Daniel Muthukrishna

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MIT Kavli Institute, 77 Massachusetts Avenue, McNair Building 37-438h, Cambridge, MA 02139, USA

Education

University of Cambridge
Cambridge, UK

PhD in Astrophysics — *Oct. 2017 - Jun. 2021*

- **Thesis:** Data-driven Discovery of Transients in the New Era of Time-Domain Astronomy
- **Advisers:** Prof Kaisey Mandel, Prof Gautham Narayan

University of Queensland
Brisbane, Australia

Bachelor of Science, Physics — *Mar. 2012 - Dec. 2016*

High Distinction Average

University of Queensland
Brisbane, Australia

Bachelor of Engineering, Electrical and Aerospace — *Mar. 2012 - Dec. 2016*

Awarded 1st Class Honours - High Distinction Average

- **Thesis:** Deep Learning for the Spectral Classification of Supernovae
- **Advisers:** Prof David Parkinson, Dr Brad Tucker

Research and Work Experience

Harvard University & Smithsonian Astronomical Observatory
Cambridge, MA, USA

AstroAI Fellow, *Center for Astrophysics* — *Beginning Sep. 2025*

Massachusetts Institute of Technology
Cambridge, MA, USA

Postdoctoral Researcher (Research Scientist from Sep. 2025) *Kavli Institute for Astrophysics* — *Sep. 2021 - Present*

- Lead development of deep learning and statistical frameworks for analyzing astronomical time-series data from the Transiting Exoplanet Survey Satellite (TESS), with direct applications to ZTF and the upcoming Vera Rubin Observatory's LSST.
- Directly supervise the research program of 6 students (2 Graduate, 3 Undergraduate, 1 high school) advancing novel machine learning methods in astronomy, with many of my students leading first-author papers published/submitted.
- Pioneered new diffusion model architectures to remove systematic effects from TESS space telescope data, essential for future space missions.
- Lead Astronet Group for exoplanet classification by developing convolutional neural networks and recurrent architectures.

University of Cambridge
Cambridge, UK

PhD candidate, *Institute of Astronomy* — *Oct. 2017 - Jun. 2021*

- Developed first real-time anomaly detection framework for large-scale time-domain surveys using Bayesian models and temporal convolutional neural networks.
- Created `RAPID` (`astrorapid.readthedocs.io`), a widely-adopted algorithm (170+ citations) for classifying astronomical transients in survey data using recurrent neural networks.
- Worked with the LSST DESC collaboration to develop PLAsTiCC, a photometric classification challenge.
- Published `DASH` (`https://astrodash.readthedocs.io`), reducing supernova spectral classification time from days to seconds with CNNs, deployed on major surveys.

University of California, Santa Cruz
Santa Cruz, California, USA

Kavli Student Fellow — *Jul. 2019 - Aug. 2019*

- Developed generative models of common astronomical objects and used the model predictions for real-time anomaly detection.

Australian National University
Canberra, Australia

Research Assistant, *Mount Stromlo Observatory* — *Mar. 2017 - Aug. 2017*

- Worked with large international Dark Energy Survey collaboration (OzDES) and the SkyMapper Transient Survey Telescope.
- Helped develop software pipeline in the SkyMapper search for Planet 9 and the BBC Stargazing living citizen science project.

Gemini South Observatory
La Serena, Chile

Research Internship — *Dec. 2016 - Feb. 2017*

- Analysed the internal kinematics of giant star-forming regions in interacting galaxies.
- Developed spectral emission line fitting tool called `FitELP` (`https://fitelp.readthedocs.io/`).

University of Queensland
Brisbane, Australia

Research Assistant — *Jan. 2014 - Feb. 2016*

- Analysed cosmological data (Type Ia Supernovae and Baryonic Acoustic Oscillations) with Bayesian statistics. Modelled cosmic acceleration without invoking a theory of gravity by using a Taylor expansion of the scale-factor.

Micreo Limited *Brisbane, Australia*

Radio Frequency Engineer *Dec. 2014 - Sep. 2015*

- Radio Frequency Engineer at a leading Microwave and Electro-optic engineering company focused on electronic warfare for defence contracts.
- Researched, designed, simulated, and manufactured various Microwave Frequency equipment.

