

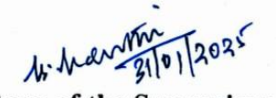
CERTIFICATE

This is to certify that the thesis entitled “Securing the VANET through a hybrid approach by Mitigating DoS Attacks and its types with Self-healing and Immunization” submitted to Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore, in partial fulfilment of the requirements for the award of the **Degree of Doctor of Philosophy in Computer Science**, is a record of original research work done by **Ms. S. Rama Mercy (17PHCSP011)** during the period of her study in the Department of Computer Science at Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore, under my Supervision and Guidance and the thesis has not formed the basis for the award of any Degree/ Diploma/ Associateship/ Fellowship or other similar title to any candidate of any University.


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DECLARATION

I, S. Rama Mercy, hereby declare that the thesis entitled “**Securing the VANET through a hybrid approach by Mitigating DoS Attacks and its types with Self-healing and Immunization**” submitted to Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore, in partial fulfilment of the requirements for the award of the **Degree of Doctor of Philosophy in Computer Science**, is a record of original research work done by me during the period of my study under the Supervision and Guidance of **Dr. G. Padmavathi, M.Sc., M.Phil., Ph.D.**, Professor and Dean, Department of Computer Science, School of Physical Sciences and Computational Sciences at Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore, and it has not formed the basis for the award of any Degree / Diploma / Associateship / Fellowship or other similar title to any candidate of any University.

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LIST OF TABLES

Title	Page No.
Table 2.1 Review of VANET Performance and Security Attacks	41
Table 2.2 Review of Cryptographic Techniques in VANET	46
Table 2.3 Review on ML-based IDS in VANET	59
Table 2.4 Review of AIS in VANET	64
Table 3.1 Parameters calculated for the Vehicular Systems	76
Table 3.2 Pseudocode of SLFN Classifier	92
Table 3.3 Micro Cluster Outlier Detection Algorithm using Linear Regression	96
Table 3.4 Adaptive Nodal Attack Detection Algorithm using Kernel Density Estimation with Entropy based SVM	103
Table 3.5 Trust Value of the Nodes	103
Table 3.6 The scale of Pearson's Correlation Coefficient	107
Table 3.7 Moth Flame Optimization Algorithm	127
Table 4.1 Parameters List in SUMO	135
Table 4.2 List of the Features Calculated for the Vehicular Systems	135
Table 4.3 Input Features of SLFN Classifier	137
Table 4.4 Accuracy Comparison for different learning function used in Proposed Algorithm	144
Table 4.5 Accuracy Comparison for the Different neurons used in GLW-SLFN Algorithm	145
Table 4.6 Comparative Analysis between the different learning algorithms in classifying the Botnet attacks	148
Table 4.7 Training Time Comparison of the Proposed GOF-SLFN Model in Detection of Attacks	148

Title	Page No.
Table 4.8 Testing Time Comparison of the Proposed GOF-SLFN Model in Detection of Attacks	149
Table 4.9 Testing Time Comparison of the Proposed GLW-SLFN Model in Detection of Attacks	149
Table 4.10 Performance of the Proposed Phase 1	150
Table 4.11 Performance Comparison of the Proposed Hybrid Approach	165

LIST OF FIGURES

Title	Page No.
Figure 1.1 General Architecture of VANET	1
Figure 1.2 Security Challenges in VANET	6
Figure 1.3 Attacks Classification on Security Requirements	9
Figure 1.4 DoS and DDoS Attacks Classification on Layers	10
Figure 1.4.1 Layer-wise DoS and DDoS Attacks based on Communication	11
Figure 1.5 DDoS Attacks	12
Figure 1.6 CISCO Research Trends of DDoS Attacks 2017 – 2022	13
Figure 1.7 An Illustration of DoS attack in VANET	15
Figure 1.8 An Illustration of DDoS attack in VANET	16
Figure 1.9 Artificial Immune System based Attack Detection	21
Figure 3.1. Proposed Three-phase Methodology	71
Figure 3.2 Three – phase Methodology with Contributions	77
Figure 3.3 VANET Scenario with communications	79
Figure 3.4 Glowworm Movement Stage	84
Figure 3.5 Glowworm Neighborhood Stage	87
Figure 3.6 Flowchart of the Adaptive Nodal Attack Detection using Kernel Density Estimation with Entropy based SVM	100
Figure 3.7 RSU and OBU	106
Figure 3.8 Flow of the steps adapting Artificial Immune System	108
Figure 3.9 DDoS Attacks	111

