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Cloud based Intelligent Video Surveillance and Predictive Monitoring Platform

PennState
Behrend

Introduction

Video surveillance has become progressively more prevalent in today's modern society, having applications ranging from traffic monitoring to fire and theft detection. By 2018, it is estimated that tens of millions of surveillance cameras will generate over two billion exabytes of raw video data every day. This massive growth in video data makes the task of a surveillance operator increasingly more difficult due to attention fatigue and human error. With advances in artificial intelligence algorithms for image recognition, the processing of surveillance video data can be greatly enhanced through the use of an expert system.
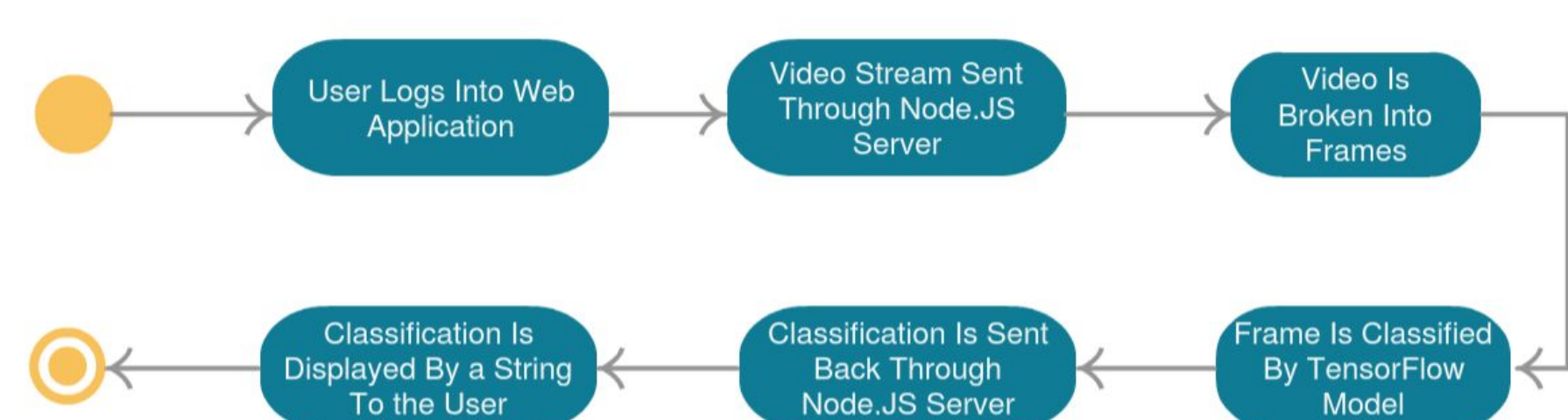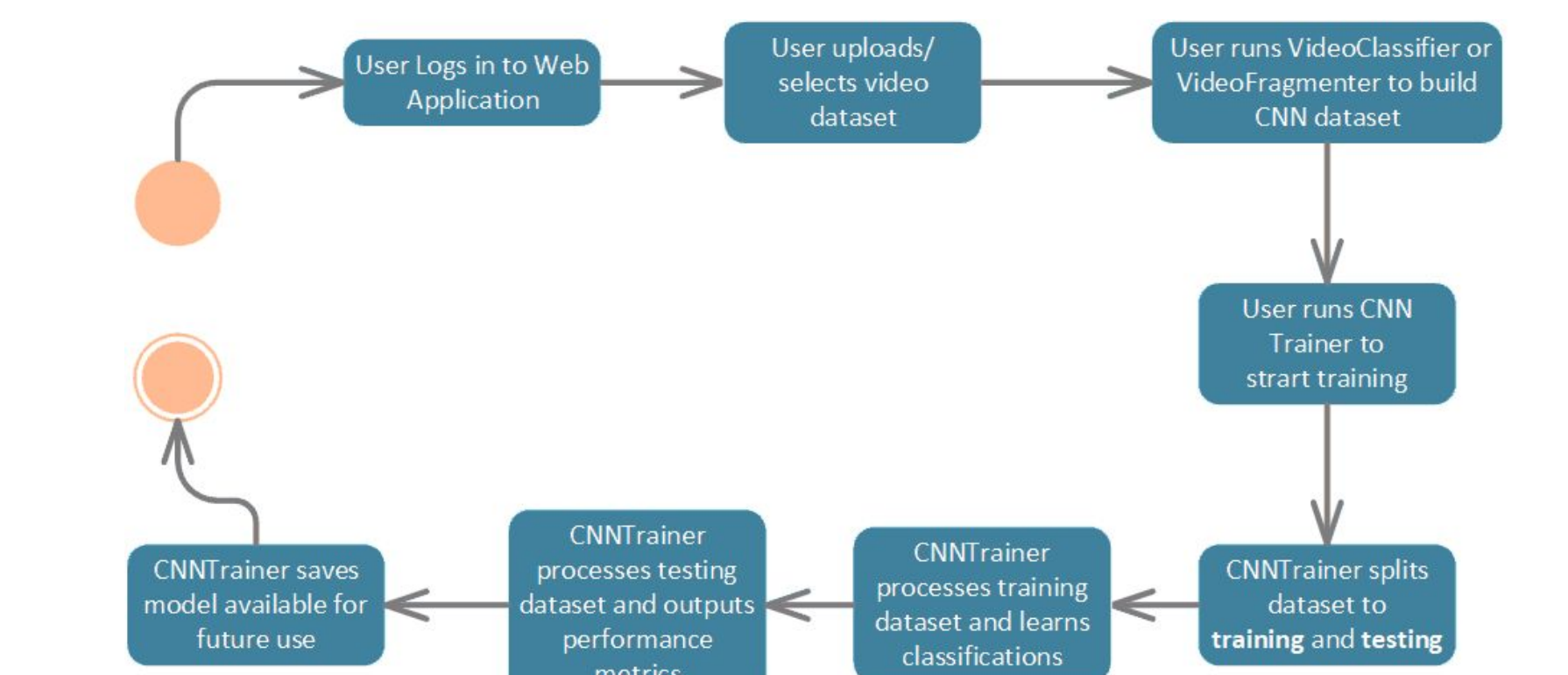
Objectives
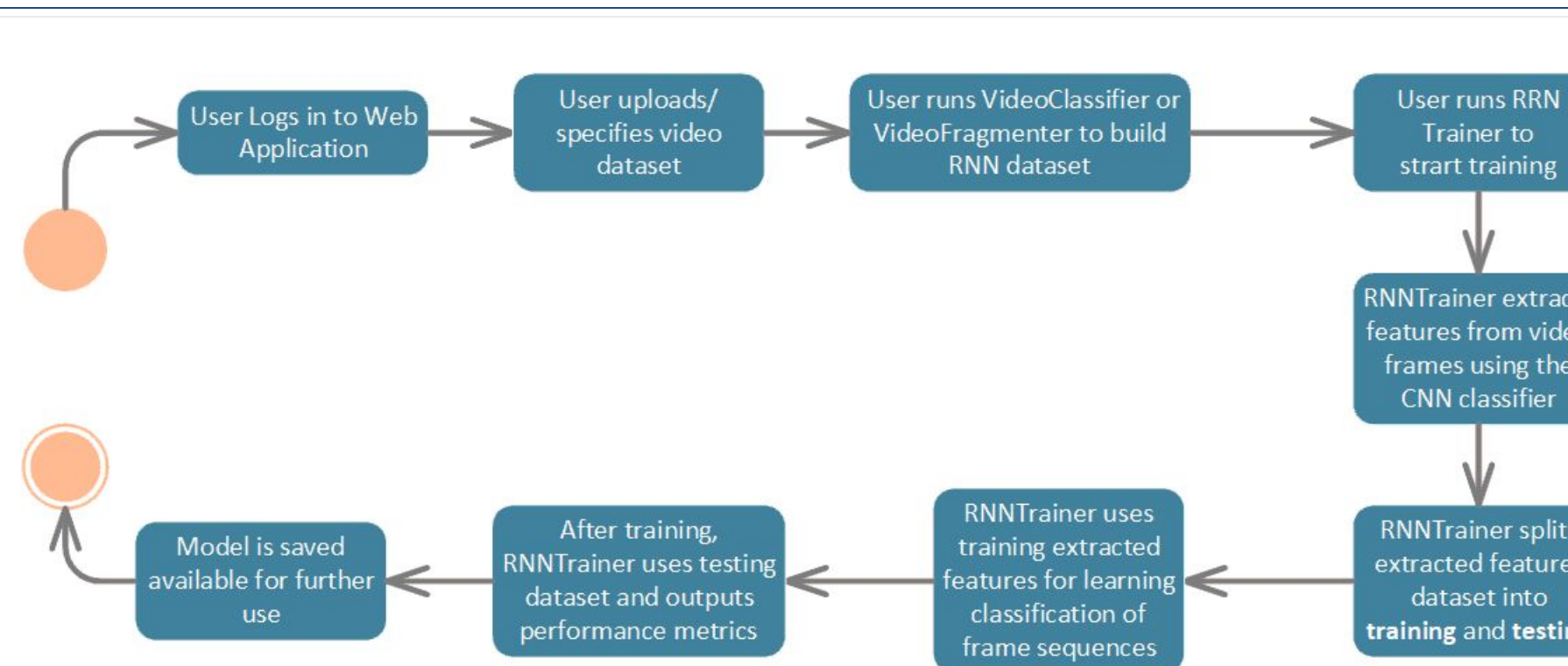

