Karthik Reddy Solipuram

☎ 443-840-9390
✉ karthik@umbc.edu
github.com/infinitron

EDUCATION

June 2022 **Ph.D. in Astrophysics**, *University of Maryland Baltimore County*, Baltimore, MD.

2019 **MS in Physics**, *University of Maryland Baltimore County*, Baltimore, MD.

2014 **B.Tech Physical Sciences**, *Indian Institute of Space Science and Technology*, Kerala, India.
Major in Astrophysics, Minor in Atmospheric sciences

EXPERIENCE

Sep-Nov 2021 **Visiting Predoc**, *Harvard-Smithsonian Center for Astrophysics.*
Systematic uncertainties in X-ray image deconvolutions.

- Performed simulation studies to understand the systematic uncertainties involved in deconvolutions of X-ray images with the LIRA algorithm.
- Rebuilt LIRA statistical tool using modern C++ techniques and SIMD intrinsics, which resulted in a 4x speed gain (`lira_simd` project on GitHub).
- Contributed to the development of `pylira` package.

2018–2022 **Graduate Research Assistant**, *UMBC.*
X-ray/radio displacements in X-ray jets

Research

- Researched morphological differences between multi-waveband high-resolution radio maps and X-ray images of about 200 X-ray jets.
- Demonstrated a technique to infer X-ray/radio positional offsets from low-count X-ray images.
- Investigated methods to quantify the viewing angle of extragalactic radio jets.

Programming

- Built a python based web-dashboard that provides interactive X-ray jet data visualization and download capabilities (`xjets-dashboard` project on GitHub)
- Developed pythonic utilities and an R based parallel processing wrapper for a statistical tool called LIRA to automate Bayesian inference from low-count X-ray observations (`lira.parallel` project on GitHub).
- Developed a suite of bash scripts to automate a large portion of reducing *Chandra* X-ray data.

Participation Experience

- Summer School in Statistics for Astronomers XVI (Penn State, June 2021)
- Generative Modeling data-challenge at the Qaurks to Cosmos Conference (CMU, July 2021)

2017–2018 **Graduate Teaching Assistant**, *UMBC.*
PHYS 122 (Introductory Physics)

- Conducted weekly discussion sessions for an average of ninety students each semester.
- Held weekly office hours, and graded exams, papers and assignments.

2014–2017 **Remote Sensing Scientist**, *National Remote Sensing Centre, Indian Space Research Organization*, Hyderabad, India.

Near Realtime Waterspread Area Informatics

Research

- Developed image classification schemes to detect water pixels in images from visible/IR and microwave earth-observing satellites.
- Conceived and executed a pilot study to determine water quality parameters from hyperspectral satellite imagery; coordinated with four universities to obtain water samples with simultaneous satellite observations.
- Contributed water spread data portions of the annual Natural resources census reports for the Indian national government.

Software development

- Implemented data processing pipelines in C++ to extract water pixels from RISAT, CARTOSAT, and LANDSAT imagery; moved the post-processing steps to PostgreSQL database, resulting in a 10x reduction in the computation time.
- Built a web portal and developed REST APIs to facilitate near real-time interactive data visualization and exploration of about 200k water bodies inside India with Node.JS , PostgreSQL and Cassandra DB based backend, and a Vue.JS based front end (`bhuvan-wbis.nrsc.gov.in/`). Several Indian state governments use this portal for effective decision-making.
- Systematized resource usage monitoring of the WBIS application using InfluxDB time-series database.
- Developed C++ based software to estimate runoff from time-series rainfall data for use by Hydrology engineers from the Central Water Works Commission.

Teaching

- Trained two Master's students on using Geographic Information System technologies for Hydrology.
- Conducted workshops to train over 50 Central Water Works Comission engineers on programmatic runoff estimation.

GRANTS AND HONOURS

2021 **PI, *Chandra* GO | Cycle 23 (#23700252), $51k grant, 50 ks**, *The curious case of a bent jet: Deciphering the X-ray emission from TXS 0833+585.*

2021 **Finalist for the Student Paper Competition**, *Joint Statistical Meetings 2021*, Astrostatistics Interest Group in the American Statistical Association, Topic: X-ray-to-radio offset inference from low-count X-ray jets.