Teaching and Courses Developed

Cambridge Centre for International Research *Online Course*

Lecturer *Feb. 2023 - Present*

- Designed and lectured comprehensive undergraduate-level course "Data-driven Astronomy: Machine Learning and Statistics for Modern Astronomy" (13 weeks)
- Developed comprehensive curriculum covering advanced topics including Bayesian inference, machine learning architectures, time-series analysis, and practical applications to astronomical datasets
- Created hands-on programming assignments using real astronomical data from major surveys.
- Received excellent student feedback on course materials and teaching effectiveness

DPMMS, Centre for Mathematical Sciences, University of Cambridge *Cambridge, UK*

Course Organiser and Summer Lecturer *Jul. 2018, Jul. 2019*

- Prepared and lectured an intensive computer training course for Part II and Part III (third and fourth-year undergraduate) students.
- Began with an introduction to Python and shell environments, and extended to big-data analysis, Markov Chain Monte Carlo sampling, solving ODEs, visualising data, and machine learning architectures using scikit-learn and Tensorflow.

School of Mathematics & Physics and School of Engineering, University of Queensland *Brisbane, Australia*

University Tutor *Mar. 2013 - Nov. 2016*

- Led classes of 20-70 students and graded coursework for undergraduate-level engineering, physics, and calculus courses.
  - ELEC3100: Fundamentals of Electromagnetic Fields & Waves
  - ENGG1300: Introduction to Electrical Systems
  - MATH1051: Calculus and Linear Algebra
  - MATH1052: Multivariate Calculus & ODEs
  - PHYS1002: Electromagnetism and Modern Physics
  - PHYS1001: Mechanics and Thermal Physics
  - ENGG1500: Engineering Thermodynamics

Mentoring

Graduate Students

Anna Tartaglia	Astrophysics, PhD student, Oct. 2024 - Present	*Harvard*
Pablo Mercader	CS and Eng., PhD student, Oct. 2024 - Present	*MIT*
Torsha Majumder	Verizon Data Scientist, Masters student, Dec. 2021 - Dec. 2023	*University of Texas*

Undergraduate Students

Peter Dong	CS and Eng., Sophomore., Jan. 2025 - Present	*MIT*
Joseph Lupo	CS and Eng., Senior, paper submitted., Jun. 2023 - Aug. 2024	*MIT*
Hali Huang	CS, Junior, paper accepted at NeurIPS workshop, Jun. 2022 - Jan 2024	*MIT*
Prajna Nair	Astrophysics, Junior, co-authored accepted at NeurIPS workshop, Mar. 2022 - Jan 2024	*MIT*
Zimi Zhang	CS and Physics, Junior, co-authored accepted, Jun. 2022 - Jan 2024	*MIT*
Miguel Chacon	CS and Physics, Sophomore, Sep. 2022 - Dec. 2023	*MIT*
Andrew Jenkins	CS and Elec. Engineering, 3rd year undergraduate, Jun. - Sep. 2022	*MIT, Tesla*
Saul Balcarcel	Astrophysics, 2nd year undergraduate, Mar. - Jun. 2022	*MIT*
Anahita Srinivasan	CS, 2nd year undergraduate, Dec. 2021 - May. 2022	*MIT*
Jaya Chand	Astronomy, 3rd year undergraduate, Jun. - Aug. 2021	*University College London*

High School Students

Rithwik Gupta	Two papers accepted at RASTI and Neurips workshops, Mar. 2022 - Present	*High School*

