

AKSHARA Viswanathan | she/her

Observational astronomer in the field of Galactic Archaeology

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Education

| Program | Affiliation | Grades | Year |
|---|---|-------------------------------|-----------|
| <i>Ph.D.</i> (Astronomy) A new view of the old Milky Way with Else Starkenburg, Amina Helmi, and Nicolas F. Martin | Kapteyn Astronomical Institute <i>University of Groningen, The Netherlands</i> <i>Thesis</i> (in preparation) | - | 2020-2024 |
| <i>M.Sc.</i> (Astrophysics) Effects of gravitational lens models on merging Binary Black Hole systems with Chris Messenger & Martin Hendry | School of Physics and Astronomy <i>University of Glasgow, United Kingdom</i> <i>Thesis</i> | Distinction 20/22 | 2019-2020 |
| <i>B.E.</i> (Electronics & Commn. Engg.) Frequency reconfigurable wearable antenna for off-body communication with Malathi Kanagasabai | College of Engineering Guindy <i>Anna University, India</i> <i>Thesis</i> | Distinction 9.21/10 | 2015-2019 |

Academic honours and fellowships

- *Mitacs Globalink Research Fellowship (7000 CAD)* at University of Victoria, Canada. (2018).
- *IASc-NASI-INSa Research Fellowship (25000 INR)* at Institute for Plasma Research, India (2017).
- *IAU travel grant (500 AUS\$)* to present at IAUS377 in Kuala Lumpur, Malaysia (2023).
- *MW-Gaia COST Action grant (1300 €)* to present at Revealed by Gaia workshop in Cambridge, UK (2023).
- *Best Paper Award (2000 INR)* at National Conference on Information and Communication Technologies (2019).
- *Best Club Award* by Anna University for founding and leading Astro Club of CEG (2019).
- *Short-listed for PLANCKS UK 2020* national physics competition held in Edinburgh, UK (2020).
- *State Award* for Computer Science and Mathematics in HSC by Tamil Nadu Government (2015).
- *Central Award* for 10 CGPA in SSLC by Indian Government (2013).

Publications and conference contribution record

- *7 primary author publications* (4 refereed, 2 proceedings, 1 to be submitted to a journal) with 100+ citations.
 - *3 primary author publications in preparation.*
 - *7 co-authored publications* with 40+ citations.
 - *1 invited talk, 11 contributed talks, 6 collaboration talks, 4 contributed posters* at international conferences.
 - *8 invited talks and 1 invited workshop* at international universities.
- (See the list of publications and conference contributions in Appendix A)

Successful observing proposals

- *PI of an ongoing long term program (23B, 23A, 22B) at the Isaac Newton Telescope Intermediate Dispersion Spectrograph (INT/IDS), La Palma* with 27 nights to follow-up extremely metal poor stars (EMP from Pristine and Gaia synthetic CaHK surveys. 23B proposal submitted. - 9 nights of observing experience.
- *Delegated PI of a Fast Turnaround program at GHOST, Gemini, Hawaii* for the oldest stars in the MSS.
- *Significantly contributing co-I of a program (P111) at the UVES@VLT, ESO, Chile* with filler time to follow-up 'Oldest stars in the Milky Way from an accreted galaxy'.
- *Co-I of a program (22A, 21B) at the INT/IDS, La Palma* with 28 nights to follow-up stream member candidates from STREAMFINDER. - 4 nights of observing experience.
- *Significantly contributing co-I of a program (P112, P111) at the UVES@VLT, ESO, Chile* with 40 hours and 47 minutes for high resolution followup of extremely metal-poor candidates from Gaia-Pristine.
- *Co-I of a program at the HDS on Subaru, USA* to follow-up 'bright, EMP stars' from Matsuno et al. (2023).

Decision pending proposals

- *PI of a program at UVES@VLT, ESO, Chile* for the oldest and most-metal-poor stars in the Magellanic Stream.

- *Delegated PI of a program at GHOST, Gemini, Hawaii* for Oldest and most-metal-poor stars in the MSS.

Teaching and supervision

- *Design and co-supervision of Heidi Vos's* bachelor thesis titled "The progenitor of the C-19 stellar stream?" with Else Starkenburg and Petra Awad (ongoing).
- *Design and co-supervision of Anne Foppen's* bachelor thesis titled "The metallicity structure of the outer Galactic halo" with Else Starkenburg (2023).
- *Design and co-supervision of Anna F. Esselink's* bachelor thesis titled "Investigating stellar streams in the retrograde Milky Way halo" with Else Starkenburg (2022) and a summer project on deriving metallicities (2021).
- *Teaching Assitant* for Cosmology (2021) and Physics of Galaxies (2022, 2023) including computation project design.

