

A Project Stage-II Report on

ARTIFICIAL NEURAL NETWORK MODEL FOR CLASSIFICATION OF IOT DEVICE STATES IN MEDICAL INDUSTRY

Submitted in partial fulfilment of the requirements
for the award of the degree of

BACHELOR OF TECHNOLOGY

IN

COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

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MALLA REDDY ENGINEERING COLLEGE AND MANAGEMENT SCIENCES

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(An UGC autonomous Institution, NBA Accredited in CSE, ECE, IT, EEE)

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CERTIFICATE

This is to certify that the Project Stage-II report entitled “**ARTIFICIAL NEURAL NETWORK MODEL FOR CLASSIFICATION OF IOT DEVICE STATES IN MEDICAL INDUSTRY**” is the bonafide work carried out and submitted by

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LIST OF CONTENT

ABSTRACT	i
LIST OF FIGURES	ii
LIST OF TABLES	iii
ABBREVIATIONS	iv

CHAPTER NO.	DESCRIPTION	PAGE NO.
CHAPTER 1:	INTRODUCTION	1
1.1	Overview	1
1.2	Research motivation	1
1.3	Problem definition	2
1.4	Significance	3
1.5	Research objective	3
1.6	Advantages	3
1.7	Applications	4
1.8	Performance evaluation	5
1.9	Organizational thesis	7
CHAPTER 2:	LITERATURE SURVEY	9
2.1	Literature Review	9
2.2	Research Gaps	58
2.3	Comparative Study	59
CHAPTER 3:	EXISTING SYSTEM	68
3.1	Threshold based monitoring	68
3.2	Scheduled Maintenance and Manual Logging	68
3.3	Visual and Auditory Inspections by Operators	69
3.4	Common Problem Statement	70
CHAPTER 4:	PROPOSED SYSTEM	71
4.1	ANN Feature Extraction	71
4.1.1	Advantages of ANN Feature Extraction	72

4.2	System Architecture	73
4.3	Data Preprocessing	75
4.4	Existing GNBC	76
4.4.1	Drawbacks	78
4.4	ETC Classifier	79
CHAPTER 5:	UML DIAGRAMS	81
CHAPTER 6:	SYSTEM ENVIRONEMENT	88
6.1	Software Requirements	88
6.1.1	Tensorflow Environment	88
6.1.2	Packages Overview	89
6.1.3	Python Installation Procedure	90
6.2	Hardware Requirement	95
CHAPTER 7:	FUNCTIONAL REQUIREMENTS	97
CHAPTER 8:	SOURCE CODE	105
CHAPTER 9:	RESULTS AND DISCUSSION	118
9.1	Implementation Description	118
9.2	Dataset Description	122
9.3	Result Analysis	124
9.4	Comparative Analysis	126
CHAPTER 10:	CONCLUSION AND FUTURE SCOPE	129
	REFERENCE	

ABSTRACT

The widespread adoption of Internet of Things (IoT) devices in healthcare has underscored the need for intelligent systems to accurately classify device operational states. With over 60% of hospitals utilizing IoT for patient monitoring and the global medical IoT market projected to reach USD 254.2 billion by 2026, ensuring device reliability is critical. However, studies indicate that approximately 15% of medical IoT devices suffer from undetected malfunctions due to inefficient classification systems. Traditional manual monitoring methods are prone to errors, cannot handle large-scale real-time data, and often miss transient faults that can compromise patient safety and disrupt hospital operations. This study introduces a hybrid classification framework that combines an Artificial Neural Network (ANN) with an Extra Trees Classifier (ETC) to classify device states as either Normal or Anomaly. Data is sourced from hospital telemetry logs and the open-source Medical IoT Device Dataset (MIDD), undergoing preprocessing steps including null value removal, min-max normalization, and time-series segmentation. A baseline Gaussian Naïve Bayes Classifier (NBC) demonstrated moderate accuracy but failed to capture nonlinear relationships. In contrast, the ANN enables deep temporal feature extraction, and ETC ensures robust and efficient classification. The ANN with ETC model significantly outperforms traditional approaches in accuracy and anomaly detection, offering a reliable solution for real-time medical IoT monitoring.

Keywords:

Artificial Neural Network, Extra Trees Classifier, IoT device classification, medical IoT, healthcare technology, anomaly detection, device state monitoring, machine learning in healthcare, hybrid model, real-time telemetry, data preprocessing, intelligent healthcare systems, fault detection, time-series analysis, MIDD dataset, automated device status identification, neural network classifier, predictive maintenance, patient safety systems.

LIST OF FIGURES

FIGURE NO.	DESCRIPTION	PAGE NO.
Figure 4.1	ANN Feature Extraction	71
Figure 4.2	Proposed System Architecture	74
Figure 4.4	Existing GNBC Block Diagram	77
Figure 4.5	ETC Classificatation .	80
Figure 5.1	Class Diagram.	82
Figure 5.2	Activity Diagram.	83
Figure 5.3	Use case Diagram.	84
Figure 5.4	Sequence Diagram.	84
Figure 5.5	Dataflow Diagram.	85
Figure 5.6	Deployment Diagram	86
Figure 5.7	Architectural Diagram	87
Figure 6.1.1	Locating the downloadable file	91
Figure 6.1.2	Installation Setup on Windows – Select Installation Options	91
Figure 6.1.3	Selection Process	92
Figure 6.1.4	Installing Python 3.7.6: Add to PATH and Click Install No	93
Figure 6.1.5	Command prompt	93
Figure 6.1.6	Verifying python installation	94
Figure 6.1.7	Showcasing python version	95
Figure 9.3.1	Uploading Dataset	124
Figure 9.3.2	Data Preprocessing steps	125
Figure 9.3.3	Exploratory Data Analysis	125
Figure 9.3.4	Performance Matrix plot for the Gaussian Naive Bayes Classifier	126
Figure 9.4.1	Confusion matrix obtained for proposed MLP with extra trees classifier	128
Figure 9.4.2	Output obtained on test data using proposed MLP	128

LIST OF TABLES

Table 9.4.1	Performance Comparison for the Gaussian NBC and MLP with the Extra Trees Classifier algorithms.	126
Table 9.4.2	Performance Metrics of Existing Gaussian NBC	127
Table 9.4.3	Performance Metrics of Proposed MLP with the Extra Trees.	127

ABBREVIATIONS

ANN	Artificial Neural Network
SVM	Support Vector Machine
KNN	K-Nearest Neighbors
XNN	Extreme Neural Network
CSTM	Customized State Transition Model
IDS	Intrusion Detection System
HDC	Hyper dimensional Computing
DT	Decision Tree
RF	Random Forest
MLP	Multi-Layer Perceptron
CNN	Convolutional Neural Network
IOT-MED	Internet of Things in Medical Applications
MDCS	Medical Device Classification System
NB	Naive Bayes
LR	Logistic Regression