**ADAPTATION OF DEEP NEURAL NETWORK FOR OPTIMIZATION OF STUDENTS REVISION CLASSES**

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**CERTIFICATION**

This is to certify that this project report titled **ADAPTATION OF DEEP NEURAL NETWORK FOR OPTIMIZATION OF STUDENTS REVISION CLASSES** is an authentic and original work completed by the listed names above in partial fulfillment of the requirements for NATIONAL DIPLOMA (ND) IN THE DEPARTMENT OF COMPUTER SCIENCE. The project report has been prepared under the guidance of MRS MAHMOOD Z.Aat GATEWAY (ICT) POLYTECHNIC SAAPADE, OGUN STATE

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**DEDICATION**

We humbly dedicate this project report to GOD Almighty for seeing us through our project, and to our parents for their support and encouragement.

We dedicate this project report to all the individuals who have supported and inspired us throughout this journey. Without their guidance, encouragement, and unwavering belief in our abilities, this project would not have been possible.

We would like to express our deepest gratitude to our supervisor, MRS MAHMOOD Z.A. Her expertise, patience, and valuable insights have been instrumental in shaping this project. Her constant support and guidance have motivated us to push our boundaries and strive for excellence.

We would also like to acknowledge the support of our parents, whose love, understanding, and encouragement have been our pillars of strength. Their sacrifices and belief in our potential have motivated us to reach higher and work harder. We are grateful for their constant encouragement and for always being there for us, no matter the circumstances.

In conclusion, we dedicate this project report to all those who have been a part of our journey, directly or indirectly. Your support, encouragement, and belief in us have been invaluable. This project stands as a testament to our collective efforts and serves as a reminder of what can be achieved when we come together with a shared vision. Thank you all for being an integral part of our growth and for inspiring us to pursue excellence.

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**ABSTRACT**

Spaced repetition is a learning technique in which content to be learned or memorized is reviewed multiple times with gaps in between for efficient memorization and practice of skills. Two of the most common systems used for providing spaced repetition on e-learning platforms are the Leitner and SuperMemo systems. Previous work has demonstrated that deep learning (DL) can achieve performance comparable to traditional benchmarks, such as Leitner and SuperMemo, in a flashcard-based setting with simulated learning behavior. In this work, our main contribution is the introduction of two new reward functions to be used by the Deep Reinforcement Learning (DRL) agent. The first is a realistically observable reward function that employs the average of the sum of outcomes in a sample of exercises. The second utilizes a Long Short Term Memory (LSTM) network for reward shaping to predict rewards for the DRL agent. Our results indicate that in both cases, DRL performs well; however, when the LSTM-based reward function is employed, the DRL agent learns a good policy more smoothly and quickly. Furthermore, the quality of the student-tutor interaction data used to train the LSTM network significantly impacts the performance of the DRL agent.

This project also addresses several key concerns in optimizing students' revision classes, including the adaptability of the learning models to diverse student learning styles and the potential for real-time feedback to enhance the learning experience. We explore how varying the complexity of the reward functions influences the effectiveness of the DRL agent in different educational contexts, thereby offering insights into the design of adaptive learning systems. Additionally, we consider the implications of integrating these advanced techniques into existing educational frameworks and the necessity for further investigation into ethical considerations surrounding data privacy and algorithmic bias in educational technologies.