Figure 1: Use Process

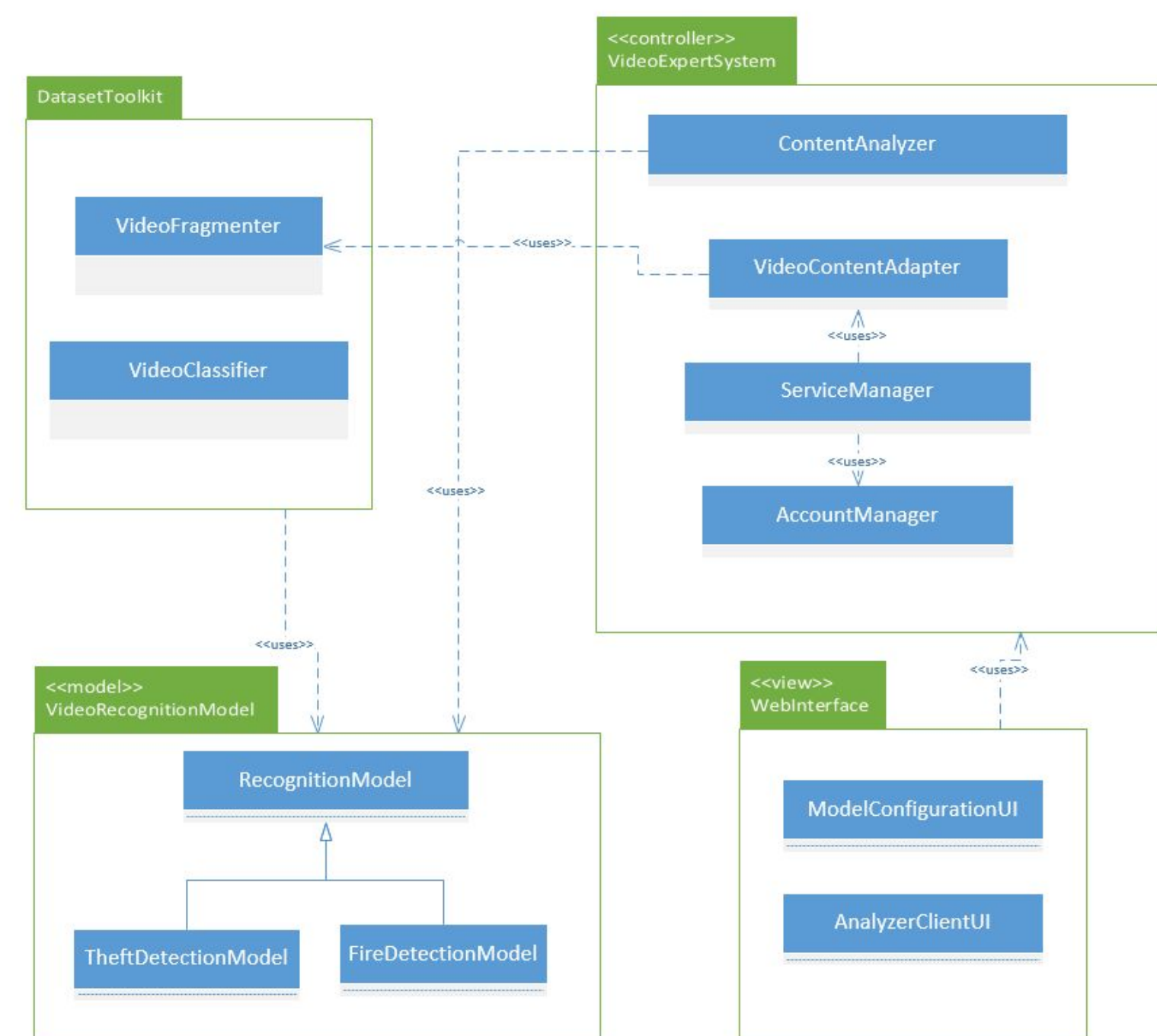Figure 2: CNN Train Process

Figure 3: LSTM RNN Train Process

Figure 4: Architecture Diagram

Author & Abstract

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Sponsored By: Concurrent Computer Corporation

