

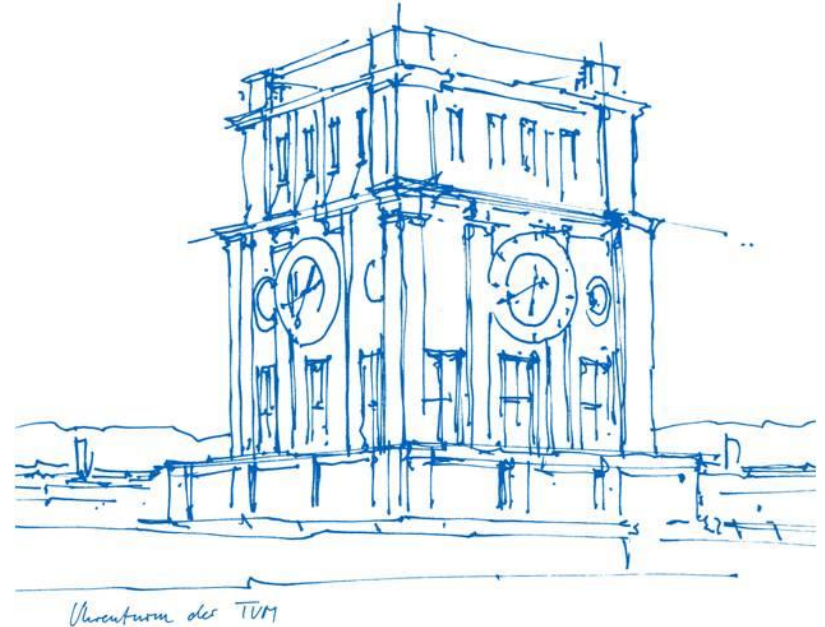
# Idea Presentation

Ahmed Kaddah, Marlon Müller, Shao Jie Hu Chen

Edge Computing and the Internet of Things

Technische Universität München

München, 03.11.2023



# Objectives and Motivation

## Objectives

- Microcontrollers equipped with microphones for recording bird calls
- Local classification (e.g. of native species) using deep learning
- Aggregated statistics accessible to researchers, hikers etc.

## Motivation

- Automation enables efficient data collection, reduced human intervention and real-time monitoring
- Essential for accurately studying bird populations, behaviours, migration patterns, and general ecosystem health
- Casual interest: tourism, hiking ...

