

### Coordination

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Participants: up to 35 students from engineering master's or diploma programmes at Thuringian universities. The Master Science Camp offers optimal opportunities for networking with other students and lecturers from Thuringian universities as well as with attractive companies and research institutions in the region.

The camp is aimed at anyone who would like to familiarise themselves with the interaction between different specialist disciplines on current issues relating to biodiversity monitoring. The team projects will focus on the fascinating world of bird song recognition. This includes the energy-saving recording of environmental data and bird populations. AI-supported signal analysis is used to recognise bird calls and visualise the results in a web-based format. The project groups also work on a question from current research and development tasks of our implementation partner NABU. The project work is carried out in fixed groups of approx. 5 students. Languages: German and English

**KICK-OFF:** Introduction, keynote and getting to know each other on 23.09.2024

**Methods:** Welcome, keynote, exchange to get to know each other

**Keynote 1:** Dr. Florian Römer (Fraunhofer Institute for Non-Destructive Testing):  
'Chat GPT - the AI for chatting - what distinguishes this form of artificial intelligence (AI) from AI used in data analysis? (AI - presentation of methods / state of the art).

## Biodiversity and monitoring :

- (a) Participants understand the importance and methods of biodiversity monitoring and how current technologies can support this.

**Methods:** Introductory lecture, study of specialised literature with list of recommendations provided, discussion rounds, guided hike/excursion

- (b) Participants learn about research projects and applications in this context.

**Methods:** Introductory lecture and discussion round with the Flora-Incognita team, practical testing of various apps for monitoring flora and fauna.

## Team-PROJECT

- (a) In their project group, the participants develop a monitoring system for recording bird calls and relevant environmental data. Energy-saving components and technologies are to be used to record and transmit the sensor signals. AI-supported signal analysis will be used to recognise the bird calls and the results will be visualised on the web.
- (b) Furthermore, the project groups work on a question from current research and development tasks of our implementation partner NABU. The following topics are available for selection:

Bird Crash Protection: Conception and discussion of suitable structural measures for bird protection (protection against bird strikes on glass panes). The resulting concepts are intended to supplement the recommendations of the NABU working group

Bird Fly Monitoring: Conception and discussion of optimisations to the technical setup for recording and transmitting data to describe bird flight paths using bird song recognition. The basis is a setup that is currently being used near the Thuringian Landesternwarte Tautenburg near Jena. The concepts developed can be incorporated into the construction of further observation stations in the future.

Bird Fly Analyse: Comprehensive audio data is available from an observation station near the Thuringian State Observatory in Tautenburg near Jena. The aim is to make statements about which bird species (flocks) used the flight route via the observation station in which periods of time. The voices/communication of birds during their migration (long-distance journeys) differ significantly from communication during other phases of their lives. Currently available models for the automated analysis of this data material have therefore not yet delivered any useful results.

The task is to design/implement (partial) solutions for the automatic evaluation of the data, to support the training of a suitable AI model or for the appropriate visualisation of processed data. The results should support future research work on this topic.

