Analysis of Satellite Image for wildfire identification

A MINOR – II PROJECT REPORT

Submitted by
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DECLARATION

I, Md Asif Nasim Siddiqui a student of Bachelor of Technology (Computer Science & Engineering) (BTCSE), (Enrolment No.: 2016-310-043) hereby declare that the dissertation entitled "**Analysis of Satellite Image**" which is being submitted by me to the Department of Computer Science, Jamia Hamdard, New Delhi in partial fulfillment of the requirement for the award of degree of B.Tech(Computer Science)(BTCSE), is my original work and has not been submitted anywhere else for the award of any Degree, Diploma, Associateship, Fellowship or other similar title or recognition.

Md Asif Nasim

Date:
Place:

ACKNOWLEDGEMENT

Date:

Table of content

Analysis of Satellite Image

<ins>ABSTRACT</ins>

The abstract for which this project is built is to analyze satellite image that will give meaningful insights We take input from the .CSV(comma separated values) file that works as a database and display the meaningful insight in the form bar charts and graphs using Matplotlib.

The other objectives of this project also include the following:
1. To successfully take input.
2. To convert raw data in the required format.
3. To import data in the correct format
4. Successfully plotting the insight in the desired graph and plot.

<u>INTRODUCTION</u>

In the application, we are using Machine Learning Libraries like Numpy[3], Pandas[4] and Matplotlib[5] in order to extract meaningful insight in the best possible human readable format and that too easy to understand.

In the application we are analyzing satellite image. Satellite images are used by many professionals and the image that we got is sometimes very cumbersome to understand, So Data Scientists and developers around the world work very hard to make the analysis of image easier by developing some great Machine learning and data Science Libraries like numpy, pandas , Matplotlib etc. These are the best availables in the market to make the work easier for them upto the naive level.

We start the project and our first task is to clean the data in the proper format, by removing the NaN values or filling them with the mean value. and then by dropping or not dropping the attribute which favoured the result.

PROBLEM STATEMENT

We are living in world where filters has become the integral part of our life take the examples of the most famous application like instagram and snapchat they uses the filters to make people appear more pretty. and moreover. It has application in medicines and astronomy as well. It will be a cumbersome task to apply simple techniques to understand and meaningful insight from those pictures.

The Forest area is very dense and its get very difficult to detect which area is more prone wildfire. So by analysing the satellite image we can save a large portion of area before it comes under the flames of wildfire.

Recently, first ever real image of the Black-Hole has been captured, and that become possible with the use of these great tools like Numpy, Pandas, Matplotlib etc.

SOFTWARE REQUIREMENT SPECIFICATION

Introduction

Purpose

Satellite Image Analysis is an applications which is used to recognize many insightful things like which part has the high elevation and which part has volcanic activity etc. which would not be possible otherwise. This Course was offered by University of California San Diego.[3]

Document Conventions

The Documents subsequently explains the needs and traits of the project produced, with sufficient re-modeling of data. The important data has expressed in proper fonts and using techniques

Intended Audience and Reading Suggestions

The application developed is intended to be used by all the people globally who use any sort of web or device based application. The application is in development stage.

