Rare Event Detection in Machine Vision   
using Deep Learning

**Software Development Plan**

**Version** 1.0

Group 16

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**Revision History**

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**Software Development Plan**

# **Introduction**

This section will introduce our project briefly.

## **Purpose**

Surveillance cameras have become a part of our life. We see them in almost every corner of the street and outside restaurants. However, hiring people to monitor all the surveillance video is expensive. The purpose of our project is to implement an algorithm that will detect abnormal activity such as robbery, accident etc and alert the corresponding authorities.

## **Scope**

The scope of this project is to create a system that will detect anomalous event through images and videos using deep learning. In the subsequent release, we will design a classification method to classify the event. After that, we will design an alert system to alert the corresponding person about anomalous event

## **Overview**

This document will briefly go over the overall view of the project, constraints, assumptions, project planning, and deliverable.

## **Definitions, Acronyms and Abbreviations**

Below is the list of Acronyms that are in this document:

CNN: Convolutional Neural Network

Below is the list of definitions that you may need to know:

Neural Network: use for solving pattern recognition problem, involves large number of processes operating in parallel and arranged in tiers.

CNN: algorithm of Neural Network, analyze visual imagery.

Pixel: Smallest unit of picture

RGB: Red, Green, Blue

Computer Vision: algorithms for understanding of digital image

Anomalous: abnormal, unusual

# **Project Overview**

## **Project purpose, scope and objectives**

The focus of this project is the implementation of an algorithm that distinguishes unusual activity in a public scenario. The detection of this abnormal events would be determined using deep learning in surveillance images and videos monitored by public cameras. The method proposed will send a notification to the corresponding authorities which could help to avoid dangerous public disturbances.

The project is a fundamental experience that intents to promote a successful transition to a professional environment or further education to computer science students at Kennesaw State University.

There are objectives that should be satisfied within the Senior Project to make this a knowledgeable experience, the score would be determined by the instructor’s observation of the team throughout the course and peer evaluation during the project presentations.

· Effective Team Communication, time management, and workflow.

· Formal technique in project documentation, design, and implementation.

· Reflection of Senior Project team knowledge acquisition.

· Senior Project Supervisor provided general advice and guidance.

## **Assumptions and constraints**

This project has an estimated 16-week timeframe. Therefore, the project should be completed and prepared to be presented on date assigned for the final presentations.

## **Project deliverables**

The following deliverables will be produced during the project:

o Planning Phase

* Software Development Plan (SDP)
* Project Proposal Presentation and PowerPoint
* Software Requirements Specification (SRS)

o Research and Model Selection Phase

* Software Design Document (SDD)
* Project Middle Update Presentation and PowerPoint

o Integration Phase (Week 15 - 16)

* Poster
* Final Binder
* Final Presentation Slide

Other than these deliverables, we also have to submit weekly report about the overall progress of the project.

# **Project Organization**

This section outlines how we plan to organize ourselves and resources throughout the semester.

## **Organizational Structure**

Progress through the project smoothly, some roles were provided. Everyone apart of this team will collaborate and contribute to research and programming throughout the semester.

|  |  |  |
| --- | --- | --- |
| **Members** | **Role** | **Description** |
| Dr.Hung | Supervisor | Provides the group direction throughout the project. |
| Roberta Beaulieu | Leader | Leads development, and ensure everyone is contributing equally. |
| Karim Rattani | Operations Manager | Provides everyone with tasks to choose from to insure smooth transition throughout the project. |
| Rakeem Durand | Model Researcher | Researches more about different models we will use. |
| Thomas Fuller | Secretary | Handle the documents, and insures they are submitted. |
| Ihsan Hashem | Integration Researcher | Researches ways to integrate everything we put together for our final product. |

Table 3.1 - Team Member Roles

## **External Interfaces**

We will be getting information from the professor at KSU. Dr. Hung will be our main point of contact in supervising throughout the project. We might get our test and training data from Dr. Yang.

## **Social and Ethical Issues**

In order to progress through this project, everyone apart of this team has to understand the ethical issues that are involved with our project. When it comes to ethical issues, the benefit must outweigh the dilemma in order to progress. Some of the ethical areas that are of concern include, data collection/management, surveillance, and ultimately privacy.

**Data Collection/Management**

One of the main objectives of this project is to capture a large set of data for a machine to learn from and identify anomalies. When using data from outside source, concerns will include on how this data will be used, what will happen when we are finish, will it be used appropriately, and how much do the end-users know about. Whenever real data is being used with this type of project, gathering data may be unknown by the user thus leading to a surveillance issues.

**Surveillance**

Large projects require some sort of data to use in order to provide a basis for the project to progress. With Event Detection Machine Vision, data is collected through some sort of surveillance. By proceeding forward with our project, users may feel like they are being watch all the time. Once implemented users may feel as though their privacy is being threatened due to them being unaware of said event detection.

**Privacy**

Ultimately, everything comes down to privacy. Being able to have control over people's surroundings as well as where they are doing gives one a sense of empowerment. By having a program that is able to constantly monitor individuals for an anomaly detection in the surrounding area may lead to a feeling of no privacy. There always exists possibilities for resources being used to be handled in an unintended way. But by providing proper documentation and handling of data, the end result may be more beneficial.

# **Management Process**

This section covers the team’s plan to complete the project within the given amount of time.

## **Project Plan**

This section outlines the timeline of the major project phases and milestones.

