CERTIFICATE

I certify that the thesis entitled **"Hybrid Transfer Learning Models for Video Anomaly Detection in Surveillance Systems".** submitted for the degree of Doctor of Philosophy (Ph.D.) in Computer Science and Engineering, is the record of research work carried out by **Mrs. Sreedevi R. Krishnan (19PHEOP005)** during the period of her study from January 2020 to March 2025 in the Department of Computer Science and Engineering at Avinashilingam Institute for Home Science and Higher Education for Women Coimbatore, under my guidance and supervision and the thesis has not formed the basis for the award of any degree / Diploma / Associateship /Fellowship or any other similar titles of any candidate of this institute or any other University/Institution of Higher Learning.

3/3/2025
Signature of the HoD

3/3/2025
Signature of the Supervisor

3/3/25
Signature of the Dean

DECLARATION

I, Mrs. Sreedevi R. Krishnan hereby declare that the thesis entitled **"Hybrid Transfer Learning Models for Video Anomaly Detection in Surveillance Systems"** submitted to the Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore, in partial fulfillment of the requirements for the award of the Degree of **Doctor of Philosophy (Ph.D.) in Computer Science and Engineering** is a record of original and independent research work carried out by me during the period from January 2020 to March 2025 under the guidance of **Dr. P. Amudha B. E., M. Tech, Ph.D,** Professor, Department of Computer Science and Engineering, School of Engineering, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore and has not formed the basis for the award of any degree / Diploma / Associateship / Fellowship or any other similar Titles in this Institute or any other University / other similar Institution of Higher Learning.

3/3/25

Signature of the Research Scholar

3/3/2025

Signature of the Supervisor

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Mrs. Sreedevi R. Krishnan

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ABBREVIATION

AD	Anomaly Detection
AdaGrad	Adaptive Gradient
AI	Artificial Intelligence
ANN	Artificial Neural Networks
AOAB	Abnormal Object and Abnormal Behavior
AONB	Abnormal Object and Normal Behavior
AS	Anomaly Score
AUC	Area Under Curve
BD-LSTM	Bi-Directional Long Short-Term Memory
BiLSTM	Bidirectional Long Short-Term Memory
CCTV	Closed-Circuit Television
CDF	Cumulative Distribution Function
CNN	Convolutional Neural Networks
ConvLSTM	Convolutional Long Short-Term Memory
CSP Darknet-53	Cross-Stage Partial Darkset-53
CSWT	Cascade Sliding Window Technique
CUHK	Chinese University of Hong Kong
CV	Computer Vision
dB	Decibel
DB-ConvLSTM	Deeper Bidirectional Convolutional Long Short-Term Memory
DCE	Dynamic Contrast Enhancer
DenseNet121	Densely Connected Convolutional Network 121
DL	Deep Learning
DNN	Deep Neural Networks
DR-STN	Deep Residual Spatiotemporal Translation Network
Dy-MIL	Dynamic Multiple-Instance Learning
EADN	Efficient Deep Learning Model for Anomaly Detection
EER	Equal Error Rate
FAR	False Acceptance Rate
FC-LSTM	Fully Connected LSTM
FN	False Negative
FP	False Positive
FPNet	Feature Pyramid Network
FPR	False Positive Rate

FRR	False Rejective Rate
GAN	Generative Adversarial Networks
GAP	Global Average Pooling
GCN	Graph Convolutional Networks
GPU	Graphical Processing Unit
GridHTM	Grid-Based Hierarchical Temporal Memory
GRU	Gated Recurrent Unit
GTL	Generative Transfer Learning
HDC	Hybrid Dilated Convolution
HERR	Hybrid Ensemble RR
HSOE-FAST	Histo Sigmoid of Orientation and Enthalpy with Fast Accelerated Segment Test
IMED	Image Euclidean Distance
IOU	Intersection Over Union
IP	Internet Protocol
IUNet	Improved-U-Shaped Network
LSTM	Long Short-Term Memory
LTC	Long-Term Context
LTI	Linear Time-Invariant
M-CNN	Multiscale CNN
MII	Motion Information Images
ML	Machine Learning
MLNN	Multi-Layer Neural Network
MLP-RNN	Multi-Layer Perceptron Recurrent Neural Network
MobileNetV2	Mobile Network Version 2
MSE	Mean Squared Error
NLP	Natural Language Processing
NMS	Non-Maximum Suppression
NN	Neural Network
NUT	Nanjing University of Technology
NVR	Network Video Recorder
OCC	One-Class Classification
PAN	Path Aggregation Networks
PCA	Principal Component Analysis
PETS2009	Performance Evaluation of Tracking and Surveillance 2009
PMF	Probability Mass Function
PSNR	Peak Signal-To-Noise Ratio
ReLU	Rectified Linear Unit

ResNet	Residual Network
RGB-D	RGB-Depth
RMSProp	Root Mean Square Propagation
RNN	Recurrent Neural Networks
ROC	Receiver Operating Characteristic
ROC-AUC	Receiver Operating Characteristic - Area Under the Curve
SENN	Spatially Expanded Neural Network
SGD	Stochastic Gradient Descent
SMAMS	Spatiotemporal Masked Autoencoder with Multi-memory modules and Skip connections
SPP	Spatial Pyramid Pooling
STG-NF	Spatio-Temporal Graph Normalizing Flow
STPR-net	Spatio-Temporal Prediction and Reconstruction Network
SVM	Support Vector machine
TL	Transfer Learning
TN	True Negative
TP	True Positive
TPR	True Positive Rate
UBnormal	Unsupervised Behavior Anomaly Detection
UCF-Crime	University of Central Florida-Crime
UCSD	University of California, San Diego
Peds1	UCSD Pedestrian1
Peds2	UCSD Pedestrian2
UMN	University of Minnesota
UNet	U-Shaped Network
UVAD	Unsupervised Video Anomaly Detection
VAD	Video Anomaly Detection
VAE	Variational Autoencoder
VGG16	Visual Geometry Group16
VGGNet-19	Visual Geometry Group Neural Network-19
VS	Video Surveillance
VSS	Video Surveillance Systems
WAN	Wide Area Networks
WOCC	Weighted One-Class Classification
WS	Weakly-Supervised
WS-VAD	Weakly-Supervised Video Anomaly Detection
XAI	Explainable AI
XD-Violence	Extensive and Diverse-Violence
YOLO	You Only Look Once