

SDD
AJE Fire Detection System

Version 1.2

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AJE

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Revisions Page

Date	Version	Changes
11/06/2018	1.0	Creation of document
11/30/2018	1.1	Scope revisions
1/23/2019	1.2	Component additions/modifications
3/10/2019	1.3	Component additions/modifications

1. Introduction

1.1 Purpose(SDD)

_____The purpose of the SDD document is to describe the architecture and design of the AJE Fire Detection System. In this document, diagrams are built to convey the modules and interfaces of the system, and how they relate to each other and to our requirements.

1.2 Scope

_____Given that so little is known about what the EarthNow API will look like, we decided to focus on building just a fire detection module that would eventually become a part of our complete system. The finished detection module would take satellite images as inputs, and output 'true' or 'false' for whether or not the provided image contains a fire. The detection module would use an artificial neural network to analyze images, and so the ANN would need to be developed and refined by taking training data as input. Training data would consist of images that have fires and images that don't, plus the true classification for each image, that is, whether or not a given image actually has a fire. The ANN model will periodically add more training samples to the already existing training set with the expectation of it improving the accuracy of the network. In order to streamline the process of testing and training the ANN, our application will have a GUI, which will allow us to easily input training and testing data into the application.

1.3 Definitions, Acronyms, and Abbreviations

AJE: Anis Joey Ephraim (the name of our system)

Testing Data: Determine if our fire recognition algorithm accurately displays the correct outcome

Training Data: Data that will be used to further develop our fire recognition algorithm and improve its accuracy

ANN: Artificial Neural Network

BackPropagation: A common method of ANN.

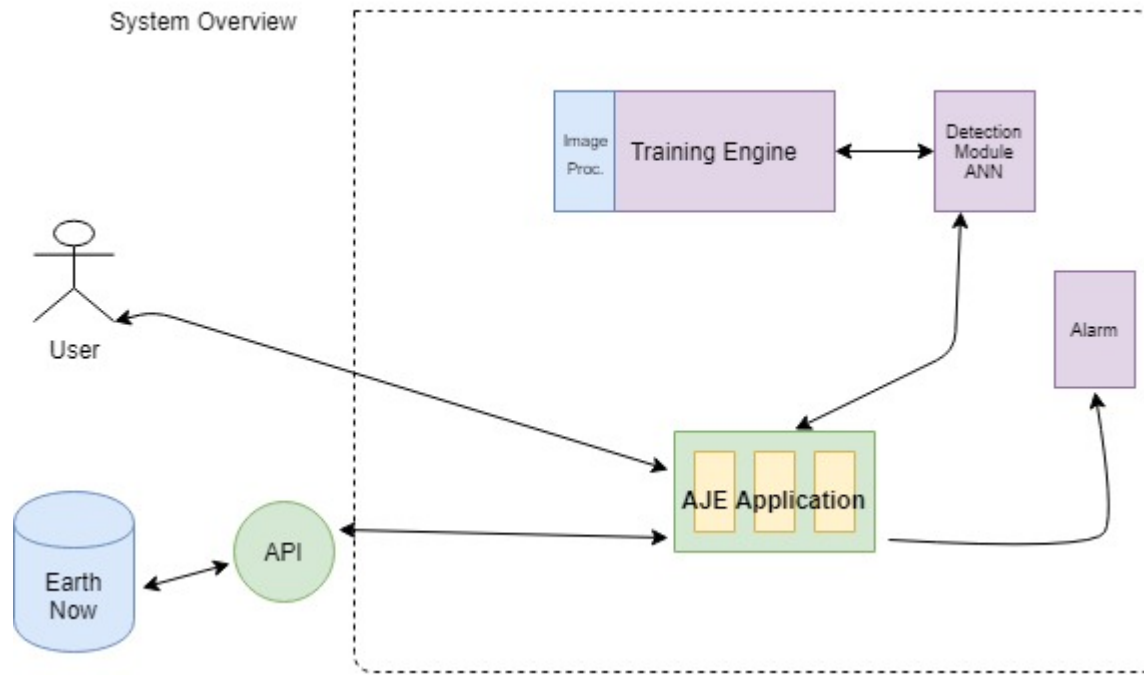
GUI: Graphical User Interface

1.4 References

<https://www.draw.io/>

Sommerville, Ian. Software Engineering. 10th ed., Pearson Education South Asia Pte Ltd, 2016.

