1 Introduction

Why rainfall detection in audio data?

What are the downstream implications of this work?

(1) Advancements in preprocessing, detection and classification techniques for eco acoustic data: A comprehensive review for large-scale Passive Acoustic Monitoring [5]
(2) To remove noisy recordings, we found that authors use automatic classification methods to identify saturation in the Power Spectrum Density or changes in acoustic indices of audios, such as in, where a threshold-based approach using Multi-Layer Perceptron with Acoustic Indices and MFCCs for rain detection is presented. [6]
(3) Scalable preprocessing of high volume environmental acoustic data for bioacoustic monitoring [9]

What is your new approach that you want to apply?

I want to use supervised deep learning methods, so I will answer from other areas.

Where are you inspired from?

Deep learning has been used in topics closely related to this but not directly in this area. Cite

(1) accurate estimate of rainfall levels [1]
(2) Rainfall detection in underwater noise [2]
(3) Did similar work but using CNN and rain gauge [8]
(4) To detect wind using pre-trained CNN [10]

The contribution of this research includes

(1) Use of advanced deep learning methods for classification.
(2) Using the model to extract the part of recording which includes rain.
(3) Classify recordings into no-rain, light-rain, heavy rain.
(4) Comparison between traditional ML and current DL methods

2 Related Work

Think about doing a comparative study :) - figure out how.

(1) hardRain: an R package for quick, automated rainfall detection in ecoacoustic datasets using a 1 threshold-based approach [3]
(2) Detection of Rain in Acoustic Recordings of the Environment: Traditional ML methods [4]
(3) Automatic identification of rainfall in acoustic recordings [7]
(4) Principal component analysis and linear discriminant analysis [11]
(5) Using acoustic indices [12]
(6) Using acoustic indices and Mel Frequency Cepstral Coefficients (MFCCs) as acoustic features to detect these noise sources [13]

Feature extraction is an important step. Write about reviews with different features.
environmental sound source classification, little research has been done for rain classification.

(1) novel feature extraction method that uses a matching pursuit (MP) algorithm. combining MFCCs and MP-based features [Chu et al]
(2) Barkana et al. [7] explored the classification of a limited number of environmental sound sources, including those produced by engines, restaurants, and rain. They proposed a new feature extraction technique based on the fundamental frequency (pitch) of the sound.

They evaluate five features intended to describe rain in audio recordings:

- Acoustic entropy (H) for which we calculated spectral and temporal entropy (Hf, Ht) respectively,
- Acoustic complexity index (ACI),
- background noise (BgN) and
- spectral cover (SC),

which have been used for environmental monitoring but not extensively applied and evaluated for rain detection and classification.
Also they do both classification and regression analysis using traditional ML methods

So I also will need to write what I am using.

3 Methods

3.1 Dataset description
Describe the diverse dataset that you plan to use:

- The data that Flor collected
- Data from amazon? https://dataverse.ird.fr/dataset.xhtml?persistentId=doi:10.23708/I0QYNM
- Data from Gainforest

3.2 Preprocessing of Audio Recordings
3.3 Feature Selection/Extraction
3.4 Training

4 Results and Discussion

4.1 Binary Classification (rain/no-rain)
4.2 Multi-class Classification (no-rain/light-rain/heavy-rain)
4.3 Extraction from a 24-hour recording

5 Conclusion and Future work

6 References

[1] A Convolutional Neural Networks Approach to Audio Classification for Rainfall Estimation
[2] A Supervised Learning Approach for Rainfall Detection From Underwater Noise Analysis
[3] hardRain: an R package for quick, automated rainfall detection in ecoacoustic datasets using a 1 threshold-based approach
[4] Detection of Rain in Acoustic Recordings of the Environment
[5] Advancements in preprocessing, detection and classification techniques for ecoacoustic data: A comprehensive review for large-scale Passive Acoustic Monitoring
[6] Systematic review of machine learning methods applied to ecoacoustics and soundscape monitoring
[7] Automatic identification of rainfall in acoustic recordings
[8] An Innovative Acoustic Rain Gauge Based on Convolutional Neural Networks
[9] Scalable preprocessing of high volume environmental acoustic data for bioacoustic monitoring
[10] Windy events detection in big bioacoustics datasets using a pre-trained Convolutional Neural Network
[11] Listening for rain: Principal component analysis and linear discriminant analysis for broadband acoustic rainfall detection
[12] Ecoacoustics in the rain: understanding acoustic indices under the most common geophonic source in tropical rainforests
[13] Automatic Rain and Cicada Chorus Filtering of Bird Acoustic Data