Selected Awards

2025 **Generative AI Impact Consortium**, Awarded $150,000 on astrophysics foundation model — *MIT*
2025 **AstroAI Fellowship**, AI for Astrophysics fellowship, SAO ($86,000) — *Harvard University and Smithsonian*
2024 **DAAD AInet Fellow**, Selected outstanding international early career AI researchers ($5000) — *DAAD, German Academic Exchange*
2021 **Paul Murdin Prize**, Best Published Journal Paper by an Astronomy PhD Student ($300) — *University of Cambridge*
2019 **Astrostatistics Student Paper Competition**, Finalist — *American Statistical Association*
2019 **Kavli Student Fellow**, Selected fellow of the Kavli Summer Program in Astrophysics ($4000) — *UC Santa Cruz*
2017 **Bok Prize Highly Commended**, Awarded to top three astronomy Masters theses in Australia — *Astronomical Society of Australia*
2017 **Cambridge Australia Poynton Scholarship**, Awarded to top applicants from Australia — *Cambridge Trust*
2017 **President's PhD Scholarship**, Awarded to the top applicants across Imperial College — *Imperial College*

2017 **AAO Scholarship**, Awarded to top astrophysics graduate students ($5000) — *Australian Astro. Observatory*
2016 **IEEE Student Thesis Prize**, Best Engineering thesis from all students in Queensland ($1000) — *Institute of Electrical Engineers*
2016 **GBST Best Software Project**, Best software-related thesis at the University of Queensland ($500) — *GBST and University of Queensland*
2016 **Gemini Studentship**, Two students from Australia selected — *Australian Astro. Observatory*
2016 **Dean's Commendations for High Achievement**, Awarded to students with top-ranking GPAs — *University of Queensland*
2015 **RSAA Astronomy Winter School**, Four students from Australia and New Zealand were selected — *RSAA, Canberra*
2014 **Micreo Scholarship in Electrical Engineering**, Awarded to one student in Queensland ($12000) — *University of Queensland*
2013 **Mpemba Effect Competition**, Selected in the top 10 out of 22000 entrants — *Royal Society of Chemistry*
2012 **Students for the Future Award**, Awarded to top 100 engineering students in QLD ($1000) — *Queensland Resource Council*

Selected Seminars & Conference Presentations

Oct. 2024 **Tufts University**, Astronomy Seminar, ***Invited speaker*** — *Somerville, MA*
Jul. 2024 **University of Oxford**, Breakthrough Discuss, New Searches for Intelligence, ***Invited speaker*** — *Oxford, UK*
Apr. 2024 **University of Washington**, Institute for Data-Intensive Research (DiRAC), ***Invited speaker*** — *Seattle, WA*
Nov. 2023 **Yale University**, Yale Data Science x Astronomy & Astrophysics, ***Invited speaker*** — *New Haven, CT*
Sep. 2023 **Havard University**, Center for Astrophysics Seminar, ***Invited speaker*** — *Pasadena, CA*
Mar. 2023 **NASA Jet Propulsion Laboratory**, Machine Learning and Instrument Autonomy group — *Los Angeles, CA, USA*
May. 2022 **ESO Garching**, SciOps 2022: Artificial Intelligence for Science in Astronomy, Contributed — *Garching, Germany*
Mar. 2022 **Korea Astronomy and Space Science Institute** , Cosmology Seminar Series, ***Invited speaker*** — *Online*
Mar. 2021 **Telstra Telecommunications Company**, AI ML forum, ***Invited speaker*** — *Online*
Dec. 2020 **University of Sheffield**, Astronomy Seminar, ***Invited speaker*** — *Online*
Feb. 2020 **Stanford University, SLAC National Accelerator Laboratory**, AI Seminar Series, ***Invited*** — *Stanford, CA, USA*
Feb. 2020 **University of California Berkeley, SETI**, Search for Extraterrestrial Intelligence Weekly Meeting — *Berkeley, CA, USA*
Feb. 2020 **Texas A&M University**, Astronomical Data Science Workshop, ***Invited speaker*** — *Texas, USA*
Nov. 2019 **DESY (Deutsches Elektronen-Synchrotron)**, Astroparticle Seminar, ***Invited speaker*** — *Hamburg, Germany*
Aug. 2019 **Northwestern University**, Hotwiring the transient universe workshop, ***Invited speaker*** — *Evanston, IL, USA*
Jul. 2019 **Joint Statistical Meeting**, Astrostatistics Best Student Paper Session — *Denver, CO, USA*
Jun. 2019 **Institute of Astronomy, University of Cambridge**, Wednesday Seminar — *Cambridge, UK*
Apr. 2019 **Space Telescope Science Institute**, Enabling Multi-messenger Astrophysics in the Big Data Era — *Baltimore, MD, USA*
Mar. 2019 **Royal Astronomical Society**, Machine Learning and AI applied to Astronomy, Contributed — *London, UK*
Mar. 2019 **University of California, Santa Cruz**, Invited Talk to Transient group — *Santa Cruz, CA, USA*
Jan. 2019 **Harvard University**, CHASC Topics in Astrostatistics group — *Online seminar*
Jun. 2018 **University of Oxford**, Planning for Surprises in the era of Data-Driven Astronomy, Contributed — *Oxford, UK*