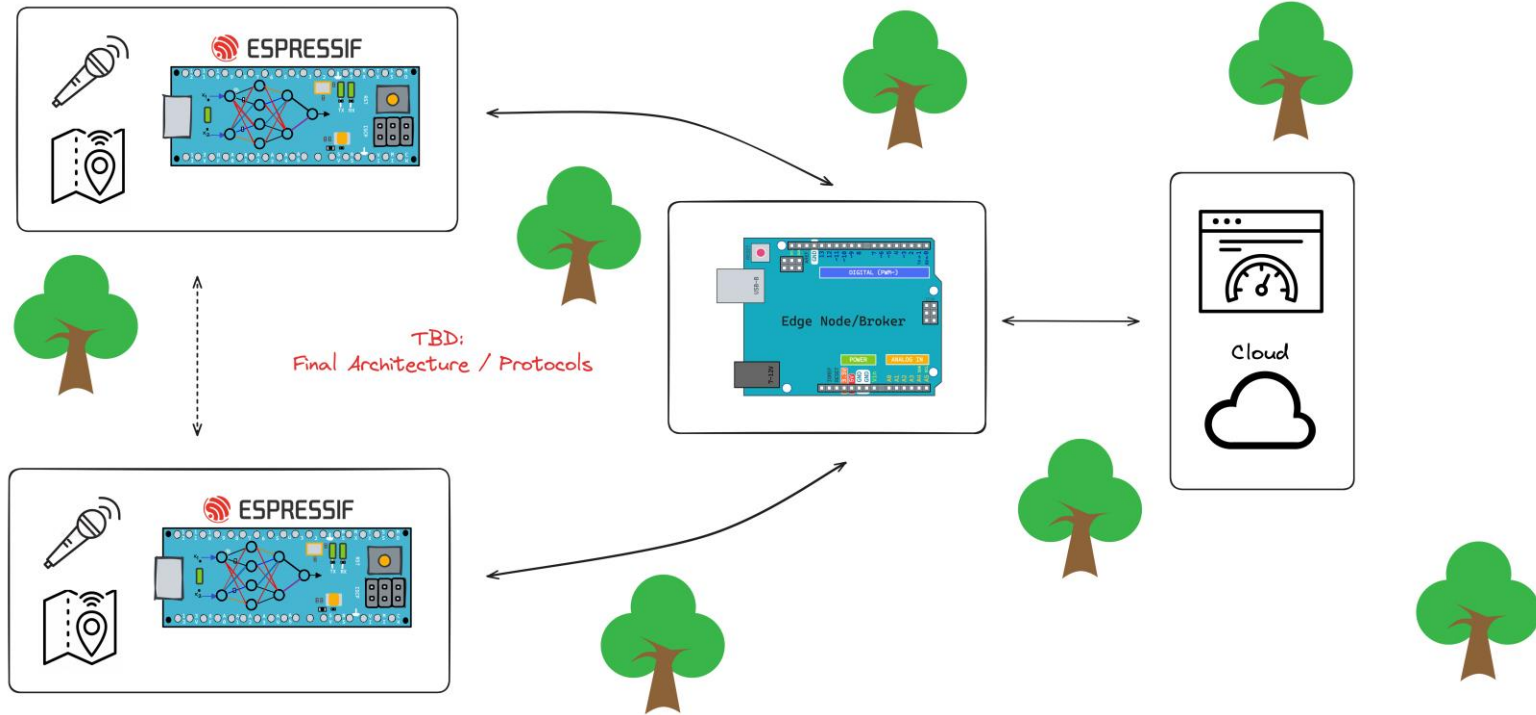


# Requirement Analysis

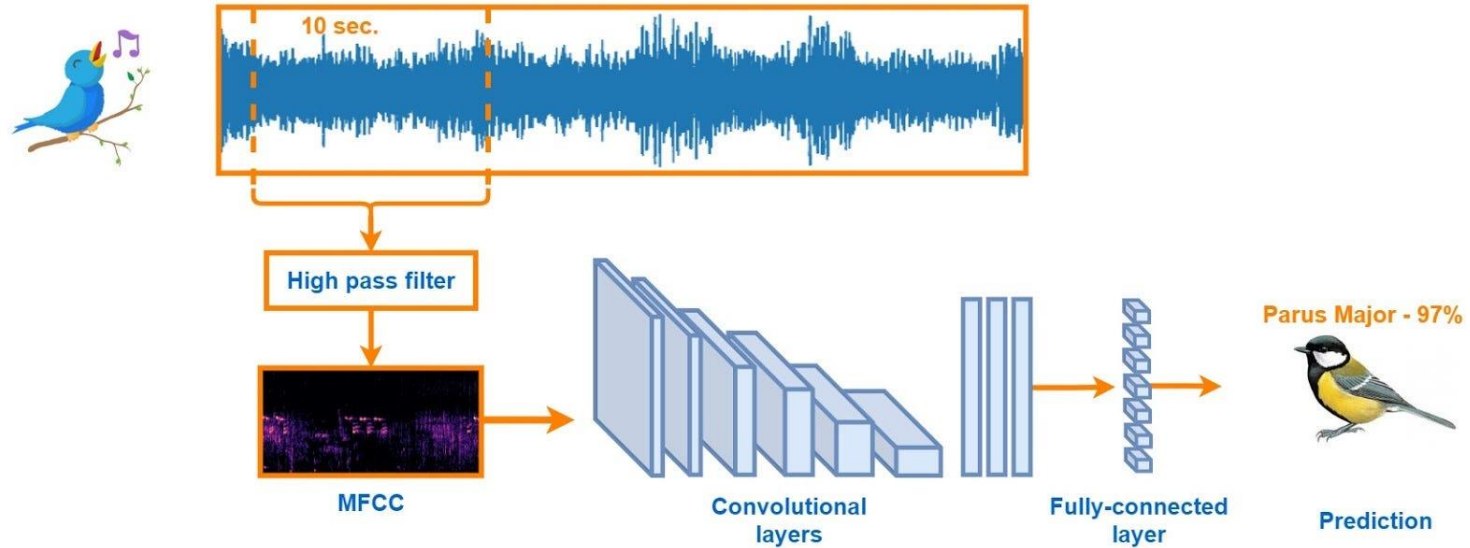
- Requires local / edge computing to minimize data transmission
- Requires ability to scale for large-scale data collection
- Requires energy-efficient operation due to remote deployment
- Requires embedded and low-level development
- Requires the utilization of sensors and actuators