2. System Overview

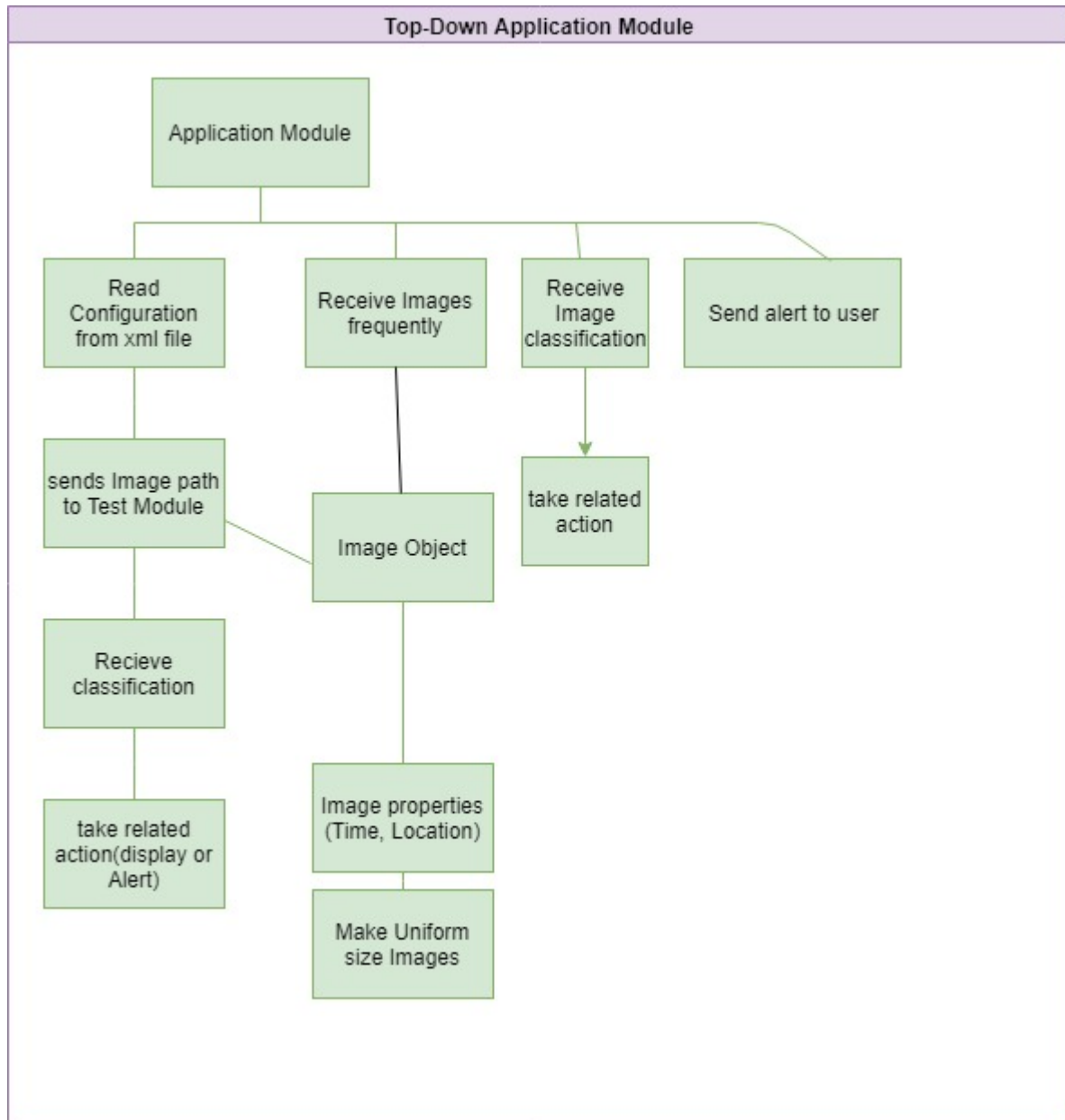


AJE program consists of different components and modules. The core of the application, AJE Application, is in charge of getting commands from user and sending output through the GUI. Once the user command of training is received, AJE will load the training data into detection module, which uses ANN. Another input data is from Earth Now satellite images, which is called the test data. Once any possible fires are detected, the user will be notified. AJE is also able to send an on-demand alarm to the user through the Alarm Module. This is a secondary notification to whom may take actions in such situation.

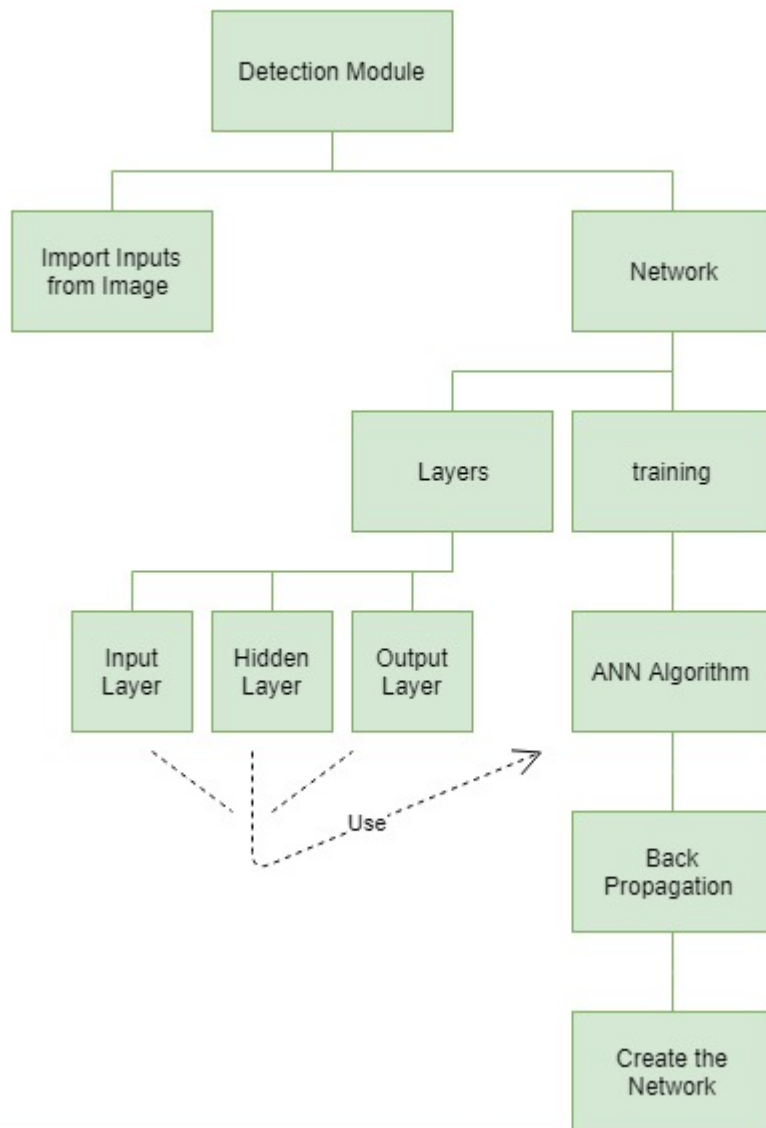
3. System Components:

