

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

RADIO FREQUENCY ENGINEER

- 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.

Brisbane, Australia

Dec. 2014 - Sep. 2015

Teaching and Courses Developed

Cambridge Centre for International Research

LECTURER

- 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

Online Course

Feb. 2023 - Present

DPMMS, Centre for Mathematical Sciences, University of Cambridge

COURSE ORGANISER AND SUMMER LECTURER

- 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.

Cambridge, UK

Jul. 2018, Jul. 2019

School of Mathematics & Physics and School of Engineering, University of Queensland

UNIVERSITY TUTOR

- 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

Brisbane, Australia

Mar. 2013 - Nov. 2016

Mentoring

GRADUATE STUDENTS

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

Drew Tufto

CS and Eng., Senior., May. 2025 - Present

MIT

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	NASA TESS Guest Investigator Program , Awarded \$90,000 for Modeling TESS Noise with Gen AI	NASA
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 Alnet 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

Jul. 2025	Harvard University , AstroAI workshop, <i>Invited speaker</i>	Cambridge, MA
Oct. 2024	Tufts University , Astronomy Seminar, <i>Invited speaker</i>	Somerville, MA
Jul. 2024	University of Oxford , Breakthrough Discuss, New Searches for Intelligence, <i>Invited speaker</i>	Oxford, UK
Apr. 2024	University of Washington , Institute for Data-Intensive Research (DiRAC), <i>Invited speaker</i>	Seattle, WA
Nov. 2023	Yale University , Yale Data Science x Astronomy & Astrophysics, <i>Invited speaker</i>	New Haven, CT
Sep. 2023	Harvard University , Center for Astrophysics Seminar, <i>Invited speaker</i>	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, <i>Invited speaker</i>	Online
Mar. 2021	Telstra Telecommunications Company , AI ML forum, <i>Invited speaker</i>	Online
Dec. 2020	University of Sheffield , Astronomy Seminar, <i>Invited speaker</i>	Online
Feb. 2020	Stanford University, SLAC National Accelerator Laboratory , AI Seminar Series, <i>Invited</i>	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, <i>Invited speaker</i>	Texas, USA
Nov. 2019	DESY (Deutsches Elektronen-Synchrotron) , Astroparticle Seminar, <i>Invited speaker</i>	Hamburg, Germany
Aug. 2019	Northwestern University , Hotwiring the transient universe workshop, <i>Invited speaker</i>	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, Pittsburgh, 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. *Mercader-Perez, P., **Muthukrishna, D.**, Haviland, J., Dimond, D., 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 [[ads](#)][[doi](#)]
2. *Gupta, R., **Muthukrishna, D.**, *Simulation-Based Pretraining and Domain Adaptation for Astronomical Time Series Tasks with Minimal Labeled Data*, Accepted at the Foundation Models for Structured Data Workshop at the Forty-Second International Conference on Machine Learning (ICML) 2025. [[doi](#)]
3. *Gupta, R. & **Muthukrishna, D.**, Rehemtulla, N., Shah, V., *Transfer Learning for Transient Classification: From Simulations to Real Data and ZTF to LSST*. Monthly Notices of the Royal Astronomical Society: Letters, 2025; slaf074. [[ads](#)] [[doi](#)]
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.

OTHER CO-AUTHOR

15. Fox Fortino, W., Bianco, F., Protopapas, P., **Muthukrishna, D.**, Brockmeier, A., *ABC-SN: Attention Based Classifier for Supernova Spectra*. 2025, submitted to Astronomy & Computing. [[ads](#)][[doi](#)]
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*. 2020, 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 II Zw 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

35. 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](#)]
36. Allen, G., et al. *Multi-Messenger Astrophysics: Harnessing the Data Revolution*. 2018, arXiv:1807.04780. [[ads](#)]
37. The PLAsTiCC team, et al. *The Photometric LSST Astronomical Time-series Classification Challenge (PLAsTiCC): Data set*. 2018, arXiv:1810.00001. [[ads](#)]
38. **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](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/astorapid>

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.