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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

A PROJECT REPORT

ON

"WEB PHISHING DETECTION"

Submitted in "HX8001 PROFESSIONAL READINESS FOR INNOVATION EMPOLYABILITY AND ENTREPRENEURSHIP"

BACHELOR OF ENGINEERING

IN

COMPUTER SCIENCE AND ENGINEERING

BY

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ABSTRACT

The criminals, who want to obtain sensitive data, first create unauthorized replicas of a real website and e-mail. The e-mail will be created using logos and slogans of a legitimate company. The nature of website creation is one of the reasons that the Internet has grown so rapidlyas a communication medium. Phisher then send the "spoofed" e-mails to as many people as possible in an attempt tolure them into the scheme. When these e-mails are opened or when a link in the mail is clicked, the consumers areredirected to a spoofed website, appearing to be from the legitimate entity. We discuss the methods used for detection of phishing Web sites based on url importance properties

CHAPTER 1

1.1 About Detection Of Phishing Website

Phishing costs Internet users billions of dollars per year. It refers to luring techniques used by identity thieves to fish for personal information in a pond of unsuspecting Internet users. Phishers use spoofed e-mail, phishing software to steal personal information and financial account details such as usernames and passwords. This paper deals with methods for detecting phishing Web sites by analyzing various features of benign and phishing URLs by Machine learning techniques. We discuss the methods used for detection of phishing Web sites based on lexical features, host properties and page importance properties. We consider various machine learning algorithms for evaluation of the features in order to get a better understanding of the structure of URLs that spread phishing. The fine-tuned parameters are useful in selecting the apt machine learning algorithm for separating the phishing sites from benign sites. The criminals, who want to obtain sensitive data, first create unauthorized replicas of a real website and e-mail, usually from a financial institution or another company that deals with financial information. The e-mail will be created using logos and slogans of a legitimate company. The nature of website creation is one of the reasons that the Internet has grown so rapidly as a communication medium, it also permits the abuse of trademarks, trade names, and other corporate identifiers upon which consumers have come to rely as mechanisms for authentication. Phisher then send the "spoofed" e-mails to as many people as possible in an attempt to lure them in to the scheme. When these e-mails are opened or when a link in the mail is clicked, the consumers are redirected to a spoofed website, appearing to be from the legitimate entity.

Advantages

• This system can be used by many E-commerce or other websites in order to have good customer relationship. • User can make online payment securely

. • Data mining algorithm used in this system provides better performance as compared to other traditional classifications algorithms.

• With the help of this system user can also purchase products online without any hesitation.

Disadvantages

• If Internet connection fails, this system won't work

. • All websites related data will be stored in one place.

1.1 Problem Definition

Phishing is one of the techniques which are used by the intruders to get access to the user credentials or to gain access to the sensitive data. This type of accessing the is done by creating the replica of the websites which looks same as the original websites which we use on our daily basis but when a user click on the link he will see the website and think its original and try to provide his credentials . To overcome this problem we are using some of the machine learning algorithms in whichit will help us to identify the phishing websites based on the features present in the algorithm. By using these algorithm we cam be able to keep the user personal credentialsor the sensitive data safe from the intruders.

1.3 Project Purpose

The main purpose of the project is to detect the fake or phishing websites who are trying to get access to the sensitive data or by creating the fake websites and trying to get access of the user personal credentials. We are using machine learning algorithms to safeguard the sensitive data and to detect the phishing websites who are trying to gain access on sensitive data.

1.4 Project Features:

One of the challengesfaced by our research wasthe unavailability of reliable trainingdatasets. In fact, this challenge faces any researcher in the field. However, although plentyof articles about predicting phishing websites using data mining techniques have beendisseminated these days, no reliable training dataset has been published publically, maybe because there is no agreement in literature on the definitive features that characterize phishing websites, hence it is difficult to shape a dataset that covers all possible features. In this article, we shed light on the important features that have proved to be sound and effective in predicting phishing websites. In addition, we proposed some new features, experimentally assign new rules to some well-known features and update some other features.

1.1. Address Bar based Features

1.1.1. Using the IP Address

If an IP address is used as an alternative of the domain name in the URL, such as “http://125.98.3.123/fake.html”, users can be sure that someone is trying to steal their personal information. Sometimes,

the IP address is even transformed into hexadecimal code as shown in the following link “http://0x58.0xCC.0xCA.0x62/2/paypal.ca/index.html”.

1.1.2 Long URL to Hide the Suspicious Part

Phishers can use long URL to hide the doubtfulpart in the address bar. For example:

http://federmacedoadv.com.br/3f/aze/ab51e2e319e51502f416dbe46b773a5e/?cmd=_home&dispatch=11004d58f5b74f8dc1e7c2e8dd4105e811004d58f5b74f8dc1e7c2e8dd4105

e8@phishing.website.html

To ensure accuracy of our study, we calculated the length of URLs in the datasetand produced an average URL length. The results showed that if the length of the URL is greater than or equal 54 characters then the URL classified as phishing. By reviewing our dataset we were able to find 1220 URLs lengths equals to 54 or more which constitute 48.8% of thetotal datasetsize.

$$URL\ length < 54 \rightarrow feature = \text{Legitimate}$$

Rule: IF$\{ else\ if\ URL\ length \geq 54\ and \leq 75 \rightarrow feature = Suspicious$

$$otherwise \rightarrow feature = \text{Phishing}$$

We have been able to update this feature rule by using a method based on frequency and thus improvingupon its accuracy.

1.1.3 Using URL Shortening Services “TinyURL”

URL shortening is a method on the “World Wide Web” in whicha URL may be made considerably smaller in length and still lead to the required webpage. This is accomplishedby means of an “HTTPRedirect” on a domain name that is short, whichlinks to the webpagethat has a long URL. For example, the URL “http://portal.hud.ac.uk/” can be shortenedto “bit.ly/19DXSk4”.

TinyURL → Phishing

Rule: IF{Otherwise → Legitimate

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TinyURL → Phishing *Rule*: IF{Otherwise → Legitimate

1.1.5 Redirecting using “//”

The existence of “//” within the URL path means that the user will be redirected to another website. An example of such URL’s is: “http://www.legitimate.com//http://www.phishing.com”. We examin the location wherethe“//” appears. We find that if the URL starts with “HTTP”, that means the “//” should appear in the sixth position. However, if the URL employs “HTTPS” then the “//” should appear in seventhposition.

ThePosition of the Last Occurrence of "//" in the URL > 7 → *Phishing*
Rule: IF { Otherwise → Legitimate

1.1.6 Adding Prefix or Suffix Separated by (-) to the Domain

The dash symbol is rarely used in legitimate URLs. Phishers tend to add prefixes or suffixes separated by (-) to the domainname so that users feel that they are dealingwith a legitimate webpage. For example http://www.Confirme-paypal.com/.

Domain Name Part Includes(−) Symbol → Phishing
Rule: IF { Otherwise → Legitimate

1.1.7 Sub Domain and Multi Sub Domains

Let us assume we have the following link: http://www.hud.ac.uk/students/. A domain name might include the country-code top-level domains (ccTLD), which in our example is “uk”. The “ac” part is shorthand for “academic”, the combined “ac.uk” is called a second-level domain (SLD) and “hud” is the actual name of the domain. To produce a rule for extracting this feature,we firstly have to omit the (www.) from the URL which is in fact a sub domain in itself.

Then, we have to remove the (ccTLD) if it exists. Finally, we count the remaining dots. If the number of dots is greater than one, then the URL is classified as “Suspicious” since it has one sub domain. However, if the dots are greater than two, it is classified as “Phishing” since it will have multiple sub domains. Otherwise, if the URL has no sub domains, we will assign “Legitimate” to the feature.

Dots In Domain Part = 1 → Legitimate
Rule: IF {Dots In DomainPart = 2 → Suspicious
Otherwise → Phishing

1.1.8 HTTPS (Hyper Text Transfer Protocolwith Secure SocketsLayer)

The existence of HTTPS is very important in giving the impression of website legitimacy, but this is clearly not enough. The authors in (Mohammad, Thabtahand McCluskey 2012) (Mohammad, Thabtah and McCluskey 2013) suggest checking the certificate assigned with HTTPS including the extent of the trust certificate issuer, and the certificate age. Certificate Authorities that are consistently listedamong the top trustworthy namesinclude: “GeoTrust, GoDaddy,Network Solutions, Thawte,Comodo, Doster and VeriSign”. Furthermore, by testing out our datasets, we find that the minimumage of a reputable certificate is two years.

Rule:

Use https and IssuerIs Trusted $and\ Age\ of\ Certificate$ ≥ 1 Years → Legitimate
Using https and Issuer Is Not Trusted → SuspiciousOtherwise → Phishing

1.1.9 Domain Registration Length

Based on the fact that a phishing website lives for a short period of time, we believe that trustworthy domains are regularly paid for several years in advance. In our dataset, we find that the longest fraudulent domainshave been used for one year only.

Rule: IF{

Domains Expires on ≤ 1 years → PhishingOtherwise →
Legitimate

1.1.10 Favicon

A favicon is a graphic image (icon) associated with a specific webpage. Many existing user agents such as graphical browsers and newsreaders show favicon as a visual reminder of the website identity in the address bar. If the favicon is loaded from a domain other than that shown in the address bar, then the webpage is likely to be considered a Phishing attempt.

Rule: IF{

Favicon LoadedFrom External Domain → PhishingOtherwise →
Legitimate

1.1.11 Using Non-Standard Port

This feature is useful in validating if a particular service (e.g. HTTP) is up or down on a specific server.In the aim of controlling intrusions, it is much betterto merely open ports that you need. Several firewalls, Proxy and Network Address Translation (NAT) servers will, by default, block all or most of the ports and only open the ones selected. If all ports are open, phisherscan run almost any servicethey want and as a result, user information is threatened. The most important ports and their preferredstatus are shown in Table 2.