Product Scope

- It is a subset of Machine learning and Artificial Intelligence.
- It's a Real Time Recognition System which is easy to use.
- Moreover it is User-Friendly
- It is very Cost-Effective, Faster, And Reliable, and towards the idea of typing less conversation.
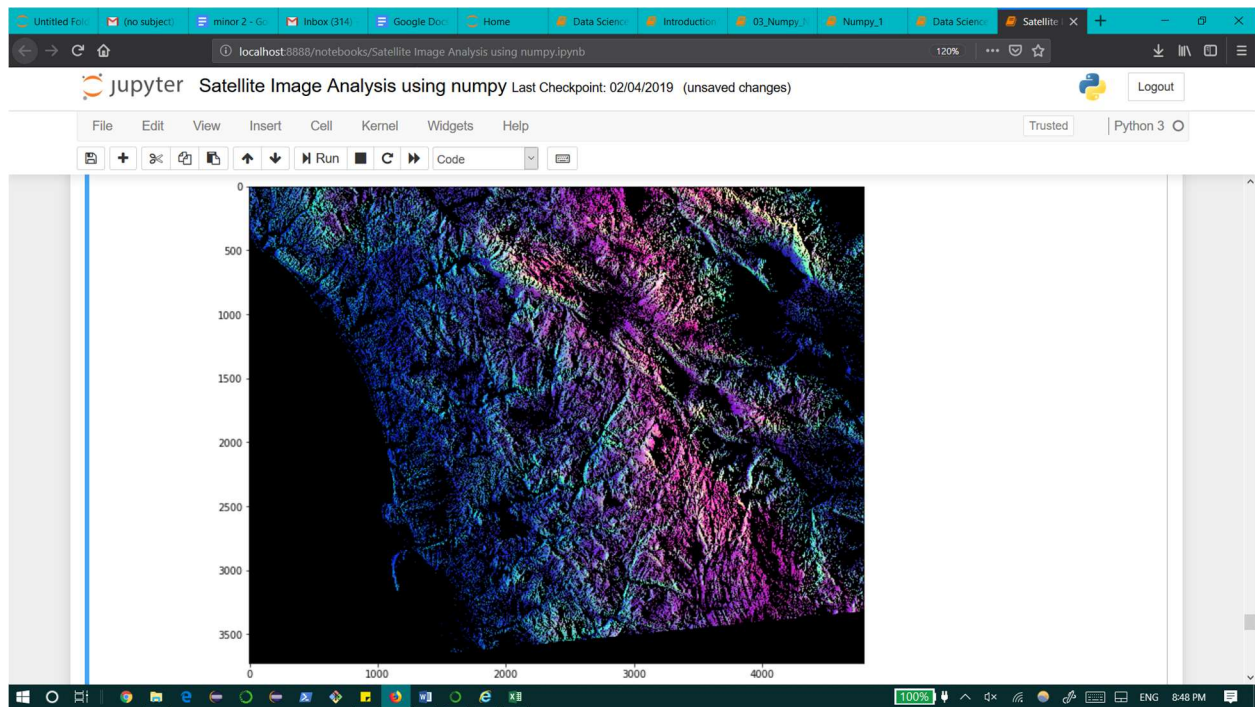
Overall Description

fig-01

Operating Environment

The software requires Python 3.6 and an IDE that can run Python in it ex. Jupyter. The Software will coexist with mostly all the system based application without creating a problem to other tools. This can work on both UBUNTU and WINDOWS based systems

Design and Implementation Constraints

The software does not hold any constraints as the developer can always edit and remap the software according the fresh needs and ideas. The availability of data in improper and scattered format may affect the user input input and difficulty in cleaning of data, better the processor better the result and it huge RAM and processing power to compute the analytics.Though the developers needs a specific tool set to work upon the described software. The client cannot make and code based changes.

User Documentation

The software comes with a manual and software based Readme File to help the client out.

Assumptions and Dependencies

The Software uses Numpy, Pandas and matplotlib dependencies from the Libraries of Python 3.x

Other Nonfunctional Requirements

Performance Requirements

It will require a minimum of 4GB of RAM and there is no memory constraint for the application.

Security Requirements

Once the data is being cleaned user must not alter the given data in it as it may conflict at the time of analysis.

Software Quality Attributes

The user can use a more RAM to Process and analyze the data in a more precise and fundamental way

Business Rules

No business rule as such required. As the application is still under development and is not incorporated by means of any business
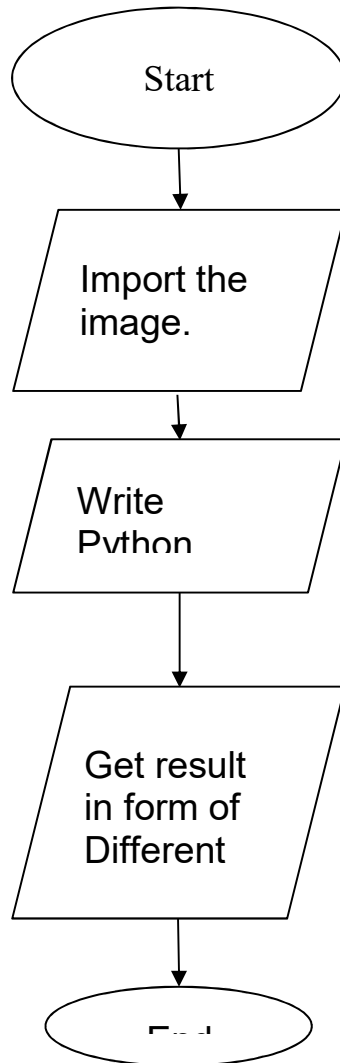
FlowChart

