Dr. Thejasvi **Beleyur**

Research group-leader, Active Sensing Collectives Lab

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Work Experience

Research group leader
Centre for the Advanced Study of Collective Behaviour (CASCB), Konstanz, Germany

Group leader of the 'Active Sensing Collectives' lab
1 March 2025-current

CASCB Bridge Postdoc
CASCB, Uni. Konstanz
Dec 1 2024 - Feb 28 2025

DFG Walter Benjamin Postdoc
Dept. of Biology, Uni Konstanz, Germany

Methods development for multi-sensor datasets and prototyping an echolocating swarm robotics platform
Aug 1 2022- Nov 30 2024

Postdoctoral researcher
CASCB, Uni. Konstanz

Extension contract for CASCB work
April 1 2022-June 30 2022

Postdoctoral researcher
CASCB, Uni Konstanz

Developing analysis workflows to analyse the multi-sensor Ushichka dataset of free-flying bat groups
March 15 2021-March 14 2022

Doctoral work on IMPRS contract
Max-Planck Institute for Ornithology, Seewiesen, Germany

Modelling and multi-sensor tracking of free-flying bat groups
June 1 2020- Nov 31 2020

Doctoral work on DAAD scholarship
Max-Planck Institute for Ornithology, Seewiesen, Germany

Modelling and multi-sensor tracking of free-flying bat groups
Sep 1 2015- Feb 28 2020

Research assistant and lab manager
Azim Premji University, Bengaluru, India

Social spider web construction and setting up undergraduate laboratory facilities
Aug 1 2014 - July 31 2015

Breaks/part-time work in career

- 29/12/2023 - 28/4/2024 : 60% full-time work on parental leave (Elternzeit)
- 29/12/2022 - 28/2/2023 : full parental leave (Elternzeit)
- 01/02/2020 - 01/06/2020 : break in employment due to residence permit related delays

Peer-reviewed publications

1. Doimo, A., Hamann, H., Reina, A., & Beleyur, T. (2026). SonoRo: A swarm robotics platform to study acoustically driven collective behaviour. *ANTS 2026*.
2. Framond, L. de, Sharp, S. P., Duclos, K., Beleyur, T., & Brumm, H. (2025). Stream noise induces song plasticity and a shift to visual signals in a riverine songbird. *Current Biology*. https://doi.org/10.1016/j.cub.2025.07.049
3. Jandeleit, J., Beleyur, T., & Goldlücke, B. (2024). Aligning thermal cameras with LiDAR scenes in subterranean environments. *CV4Animals Workshop (CVPR Seattle 2024)*. https://www.cv4animals.com/
4. Framond, L. de, Beleyur, T., Lewanzik, D., & Goerlitz, H. R. (2023). Calibrated microphone array recordings reveal that a gleaning bat emits low-intensity echolocation calls even in open-space habitat. *Journal of Experimental Biology*. https://doi.org/10.1242/jeb.245801
5. Beleyur, T. (2022). beamshapes: A Python package to generate directivity patterns for various sound source models. *Journal of Open Source Software*, *7*(69), 3740. https://doi.org/10.21105/joss.03740
6. Beleyur, T., Murthy, T. G., Singh, S., Somanathan, H., & Uma, D. (2021). Web architecture, dynamics and silk investment in the social spider Stegodyphus sarasinorum. *Animal Behaviour*, *179*, 139–146. https://doi.org/10.1016/j.anbehav.2021.06.029

7. Beleyur, T., & Goerlitz, H. R. (2019). Modeling active sensing reveals echo detection even in large groups of bats. *Proceedings of the National Academy of Sciences*, *116*(52), 26662–26668. https://doi.org/10.1073/pnas.1821722116
8. Batstone, K., Flood, G., Beleyur, T., Larsson, V., Goerlitz, H. R., Oskarsson, M., & Astroem, K. (2019). Robust self-calibration of constant offset time-difference-of-arrival. *ICASSP 2019-2019 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, 4410–4414. https://doi.org/10.1109/ICASSP.2019.8683221
9. Beleyur, T., Bellur, D. U., & Somanathan, H. (2015). Long-term behavioural consistency in prey capture but not in web maintenance in a social spider. *Behavioral Ecology and Sociobiology*, *69*(6), 1019–1028. https://doi.org/10.1007/s00265-015-1915-z
10. Beleyur, T., Abdul Kareem, V. K., Shaji, A., & Prasad, K. (2013). A mathematical basis for plant patterning derived from physico-chemical phenomena. *Bioessays*, *35*(4), 366–376. https://doi.org/10.1002/bies.201200126

Education

PhD — *University of Konstanz, Germany*

PhD thesis: Theoretical and empirical investigations of echolocation in bat groups — *2015-2021 (Defence: 10th June 2021)*