Rule: IF{

Port # is of the Preffered Status → PhishingOtherwise →
Legitimate

Table 1 Common portsto be checked

PORT	Service	Meaning	Preferred Status
21	FTP	Transfer filesfrom one hostto another	Close
22	SSH	Secure FileTransfer Protocol	Close
23	Telnet	provide a bidirectional interactive text-oriented communication	Close
80	HTTP	Hyper testtransfer protocol	Open
443	HTTPS	Hypertext transfer protocol secured	Open
445	SMB	Providing sharedaccess to files,printers, serial ports	Close
1433	MSSQL	Store and retrieve data as requested by other software applications	Close
1521	ORACLE	Access oracledatabase from web.	Close
3306	MySQL	Access MySQLdatabase from web.	Close
3389	Remote Desktop	allow remoteaccess and remotecollaboration	Close

1.1.12 The Existenceof “HTTPS” Token in the Domain Part ofthe URL

1.2 Abnormal Based Features

1.2.1 Request url

Request URL examines whether the external objects contained within a webpage such as images, videos and sounds are loaded from another domain. In legitimate webpages, the webpage address and most of objects embedded within the webpage are sharing the same domain.

$$\%\ \text{of Request URL} < 22\% \rightarrow \textit{Legitimate}$$

Rule: IF {%of Request URL ≥ 22% and 61% → SuspiciousOtherwise →

feature = Phishing

1.2.2 URL of Anchor

An anchor is an element defined by the <a> tag. This feature is treated exactly as “Request URL”.However, for this feature we examine:

1. If the <a> tags and the website have different domainnames. This is similar to request URL feature.
2. If the anchordoes not link to any webpage, e.g.:

   a. <a href=“#”>

   b. <a href=“#content”>

   c. <a href=“#skip”>

   d. <a href=“JavaScript ::void(0)”>

$$\%\ \text{of URL Of Anchor} < 31\% \rightarrow \textit{Legitimate}$$
$$\underline{\textit{Rule}}\text{: IF}\{\%\ \text{of URL Of Anchor} \geq 31\%\ \text{And} \leq 67\% \rightarrow \text{Suspicious}$$
$$\text{Otherwise} \rightarrow \text{Phishing}$$

1.2.3 Links in <Meta>, <Script> and <Link> tags

Given that our investigation covers all angles likely to be used in the webpage source code, we find that it is commonfor legitimate websitesto use <Meta> tags to offer metadataabout the HTML document; <Script> tags to create a client side script; and <Link> tags to retrieve other web resources. It is expected that these tags are linked to the same domainof the

webpage.

Rule:

IF

$$\%\text{of Linksin " < } Meta \text{ > "," < } Script \text{ > " } and \text{ " < Link>" < 17\% } \rightarrow \ Legitimate$$

{% of Links in < $Meta$ > "," < $Script$ > " and " < Link>" ≥ 17% And ≤ 81% → Suspicious

Otherwise → Phishing

1. Server Form Handler (SFH)

SFHs that contain an empty string or “about:blank” are considered doubtful because an action should be taken upon the submitted information. In addition, if the domain name in SFHs is different from the domain name of the webpage, this reveals that the webpage is suspicious because the submitted information is rarely handledby external domains.

SFHis "about: blank" Or Is Empty → Phishing

Rule: IF{ SFH Refers To A Different Domain → Suspicious

Otherwise → Legitimate

2. Submitting Information to Email

Web form allows a user to submit his personal information that is directed to a server forprocessing. A phishermight redirect the user’s information to his personalemail. To that end, a server-side scriptlanguage might be used such as “mail()”function in PHP. One more client-side function that might be used for thispurpose is the “mailto:” function.

Rule: IF{Using "mail()" or "mailto:" Functionto Submit User Information → Phishing

Otherwise → Legitimate

3. Abnormal URL

This feature can be extracted from WHOIS database. For a legitimate website, identity is typically part ofits URL.

The Host Name Is Not IncludedIn URL → Phishing

Rule: IF { Otherwise → Legitimate

1.3 HTML and JavaScript based Features

1.3.1 Website Forwarding

The fine line that distinguishes phishing websites from legitimate ones is how many times a website has been redirected. In our dataset, we find that legitimate websites have been redirected one time max. On the other hand, phishing websites containing this feature have been redirected at least 4 times.

Rule: IF {

ofRedirect Page ≤ 1 → Legitimate
of RedirectPage ≥ 2 And < 4 → $Suspicious$

Otherwise → Phishing

1.3.2 Status Bar Customization

Phishers may use JavaScript to show a fake URL in the status bar to users. To extract this feature, we must dig-out the webpage source code, particularly the “onMouseOver” event, and check if it makes any changeson the status bar.

Rule: IF{

onMouseOver ChangesStatus Bar → PhishingIt Does′t Change
Status Bar → Legitimate

1.3.3 Disabling Right Click

Phishers use JavaScript to disable the right-click function, so that users cannot view and savethe webpage source code. This feature is treated exactly as “Using onMouseOver to hide the Link”. Nonetheless, for this feature, we will search for event “event.button==2” in the webpage source code

and check if the rightclick is disabled.

Rule: IF{

Right Click Disabled → PhishingOtherwise → Legitimate

Using Pop-up Window

It is unusual to find a legitimate website asking users to submit their personal informationthrougha pop-up window. On the other hand, this feature has been used in some legitimate

welcome announcement, though no personal information was asked to be filled in through these pop-upwindows.

Popoup Window Contains Text Fields → Phishing
Rule: IF { Otherwise → Legitimate

i. IFrame Redirection

IFrame is an HTML tag used to display an additional webpageinto one that is currentlyshown. Phishers can make use of the “iframe” tag and make it invisible i.e. without frame borders. In this regard, phishers make use of the “frameBorder” attribute which causes the browser to render a visual delineation.

Rule: IF {Using iframe → PhishingOtherwise →

Legitimate

b. Domain based Features

i. Age of Domain

This feature can be extracted from WHOIS database (Whois 2005). Most phishing websites live for a short period of time. By reviewing our dataset, we find that the minimumage of the legitimate domain is 6 months.

Age Of Domain ≥ 6 months → Legitimate
Rule: IF { Otherwise → Phishing

ii. DNS Record

For phishing websites, either the claimed identity is not recognized by the WHOIS database (Whois 2005)or no records founded for the hostname(Pan and Ding 2006). If the DNS record is empty or not found then the website is classified as “Phishing”, otherwise it is classified as “Legitimate”.

Rule: IF{

$$\text{no DNS Record For The Domain} \rightarrow \text{Phishing}\text{Otherwise} \rightarrow \text{Legitimate}$$

iii. Website Traffic

This feature measures the popularity of the website by determining the number of visitors and the number of pages they visit. However, since phishing websites live for a short period of time, they may not be recognized by the Alexa database (Alexa the Web Information Company.,1996). By reviewing our dataset, we find that in worst scenarios, legitimate websites ranked among the top 100,000. Furthermore, if the domain has no traffic or is not recognized by the Alexa database, it is classified as “Phishing”. Otherwise, it is classified as “Suspicious”.

$$\text{Rule: IF}\begin{cases}\text{Website Rank} < 100{,}000 \rightarrow \text{Legitimate} \\ \text{Website Rank} > 100{,}000 \rightarrow \textit{Suspicious} \\ \text{Otherwise} \rightarrow \text{Phish}\end{cases}$$

iv. PageRank

PageRank is a value ranging from “0” to “1”. PageRank aims to measure how important a webpage is on the Internet. The greater the PageRank value the more important the webpage. In our datasets, we find that about 95% of phishing webpages have no PageRank. Moreover, we find that the remaining 5% of phishing webpages may reach a PageRank valueup to “0.2”.

Rule: IF{

$$\text{PageRank} < 0.2 \rightarrow \text{Phishing}\text{Otherwise} \rightarrow \text{Legitimate}$$

v. Google Index

This feature examines whether a website is in Google’s index or not. When a site is indexed by Google, it is displayed on search results (Webmaster resources, 2014). Usually, phishing webpages are

merely accessible for a short period and as a result, many phishing webpages may not be found on the Google index.

Rule: IF{

Webpage Indexedby Google → LegitimateOtherwise →
Phishing

vi. Number of Links Pointing to Page

The number of links pointing to the webpage indicates its legitimacy level, even if some linksare of the same domain (Dean, 2014). In our datasets and due to its short life span, we find

that 98% of phishingdataset items have no links pointing to them. On the other hand,legitimate websites have at least 2 external links pointing to them.

Rule:IF

{

OfLink Pointing to The Webpage= 0 → Phishing
Of Link Pointing to The Webpage> 0 $and \leq 2 \rightarrow Suspicious$

Otherwise → Legitimate

vii. Statistical-Reports Based Feature

Several parties such as PhishTank(PhishTank Stats, 2010-2012), and StopBadware (StopBadware, 2010-2012) formulate numerous statistical reports on phishing websites at every given period of time; some are monthly and others are quarterly. In our research, we used 2 forms of the top ten statistics from PhishTank: “Top 10 Domains” and “Top 10 IPs” according to statistical-reports published in the last three years, starting in January2010 to November2012. Whereas for “StopBadware”, we used “Top 50” IP addresses.

Rule: IF{

Host Belongs to Top Phishing IPs or Top Phishing Domains → PhishingOtherwise → Legitimate

Phishing is one of the most common and most dangerous attacks among cybercrimes. The aim of these attacks is to steal the information used by individuals and organizations to conduct transactions. Phishing websites are fake websites that contain various hints among their contents and web browser-based information. When a user opens a fake webpage and enters the usernameand protected password, the credentials of the user are acquiredby the attacker which can be used for malicious purposes. Phishing websites look very similar in appearance to their corresponding legitimate websites to attract large number of Internet users.

GOALS

1. Use of features extracted from websites which explain characteristics of a websiteforphishing detection

2. Classification of website based on such features, using Extreme Learning Machines (ELM) which is an advanced neural network leveraging generalization capabilities given by randomization of weights

METHODOLOGY

The steps involved in achieving phishingdetection are as follows:

The study uses a datasetwhich contains approximately 11,000 data containing the 30features extracted based on the features of websites in UC Irvine Machine LearningRepository database. For classification, a neural networknamed Extreme LearningMachine (ELM) will be used. Extreme Learning Machine (ELM) is a feed-forward artificial neural network (ANN) model with a single hidden layer. In ELM LearningProcesses, differentlyfrom ANN that renews its parameters as gradient-based, input weights are randomly selected while output weights are analytically calculated. The given data set will be divided into three parts as training,validationandtest data by three-phase divisionin K-Fold method, and model selectionand performance status will be simultaneously performed. This way the performance of the model will be measured in a reliable manner.