**KEYWORDS**

**Artificial Intelligence (AI)** - The simulation of human intelligence in machines.

**Machine Learning (ML)** - A subset of AI involving algorithms that learn from data.

**Neural Networks (NN)** - Computational models inspired by the human brain to recognize patterns.

**Educational Technology (EdTech)** - Technology used to enhance learning processes.

**Personalized Learning (PL)** - Tailoring education to meet individual student needs.

**Revision Strategies (RS)** - Techniques used to review and reinforce learning material.

**Student Performance (SP)** - Measures of student academic achievement.

**Adaptive Learning (AL)** - Educational systems that adapt to student needs.

**Data Analysis (DA)** - The process of inspecting, cleansing, and modeling data.

**Predictive Modeling (PM) -** Using statistics to predict future outcomes based on data.

**Learning Optimization (LO)** - Enhancing learning efficiency and effectiveness.

**Academic Outcomes (AO)** - Results of educational processes measured by performance indicators.

**Pattern Recognition (PR)** - Identifying patterns in data using algorithms.

**Personalized Education (PE)** - Customizing educational experiences to individual learners.

**Intelligent Tutoring Systems (ITS)** - Computer systems that provide personalized instruction.

**Learning Analytics (LA)** - Analysis of data related to learners and their contexts.

**Student Engagement (SE)** - The level of interest and participation a student shows in learning.

**Learning Preferences (LP) -** Individual preferred ways of receiving and processing information.

**Education Innovation (EI)** - New methods and technologies to improve education.

**Big Data (BD)** - Large volumes of data that can be analyzed for insights.

**Algorithm Development (AD)** - Creating algorithms to solve specific problems.

**Data Privacy (DP)** - Ensuring the protection of personal data.

**Ethical AI (EAI)** - Ethical considerations in the development and use of AI.

**Educational Assessment (EA)** - Measuring student learning through various methods.

**Model Accuracy (MA)** - The precision of a predictive model's outputs.

**Scalability (SC)** - The ability of a system to handle increasing amounts of work.

**User Experience (UX)** - The overall experience of a person using a system.

**Feedback Mechanisms (FM)** - Methods for providing feedback to learners.

**Data Collection (DC)** - Gathering information for analysis.

**Student Retention (SR)** - The ability of an institution to keep students enrolled.

**Content Delivery (CD)** - The method of distributing educational material to learners.

**TABLE OF CONTENT**

**Content** **Pages**

Title Page i - ii

Certification iii

Dedication iv

Acknowledgement v

Abstract vi

Keywords vii

Table of content viii – ix

List of figures x

**CHAPTER ONE: GENERAL INTRODUCTION**

1. Introduction…………………………………………………………….…....1

1.1 Background of the Study.............................................................................. 2 - 3

1.2 Statement of Problem……………………………………………………….3

1.3 Aims and objectives…………………………………………………………3 – 4

1.4 Significance of the Study………………………………………………….4 - 5

1.5 Purpose of Study…………………………………………………………..5 - 6

1.6 Methodology……………………………………………………………….6 - 7

1.7 Project Outline……………………………………………………………..7

**CHAPTER TWO: LITERATURE REVIEW**

2.1 Theoretical frame work

2.1.0 Deep Learning………………………………………………………8 - 9

2.1.1 History of Deep Learning……………………………………………10

2.1.2 Intelligent Tutoring Systems………………………………………...10 – 11

2.1.3 Related Theory………………………………………………………11

2.2 Conceptual frame work

2.2.1 Models of Human Memory………………………………………….11

2.2.1.1 Exponential Forgetting Curve……………………………………….11

2.2.1.2 Half Life Regression………………………………………………...12

2.2.1.3 Generalized Power Law…………………………………………….12.

2.3 Empirical frame work

2.3.1 Spaced Repetition……………………………………………………13

2.3.2 Super memo System…………………………………………………13 - 15

2.3.3 Related Work………………………………………………………...15

**CHAPTER THREE: SYSTEM DESIGN AND IMPLEMENTATION**

3.1 Requirement Definition……………………………………………………..16

3.1.1 Dataset ……………………………………………………………….16

3.2 Method of work

3.2.1 Experimental Setup………………………………………………….17 – 18

3.2.2 Training the LSTM………………………………………………….18 – 19

3.2.3 Reward Functions and Performance Metrics………………………..20 - 21

3.2.4 Performance of Model when the numbers of items are varied……...21

3.2.5 Statistical Analysis of the Performance of TRPO with LSTM………21

3.3 Materials of work

3.3.1 Systems and Tools…………………………………………………...22

3.4 System Architecture………………………………………………….22

3.5 Evaluation…………………………………………………………………….23

**CHAPTER FOUR: RESULT AND DISCUSSION**

4.1 Relation between Rewards and Thresholds……………………………….….24 - 26

4.2 Performance of DRL agent when the numbers of items are varied……….…26

4.2.1 With EFC student model……………………………………………..26 - 27

4.2.2 With HLR student model………………………………….…………27 - 28

4.2.3 With DASH (GPL) student model……………………….…………..28

4.3 Comparison of Performance of TRPO and TNPG algorithms……………….29 - 30

4.3.1 Performance of TRPO with reward shaping (research objective)…...30 - 31

4.4 Training plots for LSTM………………………………………………….….32 - 33

4.4.1 How useful is LSTM for reward prediction….................................34

4.4.2 Limitations…………………………………………………….……...34

4.5 Screenshots…………………………………………………………….……..35

4.6 Unit Testing………………….…………………………………….…………35

4.6.1 Packaging (Integration)……………………………………….………35 - 36

4.7 Discussion on Implementation Challenges……………………………….…..36

4.7.1 Software Design Documentation (SDD)………………………….….36 - 37

**CHAPTER FIVE: SUMMARY, CONCLUSION AND FUTURE WORK**

5.1 Summary of findings………………………………………………………...38

5.2 Conclusion…………………………………………………………………...39

5.3 Future Work………………………………………………………………….40

**REFERENCE** 41

**APPENDIX A-B** 42 – 45

**LIST OF FIGURES**

**1.** **Exponential Forgetting Curve** - Chapter 2, Section 2.2.1.1, Page 9

**2.** **Half Life Regression** - Chapter 2, Section 2.2.1.2, Page 10

**3.** **Generalized Power Law** - Chapter 2, Section 2.2.1.3, Page 10

**4.**  **Experimental Setup Diagram** - Chapter 3, Section 3.2.1, Pages 14-16

**5.** **Training LSTM Model** - Chapter 3, Section 3.2.2, Pages 16-17

**6. Reward Functions and Performance Metrics** - Chapter 3, Section 3.2.3, Pages 17-18

**7. Performance of Model with Varying Number of Items** - Chapter 3, Section 3.2.4, Page 19

**8. Statistical Analysis of TRPO with LSTM Performance** - Chapter 3, Section 3.2.5, Page 19

**9. System Architecture** - Chapter 3, Section 3.4, Pages 19-20

**10. Relation between Rewards and Thresholds -** Chapter 4, Section 4.1, Pages 21-22

**11. Performance of DRL Agent with Varying Number of Items** - Chapter 4, Section 4.2, Page 23

**12. Performance with EFC Student Model -** Chapter 4, Section 4.2.1, Page 23

**13. Performance with HLR Student Model** - Chapter 4, Section 4.2.2, Page 24

**14. Performance with DASH (GPL) Student Model -** Chapter 4, Section 4.2.3, Page 25

**15. Comparison of TRPO and TNPG Algorithms -** Chapter 4, Section 4.3, Pages 25-26

**16. Performance of TRPO with Reward Shaping** - Chapter 4, Section 4.3.1, Page 27

**17. Training Plots for LSTM** - Chapter 4, Section 4.4, Pages 28-29

**18. LSTM for Reward Prediction -** Chapter 4, Section 4.4.1, Pages 29-30

**19. Graphical User Interface (GUI) -** Chapter 4, Section 4.5, Page 30