Application : For Satellite Image

```
                    ┌─────────────┐
                   (    Start      )
                    └─────────────┘
                          │
                          ▼
                  ╱──────────────╱
                 ╱  Import the   ╱
                ╱   image.      ╱
               ╱──────────────╱
                          │
                          ▼
                  ╱──────────────╱
                 ╱  Write        ╱
                ╱   Python      ╱
               ╱──────────────╱
                          │
                          ▼
                  ╱──────────────╱
                 ╱  Get result   ╱
                ╱   in form of  ╱
               ╱   Different    ╱
              ╱──────────────╱
                          │
                          ▼
                    ┌─────────────┐
                   (    End        )
                    └─────────────┘
```

fig-02

Data-Flow Diagram

		Data Cleaning

Input

Satellite Image

To Be analysed

Application

Analysed image

Output
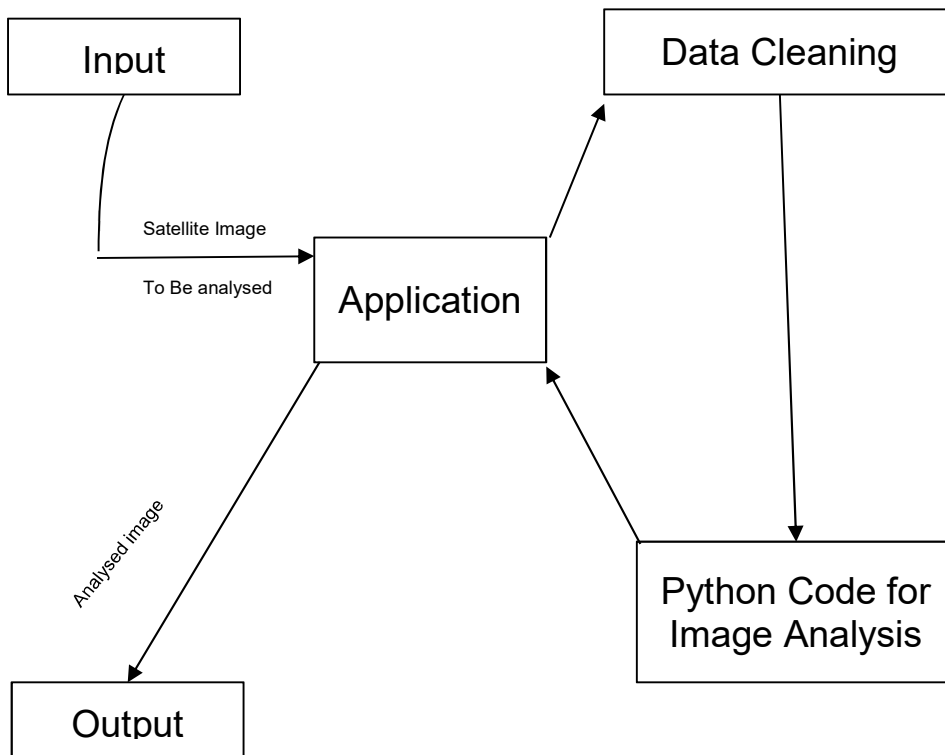
Python Code for Image Analysis

fig- 03

Procedure
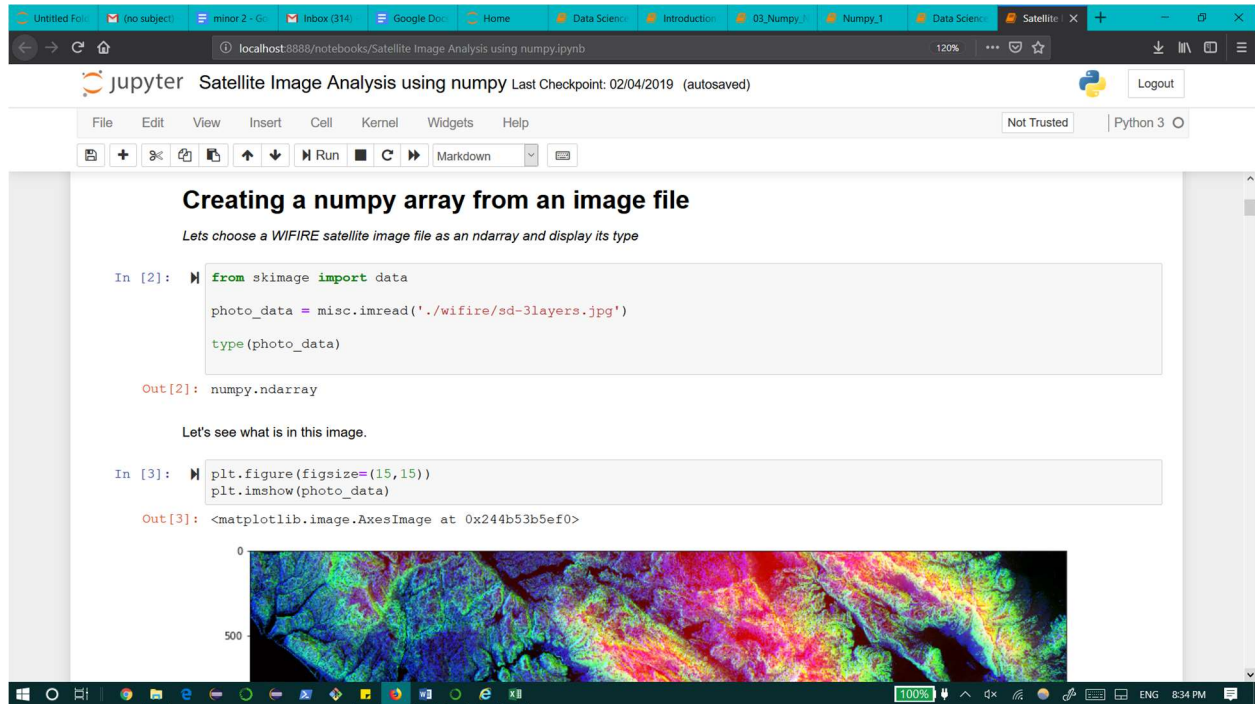
Capturing Dataset

For satellite Image.[1]

fig-04

We have separate file for the image that we used in the analysis, which we got from the wifire project. It is the project that was completed by University of California, San Diego [1].

The WIFIRE Lab develops integrated systems for natural hazards monitoring, simulation, and response. We do this by building knowledge cyber infrastructures: the end-to-end management layer from the data collection to modeling efforts to data driven knowledge.
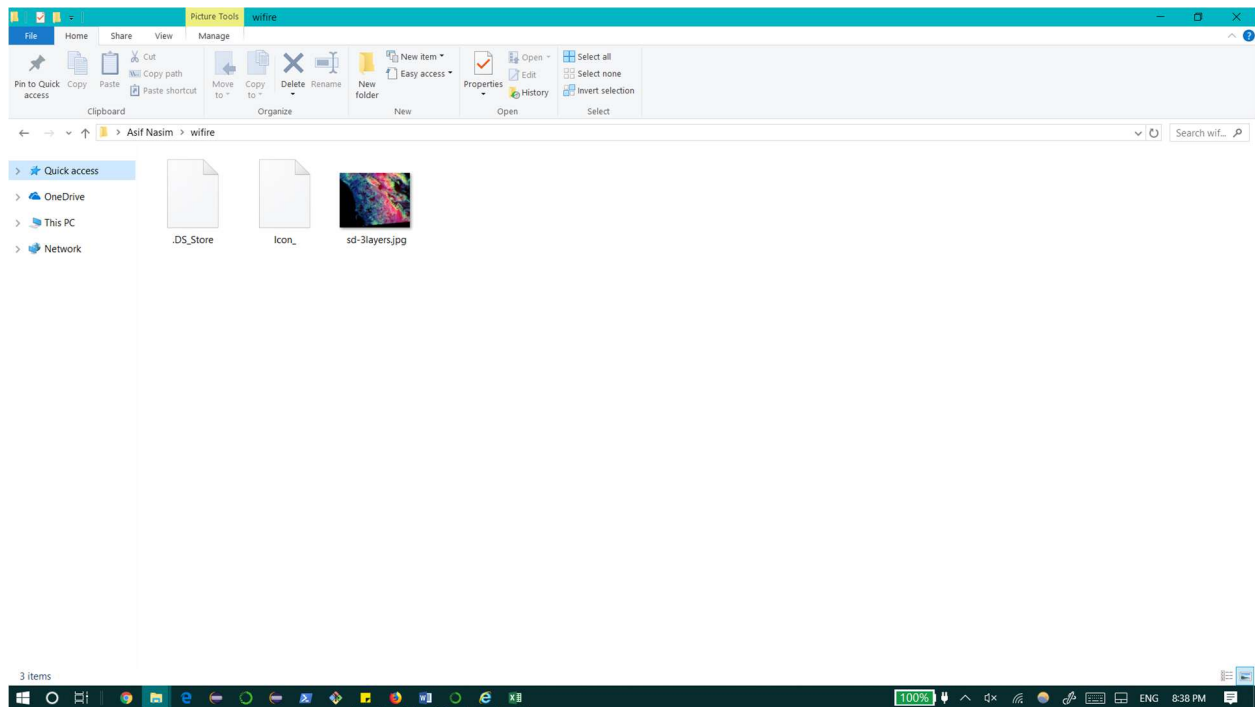
fig-05

