

# Real-time Video Analysis

A new efficient way to analyse video data which out performs other methods, whilst requiring lower processing, storage and training time.



*Please note, header image is purely illustrative. Please see below for source details.*

## IP Status

Patent application submitted

## Seeking

Licensing

## About **University of Warwick**

We are committed to ensuring that our research makes a distinctive, competitive impact on the world. We believe in a collaborative approach to research and education in addressing global challenges and opportunities.

# Background

Each day in 2019, around 2,000 petabytes of video data are generated by security cameras around the world, up from 500 petabytes per day in 2015 which is equivalent to 75 million users streaming an hour's HDTV simultaneously (IHS Markit, Jan 26, 2016). This dramatic growth is driving the demand for more efficient methods of analysing video data.

Commonly used deep neural networks such as Convolutional Neural Networks (CNN) have demonstrated outstanding performance for video analysis tasks, but the training process for CNNs can take days to months to complete.

While methods based on hand crafted feature descriptors require shorter training and processing times, the high-dimensionality of the extracted features demands vast storage capacities and computational resources.

New analytics from the University of Warwick are able to address these needs and can be used for classification, action recognition, object recognition, video surveillance, monitoring and abnormal event detection.

## Tech Overview

Researchers at the University of Warwick have designed a new method of feature descriptor for video analytics that encodes the motion information of a **Spatio-Temporal** support region in to a low-dimensional **Binary** string (STB).

The encoded motion information is obtained from two motion sources: optical flow (BiTE) and temporal gradients (BIVE), which provide rich motion information by considering pixel intensity changes to create a new data space that disregards the background.

### Comparative Performance

BIVE significantly outperforms 3D-FREAK, 3D-BRISK, 3D-ORB and 3D-BRIEF binary descriptors. This confirms the advantages of using wavelet-based patterns and relatively large regions to encode the temporal gradients of video volumes. The STB descriptor is around 1200x faster than 3D-SIFT and 200x faster than HOG. In terms of memory demands, feature vectors generated by STB are approximately 830x more compact than those generated by 3DSIFT, and 30x more compact than those generated by HOG. When used for video analytics, for example action recognition, a machine learning system using STB descriptor can be trained in hours, which is much faster than the training time required by common CNN-based systems, which may be in the order of several days.

### Further Details

- R. Leyva, V . Sanchez, and C.-T. Li, "Detecting Small Objects in High-resolution Images with Integral Fisher Score," accepted to the 2018 IEEE International Conference on Image Processing, October 2018, Athens,

Greece

- R. Leyva, V. Sanchez, and C.-Li, "Fast Detection of Abnormal Events in Videos with Binary Features," Proceedings of the 2018 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), pp.1318-1322, April 2018, Calgary, Canada.

## Benefits

- Can be used in classification, activity recognition, object recognition, video surveillance, monitoring and video anomaly detection
- Low computational time and reduced memory and storage requirements
- Motion information from two sources is independently encoded, giving increased descriptive power
- Much shorter training times are required than those required by common CNN based systems
- Significantly outperforms other binary descriptors including 3D-FREAK, 3D-BRISK, 3D-ORB and 3D-BRIEF
- Suitable for real-time applications and in devices with low-computational capacity.

*[Header image source: In the Security Control Room Officer Monitors Multiple Screens for Suspicious Activities. He's Surrounded by Monitors and Guards Facility of National Importance., Gorodenkoff, stock.adobe.com.]*

## Opportunity

Seeking trial sites to demonstrate analytics in view of licensing.

## Patents

- International patent application number: PCT GB2018/05810326 October 2018