Interdisciplinary and inter-university collaborations

- *Computer science and AI group in Groningen: Petra Awad and Marco Canducci* on a PhD thesis scientific chapter analysing the Jhelum stellar stream (submitted).
- *Côte d'Azur Observatory: Eloisa Poggio and Alejandra Recio-Blanco* on a paper looking for substructures using reduced proper motion halo sample using clustering algorithms (ongoing).
- *Center for Computational Astrophysics, NYC: Adrian Price-Whelan and Danny Horta* on my first author paper studying the dynamical origin of metal-poor stars in disk-like orbits (ongoing).

Collaborations

- *Active contributor* of the Pristine survey collaboration (2020-Present). [3 talks in annual meetings 2021, 2022, 2023]
- *Active member* of the STREAMFINDER collaboration (2022-Present).
- *Early career scientist* of The Early Milky Way ISSI Team (2022). [2 talks in annual meeting 2022]
- *Active member* of the WEAVE Galactic archaeology low resolution, high latitude survey (2022-Present). [1 talk]
- *Member* of the European Astronomical Society (EAS) (2021-Present).
- *Member* of the Royal Netherlands Astronomical Society (NAC) (2021-Present).
- *Member* of the Netherlands Research School for Astronomy (NOVA) Network 1 (2020-Present).

Responsibilities held

- *PhD representative* of Kapteyn Institute Equity, Diversity and Inclusivity committee (2022-present).
- *Head* of Wednesday Lunch Talk committee at Kapteyn Institute, Groningen (2021-22).
- *Secretary* of Young Minds Groningen Chapter, European Physical Society (2021-Present).
- *Writer* for European Physical Society's newsletter 53/3 (2022-Present).
- *MSc Student Representative* at School of Physics and Astronomy, University of Glasgow (2019-20).
- *Founder and President* of Astronomy and Planetary Sciences Club of Anna University (2018-19).
- *3 years of social service* with the National Service Scheme, India (2015-18).
- *Vice President* of Electronics and Communication Engineering Association-ECEA (2016-19).
- *Student Representative* of the department of Electronics and Communication Engineering (2017-18).
- *Director of Interviews* of The Guindy Times, Official Campus Magazine of CEG, ACT SAP (2015-19).
- *Event Organizer, Content Writer and Designer* of Kurukshetra with UNESCO Patronage (2015-18).
- *Mentor and Club Administrator* at the Robotics Club of CEG (2016-18).
- *Member* of Astrosoc Club at University of Glasgow (2019-20).
- *Outreach and EDI events organized:*
 - Seminar for International day of Women and Girls in Science (2022, 2023, 2024 upcoming)
 - Hands-On Telescope workshop (2019)
 - Zero Shadow Day event (2019)
 - Astro Coffee-TED Talks (2019)
 - Model Rocketry & Star Gazing at Yelagiri (2019)
 - College carousal at Blaauw Observatory (2022)
 - Industrial visit to ISRO (2017)
 - Traffic Awareness program (2016)
 - Technical event: How stuff works
 - Non-technical events: Word wars, Alcatraz, Harry Potter, Sherlock Holmes, Game of Thrones.
 - Twitter podcast about Galactic archaeology (2023)
 - Astronomy as a career for south-asian students (2023)

Technical skills

- Programming Language: Python(main), C++, MATLAB
- Dynamical analysis: AGAMA, gala
- Data reduction and spectral analysis: IRAF, FERRE
- Big data analysis: vaex, pandas, TOPCAT

APPENDIX A

Publications list

*co-supervised (or closely involved in supervision) works

Primary author.....

