Real-time Scalable Video Stream Analysis with Object, Event and Anomaly Detection.

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Author Note

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Abstract

Computer vision has been a large area of research in recent years, devising methodologies to understand and act on events seen within video streams. A major application of computer vision is to detect anomalies autonomously, and alerting users to when they occur. Although industrial technologies exist that are able to do this to a basic standard, they often rely on expensive and exclusive hardware.

This paper proposes an extendable and scalable framework that is able to provide accurate anomaly detection, in real-time, without complex hardware requirements. The framework will show how the adoption of distributed computing and machine learning enable real-time anomaly detections, without requiring specialized hardware. My design approach is to allow extensibility at every opportunity so the framework can be adapted for a multitude of use cases, some of which I propose within this paper. Furthermore, the framework will allow horizontal scaling enabling it to handle large volumes of data, while keeping its real-time requirements intact. Finally, the framework will be hosted publicly allowing new avenues to be explored by the community, some of which I suggest in this paper.

Declaration

“I declare that this dissertation represents my own work, except where otherwise stated.”

Acknowledgments

This is my acknowledgments.

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# Introduction

## Motivation

This will be my motivation.

## Aims

The aims of the project are to:

* Investigate the application of machine learning on real-time video streams in order to provide anomaly detection.
* Propose an extendable framework for client-side object detection, accompanied by server-side event and anomaly detection, making use of distributed computing.

### Objectives

1. To research existing video processing techniques and available software packages in order to detect objects and events within a video stream.
2. To research machine learning techniques for detecting anomalies in time series data produced from objective one.
3. Develop testing scenarios that will allow the evaluation of machine learning models in their ability to detect anomalies in real-time.
4. Develop a framework that provides a minimum viable product of object, event and anomaly detection, while being scalable and extensible.
5. Using the test scenarios defined in objective three, evaluate the applications ability to detect anomalies and alert users in real-time.
6. Compare and contrast the performance and storage requirements of the proposed framework against existing CCTV technologies and approaches.

## Paper Structure

I will describe my paper structure here.

# Background and Literature Review

## Video Processing Methodologies and their Adoption

In order to develop an effective video processing service, we must be able to understand what is within each frame. We then must extrapolate and recognize the events that are occurring within the video, such as people walking or cars driving. To do this we adopt object and event detection techniques.

### Object Detection Techniques

Detection techniques.

### Event Detection Techniques

Detection techniques.

### Hardware Constraints

Talk about why we cannot use deep learning.

## Anomaly Detection with Machine Learning

This will be a talk on anomaly detection and machine learning.

### Anomaly Detection Models

Talk about the models specifically and research done into them.

### The Impact of Human Behavior

Talk about how humans may effect ability to detect anomalies.

## Distributed Computing and the Cloud

This will be a talk on distributed computing and the cloud.

### Cloud Providers

Talk about cloud providers and their benefit.

### Distributed Computing

Apache Storm, talk about the key technologies.

### Distributed Messaging

Apache Kafka, talk about the key technologies.

## Existing Technologies and Approaches

This will be a talk on existing technologies.

References

Last Name, F. M. (Year). Article Title. *Journal Title*, Pages From - To.

Last Name, F. M. (Year). *Book Title.* City Name: Publisher Name.

Footnotes

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