Academic Service

National Science Foundation (NSF) — *Alexandria, VA*

Review Panelist — *2024*

- Invited review panelist for large survey grant proposals up to $2 million

NASA TESS Guest Investigator Program — *Milwaukee, WI*

Review Panelist — *2024*

- Invited review panelist for proposals on variable stars and stellar astrophysics. (up to $150,000)
- Evaluated technical feasibility and scientific merit of TESS observing programs

Schmidt Sciences LINCC Frameworks Project *CMU, Pitsburgh, PA*

Review Panelist *2025*

- Invited review panelist to for Rubin Observatory's LINCC (LSST Interdisciplinary Network for Collaboration and Computing) mid-project review ($3 million per year)
- Selected on the review panel based on my leading expertise on software and AI for astrophysical surveys

University of Canterbury *Christchurch, New Zealand*

Thesis Examiner *2025*

- Examiner for a Master's thesis titled *The Application of Machine Learning to Source Detection and Classification of Variable Stars with TESS*

Academic Journal Referee

- The Astrophysical Journal (ApJ)
- Nature Astronomy
- Astronomy & Astrophysics (A&A)
- Monthly Notices of the Royal Astronomical Society (MNRAS)
- The Astronomical Journal (AJ)
- Neural Information Processing (NeurIPS) workshops
- International Conference of Machine Learning (ICML) workshops
- Institute of Electrical and Electronics Engineers (IEEE) Journals.

Leadership & Organizing

- Co-organizer of the first "*Freedom Trail of Code: Boston Astrophysics x Machine Learning Hackathon 2024*", Cambridge, MA
- Co-organizer of the *"Accelerating Physics with ML"* workshop, Cambridge, MA
- LOC for the *TESS Science Conference III*, Cambridge, MA

International Collaborations

- Legacy Survey of Space and Time's Dark Energy Science Collaboration (LSST DESC) member, 2018-Present
- Young Supernova Experiment member, 2024-Present
- Habitable Worlds Observatory, AI/ML Working Group member, 2024-Present
- Dark Energy Survey and OzDES member, 2016-2020
- 4MOST Time-Domain Extragalactic Survey (TiDES) member, 2018-2022

Selected Publications

See full publication list on ADS. Over 2000 citations. H-index: 18.

*My student (under my direct supervision)

In Preparation

1. **Muthukrishna, D.**, *Lupo, J., Vanderspek, R., *BEAM: Conditional Diffusion models for Correcting Systematic Effects in Astronomical Images from Space Telescopes*. in prep.

2. **Muthukrishna, D.**, Haviland, J., Vanderburg, A., Shporer, A., Audenaert, J., Ricker, G., *Identifying Exoplanets with Deep Learning. VII. Astronet Vetting Model*, in prep.

3. *Tartaglia, A., **Muthukrishna, D.**, Gagliano, A., *Predicting the age of supernovae from the Young Supernova Experiment with Bayesian methods*, in prep.

Major Contributions

1. **Muthukrishna, D.**, Audenaert, J., Gregory, P., Hogg, D., Villar, A., *Causal Foundation Models: Disentangling Physics from Instrument Properties*. Accepted at the Foundation Models for Structured Data Workshop at the Forty-Second International Conference on Machine Learning (ICML) 2025.