Title	Page No.
Figure 3.10 The value stored in Hex Tuple Mapping	115
Figure 3.11 Deep Auto Sparse Impasse Neural Network	116
Figure 3.12 Deep Trust Factorization NN	121
Figure 4.1 Distinct Scenarios of Vehicles Systems	132
Figure 4.2 Four Lane /Two Lane Road Systems	132
Figure 4.3 Simulation results of the proposed approach	136
Figure 4.4 Training Accuracy Analysis for the different Algorithms in the DoS Attacks Classification	143
Figure 4.5 Testing Accuracy Analysis for the different Algorithms in the DoS Attacks Classification	144
Figure 4.6 Sensitivity Analysis for the different Algorithms in the DoS Attacks Classification	145
Figure 4.7 Selectivity Analysis for the different Algorithms in in the DoS Attacks Classification	145
Figure 4.8 Packet loss	149
Figure 4.9 Throughput	150
Figure 4.10 Detection rate	151
Figure 4.11 Energy Consumption	153
Figure 4.12 Latency	154
Figure 4.13 Detection Rate	155
Figure 4.14 Packet loss	156
Figure 4.15 Throughput	157
Figure 4.16 Accuracy	158

Title	Page No.
Figure 4.17 Delay	158
Figure 4.18 Recall	159
Figure 4.19 F1-Score	159
Figure 4.20 Packet Delivery Ratio	160
Figure 4.21 Detection Rate	161
Figure 4.22 Detection Time	161
Figure 4.23 Routing Overhead	162

ABBREVIATIONS

Abbreviation	Description
VANET	Vehicular Ad Hoc Network
AIS	Artificial Immune System
DoS	Denial of Service
DDoS	Distributed Denial of Service
IoT	Internet of Things
OBU	Onboard units
RSU	Road-side units
DSRC	Dedicated Short-Range Communication
ITS	Intelligent Transport System
V2V	Vehicle-to-Vehicle
V2I	Vehicle-to-Infrastructure
IDS	Intrusion Detection Systems
MANET	Mobile ad hoc networks
V2RSU	Vehicle-to-roadside unit
I2V	Infrastructure-to-Vehicle
PoD	Ping of Death
TCP	Transmission Control Protocol
SYN-TCP	Synchronised TCP
SSL	Secure Socket Layer
DNS	Domain Name System
UDP	User Datagram Protocol
RST	Reset
FIN	Finish
MITM	Man-in-the-Middle

HIDS	Host Based Intrusion Detection System
PSA	Positive Selection Algorithm
NSA	Negative Selection Algorithm
DCA	Dendritic cell algorithm
CSA	Clonal selection algorithm
SVM	Support Vector Machines
NN	Neural Networks
DT	Decision Trees
ML	Machine Learning
RL	Reinforcement Learning
AODV	Ad-Hoc On-demand Distance Vector
CMs	Cluster Members
CHs	Cluster Heads
WAVE	Wireless Access to Vehicle Environment
OSI	Open Systems Interconnection
RREQ	Route Request
MAC	Media Access Control
SOMs	Self-Organizing Maps
DAER	Distance-Aware Epidemic Routing
DTN	Delay-Tolerant Network
PKI	Public Key Infrastructure
CRL	Certificate Revocation List
SEMD	Secure and Efficient Message Dissemination Scheme
CPPA	Conditional Privacy-Preserving Authentication
AISBA	Artificial Immune System Based Algorithm
DAA	Defense Against Attacks
CNS	Communication Network Simulator

TPDs	Tamper-Proof Devices
DP	Differential Privacy
LTE-V	Long Term Evolution-Vehicle
MNO	Network Operator revenues
CRAN	Cloud Radio Access Networks
iNDC	intelligent Named Data Caching
V2X	Vehicle-to-Everything
DRL	Deep Reinforcement Learning
NDN	Named data networking
RND Vn	ROOF-based Named Data Vehicular Networking
CIC-IDS	The Canadian Institute for Cybersecurity Intrusion Detection System
IP	Internet Protocol
NS-2	Network Simulator Version 2
GLW	Glowworm
SLFN	Single Layer Feedforward Neural Network
MCOD-LR	Micro-Cluster Outlier Detection – Linear Regression
SVM	Support Vector Machine
GOF – SLFN	Glowworm optimized features for Single-layer feed-forward network
SUMO	Simulation of Urban Mobility
OMNET	Objective Modular Network Testbed
MSSQL	Microsoft SQL Server
SSDP	Simple Service Discovery Protocol
SYN	Synchronise
UDP	User Datagram Protocol
KDE	Kernel Density Estimation

PDR	Packet Delivery Ratio
DR	Detection Rate
EC	Energy Consumption
TF	Trust Factor
TRHE	Triple Random Hyperbolic Encryption
GPS	Global Positioning System
NN	Neural Network
DT-NN	Deep Trust Factorization Neural Network
MFO	Moth Flame Optimization
HTTP	Hypertext Transfer Protocol
NTP	Network Time Protocol
SNMP	Simple Network Management Protocol
CCL	Cache parallelized Circulation Link routing
RSU	Road Side Unit
RTA	Regional Trusted Authority
TA	Trusted Authority
TPR	True Positive Rate
FPR	False Positive Rate
FNR	False Negative Rate
MLP	Multi-Layer Perceptron
ANN	Artificial Neural Network
RF	Random Forest
TNR	True Negative Rate
SPPA	Stream Position Performance Analysis
MVSA	Multivariant Stream Analysis Approach