BirdCLEF+ 2025 - Kaggle Competition

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1. Papers to Study

I plan to study the following two papers related to pattern detection in spatial data and machine learning techniques for acoustics and acoustics modeling.

1. Michael J. Bianco, Peter Gerstoft, James Traer, Emma Ozanich, Marie A. Roch, Sharon Gannot, Charles-Alban Deledalle. *Machine Learning in Acoustics: Theory and Applications*. https://arxiv.org/pdf/1905.04418
2. Hendrik Purwins, Bo Li, Tuomas Virtanen, Jan Schlüter, Shuo-yiin Chang, Tara Sainath. *Deep Learning for Audio Signal Processing*. https://arxiv.org/abs/1905.00078

2. Background and Motivation

The competition aims at Species identification from audio, focused on birds, amphibians, mammals and insects from the Middle Magdalena Valley of Colombia. Habitat-diverse species serve as valuable indicators of biodiversity change, as shifts in their assemblages and population dynamics can signal success of failure of ecological restoration efforts.

For the competition we would be applying machine-learning expertise combined with passive acoustic monitoring to identity under-studied species based on acoustic signatures. This will help me explore machine learning algorithms in the domain of acoustics. The project will also need to process continuous audio data and recognize species from different taxonomic groups.

The broader goals for this Kaggle competition include:
(1) Identify species of different taxonomic groups in the Middle Magdalena Valley of Colombia/El Silencio Natural Reserve in soundscape data.
(2) Train machine learning models with very limited amounts of training samples for rare and endangered species.
(3) Enhance machine learning models with unlabeled data for improving detection/classification.

3. Importance of the Papers

Machine Learning in Acoustics: Theory and Applications: This paper talks about the ML techniques that can be applied in acoustics. It shows the challenges and potential solutions when applying these techniques.

Deep Learning for Audio Signal Processing: The paper talks about audio recognition and machine learning techniques that can be utilized for the task.

4. Datasets

- **BirdCLEF+ 2025 Kaggle competition dataset:** Species identification from audio, focused on birds, amphibians, mammals and insects from the Middle Magdalena Valley of Colombia. https://www.kaggle.com/competitions/birdclef-2025/data

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