Anomaly Detection in Real Time CCTV Streams

D.M.B. Kularathne

179330X

Degree of Master of Science

Department of Computer Science Engineering

University of Moratuwa
Sri Lanka

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Name: Dr. Charith Chitraranjan

Abstract

Anomaly detection in video data has been a challenge always. After the introduction of many state-of-art designs, this still poses a challenge as those systems may fail to work in all types of environments. Even though many supervised methods claimed to have some good results in this domain, supervised systems may not be suitable for all the contexts such as in an open area, any type of anomaly can occur and it can be very difficult to train a system in a supervised manner to identify an unanticipated anomaly. On the other hand, it would be difficult for the user to annotate data each time when they change the context under surveillance for the device. Thus the ultimate solution should be an unsupervised solution with a appreciable accuracy. Recently deep learning techniques have emerged in many areas of computer science based solutions and so it is involved for anomaly detection tasks also. In this research, deep learning techniques are involved to solve the problem of video stream based anomaly detection of crowds.

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Abbreviations

AAE Adversarial Autoencoder. 24, 36, 55

ADAE Adversarial Dual Autoencoder. 29

Adam Adaptive Moment Estimation. 39

AE Autoencoder. 16, 18, 19, 21, 36

AUC Area Under Curve. ix, 32, 46, 47, 49, 52, 59, 66, 67

CAE Convolutional Autoencoder. 18–20, 31

CNN Convolutional Neural Network. 18, 19, 25, 28, 30

ConvLSTM Convolutional Long-Short-Term-Memory. v, 26

EER Equal Error Rate. ix, 32, 46, 47, 49, 52, 59, 66, 67

GAN Generative Adversarial Network. v, vii, 17, 29–31, 35

GIGO Garbage In Garbage Out. 4

GMM Gaussian Mixture Model. 13

HDP Hierarchical Dirichlet Process. 12

HMM Hidden Markov Model. 11, 12

LDA GLatent Dirichlet Allocation. 12

LSTM Long-Short-Term-Memory. v, 17, 25, 26, 28, 32, 33, 36, 37

MAE Mean Absolute Error. 24, 36

MSE Mean Squared Error. 24, 25, 31, 36, 39

PCA Principal Component Analysis. v, 16–20, 28

RBM Restricted Boltzmann Machine. 24

ReLU Rectified Linear Unit. 18

RL Representation Learning. v, 16, 17

RNN Recurrent Neural Network. 25

ROC Receiver Operating Characteristic. 46

SFA Slow Feature Analysis. v, 26–28

STSAE Spatio-Temporal Stacked frame Auto Encoder. 20

VAE Variational Autoencoder. 17, 36

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