# (Initial) Architecture



# Bioacoustic Classification



Kortas M. and MikołajczykA., SOUND-BASED BIRD CLASSIFICATION, Towards Data Science, 2020

# Datasets

## Available data,

- often crowdsourced (bias!)
- may include environment noise
- typically tailored to location or species

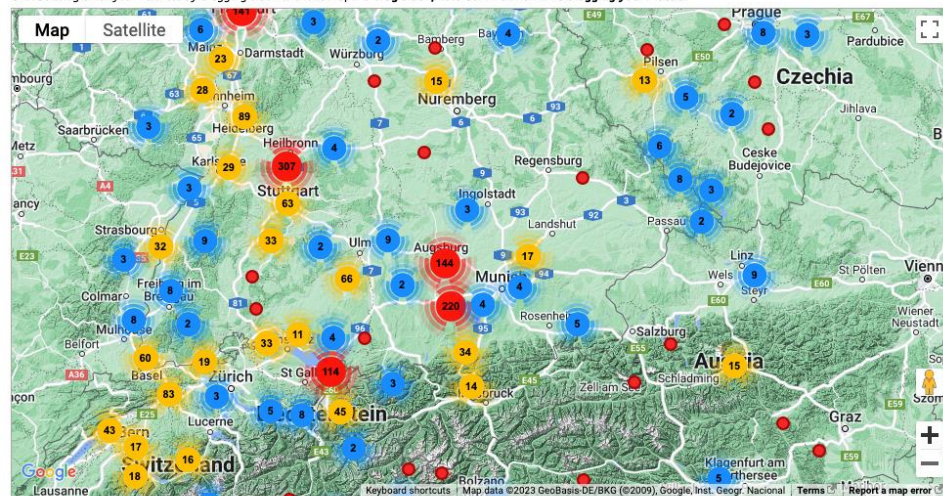
## Examples

- **Xeno-canto (global, crowdsourced)**
- Cornell Lab of Ornithology
- Macaulay Library
- Chernobyl PolandNFC

...

### Browse by Region

Choose a region of your interest by dragging a box over the map. To drag a box, hold down 'Shift' while dragging your mouse.