2. *Gupta, R., **Muthukrishna, D.**, *Building Foundation Models Using Physics-Informed Simulations for Accelerated Discovery in Astronomy*, Accepted at the Foundation Models for Structured Data Workshop at the Forty-Second International Conference on Machine Learning (ICML) 2025.

3. *Gupta, R. & **Muthukrishna, D.**, Rehemtulla, N., Shah, V., *Transfer Learning for Transient Classification: From Simulations to Real Data and ZTF to LSST*. 2025, submitted to MNRAS Letters. [ads]

4. *Gupta, R., **Muthukrishna, D.**, Lochner, M., *A Classifier-Based Approach to Multi-Class Anomaly Detection for Astronomical Time-Series*. 2024, accepted at the International Conference for Machine Learning's AI for Science Workshop. [ads][doi]

5. *Gupta, R., **Muthukrishna, D.**, Lochner, M., *A Classifier-Based Approach to Multi-Class Anomaly Detection for Astronomical Transients*. 2024, Royal Astronomical Society Techniques & Instruments Journal (RASTI), 4, rzae054. [ads][doi]

6. *Huang, H., **Muthukrishna, D.**, *Nair, P., *Zhang, Z., Fausnaugh, M., *Majumder, T., Foley, R., Ricker, G. *Predicting the Age of Astronomical Transients from Real-Time Multivariate Time Series*. 2023, Machine Learning and the Physical Sciences Workshop, Neural Information Processing Systems (NeurIPS) 2023. [ads] [doi]

7. **Muthukrishna, D.**, Mandel, K., Lochner, M., Webb, S., & Narayan, G. *Real-time detection of anomalies in large-scale transient surveys*. 2022, MNRAS, 517, 393. [ads][doi]

8. **Muthukrishna, D.**, Mandel, K., Lochner, M., Webb, S., & Narayan, G. *Real-time Detection of Anomalies in Multivariate Time Series of Astronomical Data*. 2021, Machine Learning and the Physical Sciences Workshop, Neural Information Processing Systems (NeurIPS) 2021. [ads][doi]

9. Webb, S., Lochner, M., **Muthukrishna, D.**, et al., *Unsupervised machine learning for transient discovery in Deeper, Wider, Faster light curves*. 2020, MNRAS, 498, 3077. [ads][doi]

10. **Muthukrishna, D.**, Narayan, G., Mandel, K., Biswas, R., & Hložek, R. *RAPID: Early classification of explosive transients using Recurrent Neural Networks*. 2019, PASP, 131, 118002. [ads][doi]

11. **Muthukrishna, D.**, Parkinson, D., & Tucker, B. *DASH: Deep Learning for the Automated Spectral Classification of Supernovae and their Hosts*. 2019, ApJ, 885, 85. [ads][doi]

12. **Muthukrishna, D.** & Parkinson. D. *A cosmographic analysis of the transition to acceleration using SN-Ia and BAO*. 2016, J. Cosmol. Astropart. Phys, 11, 052. [ads][doi]

13. Agarwal, M., et al. (incl **Muthukrishna, D.**) *Applications of Deep Learning to physics workflows*. 2023. [arXiv]

14. **Muthukrishna, D.**, Audenaert, J., Villar, A., Hogg, D., *A causal foundation model for variable stars: Disentangling stellar properties from instrument effects in TESS and Kepler*. in prep.

15. **Muthukrishna, D.**, Haviland, J., Vanderburg, A., Shporer, A., Audenaert, J., Ricker, G., *Identifying Exoplanets with Deep Learning. VII. Astronet Vetting Model*, in prep.

