

Project proposal :

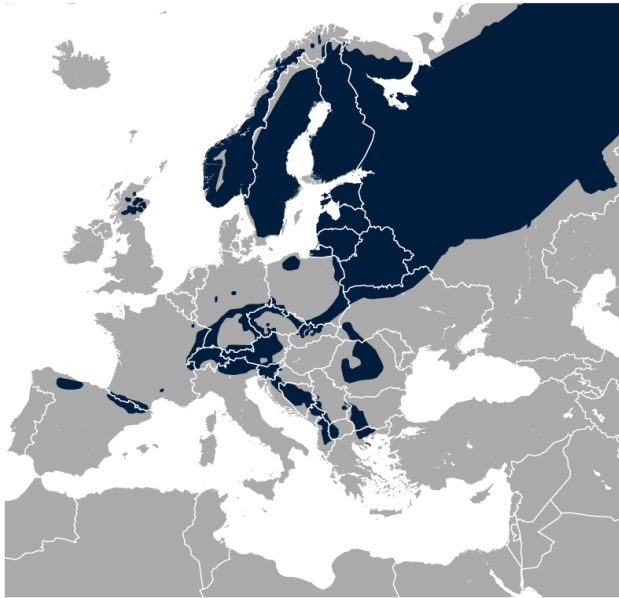
Multimodal Data Analysis for Individual Western Capercaillie Identification and Differentiation



1. Male Western Capercaillie

Introduction :

The [Western Capercaillie](#) (Tetrao Urogallus) is a bird belonging to the order [Galliformes](#), found across much of Europe, including France and Norway. While its global population is not currently at risk, certain subspecies face significant threats. This is due to the destruction of its natural habitat, territorial fragmentation, hunting, and other human activities. In some areas, particularly in the mountain ranges of Spain, Scotland, and France, these birds are at risk of extinction.



2. Western Capercaillie distribution across Europe

Monitoring and conservation efforts are underway in some of those regions where the number of individuals could sometimes be counted in the hundreds.

Context :

Given the limited genetic pool in isolated mountain valleys, monitoring breeding grounds for new arrivals from other areas is crucial. However, differentiating between individual birds can be hard, especially considering the harsh environmental conditions and the efforts made to reduce impacts on the birds' life. Current methods rely on specialists using binoculars to look at breeding grounds from a distance.

Objectiv :

The primary objective of this project is to develop a non-intrusive tool that enables the differentiation of individual Capercaillies in their breeding grounds. This tool should minimize disruption to the birds and reduce the workload on trained specialists. Additionally, it should remain cost-effective for local conservation operations.

Proposed Solution :

Long and short range cameras and microphones are often used in animal monitoring. An AI could then be used to compare 2 footage and recognise the same individuals or the arrival of a new one. As combining the two types of available information could yield better results, a multimodal data analysis should be tried.

Tools Proposal :

The neural network library I chose is PyTorch. PyTorch and TensorFlow are the leading frameworks for customizing neural network layers without starting from scratch. PyTorch is increasingly favored in the AI community due to its user-friendly interface and dynamic computation graph, which facilitate experimentation and rapid development. TensorFlow, while powerful and widely used in production settings, can be more complex for initial development.

For the training datasets, I found a database containing 21 recordings of Western Capercaillie with the time and place of the footage. I will also be using youtube videos.

Otherwise, I will be using video editing softwares to split and add artifacts to the recordings. This will add more training material containing similar birds.

Process proposal :

1. **Dataset Creation:** Compile a dataset of videos featuring Western Capercaillie. This dataset will include pairs of recordings classified by the number of birds and the number of overlapping individuals.
2. **Pipeline Development:** Construct a processing pipeline using PyTorch to slice the recordings and format the audio and visual data for analysis by the neural network.
3. **Model Experimentation:** Experiment with convolutional neural network (CNN) configurations to determine the most effective architecture for our needs.
4. **Model Training:** Train the model to identify the number of Western Capercaillie in each recording and to detect overlapping individuals.

External sources :

PyTorch and it's documentation : <https://pytorch.org/>

Main Western Capercaillie recordings database :

<https://media.ebird.org/catalog?taxonCode=wescap1&mediaType=video>

Images and information on Western Capercaillie :

https://en.wikipedia.org/wiki/Western_Capercaillie