Abstract
This project focuses on the development of a cloud based intelligent, predictive video surveillance expert system that can analyze video surveillance footage for object recognition and classification. The expert system should provide a reliable analysis of specific situations such as fire hazards, natural disasters, or theft and other suspicious activities. Utilizing the Python API for TensorFlow, the expert system will generate alerts if these situations are detected based on several pretrained video recognition models.
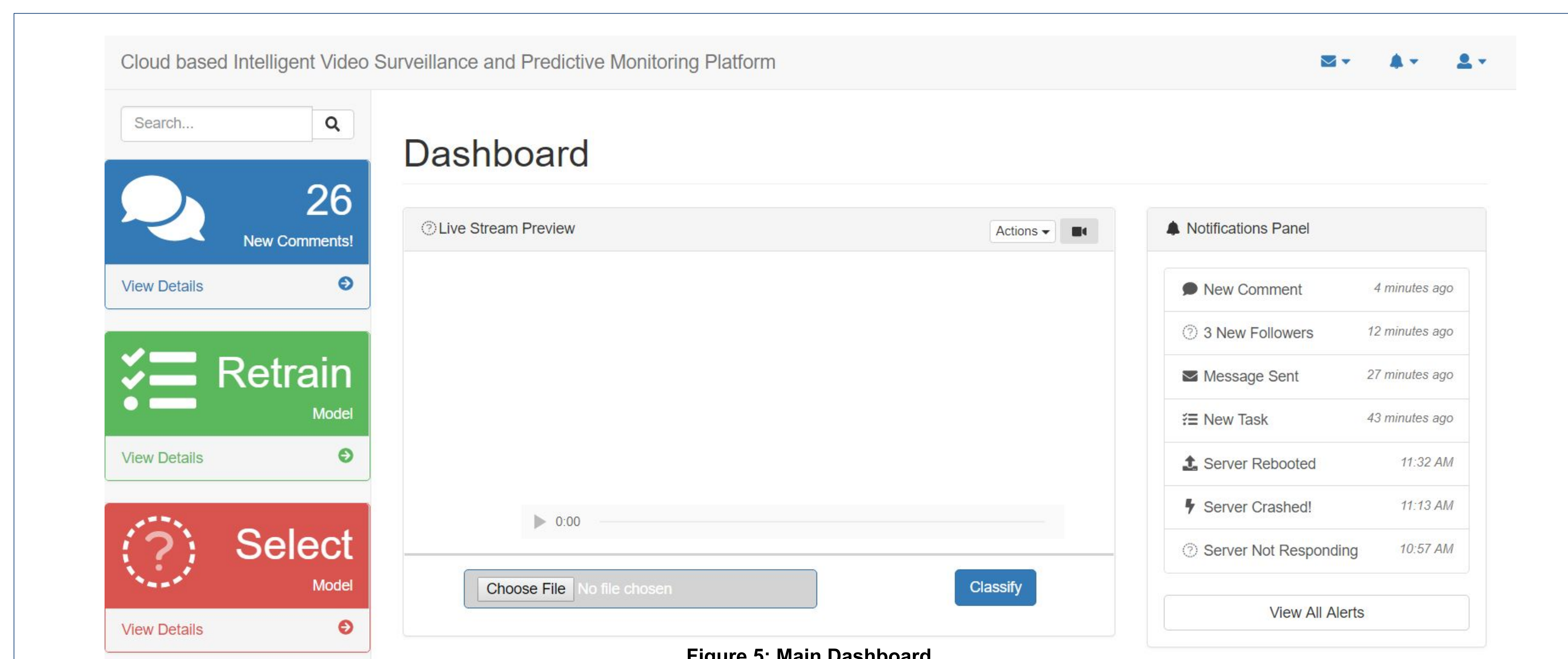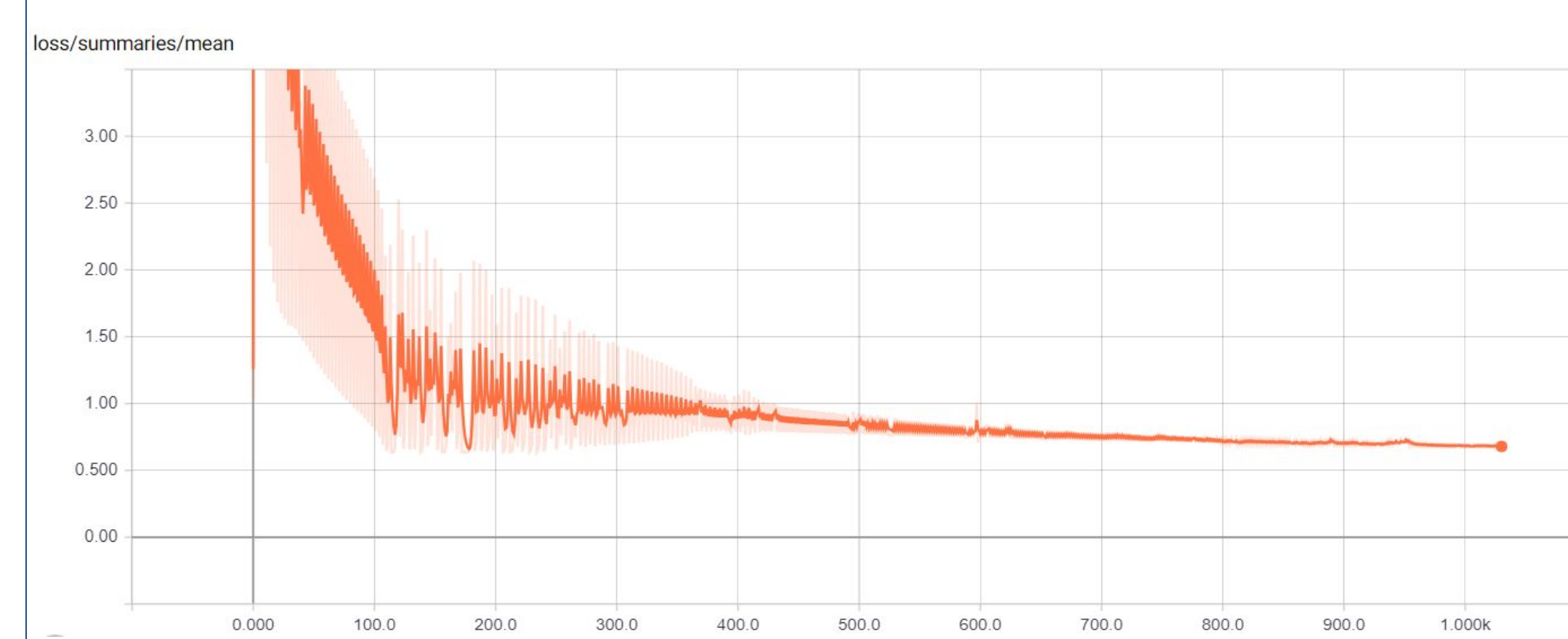
Results