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CHAPTER 2

LITERATURE SURVEY

The purpose or goal behindphishing is data, money or personal information stealing through the fake website. The best strategy for avoiding the contact with the phishing web site is to detect real time malicious URL. Phishing websites can be determined on the basisof their domains. They usually are related to URL whichneeds to be registered (low-level domain and upper-level domain, path, query). Recently acquired status of intra-URL relationship is used to evaluate it using distinctive properties extracted from words that compose a URL based on query data from various search engines such as Google and Yahoo. These properties are further led to the machine-learningbased classification for the identification of phishing URLs from a real dataset. This paper focus on real time URL phishing against phishing content by using phish-STORM. For this a few relationship between the register domain rest of the URL are consider also intra URL relentless is consider which help to dusting wish between phishingor non phishing URL. For detecting a phishing websitecertain typical blacklisted urls are used, but this technique is unproductive as the durationof phishing websitesis very short. Phishing is the name of avenue. It can be defined as the manner of deception of an organization's customer to communicate with their confidential information in an unacceptable behaviour. It can also be defined as intentionally using harsh weapons such as Spasm to automatically target the victims and targeting their private information. As many of the failures being occurred in the SMTP are exploiting vectors for the phishing websites, there is a greater availability of communication for malicious message deliveries.

Proposed a novel classification approachthat use heuristicbased feature extraction approach.
In this, they have classified extracted features into different categories such as URL Obfuscation features, Hyperlink-based features.
Moreover, proposed technique gives 92.5% accuracy. Also thismodel is purely depends on the qualityand quantity of the training set and Broken links feature extraction.

a. MACHINE LEARNING

Writing review is the most critical advance in programming improvement process. Before building up the instrument it is important to decide the time factor, economy and friends quality. When these things are fulfilled, at that point following stages is to figure out which working framework and dialect can be utilized for building up the instrument. When the developers begin fabricating the instrument the software engineers require part of outside help. This help can be gottenfrom senior

softwareengineers, from book or from sites. Beforebuilding the framework the above thought are considered for building up the proposed framework.

Machine learning

AI (ML) is a class of calculation that enables programming applications to turn out to be progressively precisein anticipating resultswithout being expresslycustomized. The fundamental reason of AI is to assemblecalculations that can get input information and utilize factual examination to foresee a yield while refreshing yields as new information winds up accessible.

The procedures engaged with AI are like that of information mining and prescient displaying.Both require scanning through information to search for examples and modifyingprogram activities as needs be. Numerous individuals know about AI from shopping on the web and being served advertisements identified with their buy. This happens on the grounds that suggestion motors use AI to customizeonline promotion conveyance in practically continuous. Past customized advertising, other regular AI use cases incorporate misrepresentation location, spam separating, arrange security risk identification, prescient supportand building news sources.

Benefits of Machinelearning:

i. Simplifies ProductMarketing and Assistsin Accurate Sales Forecasts.
ii. Utilization and efficiency improvement

- Very high Scalability
- High Computingpower

SOFTWARE DESCRIPTION

1. Selection of programming language - Python

Python is an interpreted, object-oriented, high-level programming language with dynamic semantics. Its high-level built in data structures, combined with dynamic typing and dynamic binding, make it very attractive for Rapid Application Development, as well as for use as a scripting or glue language to connect existing components together. Python's simple, easy to learn syntax emphasizes readability and thereforereduces the cost of programmaintenance. Python supports modules and packages, which encourages program modularity and code reuse. The Python interpreter and the extensive

standard library are available in source or binary form withoutcharge for all major platforms and can be freely distributed.

Programmers prefer python because of the increased productivity it provides. Since there is no compilation step, the edit-test-debug cycle is incredibly fast. Debugging Python programs is easy. A bug or bad input will never cause a segmentation fault. Instead, when the interpreter discovers an error, it raises an exception. When the program doesn't catch the exception, the interpreter prints a stack trace. A source level debugger allows inspection of local and global variables, evaluation of arbitrary expressions, setting breakpoints, stepping through the code a line at a time, and so on. On the other hand, often the quickest way to debug a programis to add a few print statements to the source.The fast edit-testdebug cyclemakes this simple approach very effective.

i. JUPYTER NOTEBOOK

The Jupyter NotebookApp is a server-customer application that permits alteringand running note pad records by means of an internet browser. The Jupyter Notebook App can be executedon a nearby work area requiring no web access (as portrayedin this report) or

can be introduced on a remote server and got to through the web. Notwithstanding showing/altering/running note pad archives, the Jupyter Notebook App has a "Dashboard" (Notebook Dashboard), a "control board" indicating nearby records and permitting to open note pad reports or closing down their portions.

1. A scratch pad part is a "computational motor" that executes the code contained in a Notebook record. The ipython part, referenced in this guide, executes python code. Portions for some,different dialects exist (official parts).
2. When you open a Notebook report, the related part is consequently propelled. At the point when the scratch pad is executed (either cell-by-cell or with menu Cell - > Run All), the portion plays out the calculation and produces the outcomes. Contingent upon the sort of calculations, the piece may expend critical CPU and RAM. Note that the RAM isn't discharged until the part is closeddown, he NotebookDashboard is the part which is indicated first when you dispatch Jupyter Notebook App. The Notebook Dashboard is essentially used to open note pad archives, and to deal with the

runningportions(picture and shutdown).

3. The Notebook Dashboard has different highlights like a record director, in particular exploringorganizers and renaming/erasing documents.

ii. MATPLOTLIB

People are exceptionally visual animals: we comprehend things better when we see things envisioned. Notwithstanding, the progression to showing investigations, results or bits of knowledge can be a bottleneck: you probably won't realize where to begin or you may have as of now a correct configuration as a top priority, however then inquiries like "Is this the correct method to imagine the bits of knowledge that I need to convey to my group of onlookers?" will have unquestionably gone over your brain.

When you're workingwith the Python plotting libraryMatplotlib, the initialstep to responding to the above inquiries is by structure up information on themes like: The life structures of a Matplotlib plot: what is a subplot? What are the Axes? What precisely is a figure?

Plot creation, which could bring up issues about what module you precisely need to import (pylab or pyplot?), how you precisely ought to approach instating the figure and the Axes of your plot, how to utilizematplotlib in Jupyternote pads, and so on.

Plotting schedules, from straightforward approaches to plot your information to further developed methods for picturing your information. Essential plot customizations, with an emphasison plot legends and content,titles, tomahawks marks and plot format.

Sparing, appearing, your plots: demonstrate the plot, spare at least one figures to, for instance, pdf documents, clear the tomahawks, clear the figure or close the plot, and so on. In conclusion, you'll quickly cover two manners by which you can alter Matplotlib: with templatesand the rc settings.

Since all is set for you to begin plottingyour information, it's an ideal opportunity to investigate some plotting schedules. You'll regularly go over capacities like plot() and disperse(), which either draw focuses with lines or markers interfacing them, or draw detached focuses,which are scaled or shaded.In any case, as you have just found in the case of the primary area, you shouldn't neglect to pass the information that you need these capacities to utilize!

These capacities are just the exposed rudiments. You will requiresome different capacities to ensure your plots look magnificent:

2.4.3 NUMPY

NumPy is, much the same as SciPy, Scikit-Learn, Pandas, and so forth one of the bundles that you can't miss when you're learning information science, principally in light of the fact that this librarygives you a cluster information structure that holdsa few advantages over Python records, for example, being increasingly reduced, quicker access in perusing and composing things,being progressively advantageous and increasingly productive.

NumPy exhibits are somewhat similar to Python records, yet at the same time particularly unique in the meantime.For those of you who are new to the subject, how about we clear up what it precisely is and what it's usefulfor. As the name gives away, a NumPy clusteris a focal information structure of the numpy library. The library's name is anotherway to say "NumericPython" or "Numerical Python".

At the end of the day, NumPy is a Python librarythat is the center libraryfor logical registering in Python. It contains an accumulation of apparatuses and strategies that can be utilized to settle on a PC numerical models of issues in Scienceand Engineering. One of these apparatuses is an elite multidimensional cluster object that is an incredible information structurefor effective calculation of exhibits and lattices. To work with these clusters, there's a tremendous measure of abnormal state scientific capacities work on these grids and exhibits.since you have set up your condition, it's the ideal opportunity for the genuinework. In fact, you have officially gone for some stuff with exhibits in the above DataCamp Light pieces. Be that as it may, you haven't generally gotten any genuine hands-on training with them, since you originally expectedto introduce NumPy all alonepc. Since you have done this current, it's a great opportunity to perceive what you have to do so as to run the above code pieces without anyoneelse.

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Remember that, so as to work with the np.array() work, you have to ensure that the numpy library is

available in your condition.The NumPy librarypursues an import tradition: when

you import this library, you need to ensure that you importit as np. By doing this, you'll ensure that different Pythonistas comprehend your code all the more effectively.

2.2.4 PANDAS

Pandas is an open-source, BSD-authorized Python library giving elite, simple to-utilize information structures and information examination instruments for the Python programming language. Python with Pandas is utilized in a wide scope of fields including scholastic and business areas including money, financial matters, Statistics, examination, and so on. In this instructional exercise, we will get familiar with the different highlights of Python Pandas and how to utilize them practically speaking. This instructional exercise has been set up for the individuals who try to become familiar with the essentials and different elements of Pandas. It will be explicitly valuable for individuals working with information purgingand examination. In the wake of finishingthis instructional exercise,you will wind up at a moderate dimension of ability from where you can take yourself to more elevatedamounts of skill.You ought to have a fundamental comprehension of Computer Programming phrasings. A fundamental comprehension of any of the programming dialects is an or more. Pandas library utilizes the vast majority of the functionalities of NumPy. It is recommended that you experience our instructional exerciseon NumPy before continuing with this instructional exercise.

2.4.5 ANACONDA

Anaconda constrictor is bundle director. Jupyter is an introduction layer.Boa constrictor endeavors to explain the reliance damnationin python—where distinctive tasks have diversereliance variants—in order to not influence distinctive venture conditions to require diverse adaptations, which may meddlewith one another.

Jupyter endeavors to fathom the issue of reproducibility in investigation by empowering an iterative and hands-on way to deal with clarifying and imagining code;by utilizing rich content documentations joined with visual portrayals, in a solitary arrangement.

Boa constrictor is like pyenv, venv and minconda; it's intended to accomplish a python situation that is 100% reproducible on another condition, autonomous of whatever different forms of a task's

conditions are accessible. It's somewhat like Docker, however limited to the Python biological system. Jupyter is an astounding introduction device for expository work; where you can display code in "squares," joins with rich content depictions among squares, and the consideration of organized yield from the squares, and charts created in an all around plannedissue by method for anothersquare's code. Jupyteris extraordinarily greatin expository work to guarantee reproducibility in somebody's exploration, so anybodycan return numerousmonths after the fact and outwardly comprehend what somebody attemptedto clarify, and see preciselywhich code drovewhich representation and end.