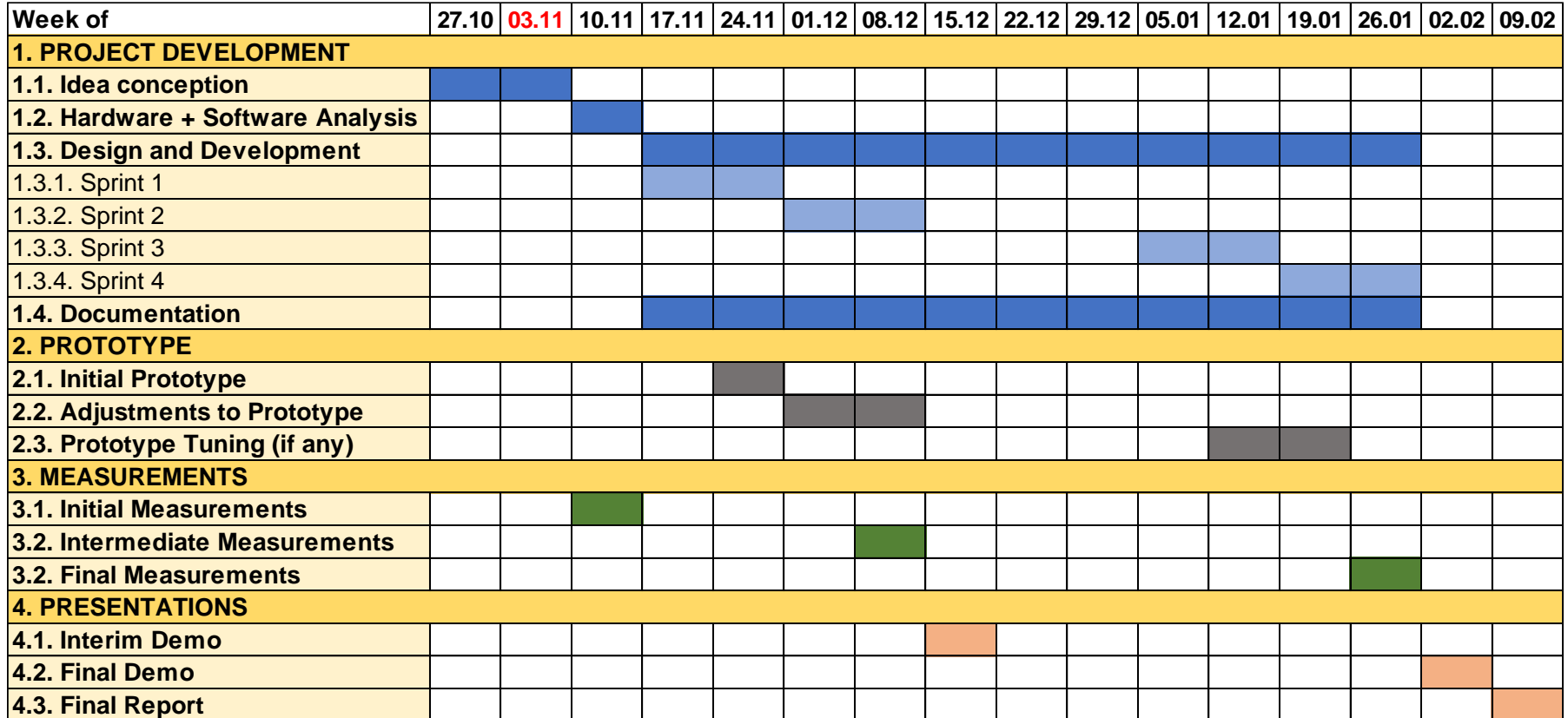
Filter results...

Filter results

23968 Recordings from 348 species (only the first 2000 recordings are shown on the map) found in the selected region

Xeno-canto

# Gantt Chart



# Goals (before Christmas)

## Now

- Initial measurements (e.g., CNN size), literature research and architecture design
- Analyse the hardware requirements (RAM, electricity, compatibility, etc.)
- Analyse the software requirements (languages to use, testing methods, etc.)

## Sprint 1

- Develop components in isolation (including tests)
- Craft preliminary version of the project prototype

## Sprint 2

- Integrate the components (including tests)
- Assemble a fully functional prototype of project (including performance measurements)
- (Construct a rudimentary website)



# Goals (after Christmas)

## **Sprint 3**

- Troubleshoot and rectify any issues
- Add non-essential features (including tests)
- Cloud connection
- Finalize website / API

## **Sprint 4**

- Finetuning
- Perform final measurements and in-depth analysis

