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EXPLORING THE FEASIBILITY OF IDENTIFYING DIFFERENT AGAR MEDIUM THROUGH MORPHOLOGIES FOR IMAGE ANALYSIS USING COMPUTER VISION

Rationale/ Introduction

Agar is a tool for growing and isolating bacteria on a cultured dish in laboratories (Kamiya, 2023). An agar medium is used to isolate and culture bacteria needed for a study. General agar media are classified for a certain bacterium. Examples of general media are Nutrient Agar (NA), Eosin-Methylene Blue Agar (EMBA), Thiosulfate Citrate Bile Sucrose Agar (TCBS), etc. (Ruangpan, 2004). Despite having enough resources to classify different agar media, there is a weakness in terms of understanding precision and accuracy that may be associated with human error.

The Researchers aim to know if it is feasible to resolve this weakness by creating a process of neural networks trained by the samples given through training models of the images and specifications within the samples. This is to eliminate human judgment in analyzing the samples to achieve precision and accuracy with 95% confidence level.

The Researchers propose to build a detection algorithm in which new images of Agar Media can run through. The algorithm is based on the neural network after deep learning the datasets prepared by the Researchers. After running through the algorithm, it will identify the name of Agar Media, type of media, and what bacteria can be cultivated.

The potential impact of this study may benefit Microbiology professors, instructors, students, and enthusiasts as more accurate data will help them to achieve near-perfect analysis of the agar media and bacteria isolation. The potential impact may also reach in the Medicine field. With this study, Medical Technologist and Pharmacists may benefit from identifying medical-related issues and developing an antidote through accurate agar media identification. An example is Eaton's agar which can be used to culture mycoplasmas pneumonae, a pathogen that is responsible for respiratory diseases.

In bacteria isolation, an agar medium is used to cultivate and culture a certain bacterium. However, there are inconsistencies in identifying agar media that may contribute to human error. The Researcher aims to know if the study is feasible to identify different media with precision and accuracy. The study may benefit the people are concerned in the

field such as students and medical professionals as well.

Significance of the Study

The study is proposed to benefit the following:

Professors and Instructors. The study may benefit professors and instructors in the field of microbiology and medicine since guaranteeing feasibility of the study will guarantee correct data and education. The study also aligns with United Nation's Sustainable Goal 4.7.1 which ensuring teacher education (c) acquires knowledge and skills needed to promote sustainable development by 2030.

Medicine Professionals. The study may benefit medicine professionals, particularly Medical Technologists and Pharmacists to ensure precise media in culturing bacterium needed. This study also aligns with United Nation's Sustainable Goal 3.b which supports the research and development of medicines for diseases in progressive countries by 2030.

Students. The study may benefit students, particularly microbiology, medical technology, and pharmaceutical science students to ensure more accurate data if the study is proven feasible.

Future Researchers. The study may benefit future researchers as a basis of algorithm and neural networks that may not be accurate in the future as new agar media may be discovered to culture bacteria.

Scope and Limitations of the Study

The proposed method is developed using Python 3.14 because of its extensive neural network and audio libraries. The main library used will be the Librosa library. This is used to convert raw audio files into mel-spectrogram images. In addition to Librosa, libraries such as Torch, NumPy, Pandas, Sound File, Matplotlib, TQDM will be used.

In testing the performance of the proposed method, GTZAN, Ballroom, and a new dataset will be the datasets to be used in training, validating, and testing the model. The genres will only be Metal, Classical, Country, Pop, Jazz, Hip-Hop, Disco, Rock, Reggae, and Blues for GTZAN and the new dataset, and Jive, Quickstep, Tango, Viennese Waltz, Tango, Waltz, Samba, Rumba, and Cha Cha Cha for the Ballroom dataset.

This study only tackles ResNet as a type of Convolutional Neural Networks (CNN) and Long-Short Term Memory (LSTM) as a type of Recurrent Neural Network. Even though the subtypes of each deep learning model still may have the characteristics of its parent model, ResNet and LSTM are different in terms of their approaches compared to the standard model types.

This study only tackles the music genre classification through the development of Hybridized CRNN. The comparative of LSTM-CRNN and ResNet-CRNN is only done during the process of data gathering selection in which the two models, LSTM-CRNN and ResNet CRNN will be both compared and evaluated through precision, accuracy, recall, F1-Score, and confusion matrices in which the results will determine the better model to create the hybridized CRNN.

While creating a hybridized CRNN may improve the accuracy of identifying and tagging music genres correctly than a standard CRNN, this approach poses new difficulties such as training the model will take more time, validating the dataset will take more time, and testing the model will process more time. These difficulties would take more processing and computing power than usual due to the added layer in the working neural network model.

Additionally, testing different neural network models using both pre-trained and new dataset could limit the trained models of classification. This may not reflect the overlapping and derived music genres that are now getting more common in modern-day music. Although the new dataset can litigate for this limitation, the purpose of the new dataset is to validate and test the models in such a smaller dataset, hence not allowing the models to be less broad in other overlapping music genres

Objectives of the Study

General Objective:

This study is proposed to seek feasibility of computer-assisted identification of agar media through new neural networks will be developed with assistance of computer vision.

Specific Objective:

Specifically, it is proposed to:

1. Develop a neural network of datasets trained from the agar media samples;
2. Develop an image identification system through these neural networks to tailor new agar media image samples; and
3. Explore the feasibility of the proposed study.

Expected Outputs

The Researchers expect the result of the hypothesis whether the neural network developed are feasible for the development of an application for common and public use. The datasets developed may also serve as a reference point for future researchers if the future researchers need to argue with the result of this study.

References

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