A Review of Automated Bioacoustics and General Acoustics Classification Research

Type	Journal Article
Author	Leah Mutanu
Author	Jeet Gohil
Author	Khushi Gupta
Author	Perpetua Wagio
Author	Gerald Kotonya
Abstract	Automated bioacoustics classification has received increasing attention from the research community in recent years due its cross-disciplinary nature and its diverse application. Applications in bioacoustics classification range from smart acoustic sensor networks that investigate the effects of acoustic vocalizations on species to context-aware edge devices that anticipate changes in their environment adapt their sensing and processing accordingly. The research described here is an in-depth survey of the current state of bioacoustics classification and monitoring. The survey examines bioacoustics classification alongside general acoustics to provide a representative picture of the research landscape. The survey reviewed 124 studies spanning eight years of research. The survey identifies the key application areas in bioacoustics research and the techniques used in audio transformation and feature extraction. The survey also examines the classification algorithms used in bioacoustics systems. Lastly, the survey examines current challenges, possible opportunities, and future directions in bioacoustics.
Date	2022-10-31
Language	en
Library Catalog	DOI.org (Crossref)
URL	https://www.mdpi.com/1424-8220/22/21/8361
Accessed	17/11/2022, 11:41:07 am
Volume	22
Pages	8361
Publication	Sensors
DOI	10.3390/s22218361
Issue	21
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ISSN	1424-8220
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- Mutanu et al. - 2022 - A Review of Automated Bioacoustics and General Aco.pdf

Audio classification and content description

Type Journal Article
Author Tobias Andersson
Language en
Library Catalog Zotero
Pages 63
Date Added 17/11/2022, 11:40:52 am
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Attachments

- Andersson - Audio classification and content description.pdf

Audio classification using braided convolutional neural networks

Type Journal Article
Author Harsh Sinha
Author Vinayak Awasthi
Author Pawan K. Ajmera
Abstract Convolutional neural networks (CNNs) work surprisingly well and have helped drastically enhance the state-of-the-art techniques in the domain of image classification. The unprecedented success motivated the application of CNNs to the domain of auditory data. Recent publications suggest hidden Markov models and deep neural networks for audio classification. This study aims to achieve audio classification by representing audio as spectrogram images and then use a CNN-based architecture for classification. This study presents an innovative strategy for a CNN-based neural architecture that learns a sparse representation imitating the receptive neurons in the primary auditory cortex in mammals. The feasibility of the proposed CNN-based neural architecture is assessed for audio classification tasks on standard benchmark datasets such as Google Speech Commands datasets (GSCv1 and GSCv2) and the UrbanSound8K dataset (US8K). The proposed CNN architecture, referred to as braided convolutional neural network, achieves 97.15, 95 and 91.9% average recognition accuracy on GSCv1, GSCv2 and US8 K datasets, respectively, outperforming other deep learning architectures.
Date 09/2020
Language en
Library Catalog DOI.org (Crossref)
URL https://onlinelibrary.wiley.com/doi/10.1049/iet-spr.2019.0381
Accessed 17/11/2022, 11:40:56 am
Volume 14
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Publication IET Signal Processing

DOI 10.1049/iet-spr.2019.0381
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ISSN 1751-9675, 1751-9683
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- Sinha et al. - 2020 - Audio classification using braided convolutional n.pdf

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Bioacoustic classification of avian calls from raw sound waveforms with an open-source deep learning architecture

Type Journal Article
Author Francisco J. Bravo Sanchez
Author Md Rahat Hossain
Author Nathan B. English
Author Steven T. Moore
Abstract Abstract The use of autonomous recordings of animal sounds to detect species is a popular conservation tool, constantly improving in fidelity as audio hardware and software evolves. Current classification algorithms utilise sound features extracted from the recording rather than the sound itself, with varying degrees of success. Neural networks that learn directly from the raw sound waveforms have been implemented in human speech recognition but the requirements of detailed labelled data have limited their use in bioacoustics. Here we test SincNet, an efficient neural network architecture that learns from the raw waveform using sinc-based filters. Results using an off-the-shelf implementation of SincNet on a publicly available bird sound dataset (NIPS4Bplus) show that the neural network rapidly converged reaching accuracies of over 65% with limited data. Their performance is comparable with traditional methods after hyperparameter tuning but they are more efficient. Learning directly from the raw waveform allows the algorithm to select automatically those elements of the sound that are best suited for the task, bypassing the onerous task of selecting feature extraction techniques and reducing possible biases. We use publicly released code and datasets to encourage others to replicate our results and to apply SincNet to their own datasets; and we review possible enhancements in the hope that algorithms that learn from the raw waveform will become useful bioacoustic tools.
Date 12/2021
Language en
Library Catalog DOI.org (Crossref)
URL https://www.nature.com/articles/s41598-021-95076-6
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Volume 11

