

**RUGBY EVENT DETECTION IN BROADCAST VIDEOS
BASED ON VISUAL FEATURES USING DEEP
LEARNING**

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Thesis/Dissertation submitted in partial fulfilment of the requirements of the degree
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Declaration

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Date:

Dedication

This thesis is dedicated to my parents.

For their endless love, support and encouragement.

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Abstract

A sports play event is an athletic activity that is performed by multiple players during a sporting event. Sports Event Detection is a challenging task in the domain of sports video analytics. Numerous attempts were made to detect events occurring in sports such as soccer, basketball, and cricket. Our primary objective in this research is to detect events in a Rugby sports video. In comparison to other sports, this one is more difficult due to the sport's chaotic nature. As a result, very little research is conducted on the Rugby sport. The Rugby Events Dataset is presented in this paper as a benchmark dataset for event detection in rugby. It contains videos with temporal annotations for events as well as images with bounding box annotations for the same. Nevertheless, using deep learning and computer vision techniques, this research was able to successfully train on this dataset and detect rugby events as well as temporally localize those events in broadcasted videos. A simple classification model is used to distinguish between sports fields and other scenes in these videos, while an object detection model is used to identify sporting events. Whereas current object detection models are used to detect objects, this research demonstrates that these models can be extended to detect sports events and still produce satisfactory results. Combining tracking with object detection models increased our accuracy of localizing events in the temporal domain even further. This project has released a Sports Event Detection Framework which can be deployed in any machine. The RugbyEvents dataset is publicly available in <https://github.com/CodeProcessor/rugby-events-dataset> and the event detection framework is available at <https://github.com/CodeProcessor/sports-events-detection>.

Keywords : Sports Event Detection, Deep Learning, Broadcast Sports Videos, SriLankan Rugby

Table of Contents

Declaration	i
Acknowledgements	iii
Abstract	iv
Table of Contents	v
List of Figures	viii
List of Tables	x
List of Abbreviations	xi
1 INTRODUCTION	1
1.1 Motivation	1
1.2 Problem Statement	2
1.3 Aims & Objectives	3
1.4 Scope	3
2 BACKGROUND	5
2.1 Literature Review	5
2.1.1 Sports Event Detection Systems	5
2.1.2 Summary of sports event detection methods	8
2.1.3 Challenges in Sports Event Detection	10
2.1.4 Event Detection Content Pyramid	11
2.1.5 Extracting activity clips	13
2.1.6 Feature learning methods	14
2.2 Image classification	16
2.3 Object Detection	18
3 IMPLEMENTATION & METHODOLOGY	21
3.1 Introduction	21
3.2 Datasets	21
3.2.1 Introduction	21
3.2.2 Data Extraction	22
3.2.3 Data Cleaning and preprocessing	23

3.2.4	Annotation	25
3.2.5	Data Augmentation	29
3.2.6	Sports Event Datasets	30
3.3	Model Development	30
3.3.1	Model Selection	30
3.3.2	Activity Detection model	31
3.3.3	Selecting a classification model	31
3.3.4	Human Pose Estimation as a Feature Extractor	32
3.3.5	Event Detection model	32
3.3.6	Selecting a Object Detection Model	33
3.3.7	Introduction to YOLO	34
3.3.8	Training Dataset	38
3.3.9	Hyperparameter Tuning	38
3.3.10	Model Training and Monitoring	40
3.3.11	Training and Validation curves	41
3.4	Event Tracking Methods	43
3.4.1	Moving Average for Event Tracking	43
3.4.2	Centroid Tracking	44
3.4.3	Bounding Box Tracking	45
3.4.4	Tracking methods used in the system	45
3.5	Event Detection System Flow	46
3.5.1	Introduction	46
3.5.2	Event Detection and Localization system	46
3.5.3	Complete System Flow Diagram	47
3.6	Deployment and User Interface	48
3.6.1	Introduction	48
3.6.2	Technology stack	48
3.6.3	UI Features and Functionalities	49
4	EVALUATION	51
4.1	Introduction	51
4.2	Different Evaluation Metrics	51
4.2.1	Binary class classification	51
4.2.2	Multiclass classification metrics	53
4.2.3	Object Detection metrics	54
4.3	Model Evaluation	57
4.3.1	Evaluating Classification Models	58
4.3.2	Evaluating Object Detection Models	58
4.4	Object Tracking	59
4.5	Overall Event Detection Evaluation	62
4.6	Comparison with other sports event detection systems	63
5	DISCUSSION & CONCLUSION	66
5.1	Discussion	66
5.2	Future Work	67
5.3	Conclusion	67

A Rugby Events	73
B Training and Validation Results	75
B.1 Digital Overlay Detection Model	75
B.2 Event Detection Detection Model	79
C Results Comparison	83

