UPENN Aviary: Latent Space Analysis of Cowbird Song

INTRODUCTION

UPENN AVIARY

- Interdisciplinary lab with biologists and engineers
- Smart Aviary: 10 cameras and 24 microphones





Vision: Location and pose Map trajectories of individual birds



Sound: Detect and classify song Latent space analysis

Behavior: Individual and pairwise Social patterns and hierarchy

BACKGROUND RESEARCH

- Reading groups and deep dives
- Sainburg et al. [2]
- Developed projections for animal and human vocalizations and explored different neural structures to analyze them



OBJECTIVE

To model various vocalizations of individual cowbirds in a 2D latent space and use these projections to computationally analyze complex songs.

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RESULTS



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CONCLUSIONS

- Cowbird song was able to be projected in a 2D latent space model, with culsterizable elements
- Individual cowbirds' songs showed grouping,
- demonstrating there exists distinct elements to each
- Hands-off computational machine learning without *a priori* assumptions can analyze complex sound data

FUTURE DIRECTIONS

- Song as trajectories
- Clustering algorithms
- Automated song/individual classifier
- Deeper research into the axis of UMAP (using more labeled data)
- Incorporate visual tracking data Markov model of cowbird behaviors and interactions

REFERENCES

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 Coenen, Andy. "Understanding UMAP." *PAIR Page Redirection*, paircode.github.io/understanding-umap/.

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