Regularly in diagnostic work you will finishup with huge amounts of half-completed note pads clarifying Proof-of-Concept thoughts, of which most won't lead anyplace at first. A portion of these introductions may months after the fact—or even years after the fact— present an establishment to work from for another issue.

- Very high Scalability
- High Computingpower

SOFTWARE DESCRIPTION

1. Selection of programming language - Python

Python is an interpreted, object-oriented, high-level programming language with dynamic semantics. Its high-level built in data structures, combined with dynamic typing and dynamic binding, make it very attractive for Rapid Application Development, as well as for use as a scripting or glue language to connect existing components together. Python's simple, easy to learn syntax emphasizes readability and thereforereduces the cost of programmaintenance. Python supports modules and packages, which encourages program modularity and code reuse. The Python interpreter and the extensive standard library are available in source or binary form withoutcharge for all major platforms and can be freely distributed.

Programmers prefer python because of the increased productivity it provides. Since there is no compilation step, the edit-test-debug cycle is incredibly fast. Debugging Python programsis easy. A bug or bad input will never cause a segmentation fault. Instead, when the interpreter discovers an error, it raises an exception. When the program doesn't catch the exception, the interpreter prints a stack trace. A source level debugger allows inspection of local and global variables, evaluation of arbitrary expressions, setting breakpoints, stepping through the code a line at a time, and so on. On the other hand, often the quickest way to debug a programis to add a few print statements to the source.The fast edit-testdebug cyclemakes this simple approach very effective.

i. JUPYTER NOTEBOOK

The Jupyter NotebookApp is a server-customer application that permits alteringand runningnote pad records by means of an internet browser. The Jupyter Notebook App can be executedon a nearby work area requiring no web access (as portrayedin this report) or

can be introduced on a remote server and got to through the web. Notwithstanding showing/altering/running note pad archives, the Jupyter Notebook App has a "Dashboard" (Notebook Dashboard), a "control board" indicating nearby records and permitting to open note pad reports or closing down their portions.

1. A scratch pad part is a "computational motor" that executes the code contained in a Notebook record. The ipython part, referenced in this guide, executes python code. Portions for some,different dialects exist (official parts).
2. When you open a Notebook report, the related part is consequently propelled. At the point when the scratch pad is executed (either cell-by-cell or with menu Cell - > Run All), the portion plays out the calculation and produces the outcomes. Contingentupon the sort of calculations, the piece may expend critical CPU and RAM. Note that the RAM isn't discharged until the part is closeddown, he NotebookDashboard is thepart which is indicated first when you dispatch Jupyter Notebook App. The NotebookDashboard is essentially used to open note pad archives, and to deal with the runningportions(picture and shutdown).
3. The Notebook Dashboard has different highlights like a record director, in particular exploringorganizers and renaming/erasing documents.

ii. MATPLOTLIB

People are exceptionally visual animals: we comprehend things better when we see things envisioned. Notwithstanding, the progression to showing investigations, results or bits of knowledge

can be a bottleneck: you probably won't realize where to begin or you may have as of now a correct configuration as a top priority, however then inquiries like "Is this the correct method to imagine the bits of knowledge that I need to convey to my group of onlookers?" will have unquestionably gone over your brain.

When you're workingwith the Python plotting libraryMatplotlib, the initialstep to responding to the above inquiries is by structure up information on themes like: The life structures of a Matplotlib plot: what is a subplot? What are the Axes? What precisely is a figure?

Plot creation, which could bring up issues about what module you precisely need to import (pylab or pyplot?), how you precisely ought to approach instating the figure and the Axes of your plot, how to utilizematplotlib in Jupyternote pads, and so on.

Plotting schedules, from straightforward approaches to plot your information to further developed methods for picturing your information. Essential plot customizations, with an emphasison plot legends and content,titles, tomahawks marks and plot format.

Sparing, appearing, your plots: demonstrate the plot, spare at least one figures to, for instance, pdf documents, clear the tomahawks, clear the figure or close the plot, and so on. In conclusion, you'll quickly cover two manners by which you can alter Matplotlib: with templatesand the rc settings.

Since all is set for you to begin plottingyour information, it's an ideal opportunity to investigate some plotting schedules. You'll regularly go over capacities like plot() and disperse(), which either draw focuses with lines or markers interfacing them, or draw detached focuses,which are scaled or shaded.In any case, as you have just found in the case of the primary area, you shouldn't neglect to pass the information that you need these capacities to utilize!

These capacities are just the exposed rudiments. You will requiresome different capacities to ensure your plots look magnificent:

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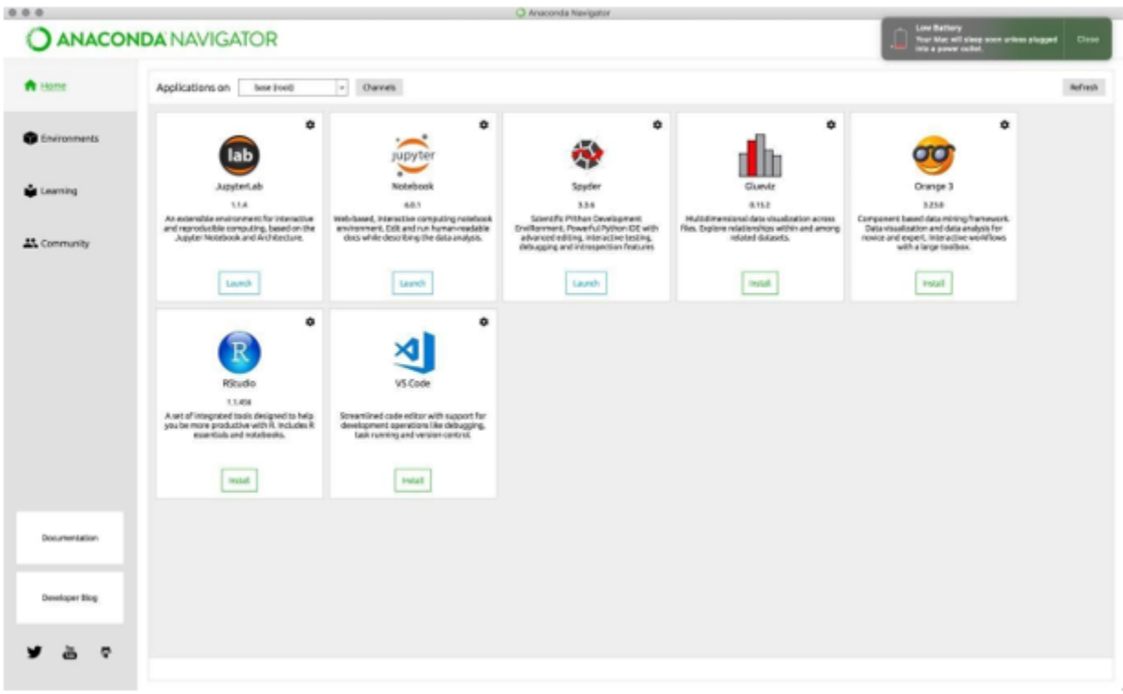

2.2.6 PYTHON

Python is a translated, object-arranged, abnormal state programming language with dynamicsemantics. Its abnormalstate worked in information structures, joined with dynamiccomposing and dynamicauthoritative, make it appealing for Rapid Application Development, just as for use as a scripting or paste language to interface existing segments together. Python's basic, simple to learn languagestructure underlines intelligibility and hence decreases the expense of program support. Python underpins modules and bundles, which empowers program seclusion and code reuse. The Python translator and the broad standard libraryare accessible in source or parallel structurewithout charge for every singlesignificantstage, and can be openlyappropriated.

Frequently, software engineers begin to look all starry eyed at Python on account of the expanded efficiency it gives. Since there is no aggregation step, the alter test-troubleshoot cycle is staggeringly quick.

Troubleshooting Python programs is simple: a bug or awful information will never cause a divisionblame. Rather, when the mediator finds a blunder, it raises a special case.At the point when the program doesn't get the special case, the translator prints a stack follow. A source level debugger permits assessment of nearby and worldwide factors,assessment of discretionary articulations, setting breakpoints, venturing through the code a line at any given moment, etc. The debugger is written in Python itself, vouching for Python's contemplative power. Then again, frequently the speediest method to troubleshoot a program is to add a couple of print proclamations to the source: the quick alter test-investigate cycle makes this straightforward methodology successful.

Python is an item situated, abnormal state programming language with incorporated unique semanticsessentially for web and application improvement. It is amazinglyalluring in the field of Rapid Application Development since it offers dynamic composing and dynamic restrictingalternatives.

Python is generallybasic, so it's anything but difficult to learn sinceit requires a one of a kind language structurethat centers around coherence. Designerscan peruse and interpret Python code a lot simpler than different dialects. Thusly, this decreases the expense of program upkeep and improvement since it enables groups to work cooperatively without huge languageand experience obstructions.

Moreover, Python underpins the utilization of modules and bundles, which implies that projects can be planned in a secluded style and code can be reused over an assortment of tasks. When you've built up a module or bundle you need, it very well may be scaled for use in different tasks, and it's anythingbut difficult to import or fare these modules.

A standout amongst the most encouraging advantages of Python is that both the standard library and the mediator are accessible for nothing out of pocket, in both parallel and source structure. There is

no restrictiveness either, as Python and all the important instruments are accessible on every singlereal stage. In this way, it is a temptingalternative for designerswho would prefernot to stress over payinghigh improvement costs.