Other co-author

16. Hon, M., et al. (incl **Muthukrishna, D.**), *A Disintegrating Rocky Planet with Prominent Comet-like Tails Around a Bright Star*. 2025, accepted to AAS Journals. [ads][doi]

17. Tey, E., et al. (incl **Muthukrishna, D.**), *Identifying Exoplanets with Deep Learning. V. Improved Light Curve Classification for TESS Full Frame Image Observations*. 2022, AJ, 165, 95. [ads][doi]

18. Fausnaugh, M., et al. (incl **Muthukrishna, D.**), *Four years of Type Ia Supernovae Observed by TESS*. 2022, ApJ, 956, 108. [ads][doi]

19. Biswas, E., Ishida, E., et al. (incl **Muthukrishna, D.**), *Enabling the discovery of fast transients: A science module for the Fink broker*. 2022, A&A, 677, A77. [ads][doi]

20. Chatterjee, D., Narayan, D., Aleo, P. D., Malanchev, K., **Muthukrishna, D.**, *Electromagnetic Counterpart Identification of Gravitational-wave candidates using deep-learning*. 2021, Accepted in NeurIPS 2021. [ads]

21. Chatterjee, D., Narayan, D., Aleo, P. D., Malanchev, K., **Muthukrishna, D.**, *El-CID: A filter for Gravitational-wave Electromagnetic Identification*. 2021, MNRAS, 509, 914. [ads]

22. Hložek, R., et al. (incl **Muthukrishna, D.**), *Results of the Photometric LSST Astronomical Time-series Classification Challenge (PLAsTiCC)*. 2021, submitted to ApJS. [ads]

23. Jones, D. O., et al. (incl **Muthukrishna, D.**), *The Young Supernova Experiment: Survey Goals, Overview, and Operations*. 2020, ApJ, 908, 24. [ads][doi]

24. Stachie, C., Coughlin, M., Christensen, N. & **Muthukrishna, D.**, *Differentiating the signal from the noise: towards optimal choices of wide field-of-view telescope transient follow-up*. 2019, MNRAS, 497, 1320. [ads][doi]

25. Malz, A. I., et al. (incl **Muthukrishna, D.**), *The Photometric LSST Astronomical Time-series Classification Challenge PLAsTiCC: Selection of a Performance Metric for Classification Probabilities Balancing Diverse Science Goals*. 2019, AJ, 158, 171. [ads][doi]

26. Campuzano Castro, F., Hagele, G. F., Bosch, G., Firpo, V., Cardaci, M., **Muthukrishna, D.**, Morrell, N. *Chemodynamics in Blue Compact Dwarf galaxies: II Zw 33 and Mrk 600*. 2019, Boletín de la Asociación Argentina de Astronomía, 61A. [ads][doi]

27. Kessler, R., et al. (incl **Muthukrishna, D.**), LSST Dark Energy Science Collaboration, Transient and Variable Stars Science

Collaboration *Models and Simulations for the Photometric LSST Astronomical Time Series Classification Challenge (PLAsTiCC)*. 2019, PASP, 131, 094501. [ads][doi]

28. Kessler, R., et al. (incl **Muthukrishna, D.**), *First cosmology results using Type Ia supernova from the Dark Energy Survey: simulations to correct supernova distance biases*. 2019, MNRAS, 485, 1171. [ads][doi]

29. Brout, D., et al. (incl **Muthukrishna, D.**), *First Cosmology Results Using SNe Ia from the Dark Energy Survey: Analysis, Systematic Uncertainties, and Validation*. 2019, ApJ, 874, 150. [ads][doi]

30. Abbott, T., et al. (incl **Muthukrishna, D.**), *First Cosmology Results using Type Ia Supernovae from the Dark Energy Survey: Constraints on Cosmological Parameters*. 2019, ApJL, 872, L30. [ads][doi]

31. D'Andrea, R., et al. (incl **Muthukrishna, D.**), *First Cosmology Results Using Type Ia Supernovae From the Dark Energy Survey: Survey Overview and Supernova Spectroscopy*. arXiv:1811.09565. [ads]

32. Campuzano Castro, F., Bosch, G., Hagele, G., Firpo, V., **Muthukrishna, D.**, Cardaci, M. *Estudio en galaxias BCD: Mrk 600 y IIZw 33*. 2018, Boletín de la Asociación Argentina de Astronomía, 60, 148. [ads]

33. Childress, M., et al. (incl **Muthukrishna, D.**), *OzDES multifibre spectroscopy for the Dark Energy Survey: 3-yr results and first data release*. 2017, MNRAS, 472, 273. [ads][doi]