We use Python data science Libraries like Numpy, Pandas and Matplotlib that built over the C++, and that is the reason it is so fast and reliable that it can compute huge datasets within seconds.

Result & Analysis

The higher values denote higher altitude, aspect and slope.

photo_data = misc.imread('./wifire/sd-3layers.jpg')

red_mask   = photo_data[:, : ,0] < 150

```
photo_data[red_mask] = 0

plt.figure(figsize=(13,9))

plt.imshow(photo_data)
```
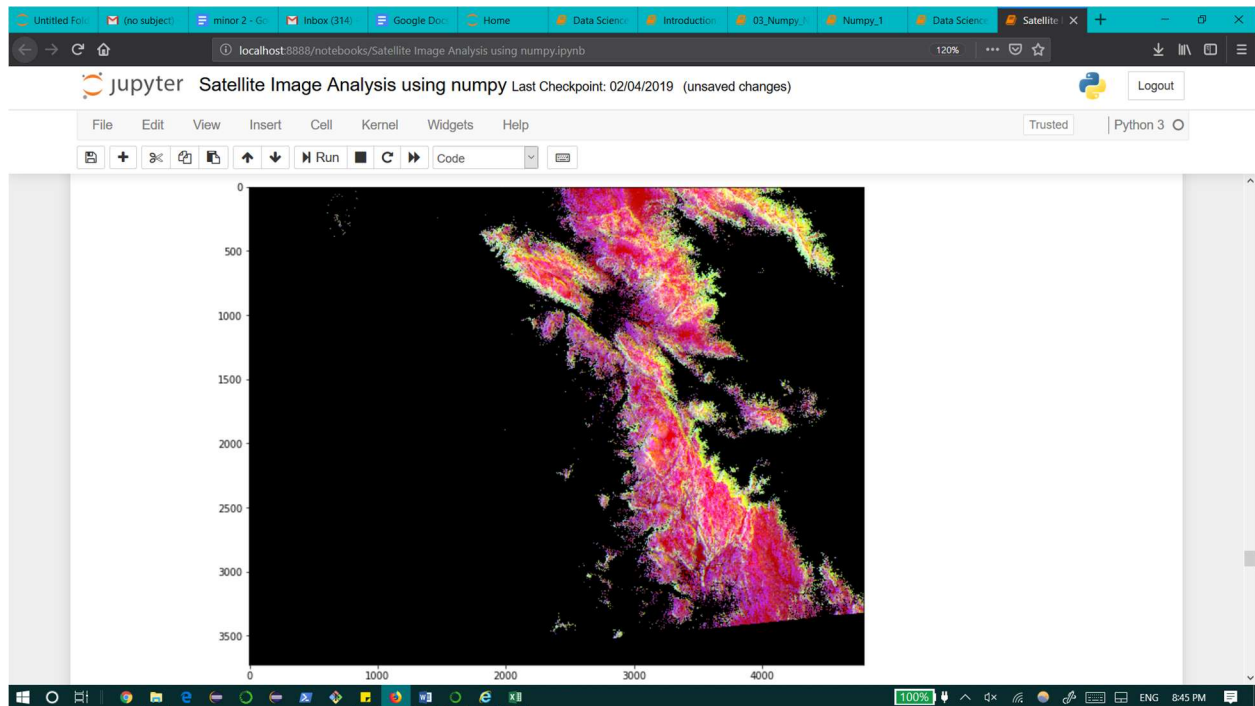

