi-messenger astrophysics with next-generation gamma-ray and neutrino observatories*
Feng, Q., for the CTA Consortium, Snowmass P5 (Particle Physics Project Prioritization Panel) Town Hall at Fermilab and Argonne National Labs, March 21st - 24th, 2023, Batavia/Lemont, IL.

2022 • *The Cherenkov Telescope Array (CTA): Prospects for Fundamental Physics and Cosmology with Very-High-Energy Gamma Rays*
Feng, Q., for the CTA Consortium, Seattle Snowmass Summer Meeting 2022 (Snowmass 2022), July 17th – 26th, 2022, Seattle, WA.

2021 • *Exploring the High-Energy Gamma-Ray Spectra of TeV Blazars*
Feng, Q., for the VERITAS Collaboration, 37th International Cosmic Ray Conference (ICRC 2021), July 12th – 23rd, 2021 Online – Berlin, Germany

• *Variability and Spectral Cutoff of Bright TeV Gamma-Ray Blazars*
Feng, Q., for the VERITAS Collaboration, 43rd COSPAR Scientific Assembly, 28 January - 4 February 2021, Sydney, Australia, and online.

2020 • *Verification of the optical system of the 9.7-m prototype Schwarzschild-Couder Telescope*
Feng, Q., for the CTA SCT Project, SPIE Optical Engineering + Applications, 24 August - 4 September 2020, online only.

2019 • *CTLearn: Deep Learning for Gamma-ray Astronomy*
Feng, Q., Brill, A., Humensky, Kim, B., Mienerd, T., Mukherjee, R., Nieto, D., and Sevilla, J., Data Science and Machine Learning Workshop, The 17th Biennial International Conference on Accelerator and Large Experimental Physics Control Systems, Oct 6, 2019, New York, NY.

• *Prototype Schwarzschild-Couder Telescope for the Cherenkov Telescope Array: Commissioning Status*

of the Optical Alignment System
Feng, Q., Brill, A., Humensky, T. B., Kaaret, P., Kieda, D., Kim, B., Mukherjee, R., Petrashyk, A., Ribeiro, D., Shang, R., Sternberger, R., Stevenson, B., Vassiliev, V. V., Wilcox, P. for the CTA pSCT project, 36th International Cosmic Ray Conference, Jul 24 - Aug 1, 2019, Madison, WI.

• *Gotta keep an eye on you – those flares we caught and wanted to catch with VERITAS*
Feng, Q., The fifth Fermi-VERITAS-HAWC Workshop, May 16-17, 2019, Houghton, MI.

• *Cosmic Accelerators Through the Eyes of Ground-Based Gamma-Ray Telescopes*
Feng, Q., LHAASO Scientific Observation and Multi-messenger Astronomy Workshop, Apr 24-28, 2019, Chengdu/Daocheng, China.

2018 • *Very-High-Energy Emission from Extragalactic Cosmic Accelerators - Highlights from recent VERITAS AGN Observations*
Feng, Q., for the VERITAS Collaboration, Eighth International Fermi Symposium, Oct 14-19, 2018, Baltimore, MD.

• *A search for primordial black hole evaporation events with the VERITAS experiment*
Feng, Q., Zitzer, B, for the VERITAS Collaboration, The 30th Rencontres de Blois, June 03-08, 2018, Blois, France.

2017 • *MWL Observations of the Blazar BL Lacertae: a new fast TeV gamma-ray flare*
Feng, Q., for the VERITAS Collaboration, Jorstad, S. G., et al., 35th International Cosmic Ray Conference, 12-20 July, 2017, Busan, Korea.

• *A citizen-science approach to muon events in VHE data: the Muon Hunter*
Feng, Q., for the VERITAS Collaboration, and Jarvis, J., 35th International Cosmic Ray Conference, 12-20 July, 2017, Busan, Korea.

2016 • *The analysis of VERITAS muon images using convolutional neural networks*
Feng, Q., Lin, Tony T. Y., for the VERITAS Collaboration, IAU Symposium 325 on Astroinformatics, Oct 20-24, 2016, Sorrento, Italy.

• *Recent Highlights from VERITAS*
Feng, Q., for the VERITAS Collaboration, 11th SciNeGHE workshop, Oct 18-21, 2016, Pisa, Italy.

2014 • *Simultaneous X-ray and gamma-ray observations of Mrk 421 during a strong flaring episode*
Feng, Q., & Cui, W., HEAD 2014, Aug 17-21, 2014, Chicago, USA.

2011 • *Highlights from the VERITAS Blazar Observation Program*
Feng, Q., Cui, W., & the VERITAS Collaboration, AAS 222, Jun 2-6, 2013, Indianapolis, USA.

• *Rapid TeV Gamma-ray Variability of BL Lacertae*
Feng, Q., HEAD 2011, Sep 7-10, 2011, Newport, USA.

Other talks

2020 • *The making of a novel telescope*, Talk at the 2020 AstroFest, 2020 Sep 18, Columbia University.

2019 • *Status and Recent Results of Very-High-Energy Gamma-ray Astrophysics with VERITAS and CTA*, Seminars talk, 2019 Aug 26, Kansas State University.

2018 • *Extragalactic Cosmic Accelerators Through the Eyes of Ground-Based Gamma-Ray Telescopes*, Seminars talk, 2018 Dec 24, Institute of High Energy Physics, Chinese Academy of Sciences.

• *Extragalactic Cosmic Accelerators Through the Eyes of Ground-Based Gamma-Ray Telescopes*, Seminars talk, 2018 Dec 21, Kavli Institute for Astronomy and Astrophysics, Peking University.

• *Extragalactic Cosmic Accelerators Through the Eyes of Ground-Based Gamma-Ray Telescopes*, Seminars talk, 2018 Dec 19, Tsinghua Center for Astrophysics, Tsinghua University.

• *Variability of Very-High-Energy Emission from Extragalactic Cosmic Accelerators*, Talk at the 2018 AstroFest, 2018 Sep 7, Columbia University.

• *Introduction to Very-High-Energy Astrophysics*, Talk to incoming 2018 Barnard College undergraduate students in the Science Pathways Scholars Program, 2018 Jul 30, Barnard College.

2017 • *Machine Learning and Crowdsourcing Made Easy for Physicists*, Public lecture at the Physics Matters Lecture Series, 2017 May 4, McGill University.

References

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More references can be provided upon request.