Selected White Papers, Notes, and Astronomical Telegrams

34. de Jong, R., et al. (incl **Muthukrishna, D.**), *4MOST: Project overview and information for the First Call for Proposals*. 2019, The Messenger, 175, 3. [ads][doi]

35. Allen, G., et al. *Multi-Messenger Astrophysics: Harnessing the Data Revolution*. 2018, arXiv:1807.04780. [ads]

36. The PLAsTiCC team, et al. *The Photometric LSST Astronomical Time-series Classification Challenge (PLAsTiCC): Data set*. 2018, arXiv:1810.00001. [ads]

37. **Muthukrishna, D.**, Sharp, R. G., Tucker, B. E., et al., *Classification of 17 DES supernova with OzDES, The Astronomer's Telegram*. 2017, ATel, 10759. [ads]

Theses

38. **Muthukrishna, D.** *Data-driven Discovery of Transients in the New Era of Time-Domain Astronomy*. 2021, PhD Thesis, University of Cambridge. [Online Thesis][doi]

39. **Muthukrishna, D.** *Deep Learning for the Spectral Classification of Supernovae*. 2016, Unpublished Honours Thesis, University of Queensland, Brisbane, Australia. [Online Thesis]
    Awarded IEEE General Student Thesis prize for the best Electrical Engineering thesis in Queensland.
    Awarded GBST prize for the best software thesis at the University of Queensland.
    Awarded Bok Prize Highly Commended for the top three ranked astronomy Honours or Masters theses in Australia.

Skills

Experienced researcher working at the intersection of astronomy and data intensive science. I use deep learning and Bayesian modelling for data-driven astrophysics. I'm enthusiastic about applying novel machine learning methods to new datasets.

Expert Python: Tensorflow, Keras, PyTorch, Numpy, Pandas, Scipy, Scikit-learn, PyMC, Jax.
Experience with: C, C++, Matlab, SQL, HTML, Fortran, IDL, Java

Developer Developed widely used packages based on convolutional and recurrent neural networks: astrodash `https://astrodash.readthedocs.io` and astrorapid `https://astrorapid.readthedocs.io`

Other Deep learning, Recurrent Neural Networks, Diffusion Models, Normalizing Flows, Transformer Architectures, Time-series modelling, Bayesian statistics, data augmentation, massive observational datasets, data visualisation, multi-collaborator git version control, teaching, supervising students, managing teams in local and international collaborations, electronics design.

Selected Software Development

1. `BEAM` (Background Elimination with Advanced Machine learning)
   GitHub: `https://github.com/daniel-muthukrishna/BEAM`
   Description: Software package for training conditional diffusion models to model and remove systematic effects from TESS image data.

2. RAPID (Real-time Automated Photometric Identification)
   Documentation: https://astrorapid.readthedocs.io
   GitHub: https://github.com/daniel-muthukrishna/astrorapid
   Description: Software package to train a deep learning model to classify astronomical transient time-series (light curves).

3. DASH (Deep learning for Automated Supernova and Host classification)
   Documentation: https://astrodash.readthedocs.io
   GitHub: https://github.com/daniel-muthukrishna/astrodash
   Description: Software package to train a deep learning model to classify supernova spectra.

4. FitELP (Fit Emission-Line Profiles)
   Documentation: https://fitelp.readthedocs.io/
   GitHub: https://github.com/daniel-muthukrishna/FitELP
   Description: Tool to fit emission lines in echelle or long-slit spectra, and compute kinematic chemical properties.

5. COVID-19 Country Comparison and LowHighCovid App
   Website: https://covid19-cases-and-deaths.herokuapp.com/, https://lowhighcovid.herokuapp.com/
   GitHub: https://github.com/daniel-muthukrishna/covid19, https://github.com/nt409/covid-19
   Description: Online dashboard that allows users to compare the growth of COVID-19 across different countries and LowHighCovid is an online dashboard that allows users to implement their own SIR model of COVID-19 growth and compare the effect of different lockdown restrictions on the growth rate. This work was led by a Cambridge Mathematical biologist.