7. *The Pristine Survey-XXV. Chemodynamics of very and extremely metal-poor stars from the first spectroscopic follow-up of Pristine-Gaia synthetic catalogue of photometric metallicities.*
Viswanathan, A., Yuan, Z., Ardern-Arentsen, A., Starkenburg, E., Martin, N. F., et al.
to be submitted to Astronomy & Astrophysics, 2023.
6. *Gaia's brightest very metal-poor (VMP) stars: A metallicity catalogue of a thousand VMP stars from Gaia RVS spectra.*
Viswanathan, A., Starkenburg, E., Matsuno, T., Venn, K. A., Martin, N. F., et al.
Astronomy & Astrophysics Letters, accepted with minor revision, 2023. [arXiv:2309.06137](#)
5. *Hidden deep in the halo: Selection of a reduced proper motion halo catalogue and mining retrograde streams in the velocity space.*
Viswanathan, A., Starkenburg, E., Koppelman, H.H., Helmi, A., Balbinot, E., Esselink, A.F.*
Monthly Notices of the Royal Astronomical Society, 521, 2, 2087–2102, 2023. [arXiv:2302.00053](#)
4. *A definitive merger-AGN connection at $z\sim 0$ with CFIS: mergers have an excess of AGN and AGN hosts are more frequently disturbed.*
Ellison, S.L., **Viswanathan, A.**, Patton, D.R., Bottrell, C., McConnachie, A.W., Gwyn, S. and Cuillandre, J.C.
Monthly Notices of the Royal Astronomical Society, 487, 2, 2491-2504, 2019. [arXiv:1905.08830](#)
3. *On the design of frequency reconfigurable tri-band miniaturized antenna for WBAN applications*
Kanagasabai, M., Sambandam, P., Mohammed, G.N.A., Dinesh, N.M., Morais, M.S., **Viswanathan, A.**, Palaniswamy, S.K. and Shrivastav, A.
AEU-International Journal of Electronics and Communications, 127, p.153450, 2020. [DOI:10.1016](#)
This paper is fully based on my Bachelor thesis.
2. *Detection of density variations and off-track features in stellar streams.*
Viswanathan, A., Starkenburg, E., Esselink, A.F.*
Dynamical Masses of Local Group Galaxies, Proceedings of IAU Symposium 379, accepted, 2023.
1. *Low Profile Modified Loop Antenna for WBAN Applications*
Dinesh, N.M., **Viswanathan, A.**, Morais, M.S., Kanagasabai, G.N.A., Rajesh, N.
Proceedings of the 5th National Conference on Information and Communication Technologies, SSN College of Engineering, pp.102-105, 2019. [NCICT-proceedings](#)

Primary author - in preparation.....

3. *The influence of Galactic bar on the motion of prograde planar metal-poor stars*
Viswanathan, A., Horta, D., Price-Whelan, A., Starkenburg, E., Yuan, Z. et al.
Astronomy & Astrophysics, in prep, 2024.
2. *The Pristine Survey-?. Metallicity structure of the outer galactic halo.*
Byström, A.*, **Viswanathan, A.**, Starkenburg, E., Foppen, A.*, Martin, N. F., et al.
Astronomy & Astrophysics, in prep, 2024. (co-first author paper)
1. *The Pristine Survey-?. Metallicity structure of the inner galactic halo.*
Viswanathan, A., Starkenburg, E., Martin, N. F., et al.
Astronomy & Astrophysics, in prep, 2023.

Co-author.....

7. *Swarming in stellar streams: unveiling the structure of the Jhelum stream with ant colony-inspired computation*
Awad, P.*, Canducci, M., Balbinot, E., **Viswanathan, A.**, Woudenberg, H., Koop, O. et al.
submitted to Astronomy & Astrophysics, 2023.
My contribution: weekly meetings with Petra and helped her interpret the science behind Jhelum's accretion history after using her innovative algorithm to select stream members - interdisciplinary collaboration.
6. *The Pristine survey XIII: uncovering the very metal-poor tail of the thin disc.*
Fernández-Alvar, E., Kordopatis, G., Hill, V., Starkenburg, E., **Viswanathan, A.**, Martin, N.F., Thomas, G.F., Navarro, J.F., Malhan, K., Sestito, F. and González Hernández, J.I.
Monthly Notices of the Royal Astronomical Society, 508, 1, 1509-1525. [arXiv:2106.03406](#)
My contribution: Crossmatches of members in the anti-center with spectroscopic surveys to confirm the existence of

