Thejasvi Beleyur,

Phd Student,

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About me: I am a biologist at heart (and formal training), with the mindset of a tinkerer-engineer. I like to study animal behaviour with a combination of experimental, theoretical and technology-driven methods. The field of bat echolocation allows me to do exactly that. In my daily life as a PhD student I handle animals, signal processing, thermal cameras and use lots of Python code to glue them all together. I am especially interested in interdisciplinary approaches to answer questions.

Education:

2015 – present: PhD investigating how echolocating bats are able to cope with acoustically difficult situations. I use a combination of theoretical and experimental approaches to tackle this question. Supervisor: Dr. Holger Goerlitz, Acoustic and Functional Ecology Group, Max Planck Institute for Ornithology, Seewiesen.

2008-2013: BS-MS dual degree in Biological Sciences, Indian Institute of Science Education and Research, Thiruvananthapuram (IISER-TVM) (CGPA: 8.09/10).

Masters Thesis in the School of Biology: *Task differentiation during prey capture and retreat-mate recognition in the Indian social spider, Stegodyphus sarasinorum (Eresidae)*. Supervisor: Dr. Hema Somanathan

Minor project in the School of Physics: *In silico modelling of auxin driven phyllotaxis.* Supervisor: Dr. Anil Shaji

Technical Skillsets	Other Competencies
- Acoustic and video tracking of animals - Design, execution and analysis of bioacoustics and animal behaviour experiments - Signal analysis, image analysis and digital data acquisition methods - Writing readable and reproducible software - Coding in order of proficiency: Python, R, MATLAB (Github page) - Familiarity with machine learning methods - Use of Google Cloud Platform to run scientific simulations	- Scientific manuscript and grant writing - Presentation and and communication of scientific results and concepts - Can work in independent and collaborative situations - Ability to work in interdisciplinary environments - Project management along with supervision and training of students - Field expedition management and planning

Languages I speak (self-assesed CEFR level)

- English (C2), German (B1-B2), Kannada (B1), Hindi (B1), Bahasa Indonesia (A2)

Scholarships/Grants awarded:

- **August 2019: Google Cloud Platform Research Credits award**: a $1000 grant that provides access to Google's cloud computing facilities to execute and analyse data from the simulations in Beleyur & Goerlitz 2019.
- **September 2015-August 2019: DAAD PhD scholarship:** awarded a scholarship to pursue PhD studies at the Max Planck Institute for Ornithology, Seewisen by the German Academic Exchange Service (DAAD).
- **August 2008-August 2013: KVPY scholarship**: awarded a scholarship to pursue my BS-MS dual degree by the Government of India.

Publications: (Google Scholar page)

- *'Modelling active sensing reveals echo detection even in large groups of bats',* Thejasvi Beleyur, Holger R. Goerlitz, 2019, Proceedings of the National Academy of Sciences
- '*Robust self-calibration of constant offset time-difference-of-arrival*', Kenneth Batstone , Gabriel Flood , Thejasvi Beleyur , Viktor Larsson , Holger R. Goerlitz , Magnus Oskarsson , Kalle Åström,

2019, conference proceeding at International Conference on Acoustics, Speech, and Signal Processing
- '*Geospatial modelling inside the „Orlova Chuka" cave in Bulgaria'*, 2018*, Asparuh Kamburov, Holger R. Goerlitz, Thejasvi Beleyur,* published conference proceedings in International Symposium On Modern Technologies, Education And Professional Practice In Geodesy And Related Fields *(non-peer-reviewed)* (Link to a flythrough video using the data)
- '*Long-term behavioural consistency in prey capture but not in web maintenance in a social spider'*, Thejasvi Beleyur, Divya U. Bellur, Hema Somanathan, 2015, Behavioural Ecology and Sociobiology
- '*A mathematical basis for plant patterning derived from physico-chemical phenomena'*, Thejasvi Beleyur, Abdul Kareem, Anil Shaji, Kalika Prasad, 2013, BioEssays

Manuscripts in Preparation

- '*The architecture, dynamics and silk investment in social spider webs'*, Thejasvi Beleyur, Divya Uma, Hema Somanathan, Tejas G. Murthy

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Coding and machine-learning related work (Github page):

Over the course of my PhD I have been building my skills in writing reproducible code by implementing practices from the software industry such as version control, unit-testing and following language conventions. This is a selection of the projects in Python I've been working on over the past four years.

Research-related projects:

- The cocktail party nightmare: Reproducible code for Beleyur & Goerlitz 2019, PNAS. This is my first formal attempt at trying to make *every* step of the research involving a computer (simulations, playbacks and data analysis) as reproducible and transparent as possible.
- trajectory-assigner (under development): With the *Uschichka* dataset, everytime a bat flies in the recording volume two trajectories are obtained, one from the video tracking and one from the audio tracking. The trajectory-assigner is a tool which allows a user to manually pair an audio and video trajectory to a single bat.

Machine-learning projects:

- bat call detection and segmentation: this repo has code and Jupyter notebooks of my experiments with neural networks using synthetic data mimicking bat calls to understand their capabilities. This repo has notebooks and code for two separate projects which handle bat call detection (presence/absence) and spectrogram segmentation in audio recordings.
- CF call classifier: This repo has my (failed) attempts at making a multi-species audio classifier. I needed to classify which of three bat species were calling in an audio snippet, and predict if there was a single or multiple individuals of each species. Working on this problem in particular

taught me how it may be easy to get high accuracy predictions while using synthetic data, but real-life performance often differs dramatically.

In-house talks and workshops given on software and coding practices: Having realised how powerful Python, version control and self-documented code are, I have shared my experience and knowledge with my peers in the form of short talks/workshops at the grad school and institute:

- '*Version Control for Organismal Biologists*': An introductory workshop on why one should use version control and how to do so with the Git software. (3 workshops given so far)
- '*Python for Organismal Biologists*': An introductory workshop on the merits of using Python for scientific computing with example code and Jupyter notebooks that participants run parallel to the instruction. (2 workshops given so far)

Public outreach:

My German is good enough to allow me to have semi-technical conversations that convey my enthusiasm for bats and the technology and techniques we use while studying them! I use the various opportunities that come up in and around Munich to talk with members of the public:
- September 2018, 'Fledermausführung': I co-led a 'bat walk' session with a lab member for a group of school children and practised science communication in German, while talking about the biology, behaviour and study techniques related to bats.
- January 2017, Thermal camera exhibit BIOTOPIA inauguration ceremony: I had an exhibit showing a live feed of a single thermal camera as people walked by and explaining how it works and how we use them in our research studying bats in the dark.
- July 2017, Tag der Oeffenen Tuer, Open day at the Max Planck Institute for Ornithology, Seewiesen: I was part of an exhibit showcasing various aspects of bat biology and echolocation.
- June 2017, BIOTOPIA Stadtteilfest: I was in charge of explaining various exhibits highlighting animal and plant form and variety as part of the one-day event to increase public attention to upcoming BIOTOPIA museum.

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