CHAPTER 3

REQUIREMENT ANALYSIS

a. FUNCTIONAL REQUIREMENTS

A function of software system is defined in functional requirement and the behavior of the system is evaluated when presented with specific inputs or conditions which may include calculations, data manipulation and processing and other specific functionality.

i. Our systemshould be able to load air qualitydata and preprocess data.
ii. It should be able to analyze the air qualitydata.
iii. It should be able to group data based onhidden patterns.
iv. It should be able to assign a label based on its data groups.
v. It shouldbe able to split data into trainsetand testset.
vi. It should be able to train model using trainset.
vii. It must validate trainedmodel using testset.
viii. It should be able to display the trained model accuracy.
ix. It should be able to accurately predictthe air quality on unseendata.

b. NON-FUNCTIONAL REQUIREMENTS

Nonfunctional requirements describehow a system must behaveand establish constraints of its functionality. This type of requirements is also known as the system's *quality attributes*. Attributes such as performance, security, usability, compatibility are not the feature of the system,they are a required characteristic. They are "developing" properties that emerge from the whole arrangement and hence we can't compose a particular line of code to execute them. Any attributes required by the customer are described by the specification. We must include only those requirements that are appropriate for our project.Some Non-Functional Requirements are as follows:

i. Reliability
ii. Maintainability
iii. Performance
iv. Portability
v. Scalability
vi. Flexibility

Some of the qualityattributes are as follows:

i. ACCESSIBILITY:

Availability is a general term used to depict how much an item, gadget, administration, orcondition is open by however many individuals as would be prudent.

In our venture individuals who have enrolledwith the cloud can get to the cloud to storeand recover their information with the assistance of a mystery key sentto their email ids.

UI is straightforward and productive and simple to utilize.

ii. MAINTAINABILITY:

In programming designing, viability is the simplicity with which a product item can bealtered so as to:

1. Correct absconds
2. Meet new necessities

New functionalities can be included in the task based the client necessities just by adding the proper documents to existing venture utilizing ASP.net and C# programming dialects. Since the writing computer programs is extremely straightforward, it is simpler to discover and address the imperfections and to roll out the improvements in the undertaking.

iii. SCALABILITY:

Framework is fit for taking care of increment all out throughput under an expanded burden when assets (commonly equipment) are included.

Framework can work ordinarily under circumstances, for example, low data transfercapacity and

substantial number of clients.

iv. PORTABILITY:

Convey ability is one of the key ideas of abnormal state programming. Convenient is the product code base component to have the capacity to reuse the current code as opposed to making new code while moving programming from a domain to another. Venture can be executed under various activity conditions gave it meet its base setups. Just framework records and dependant congregations would need to be designed in such case.

The functional requirements for a systemdescribe what the system shoulddo.

Those requirments depend on the type of software being developed,the expected users of the software. These are the statement of services the system should provide,how the system should react to particular inputsand how the system shouldbehave in particular situation.

- Extracting data from CSV files
- Cleaning the data.
- Vector Representation.

Non-functional requirements is not about functionality or behaviour of system, but rather are used to specify the capacity of a system. They are more related to properties of system such as quality, reliability and quick response time. Non- functional requirements come up via customer needs, because of budget, interoperability need such as software and hardware requirement, organizational policies or due to some external factors such as:-

- Basic Operational Requirement
- Organizational Requirement
- Product Requirement
- User Requirement

1. Basic Operational Requirement

The four primary functions of systems engineering are all performed by the end users, which is the customers. Operational requirements whichare given by:-

- **Mission profile or scenario:** It is a map which describes the procedures and leads us to the final goal/ objective. The goal of proposed system is, to predict the crop yield prediction for future year using previous year dataset.
- **Performance:** It basically gives system parameters to reach our goal. Parameters for the proposed system are accurate predicted value which is compared to the existing system.
- **Utilization environments:** It enlists the different permutations and combinations a system can be reused in many other applications whichgives better prediction, as well as gives a new approachto prediction techniques.
- **Life cycle:** It discuss about the life span of a system. As number of data increases the number of iterations increases, which will give more accuracy to the output.

1. Organizational Requirement

The Organizational requirement consists of the followingtypes:

- **Process Standards:** To make sure the system is a quality product,IEEE standards have been used during system development.
- **Design Methods:**Design is an important step, on which all other steps in the engineering process are based on.

- Ittakes the projectfrom a theoretical idea to an actualproduct. It gives us the basis of our solution.Because all the steps after designing are based on the design itself, this step affects the quality of the product and is a major player in how the testing and maintenance of a project take place and how successful they are. Followingthe design to the 'T' is ofutmost importance.

1. Product Requirement

- **Portability:** As the system is Python based,it will run on a platform whichis supported by ANACONDA.
- **Correctness:** The system has been put through rigorous testing after it has followed strict guidelines and rules. The testing has validated the data.
- **Ease of Use:** The user interface allows the user to interact with the system at a very comfortable level with no hassles.

- **Modularity:** The many different modules in the system are neatly defined for ease of use and to make the product as flexible as possible with different permutations and combinations.
- **Robustness:** During the development of the system specialcare is being taken to make sure that the end resultsare optimized to the highestlevel and the results are relevant and validated. Python language is used for the development, itself provides robustness to the systemand thus makes ithighly unlikely to fail.

'System quality' and 'Non-functional requirements' are interchangeable terms. These qualitiesmainly consist of two things i.e. evolutionand execution. Evolutionincludes scalability, maintainability and testability whereas, execution include usability and privacy of system.

User Requirement

- The user should able to have User Interface Window with Visualize Graphics.
- The user should able to configurewith neat GUI all the parameters.

Resource Requirement

Anaconda 3-5.0.3: Anaconda is a free and open source distribution of the Python and R programming languagesfor data science,machine learning and other applications. Anaconda distribution comes with 1400 packages as well as the conda package and virtual environment manager, called AnacondaNavigator. Packages can be made using the conda build command. **Anaconda Navigator**is a desktopgraphical user interfaceallows user to manage conda packages.The following applications are available by default in navigator: Jupyterlab, Jupyter netbook, Spyder, Orange, Rstudio etc. conda is an open source, cross platform, language- agnostic package managerand environment management system. It installs, runs and updatepackages and their dependencies.

1. **Jupyter Notebook**:The code is fully writtenin Python languageusing Jupyter notebook. It is the spin-off projects from the IPyton project, which used to have an IPython Notebook project itself. IPython kernel,which allows you to write your programsin Python. We can installJupyter Notebook using command $pip installJupyter. It has serveral menus that you can use to interact with your notebook they are listed as:

- File
- Edit

- View
- Insert
- Cell
- Kernel, Widgets,Help

The kernel cell is for working with the kernel that is running in the background. Here we can restartthe kernel, reconnectto it, shut it down, or even change with kernel your notebookis using.

c. Hardware Requirements:

The following is the hardwarerequirements of the system for the proposed system:

i. Processor:Any Processorabove 500 MHz
ii. RAM :8 GB
iii. Hard Disk :1 TB
iv. Input device : Standardkeyboard and mouse

d. Software Requirements:

The following is the softwarerequirements of the system for the proposedsystem:

i. OS : Windows 10
ii. Platform : Jupyter Notebook
iii. Language : Python
iv. IDE/tool : Anaconda 3-5.0.3

CHAPTER 4

DESIGN

Technologies Used

1. **PYTHON**

2. **TENSORFLOW (SCIKIT-LEARN)**

3. **MACHINE LEARNING**

4. **LIBRARIES – PANDAS , NUMPY**

    a. **Open CV**

OpenCV (Open Source Computer Vision Library) is an open source PC vision and AI programming library. OpenCV was worked to give a typical foundation to PC vision applications and to quicken the utilization of machine discernment in the business items. Being a BSD-authorized item, OpenCV makes it simple for organizations to use and adjust the code. The library has more than 2500 enhancedcalculations, which incorporates an exhaustive arrangement of both exemplary and best in class PC vision and AI calculations. These calculations can be utilized to distinguish and perceive faces, distinguish objects, arrange human activities in recordings, track camera developments, track moving articles, extricate 3D models of items, produce 3D point mists from stereo cameras, fasten pictures together to create a high goals picture of a whole scene, find comparative pictures from a picturedatabase, expel red eyes from pictures taken utilizing streak,pursue eye developments, perceive landscape and set up markers to overlay it with enlarged reality, and so on.

OpenCV has in excess of 47 thousand individuals of client network and evaluated number of downloads surpassing 18 million. The library is utilized broadly in organizations, examine gatherings and by administrative bodies. It has C++, Python,Java and MATLABinterfaces and supports Windows, Linux, Android and Mac OS.

Tensorflow:

TensorFlow is Google Brain's second-age framework. Form 1.0.0 was discharged on February 11, 2017.TensorFlow is an open source library for numerical computation and large-scale machine

learning.TensorFlow bundlestogether a slew of machinelearning and deep learning modelsand algorithms and makes them useful by way of a commonmetaphor. It uses Python to provide a convenient front-endAPI for building applications with the framework.TensorFlow is accessible on 64-bit Linux, macOS, Windows,and portable processing stages including Androidand iOS. Its adaptable design considers the simple sendingof calculation over an assortment of stages (CPUs,GPUs, TPUs), and from work areas to bunches of servers to portable and edge gadgets.TensorFlow calculations are communicated as stateful dataflow diagrams. The name TensorFlow gets from the activities that such neural systems performon multidimensional information exhibits, which are alluded to as tensors.

Neural Networks:

The neural system itself isn't a calculation, yet rather a structure for some, extraordinary AI calculations to cooperate and process complex information inputs. Such frameworks learnto perform undertakings by thinking about models, for the most part without being modified with any errand explicit principles. For instance, in picture acknowledgment, they may figure out how to distinguish picturesby dissecting precedentpictures and utilizing theoutcomes to recognizeit in different pictures.

They do this with no earlier information about felines, for instance, that they have hide, tails, hairs and feline like countenances. Rather, they consequently create distinguishing qualities from the learning material that they procedure.

Convolutional Neural Networks:

As of 2011, the state of the art in deep learning feedforward networks alternated between convolutional layers and max-pooling layers,topped by several fully or sparsely connected layers followed by a final classification layer. Learning is normally managedwithout unsupervised pre-preparing. In the convolutional layer, there are channels that are convolvedwith the information. Each channel is comparable to a loads vector that must be prepared. Such directed profound learning strategies were the first to accomplish human- aggressive executionon certain tasks.