- the metal-poor tail of the thin disc and assisted with the compilation of the training sample for the Pristine model.
5. *Typhon: a polar stream from the outer halo raining through the Solar neighborhood.*
Tenachi, W., Oria, P.A., Ibata, R., Famaey, B., Yuan, Z., Arentsen, A., Martin, N. and **Viswanathan, A.**
The Astrophysical Journal Letters, 935, 2, L22, 2022 [arXiv:2206.10405](#)
My contribution: Led the spectroscopic follow-up of Typhon members.
 4. *Antaeus: A Retrograde Group of Tidal Debris in the Milky Way's Disk Plane.*
Oria, P.A., Tenachi, W., Ibata, R., Famaey, B., Yuan, Z., Arentsen, A., Martin, N. and **Viswanathan, A.**
The Astrophysical Journal Letters, 936, 1, L3, 2022. [arXiv:2206.10404](#)
My contribution: Led the spectroscopic follow-up of Antaeus members.
 3. *The Pristine survey–XVI. The metallicity of 26 stellar streams around the Milky Way detected with the STREAMFINDER in Gaia EDR3.*
Martin, N.F., Ibata, R.A., Starkenburg, E., Yuan, Z., Malhan, K., Bellazzini, M., **Viswanathan, A.**, Aguado, D., Arentsen, A., Bonifacio, P. Carlberg, R. et al.
Monthly Notices of the Royal Astronomical Society, 516, 4, 5331–5354, 2022. [arXiv:2201.01310](#)
My contribution: Validation of the photometric metallicities from Pristine with existing spectroscopic surveys and assisted with the compilation of the training sample for the Pristine model.
 2. *The Pristine survey–XXIII. Data Release 1 and an all-sky metallicity catalogue based on Gaia DR3 BP/RP spectro-photometry.*
Martin, N. F., Starkenburg, E., Yuan, Z., Fouesneau, M., Arentsen, A., De Angeli, F., Gran, F., Montelius, M., Andrae, R., Bellazzini, M., Montegriffo, P., Esselink, A. F. *, Zhang, H., Venn, K. A., **Viswanathan, A.**, et al.
submitted to Astronomy & Astrophysics, 2023. [arXiv:2308.01344](#).
My contribution: Supervised Anna F. Esselink on the algorithm that goes from CaHK measurements to photometric metallicities in python environment and assisted with the compilation of the training sample for the Pristine model.
 1. *The Pristine survey–XVII. The C-19 stream is dynamically hot and more extended than previously thought.*
Yuan, Z., Martin, N.F., Ibata, R.A., Caffau, E., Bonifacio, P., Mashonkina, L.I., [...] **Viswanathan, A.** et al.
Monthly Notices of the Royal Astronomical Society, 514, 2, 1664-1671, 2022. [arXiv:2203.02512](#)
My contribution: Led the spectroscopic follow-up of a few C-19 members and assisted with the compilation of the training sample for the Pristine model.

Conferences and workshops list

Invited talks/workshop

10. Origin of the C-19 stellar stream - the most metal-poor structure known in the universe: blackboard talk, Columbia University (2023).
9. Tracing the Milky Way's ancient footsteps: Insights from chemodynamical investigations of bright and distant metal-poor stars: Monday Afternoon Talk, MIT Kavli Institute for Astrophysics (2023).
8. Tracing the Milky Way's ancient footsteps: Insights from chemodynamical investigations of bright and distant metal-poor stars: group seminar, Northwestern University (2023).
7. Tracing the Milky Way's ancient footsteps: Insights from chemodynamical investigations of bright and distant metal-poor stars: KICP seminar, University of Chicago (2023).
6. Tracing the Milky Way's ancient footsteps: Insights from chemodynamical investigations of bright and distant metal-poor stars: Royal Observatory, Edinburgh, UK (2023)
5. Exploring the Milky Way Halo: Tracing Stellar Streams and Metal-Poor Relics: Seminar at the Institute of Astrophysics of the Canary Islands (IAC), Spain (2023)
4. Hidden deep in the halo: Investigating retrograde streams with a reduced proper motion selected halo catalogue: Talk at the Lorentz Center workshop on Towards Real-Time Galactic Dynamics, Leiden, NL (2022)
3. Streams22 workshop: Community Atlas of Tidal Streams, virtual, USA (2022)
2. Prospects in Astronomy for Engineers: Talk at Anna University, India (2020)
1. Seminar on Galaxies at the SPACE program by PAGSA, University of Victoria (2018)