Figure 5: Main Dashboard
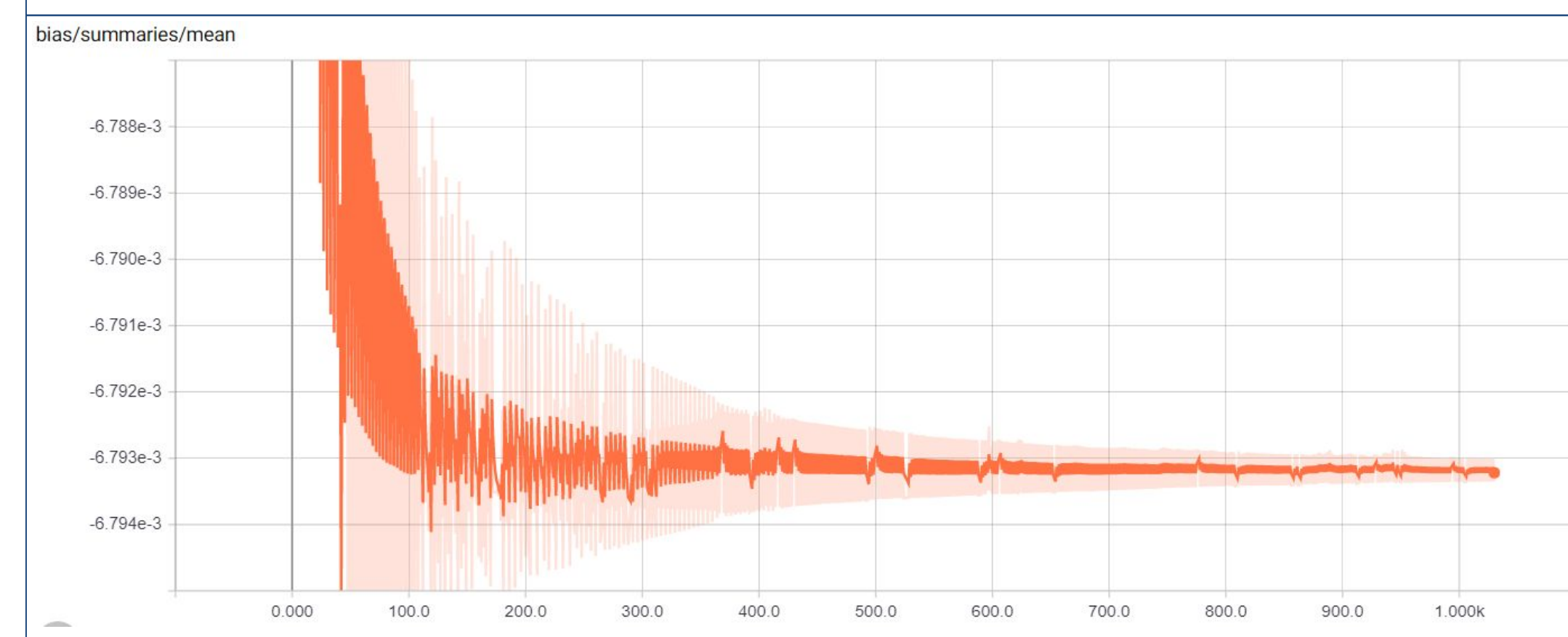

Figure 6: Average loss value over training for LSTM

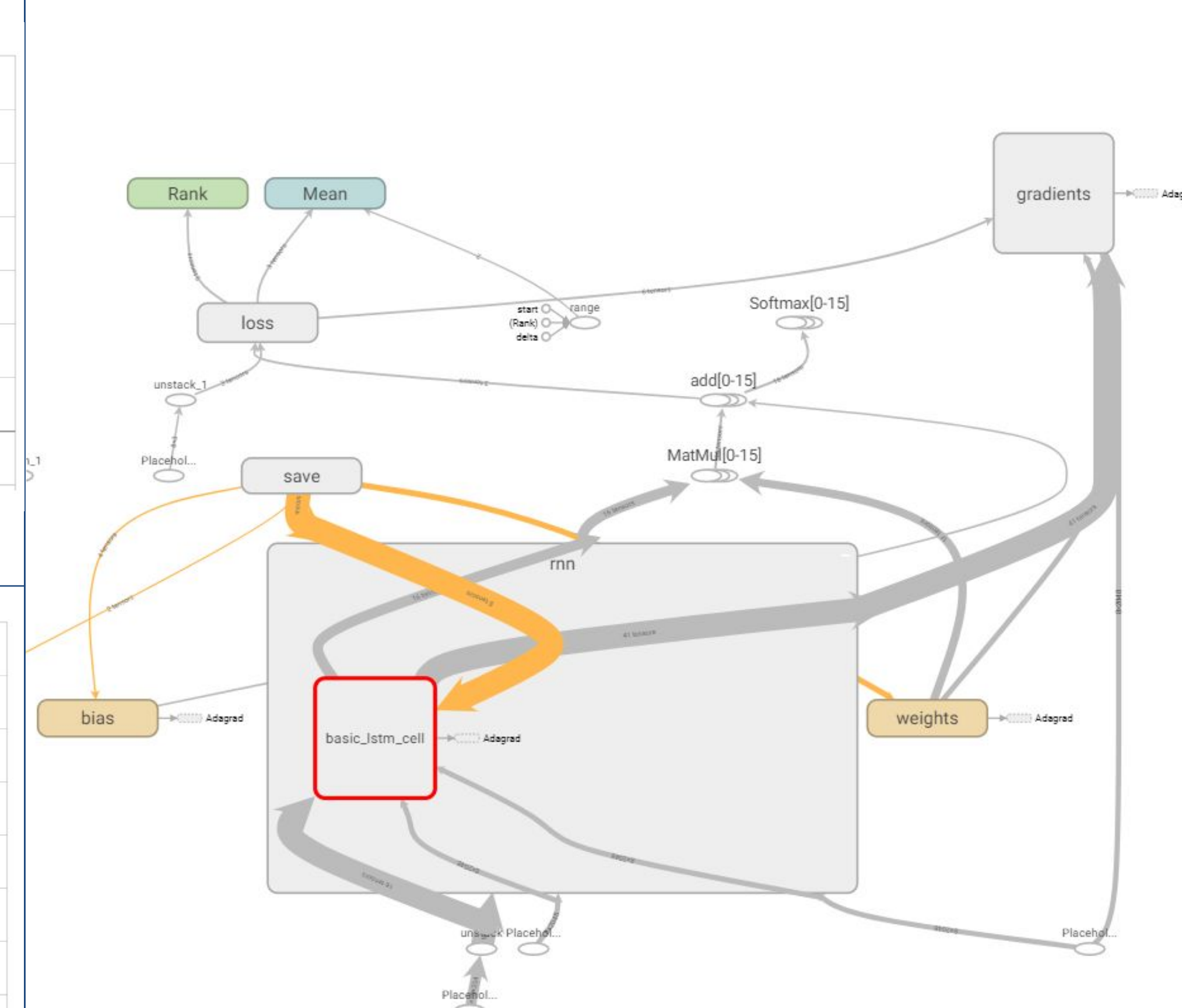Figure 7: Average bias convergence over training for LSTM

Figure 8: TensorBoard Graph depicting LSTM model for video analysis

Practical Application

Concurrent Computer Corporation is a global software and solutions company that specializes in video content delivery products and services. The company currently has multiple video streaming platforms already in place and provides a variety of live streaming products and services to businesses. Concurrent would like to expand into the video surveillance market segment and offer solutions for the analysis of video surveillance footage. Clients could potentially purchase cloud streaming and storage services for surveillance video. The client could then analyze the surveillance footage through the use of services offered by Concurrent. For decades video surveillance has been utilized to record and detect anomalies such as fire and criminal activity in and around businesses, homes, and public spaces. However the analysis of such video in the past has required significant time and effort from a human viewer, especially if the viewer is observing a live video feed. Limitations in a human's ability to vigilantly monitor video surveillance footage from potentially multiple monitors gives rise to the need for artificial intelligence that can more effectively perform surveillance operations. A client that has many facilities all collecting surveillance video from tens or even hundreds of cameras is beyond all human monitoring capabilities. In this case the client has the need for a system that can analyze live surveillance video footage from multiple video sources and reliably alert an operator of specific events. Concurrent Computer Corporation believes the solution lies in the utilization of artificial intelligence for the analysis of the surveillance video footage.

Third-Party Software

- Python
- TensorFlow
- Node.js
- OpenCV

References

[1] Christian Szegedy, Wei Liu, Yangquing Jia, Pierre Sermanet et al. "Going Deeper with Convolutions. Google Inc. 2015

[2] M.A. Rashidan, Y.M. Mustafah, S.B.A. Hamid, N.A. Zainuddin, N.N.A. Aziz. "Detection of Different Classes Moving Object in Public Surveillance Using Artificial Neural Network (ANN)" in 2014 International Conference on Computer and Communication Engineering (ICCCE). Kuala Lumpur, Malaysia. Conference Publishing Services, 2014. [Online] Available:
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