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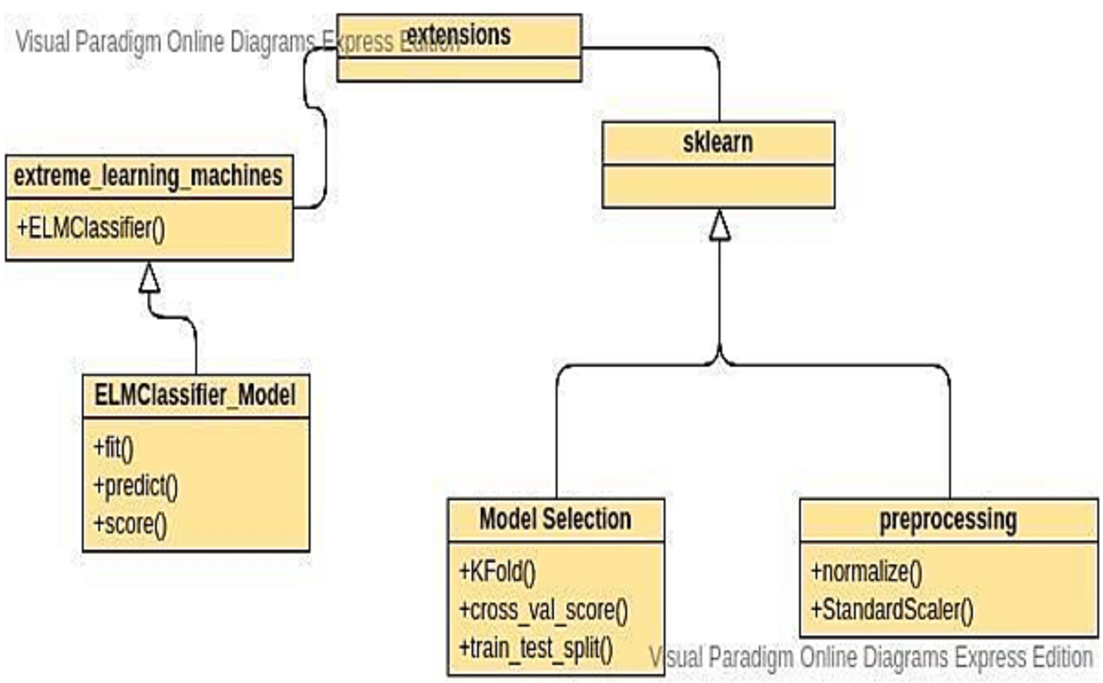
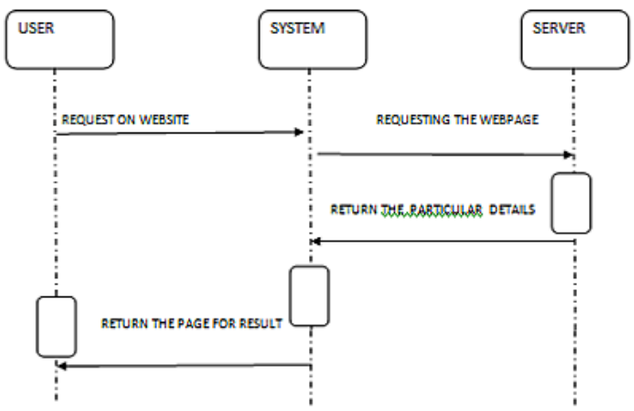
As of 2011, the state of the art in deep learning feedforward networks alternated between convolutional layers and max-pooling layers,topped by several fully or sparsely connected layers followed by a final classification layer. Learning is normally managedwithout unsupervised pre-preparing. In the convolutional layer, there are channels that are convolvedwith the information. Each channel is comparable to a loads vector that must be prepared. Such directed profound learning strategies were the first to accomplish human- aggressive executionon certain tasks.

UML Diagrams:

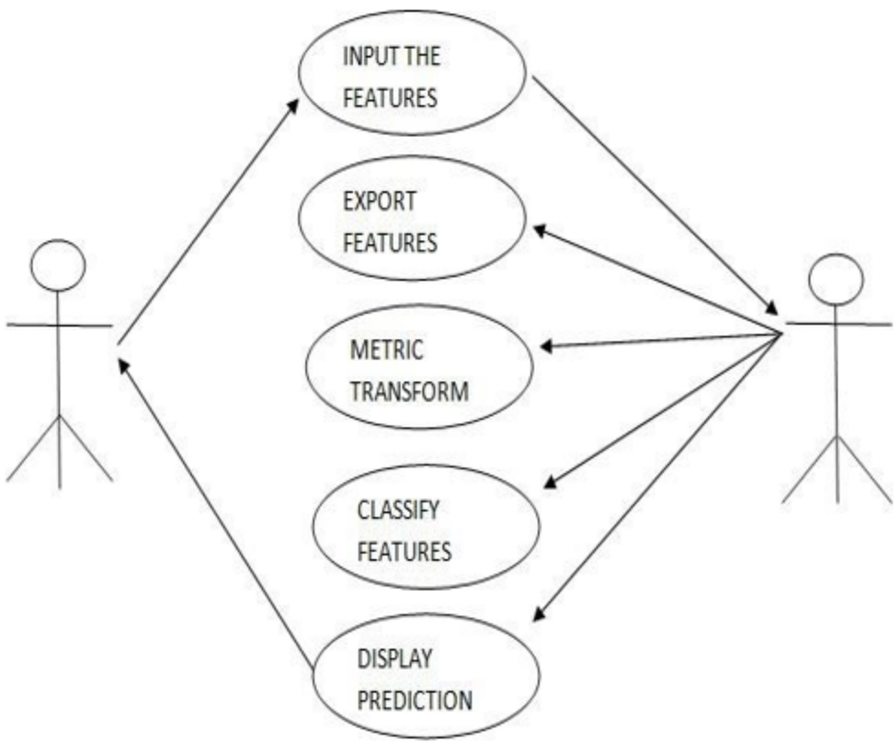
Class diagram



Sequence Diagram:



Use case Diagram



CHAPTER 5

IMPLEMENTATION

Implementation is the process of defining how the system should be built, ensuring that it is operational and meets quality standards. It is a systematic and structured approach for effectively integrating a software-based service or component into the requirements of end users.

a. Overview of system implementation

The plan contains an overview of the system, a brief description of the major tasks involved in the implementation, the overall resources needed to support the implementation effort and any site-specific implementation requirements.

i. Selection of programming language - Python

Python is an interpreted, object-oriented, high-level programming language with dynamic semantics. Its high-level built in data structures, combined with dynamic typing and dynamic binding, make it very attractive for Rapid Application Development, as well as for use as a scripting or glue language to connect existing components together. Python's simple, easy to learn syntax emphasizes readability and therefore reduces the cost of programmaintenance. Python supports modules and packages, which encourages program modularity and code reuse. The Python interpreter and the extensive standard library are available in source or binary form withoutcharge for all majorplatforms and can be freely distributed.

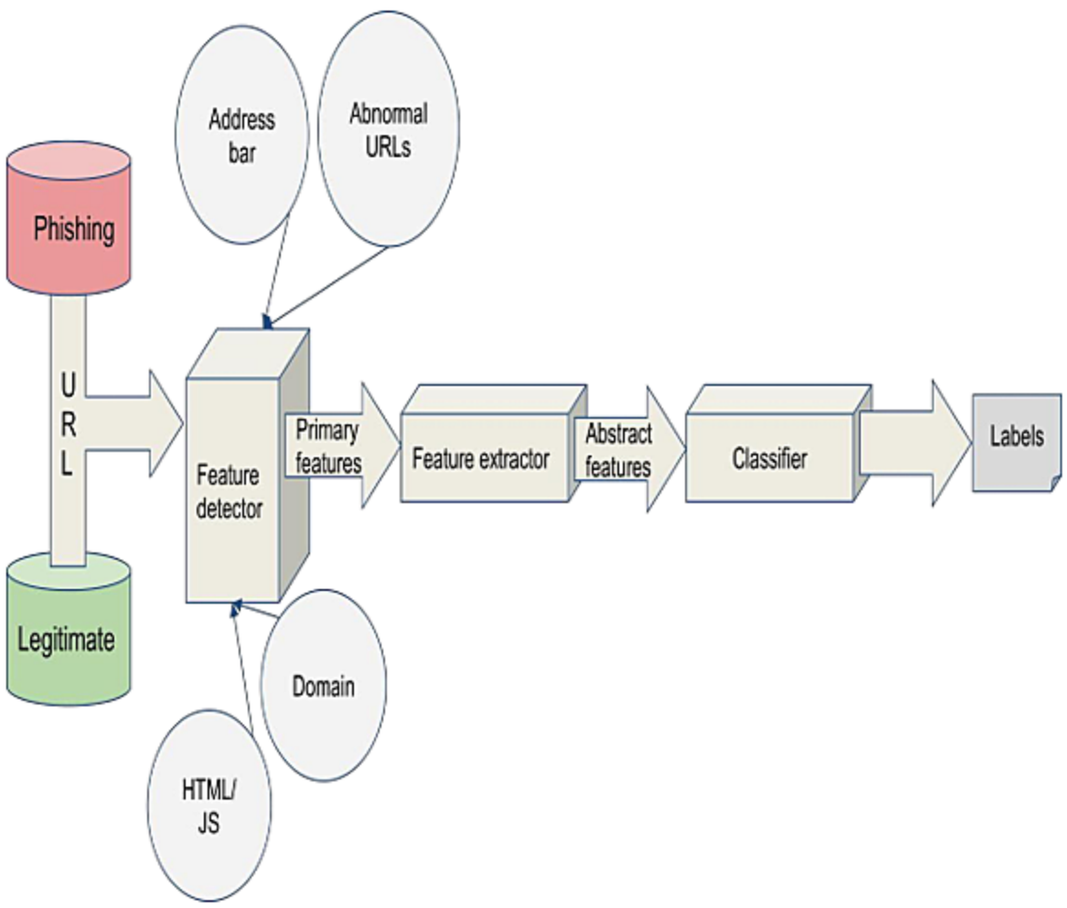
Programmers prefer python because of the increased productivity it provides. Since there is no compilation step, the edit-test-debug cycle is incredibly fast. Debugging Python programs is easy. A bug or bad input will never cause a segmentation fault. Instead, when the interpreter discovers an error, it raises an exception. When the program doesn't catch the exception, the interpreter prints a stack trace. A source level debugger allows inspection of local and global variables, evaluation of arbitrary expressions, setting breakpoints, stepping through the code a line at a time, and so on. On the other hand, often the quickest way to debug a programis to add a few print statements to the source.The fast edit-testdebug cyclemakes this simple approach very effective.

ii. Implementation support

Anaconda is a free and open sourcedistribution of the Python and R programming languages for data science and learning related applications (large-scale data processing, predictive analytics, scientific computing), that aims to simplify management and deployment.