fig-06

RED pixel indicates Altitude

```
photo_data = misc.imread('./wifire/sd-3layers.jpg')
green_mask = photo_data[:, : ,1] < 150

photo_data[green_mask] = 0
plt.figure(figsize=(13,9))
plt.imshow(photo_data)
```
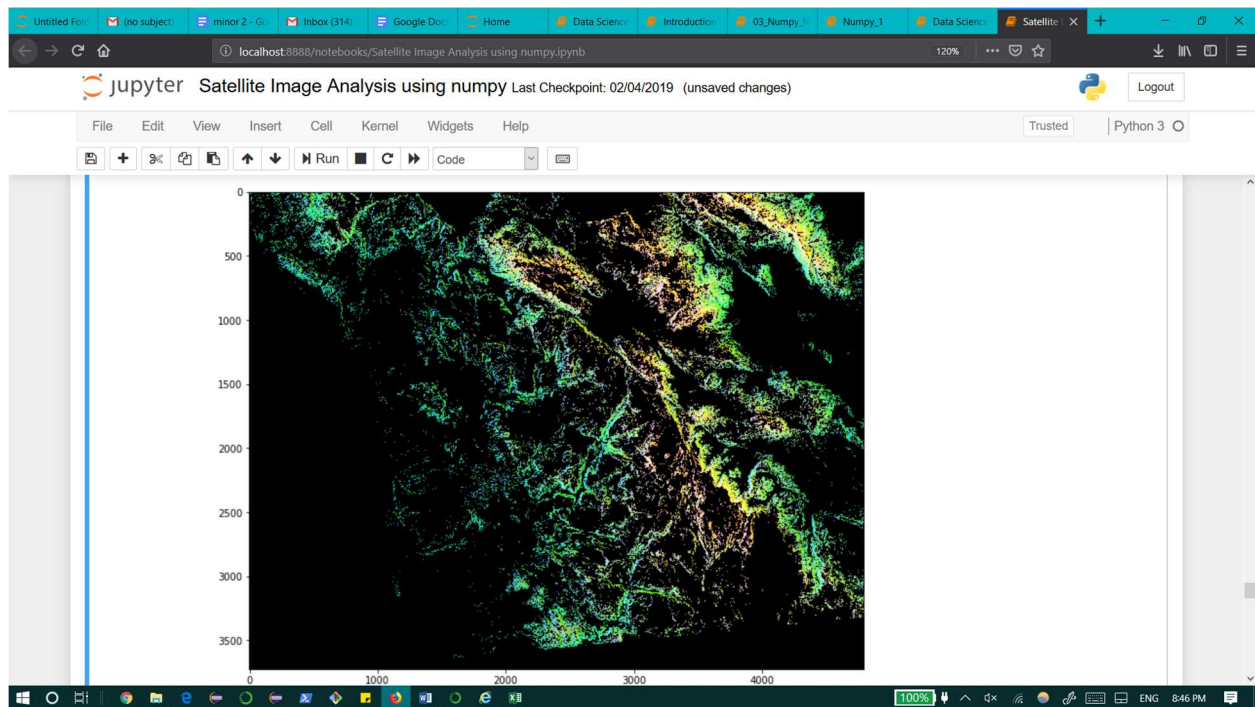
fig-07. *GREEN pixel indicates Slope*

photo_data = misc.imread('./wifire/sd-3layers.jpg')
blue_mask = photo_data[:, : ,2] < 150

