



# Time Series Prediction of Medical Records

## Incorporating Stationary Personal Details

Author: R.L. Navod Rajasinghe  
(Reg. No.: MS19812304)  
M.Sc. in IT  
Specialized in EAD

Supervisor: Dr. Dharshana Kasthurirathna

November 2021

Department of Information Technology  
Faculty of Graduate Studies & Research  
Sri Lanka Institute of Information Technology

## Abstract

Improved blood glucose monitoring techniques have emerged over the last century. Adequate glycemic control and minimal glycemic variability necessitate a perfect, accurate, and dependable glucose monitoring system. [2]. There is still research being done on blood glucose monitoring systems in order to find the best one.

According to the research proposal, the goal is to model and predict multiple blood glucose time-series from different users efficiently from limited training data in order to control and model their blood glucose levels.

Individuals must anticipate blood glucose levels in order to take preventive measures against health risks in good time. There are high quality highlights and plan expectation models for the past endeavors, which lead to low exactness because of incapable component portrayal and limited preparing data for each individual. According to the findings of this study, the best way to predict blood glucose levels is to use a multi-time-arrangement profound LSTM model (MT-LSTM). It uses an individual learning layer for customized forecast and naturally learns highlight portrayals and transient conditions of blood glucose elements by sharing information among different clients. MT-LSTM outperformed traditional predictive relapse models in assessments of 100 clients.

## Acknowledgment

Let me begin by saying how grateful I am for the guidance, support, and encouragement I have received from my lecturers throughout this project. And specially to Dr.Dharshana kasturirathna for provide supervision and guidance also to Mr. Dilshan De Silva for co-ordination.

To the Principal and Management of SLIIT, Kollupitiya, I express my gratitude for their support and cooperation in completing this project. In completing this project, I would like to thank all of SLIIT's computing teaching faculty, whose suggestions during reviews aided us. I would like to express my gratitude to the non-teaching staff of SLIIT's Department of Computing for their assistance in completing my project.

In addition, I want to express my gratitude to all of my coworkers in my company who have shared their thoughts and ideas with me about how to go about doing this and have always been there to lend a helping hand when I needed it throughout the article. Also to Dr. Saman Lokuliyana for provide support and domain knowledge medical sector. Final words of thanks: my parents and family helped me tremendously in completing this project in such a short period of time, so I want to thank them for their support, blessings, and love. I want to express my gratitude to everyone who has helped us along the way, whether it was directly or indirectly.

# Table of Contents

Abstract.....	ii
Acknowledgment .....	iii
<b>Table of Contents .....</b>	<b>iv</b>
List of Figures .....	7
List of Tables .....	8
List of Abbreviations .....	9
List of Appendices .....	10
Chapter 1 Project Introduction .....	11
1.1 Introduction .....	11
1.2 Glucose monitoring device: .....	13
1.3 Aim and Objectives .....	21
1.3.1 Aim .....	21
1.3.2 Objectives.....	22
1.4 Project Scope .....	22
1.5 Approach and Assumptions .....	24
1.5.1 Approach.....	24
1.5.2 Assumptions.....	24
1.6 Summary of Outcomes .....	24
1.7 Summary.....	25
Chapter 2 Project Background .....	26
2.1 Introduction .....	26
2.1.1 Manual Process of the existing system.....	26
2.2 Problem Statement.....	28
2.3 Literature Review.....	30
2.3.1 Evaluation of Existing software management Solutions .....	31
2.4 Comparison of existing systems .....	31
2.5 Methods & Tools.....	32
2.5.1 Technologies Adapted.....	32
2.5.2 Necessity of These Technologies .....	32
2.6 Problem Related Stakeholders .....	38
2.7 Aim and Research Question.....	38
2.7.1 Aim .....	38
2.7.2 Research Question .....	39

2.8 Summary .....	39
Chapter 3 Requirement Specification and Design .....	40
3.1 Introduction .....	40
3.2 Requirement Specification .....	40
3.3 Analysis of the System .....	41
3.3.1 Use cases and User Description .....	41
3.3.2 Functional Requirements of the system .....	41
3.3.3 Non-functional Requirements of the system.....	42
3.4 Design of the System .....	43
3.4.1 Proposed Methodology .....	43
3.4.2 Web System Basic Architecture .....	44
3.4.3 Database .....	44
3.4.4 User Interfaces .....	45
3.5 Summary .....	45
Chapter 4 System Implementation and Deployment .....	46
4.1 Introduction .....	46
4.2 System Implementation.....	46
4.2.1 Main Code Lines.....	47
4.3 Graphical User Interface .....	51
4.4 Problems Encountered with Implementation .....	52
4.5 System Deployment.....	53
4.6 Summary .....	53
Chapter 5 Evaluation and Testing .....	54
5.1 Introduction .....	54
5.2 Testing Approaches .....	54
5.3 White box testing.....	55
5.4 Testing levels .....	56
5.5 Strengths and weakness of testing.....	56
5.6 Summary .....	57
Chapter 6 Future Work .....	58
6.1 Introduction .....	58
6.2 Future Work for the system .....	58
6.3 Summary .....	58
Chapter 7 Conclusion .....	59
7.1 Introduction .....	59
7.2 Overall Completeness / Achievements.....	59

7.3 Problems and Limitations .....	59
7.4 Summary.....	59
Chapter 8 Reflection .....	60
8.1 Introduction.....	60
8.2 Technical Skills .....	60
8.3 Personal Skills .....	60
8.4 Summary.....	61
Chapter 9 Reference .....	62
Appendix .....	64
Appendix 1: System Documentation .....	64
Appendix 2: Specification & Design Documentation.....	65
a. Activity Diagram.....	65

# List of Figures

Figure 1.1 MT-LSTM architecture .....	12
Figure 3.1 Tier architecture.....	44
Figure 4.1 System implementation .....	46
Figure 4.2 Set of libraries used.....	48
Figure 4.3 Checking accuracy of dataset and consistency whether it's contained diverse data.....	48
Figure 4.4 Checking accuracy of dataset and compare to similar outcomes.....	49
Figure 4.5 Checking each parameter values in dataset which cannot be zero or null .....	49
Figure 4.6 Replace Non values with mean.....	50
Figure 4.7 Create Prediction Model.....	50
Figure 4.8 Client Input data process.....	51
Figure 4.9 Outcome viewing process.....	52
Figure 5.1 Black Box Testing .....	55
Figure 5.2 White Box Testing. ....	55
Figure 5.3 Testing levels.....	56

## List of Tables

Table 1 Blood sugar levels.....2Error! Bookmark not defined.

## List of Abbreviations

Abbreviation	Description
T1D -	Type One Diabetes
BG -	Blood Glucose
SMBG -	Self-monitoring blood glucose
MARD -	Mean Absolute Relative Difference
MAD -	Mean Absolute Difference
CV -	Coefficients of variation
ARD -	Absolute Relative Difference
BMI -	Body Mass Index

## List of Appendices

Appendix	Page
Appendix - 1	59
Appendix - 2	60