Anaconda3 includes Python 3.6. Anaconda Navigator is a desktop graphical user interface (GUI) included in Anaconda distribution that allows users to launch applications and manage anaconda packages, environments and channels without using command-line commands. Navigator can search for packages on Anaconda Cloud or in a local Anaconda Repository, install them in an environment, run the packagesand update them. It is available forWindows, macOS and Linux.The following are the system requirements:

1. License: Free use and redistribution under the terms of the Anaconda End User License Agreement.
2. Operating system: WindowsVista or newer,64-bit macOS 10.10+,or Linux, including Ubuntu, RedHat, CentOS6+, and others. Windows XP supported on Anaconda versions2.2 and earlier. See lists. Download it from our archive.
3. System architecture: 64-bit x86, 32-bit x86 with Windows or Linux, Power8 orPower9. Minimum 3 GB disk space to download and install.



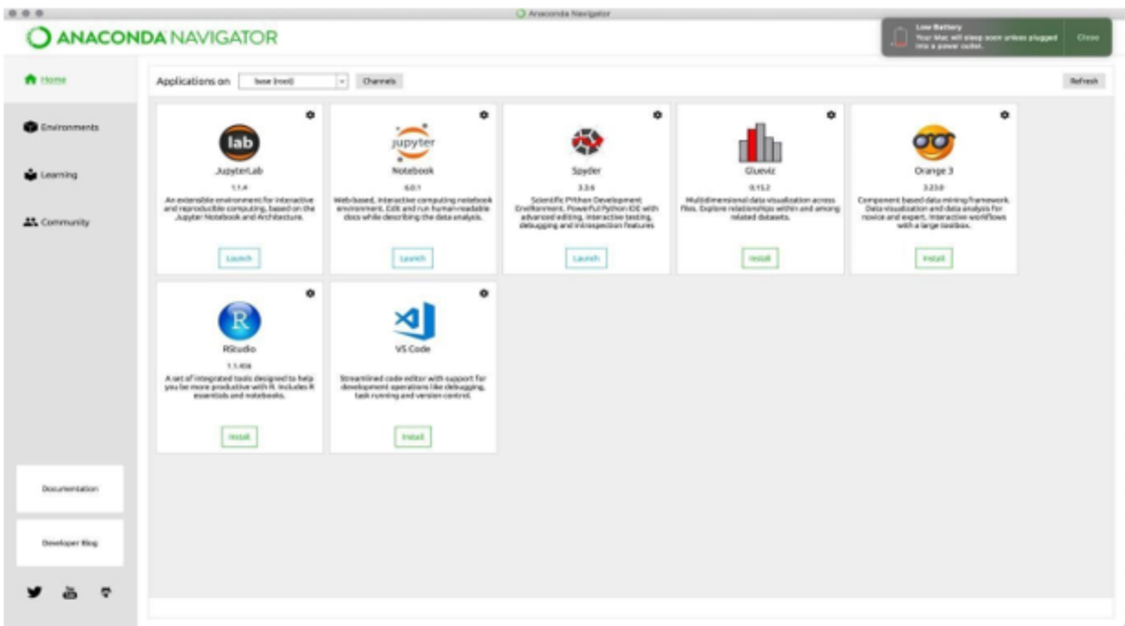


Fig 3 :Anaconda Navigator

After the installation of anaconda navigator, we were taught python programming. We were taught various inclusion of python libraries such as **NumPy** i.e. introduction to NumPy, NumPy arrays, few notes on array indexing, NumPy array indexing, NumPy operations and few exercises to recall it. We were taught how to use **Pandas**, how to include data frames, finding and replacing missing data with useful information, group-by functions, merging, joining and concatenating and other data input and output operations. We were also taught python for data visualization that is matplotlib, seaborn. **Matplotlib** is a plotting library for python and its extension NumPy. It makes use of general-purpose GUI kits and provides an object-oriented API for embedding the plots. In seaborn we were taught distribution plots, categorial plots, matrix plots, grids,regression plots etc.

CHAPTER 6

TESTING

The purpose of testing is to discover errors. Testing is the process of trying to discover every conceivable fault or weakness in a work product. It provides a way to check the functionality of components, sub assemblies, assemblies and/or a finished product it is the process of exercising software with the intent of ensuring that the Softwaresystem meets its requirements and user expectations and does not fail in an unacceptable manner. There are varioustypes of test.Each test type addresses a specific testingrequirement**.**

TYPES OF TESTS

a. UNIT TESTING

Unit testing involves the design of test cases that validate that the internal program logic is functioning properly, and that program inputs produce valid outputs. All decision branches and internal code flow should be validated. It is the testing of individual software units of the application .it is done after the completion of an individual unit before integration. Thisis a structural testing, that relies on knowledge of its construction and is invasive. Unit testsperform basic tests at component level and test a specific business process, application, and/or system configuration. Unit tests ensure that each unique path of a business processperforms accurately to the documented specifications and contains clearly defined inputs and expected results.

b. INTEGRATION TESTING

Integration tests are designedto test integrated software components to determine if theyactually run as one program. Testing is event driven and is more concerned with the basic outcome of screens or fields. Integration tests demonstrate that although the componentswere individually satisfaction, as shown by successfully unit testing, the combination of components is correct and consistent. Integration testing is specifically aimed at exposing the problems that arise from the

combination of components.

c. VALIDATION TESTING

An engineering validation test (EVT) is performed on first engineering prototypes, to ensurethat the basic unit performs to design goals and specifications. It is important in identifyingdesign problems, and solving them as early in the design cycle as possible, is the key to keeping projects on time and within budget. Too often, product design and performance problems are not detected until late in the product development cycle — when the product is ready to be shipped. The old adage holds true: It costs a penny to makea change in engineering, a dimein production and a dollarafter a product is in the field.

Verification is a Quality control process that is used to evaluate whether or not a product, service, or system complies with regulations, specifications, or conditions imposed at the start of a development phase. Verification can be in development, scale-up, or production.This is often an internalprocess.

Validation is a Quality assurance process of establishing evidence that provides a high degree of assurance that a product, service, or system accomplishes its intended requirements. This often involves acceptance of fitness for purpose with end users andother product stakeholders.

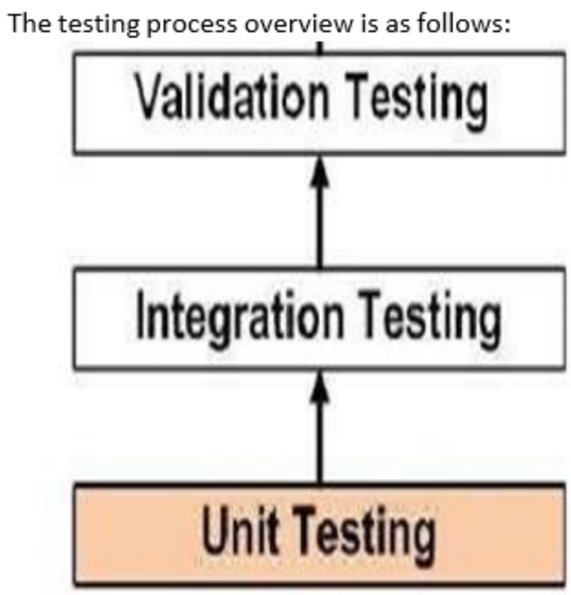


Figure 6.1: The testing process

a. SYSTEM TESTING

System testing of software or hardware is testing conducted on a complete, integrated system to evaluate the system's compliance with its specified requirements. System testingfalls within the scope of black box testing, and as such, should require no knowledge of the inner designof the code or logic.

As a rule, system testing takes, as its input, all of the "integrated" software components thathave successfully passed integration testing and also the software system itself integrated with any applicable hardware system(s).

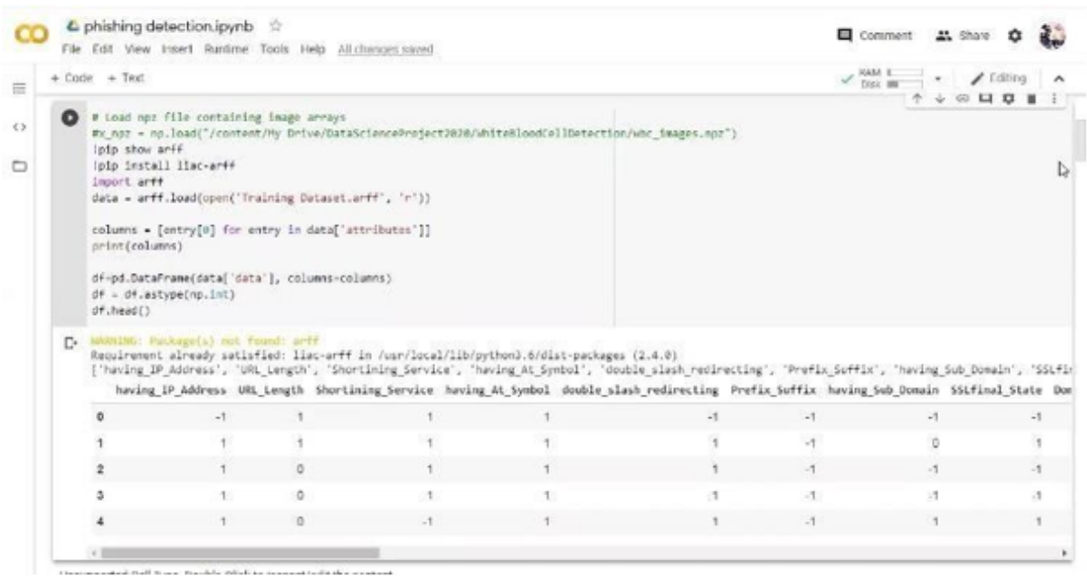
System testing is a more limited type of testing;it seeks to detect defectsboth within the"inter-assemblages" and also within the system asa whole.