### *Phase Plan*

For this project, we have defined several major phases necessary to complete our project. Table 4.1 lists all phases and what should be accomplished in each phase.

|  |  |
| --- | --- |
| Planning | Schedule and identify tasks that must be completed. |
| Research | Search and review academic literature related to the project. |
| Model Selection | Compare several models and determine the most optimal. |
| Tuning and Optimization | Optimize the chosen model to improve performance. |
| Evaluation | Analyze how the trained model performs overall. |
| Integration | Provide an application interface to utilize the final model. |
| Documentation | Document decisions, approaches, data, and findings. |

Table 4.1 - Phase Descriptions

Many of these phases will naturally overlap, Figure 4.1 plots out the time frame for each of the eight phases. The team plans to leave the last two weeks for documentation, in case some phases take longer than expected.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Week 4 | Week 5 | Week 6 | Week 7 | Week 8 | Week 9 | Week 10 | Week 11 | Week 12 | Week 13 | Week 14 | Week 15 | Week 16 |
| **Planning** |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Research** |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Model Selection** |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Tuning and Optimization** |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Evaluation** |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Integration** |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Documentation** |  |  |  |  |  |  |  |  |  |  |  |  |  |

Figure 4.1 - Gantt chart of all project phases

### *Project Schedule*

In an effort to be more concrete with the project timeline, the team has defined end dates for each of the eight phases. Table 4.2 lists each phase end date as well as its corresponding deliverables.

|  |  |  |
| --- | --- | --- |
| **Date** | **Phase** | **Deliverables** |
| 2/16 | Planning | SDP, SRS |
| 3/2 | Research | Reviewed Literature, SDD |
| 3/16 | Model Selection | Optimal model selected from a set of possible models |
| 3/23 | Tuning and Optimization | Fine-tuned, optimized model for dataset |
| 3/30 | Evaluation | Data and analysis of training and testing datasets |
| 4/20 | Integration | Deployable application that can be used to interface with model |
| 4/27 | Documentation | Findings, final binder, final PPT, and C-Day poster |

Table 4.2 - Project schedule

## **Project Monitoring and control**

This section outlines the measures this team plans to take in order to ensure the above schedule is followed.

### *Schedule control plan*

This team plans to meet at least once every week to discuss team progress and each member’s assigned responsibilities. As members complete tasks, a delegated team member will add member accomplishments to the weekly report. By doing this, the team will have a better understanding of the progress individual members are making.

To make sure continuous progress is being made on the project, the team plans to meet with their advisor (Dr. Chih-Cheng Hung) every other week at a minimum. This will improve the team’s ability to change course as needed.

In the event that the team’s advisor or instructor believes the schedule should be modified, the team plans to take appropriate actions to update the schedule within the SDP. The team will then notify team members, the advisor, and the instructor as needed with the change, and then adjust the due dates of the delegated tasks to reflect the schedule.

### *Reporting Plan*

In order to report member responsibilities and accomplishments to external parties, the team plans to rely on distributing and submitting the required weekly reports. These reports will be used as the team’s external document to detail accomplishments made by each team member.

As for internal reporting, the team plans to use an online task management system in order to assign responsibilities and deadlines to each member. This will allow the team to keep track of team productivity and work distribution.

# **Supporting process plans**

## **Documentation plan**

During the span of the current semester, we plan on delivering the following documentations that go along the development process of our project:

|  |  |
| --- | --- |
| Document | Date |
| ~~Group Information~~ | ~~5:00 PM, 1/26/2018~~ |
| ~~Weekly Report~~ | ~~2:00 PM 2/2/2018~~ |
| ~~SDP~~ | ~~5:00 PM, 2/2/2018~~ |
| ~~Project Proposal slides~~ | ~~5:00 PM, 2/3/2018~~ |
| ~~Proposal Presentation~~ | ~~2:00 PM 2/5/2018~~ |
| ~~Weekly Report~~ | ~~2:00 PM 2/9/2018~~ |
| ~~SRS~~ | ~~5:00 PM 2/16/2018~~ |
| ~~Weekly Report~~ | ~~2:00 PM 2/19/2018~~ |
| ~~Weekly Report~~ | ~~2:00 PM 2/26/2018~~ |
| ~~SDD~~ | ~~5:00 PM 3/2/2018~~ |
| ~~Weekly Report~~ | ~~2:00 PM 3/5/2018~~ |
| ~~Project Update Presentation Slides~~ | ~~5:00 PM 3/9/2018~~ |
| ~~Weekly Report~~ | ~~2:00 PM 3/12/2018~~ |
| ~~Weekly Report~~ | ~~2:00 PM 3/19/2018~~ |
| ~~Weekly Report~~ | ~~2:00 PM 3/26/2018~~ |
| ~~Weekly Report~~ | ~~2:00 PM 4/2/2018~~ |
| ~~Weekly Report~~ | ~~2:00 PM 4/9/2018~~ |
| ~~Poster~~ | ~~5:00 PM 4/13/2018~~ |
| ~~Weekly Report~~ | ~~2:00 PM 4/16/2018~~ |
| Final Presentation Slides | 5:00 PM 4/20/2018 |
| Weekly Report | 2:00 PM 4/23/2018 |
| Final Binder | 5:00 PM 4/27/2018 |

Table 5.1 - Deliverable Due Dates

# **References**

Kennesaw State University. (2018). Senior project course syllabus. Marietta, Georgia: Shi, Yong.

Sultani, Waqas, et al. “Real-World Anomaly Detection in Surveillance Videos.” *Real-World Anomaly Detection in Surveillance Videos*, University of Central Florida, 12 Jan. 2018. Web.

Stahl, Bernd Carsten. “Identifying Ethical Issues during the Development of a Computer Vision Based AmI System: A Case Study.” *University of Salzburg*, 2009.