



Title

A thesis submitted in partial fulfilment
of the requirements for the degree of
Bachelor of Science in Electronics Engineering

Department of Electronics Engineering
Faculty of Engineering
University of Santo Tomas

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Research Supervisor:

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Abstract

The abstract provides a concise summary of the project, highlighting its key objectives, methodologies, findings, and implications. It serves as a brief yet comprehensive overview, enabling readers to quickly grasp the essence of the work and its significance. (1) Include a brief introduction outlining the purpose and scope of the project. (2) Summarize the main objectives or research questions addressed in the project. (3) Describe the methodologies or approaches employed to investigate the objectives or address the research questions. (4) Highlight the key findings, results, or outcomes obtained through the research or project activities. (5) Discuss the implications, significance, or potential applications of the findings or outcomes in relevant fields or contexts. (6) Conclude with a statement emphasizing the contribution of the project to the existing body of knowledge and its relevance to stakeholders or interested parties.

[Optional: Include keywords or phrases relevant to the subject matter of the document/project for indexing and searchability purposes.]

[Optional: Provide acknowledgments or credits to individuals, organizations, or funding sources that supported the project.]

[Optional: Include a statement indicating any limitations or areas for further research identified during the course of the project.]

[Optional: Offer recommendations or suggestions for future initiatives or studies based on the findings or outcomes of the project.]

[End with any final remarks or closing thoughts that reinforce the significance of the project and its potential impact.]

Acknowledgement

[NOTE]: This is just a sample acknowledgement statement. Kindly modify this accordingly.

This work could not have been accomplished successfully without the help of many people.

We would like to express our sincere gratitude to all those who have contributed to the completion of this thesis. Without their support, encouragement, and assistance, this endeavor would not have been possible.

First and foremost, we are deeply indebted to our supervisor/advisor [Name], whose guidance, expertise, and unwavering support have been invaluable throughout this journey. Their insightful feedback, constructive criticism, and encouragement have significantly shaped the development of this thesis.

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Chapter 1

Introduction and Literature Review

1.1 Background of the Study

The background of the study provides context and rationale for the research conducted in the thesis. It outlines the significance of the topic, identifies gaps or problems in existing literature, and highlights the need for further investigation [1].

sets the stage by introducing the topic and its importance within the broader field of study. It provides a general overview of the research problem and establishes the context for the study.

[Begin with a brief introduction to the general topic area or field of study.]

[Provide context by discussing the relevance and significance of the topic within the academic discipline or field.]

[Identify the specific research problem, question, or gap in knowledge that the thesis aims to address.]

[State the purpose and objectives of the study to establish the focus and scope of the research.]

1.2 First Section of Literature Review

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Chapter 2

Problem Statement

The problem statement section defines the research problem or issue that the thesis aims to address. It articulates the specific challenge, gap, or question that motivates the research and provides a rationale for its significance.

[Begin with a brief introduction to the research topic and its importance within the broader field of study.]

[Provide context by discussing relevant background information, trends, or debates related to the research topic.]

[State the purpose of this section, which is to clearly define the research problem and its significance.]

2.1 Research Problem

The research problem succinctly states the central issue or question that the thesis seeks to investigate.

[Clearly define the research problem or issue that the thesis aims to address.]

[Identify the specific aspects, dimensions, or variables of the problem that will be examined in the study.]

[Highlight the relevance and importance of the research problem within the academic discipline, practical context, or societal domain.]

2.2 Rationale

The rationale explains why the research problem is worth investigating and why it matters to academic scholarship, practice, or society.

[Discuss the significance of the research problem in advancing knowledge, understanding, or practice within the field.]

[Explain why addressing the research problem is important or timely, considering current trends, debates, or challenges.]

[Highlight the potential implications or applications of the research findings for theory, policy, or practice.]

2.3 Research Objectives

2.3.1 Main Objective

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2.3.2 Specific Objectives

The specific objectives along with their respective expected outputs are written as follows:

1. **Data Acquisition:** To track and monitor the brain activity of the patient with depression using electroencephalography (EEG) before, during, and after the application of music therapy

Expected Output 1.1: Pre-Processed EEG Data

Expected Output 1.2: Comparison of Signal to Noise Ratio (SNR) before and after Denoising

2. **Feature Extraction** To characterize neurophysiological biomarkers before, during, and after the application of music therapy.

Expected Output 2.1: Non Linear and Linear Features of the EEG Signal

3. **Neural Manifold Learning:** To identify the most appropriate neural manifold learning model that can characterize the changes of neurophysiological biomarkers over time upon application of music therapy.

Expected Output 3.1: Neural Manifold Learning Models for both the control and experimental group.

4. **Evaluation:** To evaluate the performance of the proposed system and effectiveness of adaptive music therapy using standard metrics and statistical analyses.

Expected Output 4.1: Recurrence quantification analysis of the neural learning manifold models

Expected Output 4.2: Hypothesis Result (Paired t-test)

2.4 Significance of the Study

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2.5 Scope and Limitations

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Chapter 3

Methods and Research Design

The methodology and research design chapter outlines the approach, methods, and procedures used to address the research problem or question stated in the thesis. It provides a detailed explanation of the research design, data collection methods, and data analysis techniques employed in the study.

[Begin with a brief introduction to the methodology and research design chapter, outlining its purpose and significance.]

[Provide an overview of the research approach and the rationale for selecting specific methods and procedures.]

3.1 Research Approach

The research approach describes the overarching strategy or framework guiding the study, such as qualitative, quantitative, or mixed methods.

[Discuss the research paradigm or theoretical perspective informing the study, such as positivism, interpretivism, or critical theory.]

[Explain why the chosen research approach is appropriate for addressing the research problem and achieving the research objectives.]

[Discuss any considerations or limitations associated with the chosen approach, such as biases, assumptions, or constraints.]

3.2 Research Design

The research design outlines the overall plan or structure of the study, including its scope, sampling strategy, and data collection procedures.

[Describe the specific research design employed in the study, such as experimental, correlational, case study, or ethnographic.]

[Explain how the research design aligns with the research objectives and allows for the investigation of key variables or phenomena.]

[Discuss the sampling strategy used to select participants or cases, including criteria for inclusion and exclusion.]

3.3 Methodology

3.3.1 Data Collection Methods

The data collection methods detail the techniques and instruments used to gather empirical data for analysis.

[Describe each data collection method used in the study, such as surveys, interviews, observations, or archival research.]

[Explain how each method was implemented, including procedures for data collection, participant recruitment, and data recording.]

[Discuss any measures taken to ensure the validity, reliability, and ethical integrity of the data collection process.]

3.3.2 Data Analysis Methods

The data analysis techniques outline the procedures used to analyze and interpret the collected data to answer the research questions or test hypotheses.

[Describe the specific data analysis techniques employed in the study, such as statistical analysis, thematic coding, or content analysis.]

[Explain how the data analysis procedures were applied to the collected data to derive meaningful insights and conclusions.]

[Discuss any software or tools used to facilitate data analysis and manage research data.]

3.3.3 Evaluation Methods

Appendix A

Other Supplementary Figures

Appendix B

Source Codes

Bibliography

- [1] S. Reynolds, T. Abrahamsson, R. Schuck, P. J. Sjöström, S. R. Schultz, and P. L. Dragotti, “Able: An activity-based level set segmentation algorithm for two-photon calcium imaging data,” *eNeuro*, vol. 4, no. 5, pp. ENEURO–0012, 2017.