Interdisciplinary BS-MS dual degree, Major in Biological Sciences — *IISER-Thiruvananthapuram, India*

Masters thesis: Task differentiation during prey capture and retreat-mate recognition in the indian social spider, Stegodyphus sarasinorum (eresidae) — *2008-2013*

Interdisciplinarity & inter-personal skills

I have a track-record of bridging disciplines while working independently and collaboratively as briefly summarised below:

- 2025 - Research group leader working at the interface of *bioacoustics*, *sensory modelling*, *swarm robotics* and *computational methods development*. See lab website: activesensingcollectives.com
- 2023 onwards: collaboration with roboticists (Prof. Heiko Hamman, Dr. Andreagiovanni Reina & labs, Uni. Konstanz) to develop the 'RoBAT' echolocating swarm robotics platform.
- 2022 : wrote the `beamshapes` package - one of the few open-source implementations of non-trivial sound radiation models based on *theoretical acoustics* models of sound radiation. See Beleyur 2022 J. Open Source Software
- 2021-2024 : collaboration with *computer scientist* (Prof. Bastian Goldluecke & lab, Uni. Konstanz) to develop methods to align LiDAR and thermal camera scenes (Uni. Konstanz). See Jandeleit, Beleyur, Goldluecke 2024 CV4Animals (CVPR 2024)
- 2019 onwards : collaboration with *applied mathematicians* (Prof. Kalle Astroem & lab, Uni. Lund) to develop methods for microphone self-positioning and localising multiple sources in complex audio. See Batstone et al. 2019 ICASSP
- 2015-21 : PhD work building a multi-sensor (LiDAR, microphone array, thermal camera) array to track echolocating bats in the field, and perform computational modelling of echolocation in groups. The research area combined *acoustics*, *psychoacoustics* and *collective behaviour*. See Beleyur & Goerlitz 2019 PNAS for computational modelling work.
- 2013-15 : collaboration with *civil engineers* (Prof. Tejas Murthy & lab, IISc Bangalore) to quantify and characterise social spider collective web construction. See Beleyur et al. 2021 Animal Behaviour.

Selection of awards and grants

A longer list of funding secured *available here online*

ZeniT Fellowship — *Zukunftskolleg, Uni. Konstanz*

Cross-displinary exchange grant to develop novel methods in bioacoustics and acoustics training — *2026*

Carl Zeiss Nexus grant (1.5M EUR) — *Carl-Zeiss Stiftung*

Research group grant promoting interdisciplinary science — *2024*

Best Early Career Researcher talk — *International Bioacoustics Society conference, Japan,2023*

IBAC 2023 — *2023*

Walter Benjamin Grant — *German Research Foundation (DFG)*

Postdoctoral Grant — *2022*

DAAD-GSSP scholarship — *German Academic Exchange Service (DAAD)*

Scholarship awarded to pursue doctoral studies — *2015-2020*

Professional community service and peer-review

- Journals I have reviewed for: PNAS, eLife, Plos Computational Biology, Journal of the Acoustical Society of America (JASA), Journal of Experimental Biology, Methods in Ecology & Evolution, Journal of Open Source Software
- 2025-present: Executive Council member, International Bioacoustics Society (IBAC)

Public outreach & press

Coverage & opinion

- Professional opinion in the *New Scientist*, in an article covering a new method to study bat swarms using bird-borne tags (*link*)
- Press coverage at the *Neue Zürcher Zeitung* of Beleyur & Goerlitz 2019, PNAS (*link*)

Local outreach

While officially certified at the B1 language level recently, my German has been good enough to allow semi-technical conversations that convey my enthusiasm for bats, echolocation and the techniques we use to study them. I have used various opportunities to interact with the public:

- September 2018, June 2019, 'Fledermausführung', Wartaweil: A 'bat walk' and info session for groups of children while showing them how to find bats with a bat-detector.
- July 2017, BIOTOPIA Stadtteilfest: I was in charge of explaining various exhibits highlighting animal and plant forms as part of a one-day even to increase public awareness of the then newly opened BIOTOPIA museum.
- June 2017, Tag der Oeffenen Tür: Open day at the Max-Planck Institute for Ornithology, Seewiesen. I was part of an exhibit showcasing various aspects of bat biology and echolocation research done in my PhD lab.
- January 2017, BIOTOPIA inaugration event: exhibit showing a live feed of a thermal camera as people walked by and showing how it is used to study bats in the dark.