Pages 15733
Publication Scientific Reports
DOI 10.1038/s41598-021-95076-6
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Journal Abbr Sci Rep
ISSN 2045-2322
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- Bravo Sanchez et al. - 2021 - Bioacoustic classification of avian calls from raw.pdf

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Type Attachment
Date Added 17/11/2022, 11:40:28 am
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Deep Learning Methods for Heart Sounds Classification: A Systematic Review

Type Journal Article
Author Wei Chen
Author Qiang Sun
Author Xiaomin Chen
Author Gangcai Xie
Author Huiqun Wu
Author Chen Xu
Abstract The automated classification of heart sounds plays a significant role in the diagnosis of cardiovascular diseases (CVDs). With the recent introduction of medical big data and artificial intelligence technology, there has been an increased focus on the development of deep learning approaches for heart sound classification. However, despite significant achievements in this field, there are still limitations due to insufficient data, inefficient training, and the unavailability of effective models. With the aim of improving the accuracy of heart sounds classification, an in-depth systematic review and an analysis of existing deep learning methods were performed in the present study, with an emphasis on the convolutional neural network (CNN) and recurrent neural network (RNN) methods developed over the last five years. This paper also discusses the challenges and expected future trends in the application of deep learning to heart sounds classification with the objective of providing an essential reference for further study.

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Language	en
Short Title	Deep Learning Methods for Heart Sounds Classification
Library Catalog	DOI.org (Crossref)
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Volume	23
Pages	667
Publication	Entropy
DOI	10.3390/e23060667
Issue	6
Journal Abbr	Entropy
ISSN	1099-4300
Date Added	17/11/2022, 11:40:47 am
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- Chen et al. - 2021 - Deep Learning Methods for Heart Sounds Classificat.pdf

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Deep learning-based system to predict cardiac arrhythmia using hybrid features of transform techniques

Type	Journal Article
Author	Santanu Sahoo
Author	Pratyusa Dash
Author	B.S.P. Mishra
Author	Sukanta Kumar Sabut
Abstract	An early and accurate detection of arrhythmias is essential reduce the mortality rate due to cardiac diseases. Manual screening of the electrocardiogram (ECG) signals are time consuming, strenuous, and liable to human errors. This article proposes a deep learning approach for automated detection of cardiac arrhythmia using RCG signals fro MIT-BIH database. Various decomposition techniques namely: discrete wavelet transform (DWT), empirical mode decomposition (EMD) and variational mode decomposition (VMD) are used to de-noise the ECG signal. The time-frequency based multi-domain features are extracted from the various coefficients of the subbands from de-noised signals. These obtained features are ranked based on Chi-squared test and particle swarm optimization (PSO) based methods to select the best informative features for better classification accu racy. The hybrid features was classified with deep neural network (DNN) with ten-fold cross validation strategy in classifying five types of ECG beats. The best results was obtained with an accuracy of 99.75% with less computational complexity of 0.14 s using Chi squared selection approach. Thus the proposed model can be

used in the hospitals set-up to automatically screen the abnormal ECG beats.