List of Figures

2.1	Existing sports event detection systems	5
2.2	Event Detection Content Pyramid	12
2.3	Feature Learning Methods	14
3.1	Learning Curves for Confusion Set Disambiguation	22
3.2	YOLO v1 network architecture	35
3.3	Darknet 53 architecture	36
3.4	Weights and Biases sample dashboard	41
3.5	Yolo output Tensor Shape	41
3.6	Digital Overlay Detection Model Losses	42
3.7	Sports Event Detection Model Losses	42
3.8	Centroid Tracking	44
3.9	Bounding Box Tracking	45
3.10	Frame Level Prediction Flowchart	47
3.11	Overall Prediction Flowchart	47
3.12	Sports Event Detection Framework Flow Diagram	48
3.13	Sports Event Detection Framework User Interface	50
4.1	Binary Class Confusion Matrix	52
4.2	Intersection over union diagram	55
4.3	How IoU connects to TP, TN and FP in object detection	55
4.4	Precision Recall Curve for Logistic Classification	56
4.5	Classification Model Training Accuracy Curve	58
4.6	Classification Model Validation Accuracy Curve	58
4.7	Digital overlay Detection Model AP@0.5	59
4.8	Digital overlay Detection Model AP@0.5:0.95	59
4.9	Digital overlay Detection Model Recall Curve	59
4.10	Digital overlay Detection Model Precision Curve	59
4.11	Sports Event Detection Model mAP@0.5	60
4.12	Sports Event Detection Model mAP@0.5:0.95	60
4.13	Sports Event Detection Model Recall Curve	60
4.14	Sports Event Detection Model Precision Curve	60
4.15	Generic block diagram of the proposed algorithm	64
A.1	Image of a Rugby Lineout event	73
A.2	Image of a Rugby Scrum event	74
A.3	Image of a Rugby Ruck event	74

B.1	Digital Overlay Model Output - Training Batch 1	75
B.2	Digital Overlay Model Output - Valid Batch 1 labels	76
B.3	Digital Overlay Model Output - Valid Batch 1 predictions	76
B.4	Digital Overlay Model Output - Valid Batch 2 labels	77
B.5	Digital Overlay Model Output - Valid Batch 2 predictions	77
B.6	Digital Overlay Model Output - Valid Batch 3 labels	78
B.7	Digital Overlay Model Output - Valid Batch 3 predictions	78
B.8	Event Detection Model Output - Training Batch 1	79
B.9	Event Detection Model Output - Valid Batch 1 labels	80
B.10	Event Detection Model Output - Valid Batch 1 predictions	80
B.11	Event Detection Model Output - Valid Batch 2 labels	81
B.12	Event Detection Model Output - Valid Batch 2 predictions	81
B.13	Event Detection Model Output - Valid Batch 3 labels	82
B.14	Event Detection Model Output - Valid Batch 3 predictions	82
C.1	Block diagram of the proposed Goal detection framework.	83

List of Tables

2.1	Event Detection Papers - comparison	8
3.1	Rugby Sports Event information	23
3.2	Different Annotation Tools Comparison	27
3.3	Rugby Events Clip Dataset Information	30
3.4	Event Object Detection Dataset Information	30
3.5	Classification Model Computational Complexity	31
3.6	Activity Detection Dataset	38
3.7	Event Detection Dataset	38
3.8	Image Classification Model Hyper-parameters	39
3.9	Object Detection Model Hyper-parameters	40
3.10	Training Machine Specifications	40
4.1	Digital overlay detection - Training metrics	60
4.2	Sports event detection - Training metrics	61
4.3	Overall Event Detection Accuracy Video 1	62
4.4	Overall Event Detection Accuracy Video 2	62
C.1	Confusion matrix for event detection and summarization - Hossam M. Zawbaa et al	83
C.2	Classification error for different combination of classification kernel and features - Grigorios Tsagkatakis et al	84
C.3	Event Detection Results - Abdullah Khan et al	84

List of Abbreviations

Abbreviation	Description
ANN	Artificial Neural Network
BOW	Bag of Words
CA	Classification Accuracy
CNN	Convolutional Neural Network
CSV	Comma-Separated Values
DBN	Dynamic Bayesian Network
DCNN	Deep Convolutional Neural Networks
DNN	Deep Neural Networks
ED	Euclidean Distance
EM	Expectation-Maximization
FFT	Fast Fourier Transform
GP	Genetic programming
GT	Ground Truth
HMM	Hidden Markov Model
HPE	Human Pose Estimation
JSON	JavaScript Object Notation
KNN	K-Nearest Neighbor
LDA	Linear Discriminant Analysis
LPC	Linear Prediction Coefficients
LPCC	Linear Prediction Coefficients
LSTM	Long Short-term Memory
LTC	Long-term temporal convolutions
MFCC	Mel-Frequency Cepstral Coefficients
MLP	Multi-layer Perceptron
MSE	Mean Squared Error
PB	Part-Based
PS	Pictorial Structures
RF	Random Forest
STE	Short Time Energy
SVM	Support Vector Machine
VAE	Variational Autoencoders
ZCR	Zero-Crossing Rate