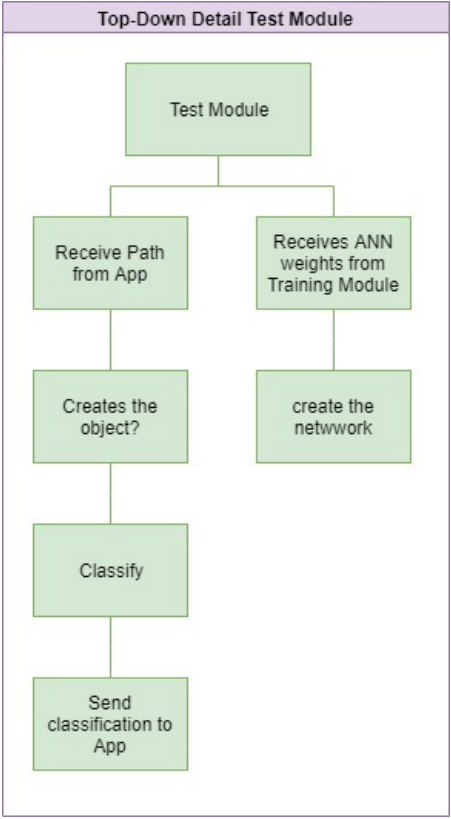
3.1 Decomposition Description:

3.1.1 Top-Down Detail:

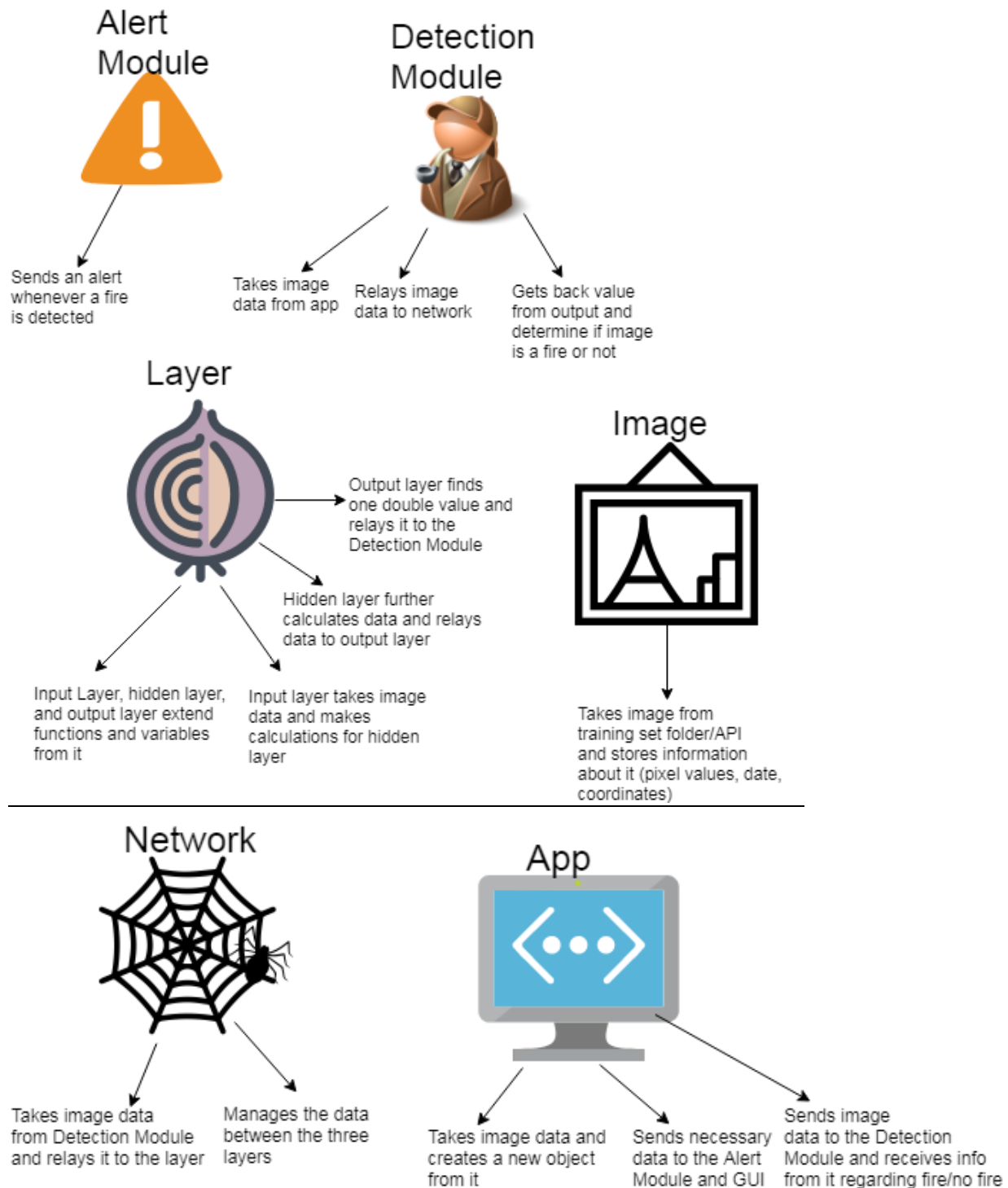


Top-Down Detection Module