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Language en
Library Catalog DOI.org (Crossref)
URL https://linkinghub.elsevier.com/retrieve/pii/S2667305322000643
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Volume 16
Pages 200127
Publication Intelligent Systems with Applications
DOI 10.1016/j.iswa.2022.200127
Journal Abbr Intelligent Systems with Applications
ISSN 26673053
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- Sahoo et al. - 2022 - Deep learning-based system to predict cardiac arrh.pdf

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Environmental Sound Classification: A descriptive review of the literature

Type Journal Article
Author Anam Bansal
Author Naresh Kumar Garg
Abstract Automatic environmental sound classification (ESC) is one of the upcoming areas of research as most of the traditional studies are focused on speech and music signals. Classifying environmental sounds such as glass breaking, helicopter, baby crying and many more can aid in surveillance systems as well as criminal in vestigations. In this paper, a vast range of literature in the field of ESC is elucidated from various facets like preprocessing, feature extraction, and classification techniques. Researchers have used various noise removal and signal enhancement techniques to preprocess the signals. This paper explicates multitude of datasets used in recent studies along with the year of publication and maximum accuracy achieved with the dataset. Deep Neural Networks surpass the traditional machine learning classifiers. The future challenges and prospective research in this field are proposed. Since no recent review on ESC has been published, this study will open up novel ways for certain business applications and security systems.
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Language en
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Library Catalog DOI.org (Crossref)
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Volume	16
Pages	200115
Publication	Intelligent Systems with Applications
DOI	10.1016/j.iswa.2022.200115
Journal Abbr	Intelligent Systems with Applications
ISSN	26673053
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- Bansal and Garg - 2022 - Environmental Sound Classification A descriptive .pdf

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IRJET-V8I7704.pdf

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Robust Deep Learning Frameworks For Acoustic Scene and Respiratory Sound Classification

Type	Report
Author	Lam Dang Pha
Abstract	Although research on Acoustic Scene Classification (ASC) is very close to, or even overshadowed by different popular research areas known as Automatic Speech Recognition (ASR), Speaker Recognition (SR) or Image Processing (IP), this field potentially opens up several distinct and meaningful application areas based on environment context detection.The challenges of ASC mainly come from different noise resources, various sounds in real-world environments, occurring as single sounds, continuous sounds or overlapping sounds.In comparison to speech, sound scenes are more challenging mainly due to their being unstructured in form and closely similar to noise in certain contexts. Although a wide range of publications have focused on ASC recently, they show task-specific ways that either explore certain aspects of an ASC system or are evaluated on limited acoustic scene datasets. Therefore, the aim of this thesis is to contribute to the development of a robust framework to be applied for ASC, evaluated on various recently published datasets, and to achieve competitive performance compared to the state-of-the-art systems.
Date	2021-10-02
Language	en
Library Catalog	DOI.org (Crossref)
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Accessed	17/11/2022, 11:41:00 am
Extra	DOI: 10.31219/osf.io/d2tzb
Report Type	preprint
Institution	Open Science Framework
Date Added	17/11/2022, 11:41:00 am
Modified	17/11/2022, 11:41:00 am

Attachments

- Pha - 2021 - Robust Deep Learning Frameworks For Acoustic Scene.pdf

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Sound Classification and Processing of Urban Environments: A Systematic Literature Review

Type	Journal Article
Author	Ana Filipa Rodrigues Nogueira
Author	Hugo S. Oliveira
Author	José J. M. Machado
Author	João Manuel R. S. Tavares
Abstract	Audio recognition can be used in smart cities for security, surveillance, manufacturing, autonomous vehicles, and noise mitigation, just to name a few. However, urban sounds are everyday audio events that occur daily, presenting unstructured characteristics containing different genres of noise and sounds unrelated to the sound event under study, making it a challenging problem. Therefore, the main objective of this literature review is to summarize the most recent works on this subject to understand the current approaches and identify their limitations. Based on the reviewed articles, it can be realized that Deep Learning (DL) architectures, attention mechanisms, data augmentation techniques, and pretraining are the most crucial factors to consider while creating an efficient sound classification model. The best-found results were obtained by Mushtaq and Su, in 2020, using a DenseNet-161 with pretrained weights from ImageNet, and NA-1 and NA-2 as augmentation techniques, which were of 97.98%, 98.52%, and 99.22% for UrbanSound8K, ESC-50, and ESC-10 datasets, respectively. Nonetheless, the use of these models in real-world scenarios has not been properly addressed, so their effectiveness is still questionable in such situations.
Date	2022-11-08
Language	en
Short Title	Sound Classification and Processing of Urban Environments
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URL	https://www.mdpi.com/1424-8220/22/22/8608
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Volume	22
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DOI 10.3390/s22228608
Issue 22
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ISSN 1424-8220
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- Nogueira et al. - 2022 - Sound Classification and Processing of Urban Envir.pdf