photo_data[blue_mask] = 0
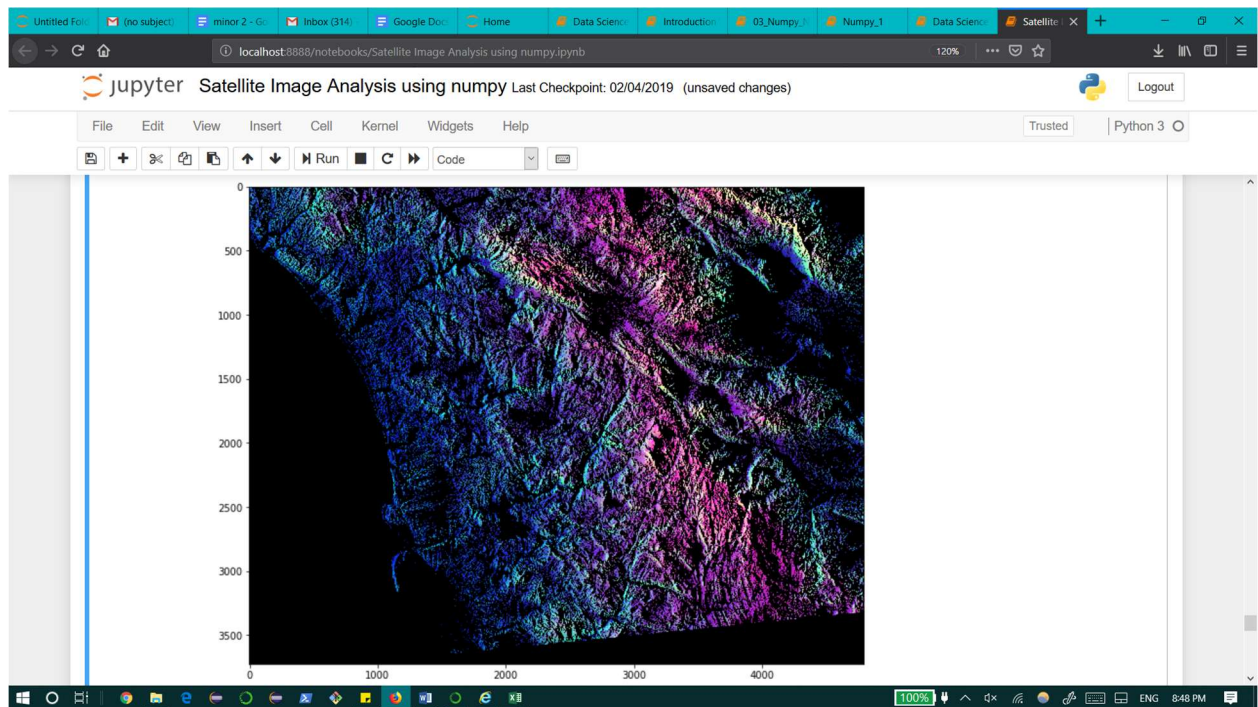plt.figure(figsize=(15,9))
plt.imshow(photo_data)

fig-08

BLUE pixel indicates Aspect

Conclusion

Through satellite image processing, I came to know how the different factors affects the initiation of wildfire in forests and wildlife. Thus protecting many organisms from the consequences of that fire. Different factors like altitude, slope, aspects which governs the climate and temperature effective for the cause of wildfire. Through this prediction and live imaging of those places, we can escape from fire and thus can take precautions.

The application has successfully determine the different kind of Satellite image in RGB pixels, The RED pixels indicates Altitude, The BLUE pixels indicates Aspects and the GREEN pixels indicates slope .
The Higher the value denotes higher altitude, aspect and slope.

Bibliography

[1] The WIFIRE project provides a REST web service that integrates access to a variety of data types from different sources. https://wifire.ucsd.edu/data-api

[2] Python for Data Science UCDS
https://courses.edx.org/courses/course-v1:UCSanDiegoX+DSE200x+1T2019/courseware/

[3] Numpy, official documentation.
https://docs.scipy.org/doc/numpy/user/

[4] Pandas official Documentation.
https://pandas.pydata.org/pandas-docs/stable/

[5] Matplotlib official Documentation.
https://matplotlib.org/tutorials/introductory/pyplot.html