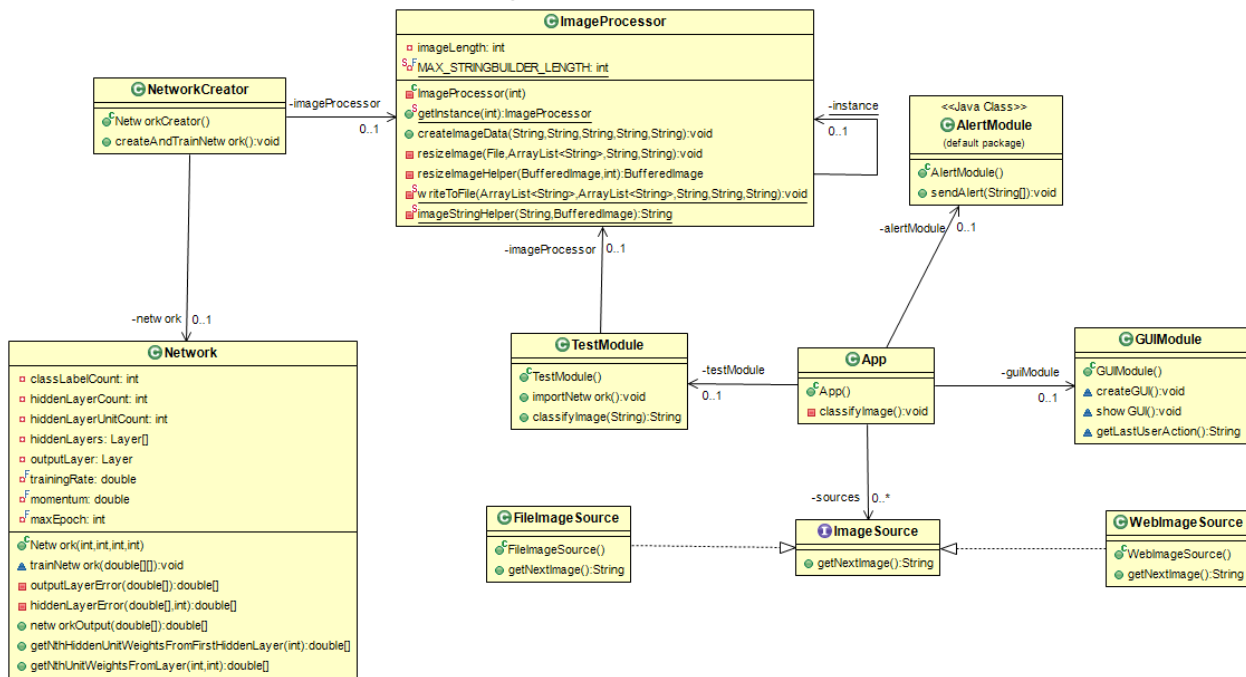
3.1.2 Component Description



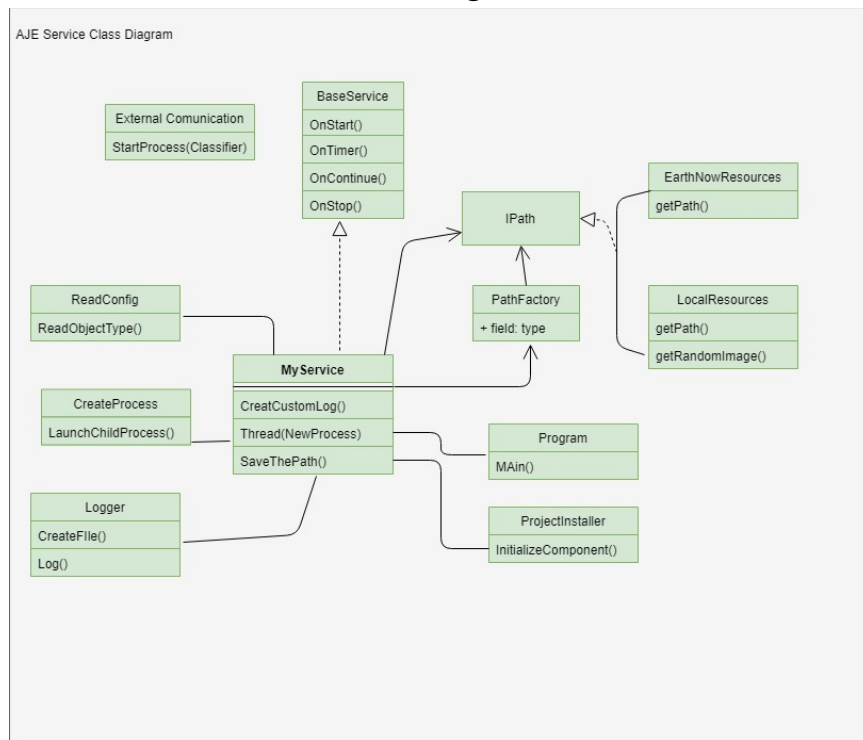