Contributed participation

14. (talk) Tracing the Milky Way's ancient footsteps: Insights from chemodynamical investigations of bright and distant metal-poor stars: Wednesday Lunch Talk 2023, Groningen, NL
13. (talk) Trapped in the disk: constraining the galactic bar using planar metal-poor stars: Revealed by Gaia: the central halo of the Milky Way 2023, Cambridge, UK
12. (talk) Hidden deep in the halo: Selection of a reduced proper motion halo catalogue and mining retrograde streams in the velocity space: Wednesday Lunch Talk 2023, Groningen, NL

11. (talk) Detection of density variations and off-track features in stellar streams: IAUS379: Dynamical Masses of Local Group Galaxies 2023, Potsdam, Germany
10. (poster) Observational Diagnostics of the Old Milky Way using the most metal-poor stars: IAUS377: Early disk galaxy formation: from JWST to the Milky Way 2023, Kuala Lumpur, Malaysia.
10. (poster) Galactic archaeology with the metal-poor Galaxy: NOVA review meeting 2023, Groningen, NL.
9. (talk) Galactic archaeology with the metal-poor Galaxy: Kapteyn science day 2022, Groningen, NL.
8. (talk) Hidden deep in the halo: A distinct chemo-dynamical perspective of retrograde tidal streams in the Milky Way: EAS 2022, Valencia, Spain
7. (poster) A new view of the old Milky Way: Fifty million local halo sources using Gaia eDR3 proper motion and photometry: EAS 2022, Valencia, Spain
6. (talk) A unique view of the metallicity structure of the Milky Way halo: EAS 2021, virtual, NL
5. (talk) A unique view of the metallicity structure of the Milky Way halo: GALAH Scienc Meeting 2021, virtual, AUS
4. (talk) A unique view of the metallicity structure of the Milky Way halo: NAC 2021, virtual, NL
3. (talk) AGN-Merger Connection: Texas symposium 2019, Portsmouth, UK
2. (poster) Quantification of the merger fraction in local AGN hosts: ASI 2019, Bangalore, India
1. (talk) Low Profile Modified Loop Antenna for WBAN Applications: National Conference on Information and Communication Technologies 2019, Chennai, India

(Actively participated in many other conferences, meetings, collaboration telecons, colloquiums, seminars, and talks)

Other workshops.....

5. Star gazing and Observation nights at Acre Road Observatory, Glasgow (2019)
4. 4-Day visit to Dominion Astrophysical Observatory – NRC Herzberg (2018)
3. Astro Spectroscopy Workshop using RSpec Software at Shastra, IIT Madras (2017)
2. Image Processing Training certified by IEEE (2017)
1. Samsung's Virtual Reality Workshop at Kurukshetra, National Technical Fest (2016)

APPENDIX B

Other research works.....

- o Emission maps and line profiles for a single solar flare observed in EUV regime at the University of Glasgow (2020)
- o Research survey on SMBH in AGNs and detection of GWs between SMBH at University of Glasgow (2019)
- o High current, high frequency pulsar for the excitation of whistler waves at Institute for Plasma Research, India (2017)
- o Statistical data analysis using MCMC at the University of Glasgow (2020)
- o Robotics project on Solar Smart Homes at Anna University (Awarded fourth place by the Robotics Club) (2017)
- o Microcontroller based remote control for home appliances at Anna University (2016)

Industry experience.....

- o Student IT Helpdesk Assistant, Technical & Specialist at University of Glasgow (2019-20)
- o Abacus Tutor & Digital marketing admin at Super Maths & English, British Youth IT College
- o Campus Ambassador/Collaborator of SPACE India (2020)
- o Outreach Event Organizer at Space Kidz India (2019)
- o Content and Research Internee at ProtoValley - a 3D Printing Company (2016)
- o Website Content Writer at Lunar Mission One, Indian Chapter (2016)
- o Ground Control Team at the GU Orbit – Microsatellites Building Group (2019)

Non-academic honours.....

- o Silver Medal for singing in patriotic music by Bharat Vikas Parishad (2013)
- o Bronze Medal in Chess by Universal Sports Club (2013)
- o Second prize in National Level Essay Writing by Kavya Kala Vaibhav (2013)

Others.....

- o Hobbies: Climbing, Yoga, Gardening, Music, Cooking
- o Languages: English, Tamil, Hindi, Dutch (elementary).

References

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- o Else Starkenburg: estarkenburg@astro.rug.nl
 - o Amina Helmi: ahelmi@astro.rug.nl
 - o Nicolas F. Martin: nicolas.martin@astro.unistra.fr

Place: Groningen, NL

Date: November 13, 2023

Akshara Viswanathan