AI-DRIVEN BIOACOUSTIC MAPPING OF THE PINK COCKATOO IN NORTHERN AUSTRALIA

Authors

Mahmudur Rahman (S383502) | Sayeed Anwar (S384116) |
Daniel Thomas Paulsuresh (S377929) | Shibbir Talukder Turag (S384112)

INTRODUCTION

The Pink Cockatoo (Lophochroa leadbeateri), also known as Major Mitchell's Cockatoo, is a culturally iconic species of Australia's arid zones. Their distinctive calls vary between regions — similar to human accents — and may reveal patterns of population structure and cultural learning.

This research explores how Artificial Intelligence (AI) can automatically detect and map these regional vocal dialects, providing a non-invasive method for monitoring biodiversity across the Northern Territory.

OBJECTIVE

- Detect and classify Pink Cockatoo vocal dialects using AI-driven models.
- Identify spatial and temporal patterns of calls across Northern Australia.
- Demonstrate how AI bioacoustics supports conservation and ecological monitoring.

METHODOLOGY

1. Data Collection:
 -Sourced around 700 bird call recordings from Xeno-Canto, eBird, and Macaulay Library.

2 .Preprocessing:
 -Converted recordings into 5-second audio clips; standardized and filtered (0.8–1.5 kHz).

3 .Feature Extraction:
 -Measured key acoustic traits — frequency, amplitude, bandwidth, and signal-to-noise ratio.

4.AI Modelling:
 -Applied in-built CNN & CRNN model on spectrogram classification. Used a Feedforward Neural Network (FNN) for numerical features.

5. Clustering & Mapping:
 -Conducted PCA and K-Means/HDBSCAN clustering to visualize dialect groups.
 -Mapped results to IBRA bioregions using GeoPandas.

RELATED LITERATURE

- BirdLife International (2022): Habitat fragmentation threatens Pink Cockatoos in eastern regions.
- Kahl et al. (2021): Deep learning models like BirdNET enable scalable avian monitoring.
- Laiolo (2010): Bioacoustics reveals cultural and ecological adaptation in wildlife.
- Wright (1996): Regional call dialects in parrots reflect social learning and population boundaries.

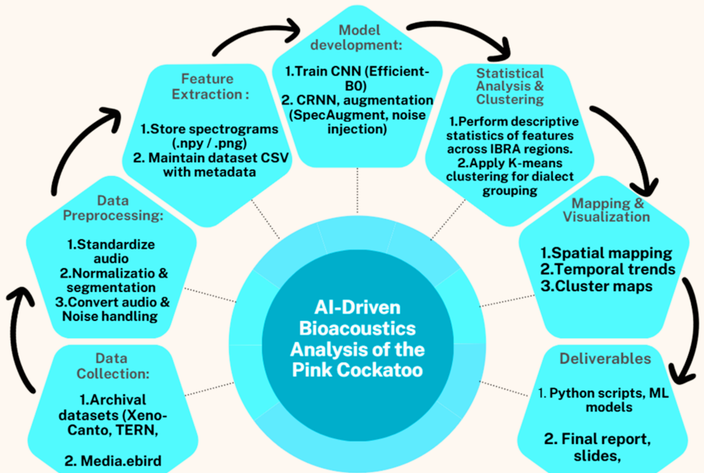

Figure 6. Process Map

ANALYSIS / RESULTS

Seasonal Patterns (Figure 1):
The seasonal distribution of Pink Cockatoo calls shows peak activity during Spring (n ≈ 250) and Autumn (n ≈ 205), as illustrated in *Figure 1*. These patterns align with breeding and social interaction periods, indicating higher vocal communication during these seasons.

Monthly Activity (Figure 2):
Figure 2 depicts the diel pattern of calling behaviour, with distinct peaks at dawn (06:00–08:00) and late afternoon (17:00–18:00) over the month by different regions. This pattern reflects typical parrot social routines — coordinating flock movement and maintaining group cohesion.

Dialect Clustering (Figure 3):
The *PCA scatter plot in Figure 3* reveals three distinct acoustic clusters, each corresponding to regional dialects. These clusters indicate that call features vary geographically, supporting the hypothesis of culturally learned vocal variations.

Regional Patterns in Acoustic Activity (Figure 4):
Distribution of recorded Pink Cockatoo calls across different Australian bioregions. Burt Plain and Central Ranges exhibited the highest number of vocal observations, suggesting greater acoustic activity or survey density in these regions.