2020 **Co-PI, EVLA, C/X/K/Ku A and B configs for about 200 jets (20B-356, 21B-356)**, *A Legacy VLA Survey of X-ray Emitting Jets.*

2016 **PI, $90k grant**, *Earth Observing and Monitoring projects*, Indian Space Research Organization, Estimating water quality parameters using hyperspectral satellite data.

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PUBLICATIONS

2021 Keenan, M., Meyer, E. T., Georganopoulos, M., **Reddy, Karthik**, & French, O. J. (2021). The relativistic jet dichotomy and the end of the blazar sequence. *Monthly Notices of the Royal Astronomical Society*, *505*(4), 4726–4745.

Reddy, Karthik, Georganopoulos, M., & Meyer, E. T. (2021a). Morphological properties of X-ray jets. *In preparation for submission to The Astrophysical Journal.*

Reddy, Karthik, Georganopoulos, M., & Meyer, E. T. (2021b). X-ray-to-radio offset

inference from low-count X-ray jets. *The Astrophysical Journal Supplement Series*, *253*(2), 37.

2019 Meyer, E. T., Iyer, A. R., **Reddy, Karthik**, Georganopoulos, M., Breiding, P., & Keenan, M. (2019). The origin of the x-ray emission in two well-aligned extragalactic jets: The case for IC/CMB. *The Astrophysical Journal Letters*, *883*(1), L2.

2015 Vemareddy, P., Venkatakrishnan, P., & **Reddy, Karthik**. (2015). Flux emergence in the solar active region NOAA 11158: The evolution of net current. *Research in Astronomy and Astrophysics*, *15*(9), 1547.

PRESENTATIONS

Oral

Mar 2022 **HEAD 19th Meeting**, *Morphological Clues to the X-ray Emission from Extragalactic jets.*, (15 minutes).
(Contributed)

Nov 2021 **CHASC Astrostatistics Talk, Harvard-Smithsonian Center for Astrophysics**, *Astrophysical Jets with Astrostatistics: Using X-ray/Radio structural differences to understand their X-ray emission* , (60 minutes).
(Invited)

Oct 2021 **Mid-Atlantic Radio-Loud AGN Meeting**, *Morphological Clues to the X-ray emission from Extragalactic Jets*, (7+3 minutes).
(Contributed)

Oct 2021 **High Energy Seminar, Harvard-Smithsonian Center for Astrophysics**, *Morphological Clues to the X-ray emission from Extragalactic Jets*, (20+5 minutes).
(Invited)

Aug 2021 **Joint Statistical Meetings 2021**, *X-Ray-to-Radio Offset Inferencefrom Low-Count X-Ray Jets*, (15+5 minutes).
(Invited)

Jan 2021 **Americal Astronomical Society 237th Meeting**, *X-Ray-to-Radio Offset Inference from Low-Count X-Ray Jets*, (7+3 minutes).
(Contributed)

Oct 2019 **Mid-Atlantic Radio-Loud AGN Meeting**, *Offsets between X-ray and Radio Emission: A step towards understanding the structure of extragalactic jets*, (10+5 minutes).
(Contributed)

Posters

Jun 2021 **Statistical Challenges in Modern Astronomy VII**, *X-Ray-to-radio Offset Inference from Low-count X-Ray Jets* .

Dec 2019 **20 Years of Chandra, Science Symposium**, *Offsets between X-ray and Radio Emission: A step towards understanding the structure of extragalactic jets.*

Nov 2019 **The New Faces of Black Holes, Joint Space-Science Institute**, *Offsets between X-ray and Radio Emission: A step towards understanding the structure of extragalactic jets.*

SKILLS

Data	VLA, JVLA, ATCA , Chandra, Fermi
Softwares	CASA, CIAO, SAOImageDS9, ERDAS Imagine, ArcGIS
Languages	Python, R, C++, Bash, SQL, CQL, Javascript
Web	Plotly dash python, Node.JS, Vue.JS, Leaflet.JS
OS	Linux, Windows
Databases	PostgreSQL, Cassandra

PROFESSIONAL MEMBERSHIPS

- American Astronomical Society
- American Statistical Association (+Astrostatistics Interest Group)
- International Astrostatistics Association
- Informatics and Statistics Science Collaboration (ISSC) of the Legacy Survey of Space and Time (LSST)
- International Indian Statistical Association