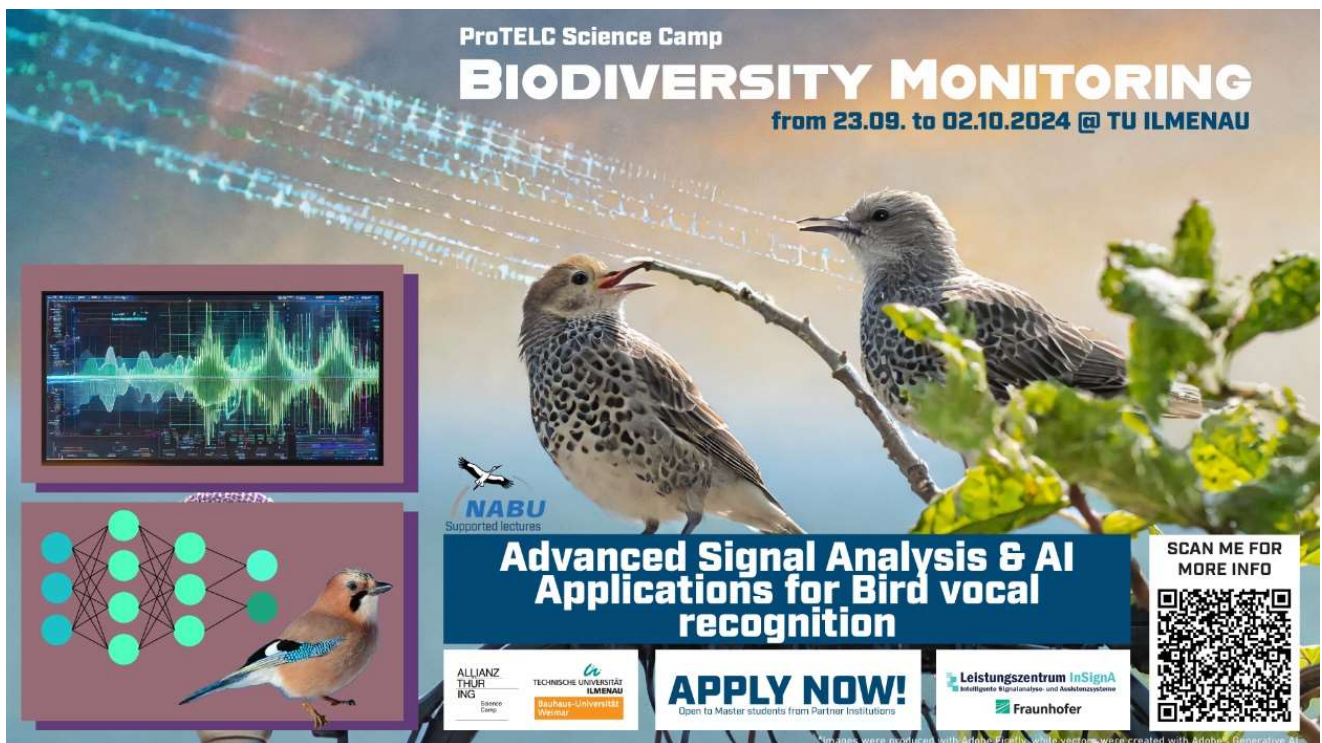
**Methods:** Project work. Technical inputs on the topics of audio signal analysis, methods of AI-supported signal analysis, IoT and data transmission, web-based visualisation. Use of labo-re/workshops. If required, expert consultations, tutorials and tutorial support on the topics: Sensors, efficient energy supply, electronic assemblies and circuits, construction, mechanical production and tool controls, 3D printing, programming, handling special tools. In the final presentations, the concepts developed, test set-ups and experiments carried out are presented and critically evaluated and potentials for concrete use are discussed.

■ Networking with students and teachers at Thuringian universities and with attractive companies and research institutions in the region ■

- (a) Excursion to the 'Erfurt Cross' on 26 September 2024 (Fraunhofer Institute for Ceramic Technologies and Systems (IKTS), Contemporary Amperex Technology Thuringia GmbH (CATL)),
- (b) Excursion on 30 September 2024 to the Fraunhofer Institute of Optronics, System Technologies and Image Exploitation - Applied Systems Engineering (IOSB-AST).
- (c) Barbecue evening: Science Talk-Career Talk on 26.9.2024 with representatives of the InSignA performance centre and others.
- (d) Walks and use of other optional leisure activities, for example at KLEINOD Ilmenau, the Ilmenau student clubs or the cinema.
- (e) + possibly, presentations/discussion rounds with other interesting players.

■ Completion on 2 October 2024 (morning) ■

- (a) Keynotes 'Concepts of the future': innovative research projects, corporate concepts,
- (b) Final presentations: Presentation and discussion of the results (with guests!),
- (c) Conclusion (evaluation and reflection).



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**Advanced Signal Analysis & AI Applications for Bird vocal recognition**

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Images were produced with Adobe Firefly, while vectors were created with Adobe Generative AI.