SCHOOL OF
COMPUTER SCIENCE

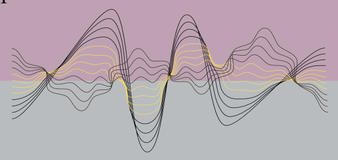
VOCAL FREQUENCY RECOGNITION OF JACOBIN CUCKOO

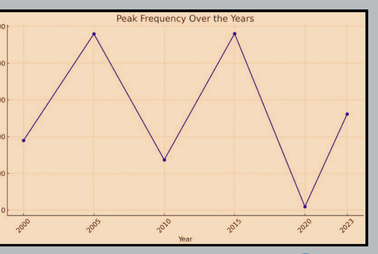
Presented by: Roshita, Somya, Mansha (Data sci. B1H,B3)

UPES

01. Abstract

The Jacobin Cuckoo, a migratory bird signaling the monsoon season in India, is facing potential threats. This project analyzes the features generated by spectrograms of the cuckoo's vocalizations, providing insights into its patterns and variations over times.





02. Project Statement

This project analyzes the vocalization patterns of the Jacobin Cuckoo by comparing features extracted from spectrograms for selected years between 2000 and 2024. The system enables users to visualize dynamic and static spectrogram features and identifies variations in the bird's calls over time, contributing to a better understanding of its behavioral patterns.

03. Methodology

The STFT algorithm is particularly suitable for this project as it allows for efficient and real-time analysis of vocal frequency patterns, which is crucial for understanding how the Jacobin cuckoo's behaviour responds to environmental changes. The integration of machine learning models enhances the ability to identify subtle patterns in vocalizations that may correlate with climate factors, providing insights valuable for conservation efforts in the future.

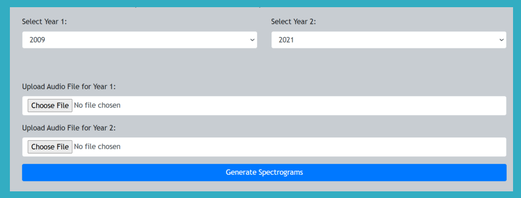
- Data collection
- Spectrogram generation and feature extraction
- Data analysis and visualization
- Reporting

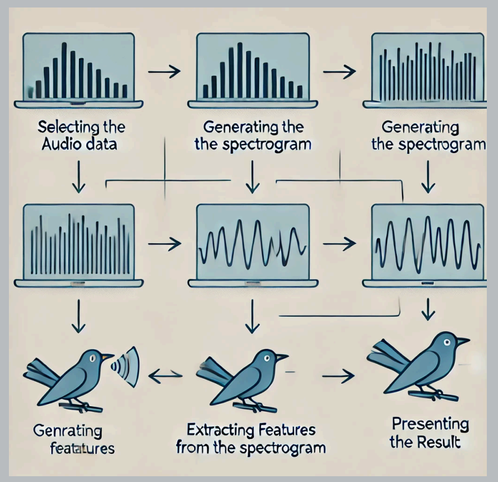
Related literature

- MFCC Flow (Tang et al., 2023)
- Spectrograms (Pahuja & Kumar, 2021)
- Chroma Features (Urbano et al., 2014)

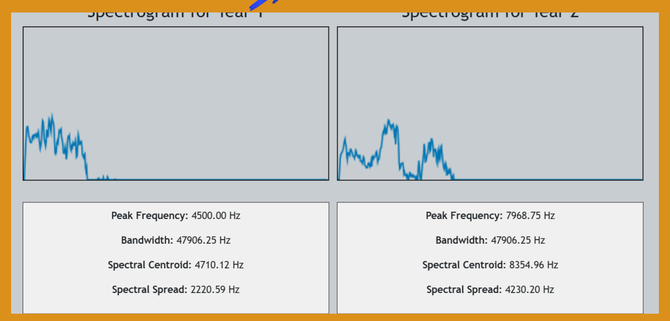
04. Findings

- **Vocal Frequency Patterns**: Analysis of Jacobin Cuckoo calls across years revealed distinct vocal frequency variations, offering insights into the bird's behavior and environmental conditions.
- **Effective Feature Extraction**: MFCC and spectrograms were effective in capturing unique vocal features, enabling accurate species identification.
- **Potential for Ecological Monitoring:** The project shows potential for broader ecological monitoring applications and conservation efforts.





05. Analysis



Static Features for Year 1

Mean Amplitude: 0.006

Peak Frequency: 32530.18 Hz

Bandwidth: 47999.96 Hz

Spectral Centroid: 21534.82 Hz

Spectral Spread: 12674.67 Hz

Static Features for Year 2

Mean Amplitude: 0.007

Peak Frequency: 10859.70 Hz

Bandwidth: 47999.96 Hz

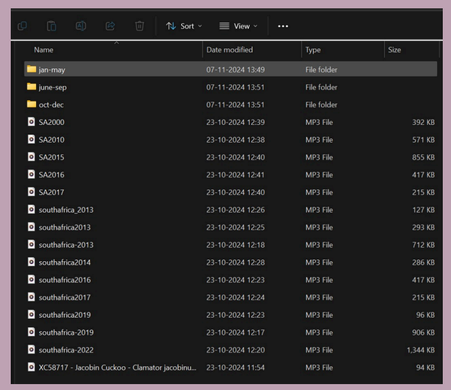
Spectral Centroid: 17017.60 Hz

Spectral Spread: 11716.87 Hz

Applications

- conservation effort
- ecological monitoring
- climate change research

Dataset



04. Future Directions

- **Incorporate additional bird species**: Expand the model to identify other bird species, enhancing its applicability to broader ecological studies.
- **Integrate weather data**: Integrate weather data to explore its influence on the vocal patterns of the Jacobin Cuckoo, allowing for a deeper understanding of migration triggers and behavior.
- **Enable data scaling and sharing**: Provide options for researchers to download the data and scale the model for broader applications in ecological monitoring.

06. Conclusion

The Jacobin Cuckoo's vocal frequency recognition project leverages machine learning and audio signal processing to enhance bird species identification. By analyzing spectrograms and extracting relevant features from the bird's calls, this system can detect subtle variations in vocal frequencies across different years, which is crucial for ecological monitoring. This approach not only aids in the identification and monitoring of the Jacobin Cuckoo but also serves as a foundation for future applications in bioacoustics and wildlife research.