4. Detailed Design:

4.1 Module Detailed Design:

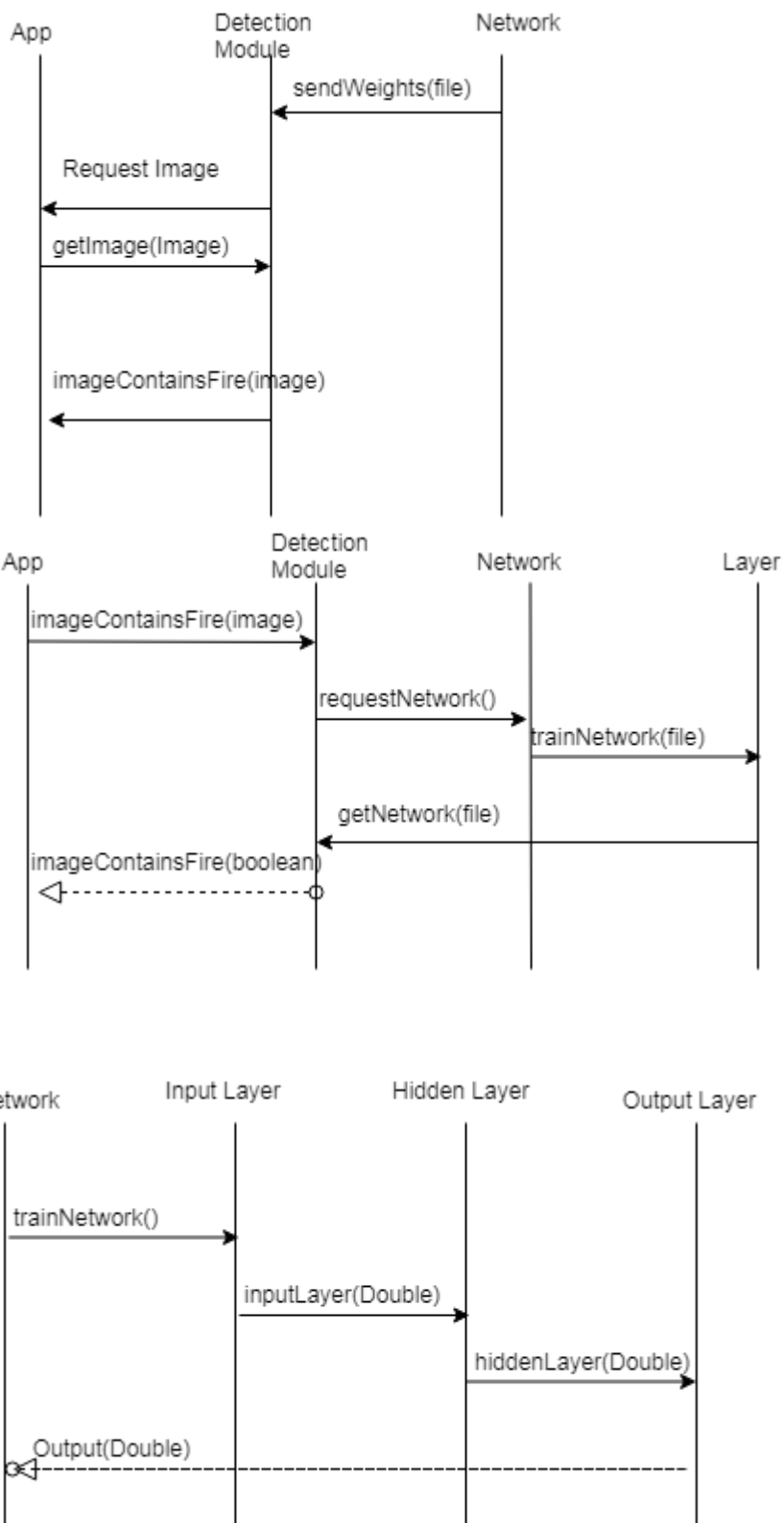
4.1.1 Class Diagram:

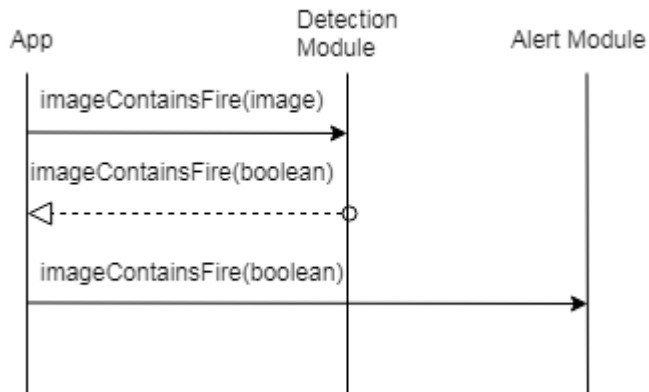


Windows Service Class Diagram



4.1.2 Sequence Diagrams:





4.2 Data Detailed Design

The primary data that is processed by our application is any image that will either be checked for a fire or used to train our ANN. The images will each contain 2 fields: a String array of any contextual information related to the image (when it was taken, the coordinates shown in the image etc.), and a double array of the images, pixels, with three values for each pixel (red, green, and blue). Since incoming images may be of different sizes, all images will be scaled to known dimensions in order to have a standard format of data that can be accepted by the ANN.

While no significant quantities of data need to be stored by the application, the application will retain the data relating to the last image that was sent to the application for classification, in case an alert needs to be sent with that image's information. Since training and testing should be complete by the time the client receives the AJE system, training and testing images are not included when referring to the data that our system interacts with.

4.3 Requirements Traceability Matrix:

<u>Requirement #</u>	<u>Requirement</u>	<u>Design Specification</u>	<u>Program Modules</u>	<u>Modification of Requirement</u>	<u>Remarks</u>
1	The system shall take training sets of fire images and recognize whether there is a fire, the beginning of a fire (smoke), or no fire at all	3.2 Functional Requirements	App, Detection Module, Layer, Network	11/5/18	
2	The system shall send a notification to the admin when it recognizes a fire in the image given	3.2 Functional Requirements	App, Alert Module	11/5/18	

3	The system shall take real inputs of satellite images and determine whether the image contains a fire or not	3.2 Functional Requirements	API Adaptor, App, Detection Module, Network, Layer	11/5/18	
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