Teaching & supervision

Lecture/courses/workshops given

- 2025 August, 'Active sensing collectives', Lecture, Konstanz School of Collective Behaviour, Uni. Konstanz.
- 2024,2025 August, *Sensory ecology, animal behaviour and collectives*, undergraduate lecture at 'Animal Behaviour' undergraduate course (Uni. Konstanz) lecture
- 2023 August, *Acoustic tracking from easy to crazy*, post-graduate level lecture at the Konstanz School of Collective Behaviour, Uni. Konstanz,

- Undergraduate Biology Lab curriculum development at Azim Premji University, India
- *Version Control for Organismal Biologists*: introductory workshop on why one should use version control and how to do it with Git (3 workshops so far)
- *Python for Organismal Biologists*: introductory workshop on using Python for scientific computing with example code and Jupyter notebooks that participants run during the workshop (2 workshops so far)

Supervision & mentoring

Name	Year	Title	Degree	Affiliation	Co-supervisors
Aditya Moger	2025	(ongoing) Dynamic models of echolocating groups	BS-MS Integrated Masters	IISER Pune	
Gabriele Baroli	2025	Echolocation for the RO-BAT Platform: Biomimetic Autonomous Mobile Robot Navigation Exploiting Ultrasonic Echoes	Masters in Audio Engineering	Polytechnic University of Milan	Dr. Andreagiovanni Reina, Prof. Heiko Hamman
Alberto Doimo	2024	RO-BAT: A bat-inspired approach on mobile robot navigation using direction of arrival estimation	Masters in Audio Engineering	Polytechnic University of Milan	Dr. Andreagiovanni Reina, Prof. Heiko Hamman
Julian Jandeleit	2021	Lidar assisted depth estimation for thermal cameras	Bachelors in Computer Science	University of Konstanz	Prof. Bastian Goldluecke
Giray Tandogan	2021	3d trajectory reconstruction for animal data	Masters in Computer Science	University of Konstanz	Dr. Hemal Naik, Prof. Oliver Deussen
Aditya Krishna	2018	Examining the behavioural and acoustic adaptations of free-flying horseshoe bats in response to jamming	Integrated BS-MS	IISER Mohali	Neetash Mysuru, Dr. habil. Holger R Goerlitz
Claire Guerin	2016	Quantifying potential sensory interference in bat aggregations	Erasmus Mundus project	LMU Munich	Dr. habil. Holger R Goerlitz

Skillsets

- Acoustic and video tracking of animals
- Design, execution and analysis of bioacoustics and animal behaviour experiments
- Experience handling animals (ants, spiders, bats) and managing field work
- Signal and image analysis, digital data acquisition methods
- Writing and maintaining scientific software packages and reproducible scientific code
- Coding in order of language proficiency: Python, R, MATLAB

Preprints/reports/datasets

1. Beleyur, T. (2021). Itsfm, an open-source package to reliably segment and measure sounds by frequency modulation. *bioRxiv*. https://doi.org/10.1101/2021.01.09.426033

2. Kamburov, H. R. ;. B., Asparuh; Goerlitz. (2018). Geospatial modelling inside the “Orlova Chuka” cave in Bulgaria. *XXVIII International Symposium on Modern Technologies, Education and Professional Practice in Geodesy and Related Fields*. https://doi.org/10.5281/zenodo.14696243
3. Beleyur, T., & Jandeleit, J. (2022). *LiDAR and thermal data for camera pose estimation using the depth-map correspondence algorithm* (Version 0.1) [Data set]. Zenodo. https://doi.org/10.5281/zenodo.6620671
4. Beleyur, T. (2021). *Ushichka speaker playback dataset* (Version 0.0.1) [Data set]. Zenodo. https://doi.org/10.5281/zenodo.5126695
5. Beleyur, T. (2019). *Experimentally parametrising the cocktail party nightmare* (Version 1.0) [Data set]. Zenodo. https://doi.org/10.5281/zenodo.3469845
6. Beleyur, T., Murthy, T. G., Singh, S., Somanathan, H., & Uma, D. (2020). *Code and data associated with 'the web architecture, dynamics, and silk investment in the social spider, stegodyphus sarasinorum'* (Version 0.1.0) [Data set]. Zenodo. https://doi.org/10.5281/zenodo.4009461

Scientific software packages

- `beamshapes`: computational implementations of various sound-radiation models. *Paper* . *Online docs*
- `itsfm`: segments sounds based on frequency modulation. Various inbuilt and custom measurements can also be performed on the segmented audio. *Preprint*. *Online docs*

Languages spoken

The Common European Framework of Reference for Languages) has three divisions (A: basic user, B: independent user, C: proficient user) with two levels (1,2) each.

- English: C2 (proficiency) - self-assessed
- German: B1 (upper intermediate) - certified
- Kannada: B1 - self-assessed
- Hindi: B1 - self-assessed
- Bahasa Indonesia: A2 (elementary) - self-assessed