

**IMPLEMENTATION OF CONVOLUTIONAL NEURAL
NETWORKS FOR MUSIC RHYTHM GENERATION
USING EEG TECHNOLOGY**

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DECLARATION

I declare that this is my own work and this thesis/dissertation does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any other University or Institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgment is made in the text. I retain the right to use this content in whole or part in future works (such as articles or books).

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The above candidate has carried out research for the PhD/MPhil/Masters thesis/dissertation under my supervision. I confirm that the declaration made above by the student is true and correct.

Name of Supervisor:

Signature of the Supervisor:

Date:

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ABSTRACT

Music plays a crucial role in human life, and musicians often require extensive training to transcribe their ideas into musical output. Brain Machine Interfaces for music applications have the potential to allow musicians to directly translate music into musical performances. Recent advancements in extracting musical data from brain responses to auditory stimuli and reconstructing music stimuli from brain signals show significant potential for this technology. In this research, we developed two Deep Convolutional Neural Network models: a regressor to predict Power Spectral Density values in music stimuli from EEG data, and a classifier to classify brain signals into musical chords matching the chromatic scale in Western music theory. The input for analysis was a continuous stream of brain waves from participants listening to naturalistic music. The evaluation metrics showed that the models performed reasonably well. However, further investigation is needed to improve the model's performance. The regression model indicated that the model explained 44.08% of the variance in the test data. The Pearson correlation coefficient suggested a significant positive linear relationship between actual and predicted values. The classification model achieved an overall accuracy of around 52% and a test loss of 2.04, suggesting that the model was not generalizing well to the validation set. The confusion matrix showed that the model made inaccurate predictions for some classes. Overall, the evaluation metrics suggest that the models have performed reasonably well, but there is still room for improvement in the accuracy of the obtained results. The study suggested future research directions to improve the models' performance, such as refining the signal processing and feature extraction methods, investigating the effect of different EEG recording parameters, and exploring the use of other neuroimaging models. This study concluded that there is great potential for further work in this area, and continued research and development could lead to significant advancements in the field of music generation using EEG technology.

Keywords: Electroencephalogram (EEG), Power Spectral Density (PSD), Convolutional Neural Network (CNN), Brain Computer Music Interface (BCMI)

TABLE OF CONTENTS

Declaration	i
Acknowledgement	ii
Abstract	iii
Table of Contents	iv
List of Figures	viii
List of Tables	ix
List of Abbreviations	x
List of Appendices	xi
Chapter 1	1
Introduction.....	1
1.1 Prolegomena.....	1
1.2 Objectives.....	3
1.3 Background and Motivation.....	3
1.4 Problem Definition.....	5
1.5 Approach of Music Rhythm Generation Model Development	5
1.6 System Requirement	6
1.7 Structure of the Thesis.....	6
1.8 Summary	7
Chapter 02.....	8
Literature Review on Music Rhythm Generation Using EEG Technology	8
2.1 Introduction	8
2.2 Overview of Music Generating Applications Using Brain Signals	8

2.3	Historical Approaches of Brain Computer Music Interfaces	10
2.4	A Review of Current Systems of Music Rhythm Generation Using EEG Technology	12
2.5	Challenges in Music Rhythm Generation Using EEG Technology	18
2.6	Future and Next Steps of Music Rhythm Generation Using EEG Technology	20
2.7	Summary of the Literature Analysis	21
2.8	Research Problem.....	25
2.9	Summary	26
Chapter 03		27
Technologies Adopted for Music Rhythm Generation Using EEG Technology		27
3.1	Introduction	27
3.2	Overview of Technologies Used in EEG based Music Rhythm Generation	27
3.3	Audio and EEG Signal Processing.....	29
3.3	Feature Extraction Techniques.....	30
3.4	Technologies Related to Convolutional Neural Network Modeling.....	31
3.5	Model Evaluation Methods	33
3.6	Summary	34
Chapter 04.....		35
A novel approach to Implement Convolutional Neural Networks For Music Rhythm Generation Using EEG Technology		35
4.1	Introduction	35
4.2	Hypothesis	35
4.3	Input	36
4.3.1	Dataset Description	37

4.3.2	Stimulus Information	38
4.4	Output.....	38
4.5	Process.....	38
4.6	Features	40
4.7	Users.....	41
4.8	Summary	41
Chapter 05	.....	42
Design	.....	42
5.1	Introduction	42
5.2	Data preprocessing	42
5.3	Feature Extraction	43
5.4	Model Architecture	44
5.5	Model Evaluation	47
5.6	Summary	48
Chapter 06	.....	49
Implementation	.....	49
6.1	Introduction	49
6.2	Data Preprocessing.....	49
6.3	Feature Extraction	52
6.4	Model Development.....	54
6.5	Summary	57
Chapter 07	.....	58
Evaluation	.....	58
7.1	Introduction	58
7.2	Model 1 Evaluation	58

7.3	Model 2 Evaluation	63
7.3	Comparison of Results with Other Research Models	65
7.4	Summary	66
Chapter 08.....		68
Conclusion and Future Works		68
8.1	Introduction	68
8.2	Conclusion.....	69
8.3	Future Works.....	71
8.4	Summary	72
Reference		74

LIST OF FIGURES

Figure	Description	Page
Figure 4.1	Process design diagram	40
Figure 6.1	The EEG signal for a single electrode and a single trial	50
Figure 6.2	EEG to PSD conversion for single electrode, epoch and trial	52
Figure 6.3	PSD conversion of a single music stimuli for a single frequency bin	53
Figure 7.1	Training and Validation Loss over Epochs for CNN Regression Model (Model 1)	59
Figure 7.2	Actual and Predicted PSD Values (Model 1)	60
Figure 7.3	Scatter Plot of Predicted vs Actual Values (Model 1)	61
Figure 7.4	Waveform conversion of actual and predicted values (Model 1)	62
Figure 7.5	Training and validation loss and accuracy (Model 2)	63
Figure 7.6	Confusion matrix for Model 2	64

LIST OF TABLES

Table	Description	Page
Table 2.1	Summary of literature review	21
Table 3.1	CNN layer types and their technological justification	31
Table 4.1	Stimulus information of wav files	38
Table 5.1	Stimulus information of wav files	43
Table 5.2	Model 1 architecture	46
Table 5.3	Model 2 architecture	47

LIST OF ABBREVIATIONS

Abbreviation	Description
EEG	Electroencephalogram
BCI	Brain Computer Interface
BCMI	Brain Computer Music Interface
PSD	Power Spectral Density
CNN	Convolutional Neural Network
SNR	Signal to Noise Ratio

LIST OF APPENDICES

Appendix	Description	Page
Appendix - A	Source code of model Architecture	62