Model Performance (Figure 5):
The figure 5 shows the model's ability to correctly classify Pink Cockatoo calls across different bioregions. Higher curves indicate stronger regional predictive performance, with Burt Plain and Mitchell Grass Downs achieving the highest AUC scores.

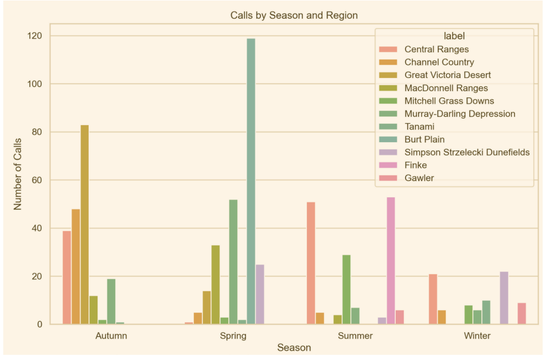

Figure 1. Seasonal Distribution of Pink Cockatoo Calls.

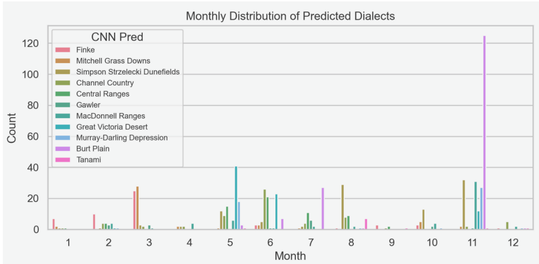

Figure 2. Monthly Distribution Of Predicted Dialects

Figure 3. Clustering of Pink Cockatoo Calls by Bioregions

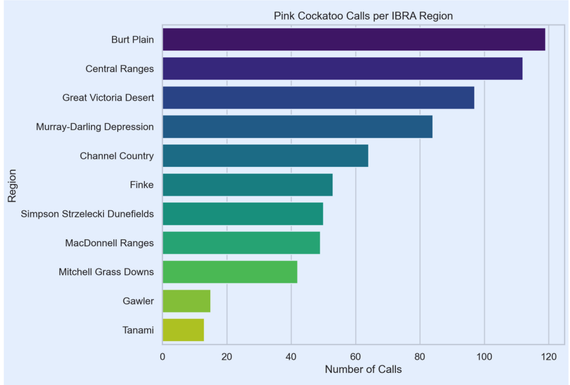

Figure 4. Pink Cockatoo Calls per IBRA Region

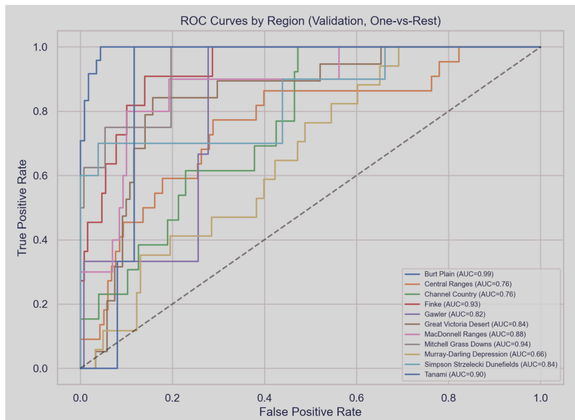

Figure 5. Predictive Performance of the Model Across NT Bioregions

FUTURE WORK

- Collect more recordings across seasons, habitats, and conditions.
- Adopt more advanced AI models in automated field devices to track calls continuously.

CONCLUSION

AI models successfully detect vocal dialect variations among Pink Cockatoos. These dialects correlate with geographic regions and seasonal activity, showing cultural-ecological links. The method proves AI-driven bioacoustics can provide scalable, non-invasive monitoring of wildlife populations.

REFERENCES

1. BIRDLIFE INTERNATIONAL (2022). LOPHOCHROA LEADBEATERI. THE IUCN RED LIST OF THREATENED SPECIES 2022.
2. BRADBURY, J. W., & BALSBY, T. J. (2016). THE FUNCTIONS OF VOCAL LEARNING IN PARROTS. BEHAVIORAL ECOLOGY AND SOCIOBIOLOGY, 70(3), 293–312.
3. CATCHPOLE, C. K., & SLATER, P. J. B. (2008). BIRD SONG: BIOLOGICAL THEMES AND VARIATIONS. CAMBRIDGE UNIVERSITY PRESS.

@PINK_COCKATOO_BIRDS