SCHOOL OF COMPUTING
Faculty of Engineering

Project Proposal Form MCST1043
Sem: 2 Session: 2024/25

SECTION A: Project Information.

Program Name: **Masters of Science (Data Science)**

Subject Name: **Project 1 (MCST1043)**

Student Name: Guo Yachao

Metric Number: MCS241039

Student Email & Phone: guoyachao@graduate.utm.my & +601116787971

Project Title: IoT Network Anomaly Detection in Smart Homes Using Machine Learning

Supervisor 1:

Supervisor 2 / Industry Advisor(if any):

SECTION B: Project Proposal

Introduction:

The Internet has revolutionized the modern technological era by providing daily conveniences at our fingertips. The Internet of Things (IoT) is a technology that has transformed modern development concepts. IoT has been applied in hospitals, agriculture, catering, roads, and even our homes. Applications based on IoT are known as smart applications. Smart homes are equipped with IoT devices that can capture and utilize smart sensors and controllers to manage various areas of the home. These sensors communicate via internet connections. These devices share data for specific tasks and purposes, including recognition, perception, communication, service, and semantics.

Problem Background:

In this modern era of technology, the Internet of Things has permeated every aspect of life, including smart scenarios, smart homes, and intelligent spaces. Smart homes are equipped with a large number of continuously operating IoT devices, without any interruptions. The security and authentication of these smart devices can provide a peaceful living environment. Monitoring the activities of smart IoT devices is crucial for ensuring their trouble-free operation.

Problem Statement:

The increasing number of IoT applications has made smart devices low-cost, energy-efficient, and compact. However, the rise in the use of IoT devices also increases the risk factors and threats to the network. Ensuring the security and

threat-free use of these devices is crucial so that people can safely use these networks in smart homes.

Aim of the Project:

This study proposes a machine learning based smart home anomaly detection method to detect the normal and abnormal behaviors of IoT device traffic, so as to identify malicious activities such as external attacks and attempts.

Objectives of the Project:

1.To collect data sets that contain more types of malicious behavior characteristics.

2.To preprocess the data by data cleaning,data balancing and feature selection.

3.To convert the data into feature vectors through label coding.

4. To select a variety of machine learning methods.

5.To detect network anomalies in the Internet of Things by using Multiple machine learning methods.

Scopes of the Project:

In this study,the data set collected is a refined UNSW BoT IoT data set that has been widely used by researchers, and various machine learning methods such as AdaBoost, decision tree, random forest, autoencoder and artificial neural network are used.

Expected Contribution of the Project:

This research work is to use machine learning methods based on feature selection to identify malicious patterns in traffic, so as to provide an important contribution for iot devices to resist external attacks. In this way, user privacy, security and security can be realized.

Project Requirements:

Software: Python, TensorFlow, PyTorch, Scikit-learn, Jupyter Notebook

Hardware: CPU: Minimum Intel i5 or AMD Ryzen 5;RAM: ≥ 8GB;Storage: ≥ 256GB SSD

GPU (Optional):Minimum NVIDIA GTX 1050 Ti

Technology/Technique/ Methodology/Algorithm: AdaBoost, Decision Tree, Random Forest, Ada Boost, Auto Encoder, and Artificial Neural Network

Type of Project (Focusing on Data Science):

[√] Data Preparation and Modeling

[√] Data Analysis and Visualization

[ ] Business Intelligence and Analytics

[√] Machine Learning and Prediction

[ ] Data Science Application in Business Domain

Status of Project:

[✓] New

[ ] Continued

If continued, what is the previous title?

SECTION C: Declaration

I declare that this project is proposed by:

[✓] Myself

[ ] Supervisor/Industry Advisor ( )

Student Name: Guo Yachao

April 17, 2025

Signature **Date**

SECTION D: Supervisor Acknowledgement

The Supervisor(s) shall complete this section.

I/We agree to become the supervisor(s) for this student under aforesaid proposed title.

Name of Supervisor 1:

Signature **Date**

Name of Supervisor 2 (if any):

Signature **Date**

SECTION E: Evaluation Panel Approval

The Evaluator(s) shall complete this section.

Result:

[ ] FULL APPROVAL [ ] CONDITIONAL APPROVAL (Major)*

[ ] CONDITIONAL APPROVAL (Minor) [ ] FAIL*

***** Student has to submit new proposal form considering the evaluators' comments.

Comments:

Name of Evaluator 1: .....

Signature ..... **Date** .....

Name of Evaluator 2: .....

Signature ..... **Date** .....