UNIVERSITI TEKNOLOGI MARA

MUSICAL INSTRUMENT IDENTIFICATION USING CONVOLUTIONAL NEURAL NETWORK (CNN) ALGORITHM

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ABSTRACT

The motivation behind the project was to help automate the cumbersome task of validating instruments from images using Convolutional Neural Network (CNNs) algorithm to identify the musical instrument so that this task could be completed with higher accuracy. This approach tried to overcome the limitations of the manual method and traditional algorithm, which tends to fail with the diverse dataset, diverse visual features, and scalability. The methodology followed a structured three-phase process: The first stage was the collection of a dataset of 5,099 images of 30 different musical instruments of Kaggle, providing variable lighting, angles, or backgrounds, along with preprocessing to standardize the inputs. In the development phase, Convolutional Neural Network model was designed and trained using sophisticated techniques of data augmentation, dropping out and hyperparameter tuning under the supervised learning methodology to increase the performance of the system. Finally, the rigor of evaluation phase is carried out to evaluate the model utilizing precision, recall, F1 score, and the overall accuracy metrics which ascertained robustness and reliability for the model.

The key novelty of this approach is in using an advanced Convolutional Neural Networks architecture that can extract hierarchical features, and optimization techniques that help improve the model's generalization ability. Unlike previous projects, this project focused on adopting robustness by using diverse datasets and performing sophisticated preprocessing, so that its application can be extended into practice. Consistent refinement and validation were also conducted to ensure unbiased performance by using confusion matrices and cross validation. Important findings indicated that the model with high precision can classify instruments and its potential to be used in the musicology, educational and entertainment areas.

In conclusion, the project is as much about showing the potential use of Convolutional Neural Network algorithm in identifying musical instruments as setting out future developments. A major step forward to applying artificial intelligence to this task has been focused on scalability, accuracy, and adaptability.

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