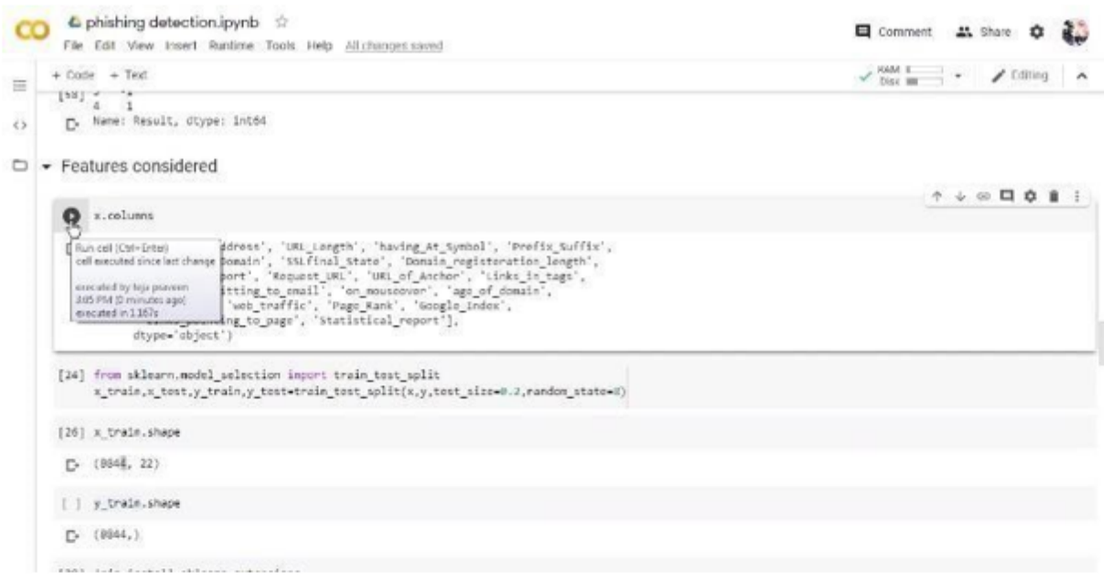
System testing is performed on the entire system in the context of a Functional Requirement Specification(s) (FRS) and/ora System Requirement Specification (SRS).

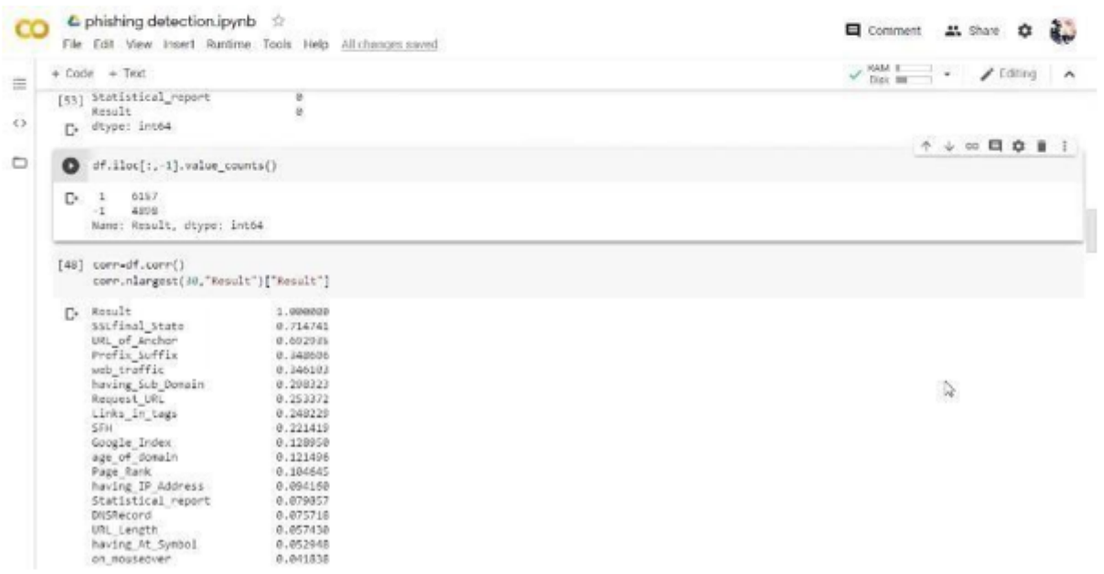
System testing tests not only the design, but also the behavior and even the believed expectations of the customer. It is also intended to test up to and beyond the bounds definedin the software/hardware requirementsspecification(s).

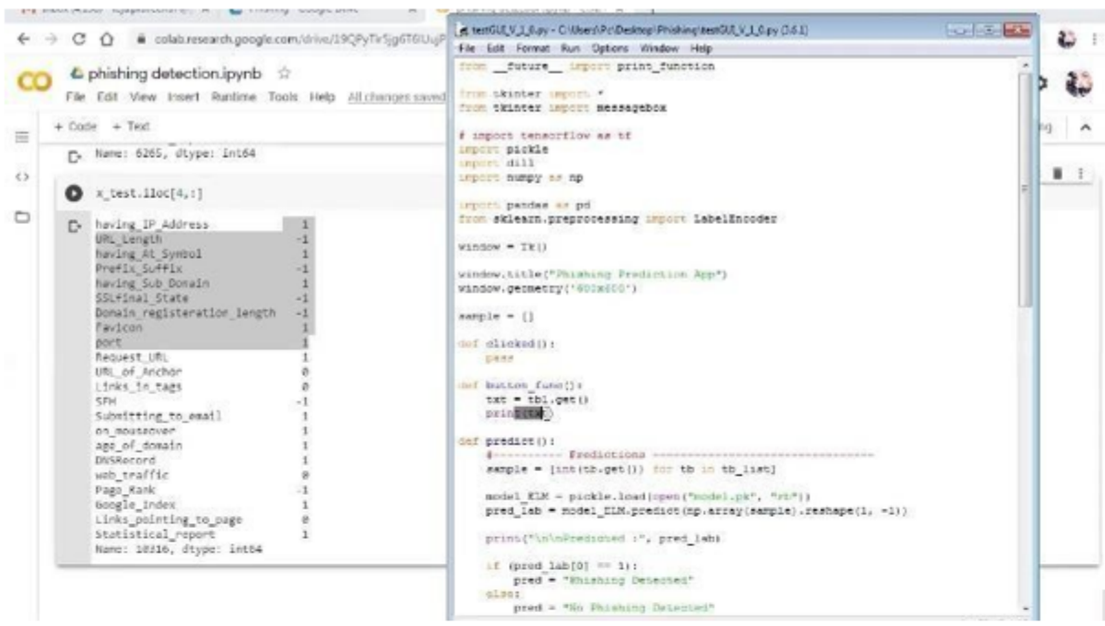
CHAPTER 7

SNAPSHOTS




phishing detection.ipynb
File Edit View Insert Runtime Tools Help All changes saved
Comment
Share
+ Code + Text
Editing
4 1
Name: Result, dtype: int64
Features considered
x.columns
Run cell (Ctrl+Enter)
cell executed since last change
executed by teja praveen
3:05 PM (0 minutes ago)
executed in 1.167s
dtype='object')
[24] from sklearn.model_selection import train_test_split
x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.2,random_state=0)
[26] x_train.shape
(8844, 22)
[ ] y_train.shape
(8844,)


phishing detection.ipynb
File Edit View Insert Runtime Tools Help All changes saved
Comment
Share
+ Code + Text
Editing
[55] Statistical_report 0
Result 0
dtype: int64
df.iloc[:,-1].value_counts()
1 6157
-1 4898
Name: Result, dtype: int64
[48] corr=df.corr()
corr.nlargest(30,"Result")["Result"]
Result 1.000000
SSLfinal_State 0.714741
URL_of_Anchor 0.692935
Prefix_Suffix 0.349606
web_traffic 0.346102
having_Sub_Domain 0.298323
Request_URL 0.253372
Links_in_tags 0.249229
SFH 0.221419
Google_Index 0.128950
age_of_domain 0.121496
Page_Rank 0.104645
having_IP_Address 0.094160
Statistical_report 0.079857
DNSRecord 0.075718
URL_Length 0.057430
having_At_Symbol 0.052948
on_mouseover 0.041838



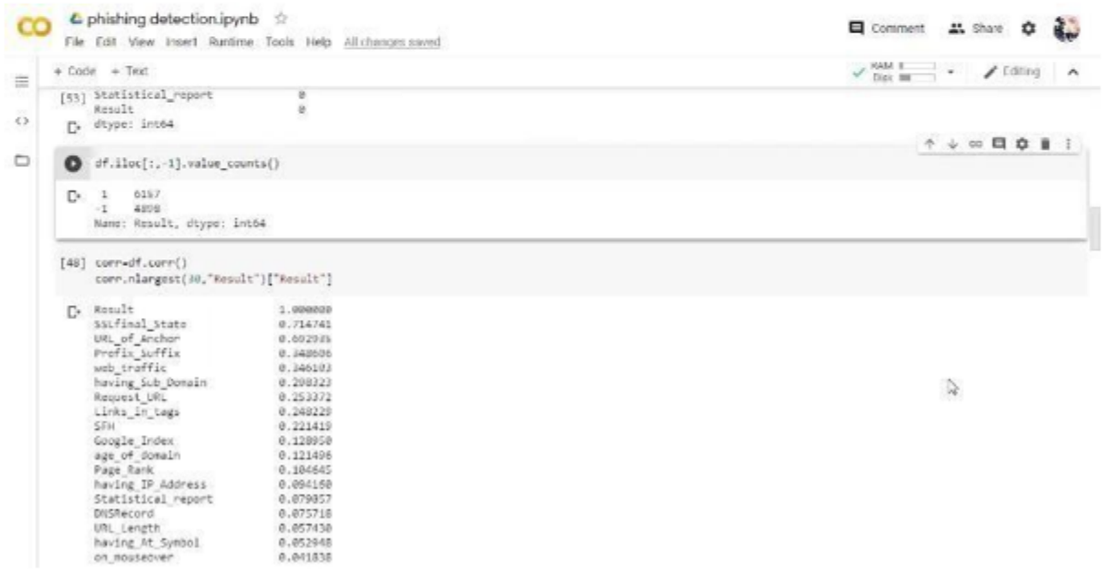
phishing detection.ipynb

```
Name: 6265, dtype: int64

x_test.iloc[4,:]

having_IP_Address          1
URL_Length                -1
having_At_Symbol           1
Prefix_Suffix             -1
having_Sub_Domain          1
SSLfinal_State            -1
Domain_registeration_length -1
Favicon                    1
port                       1
Request_URL                1
URL_of_Anchor              0
Links_in_tags              0
SFH                       -1
Submitting_to_email        1
on_mouseover               1
age_of_domain              1
DNSRecord                  1
web_traffic                0
Page_Rank                 -1
Google_Index               1
Links_pointing_to_page     0
Statistical_report         1
Name: 18316, dtype: int64
```

testGUI_V_1_0.py - C:\Users\Pc\Desktop\Phishing\testGUI_V_1_0.py (3.6.1)

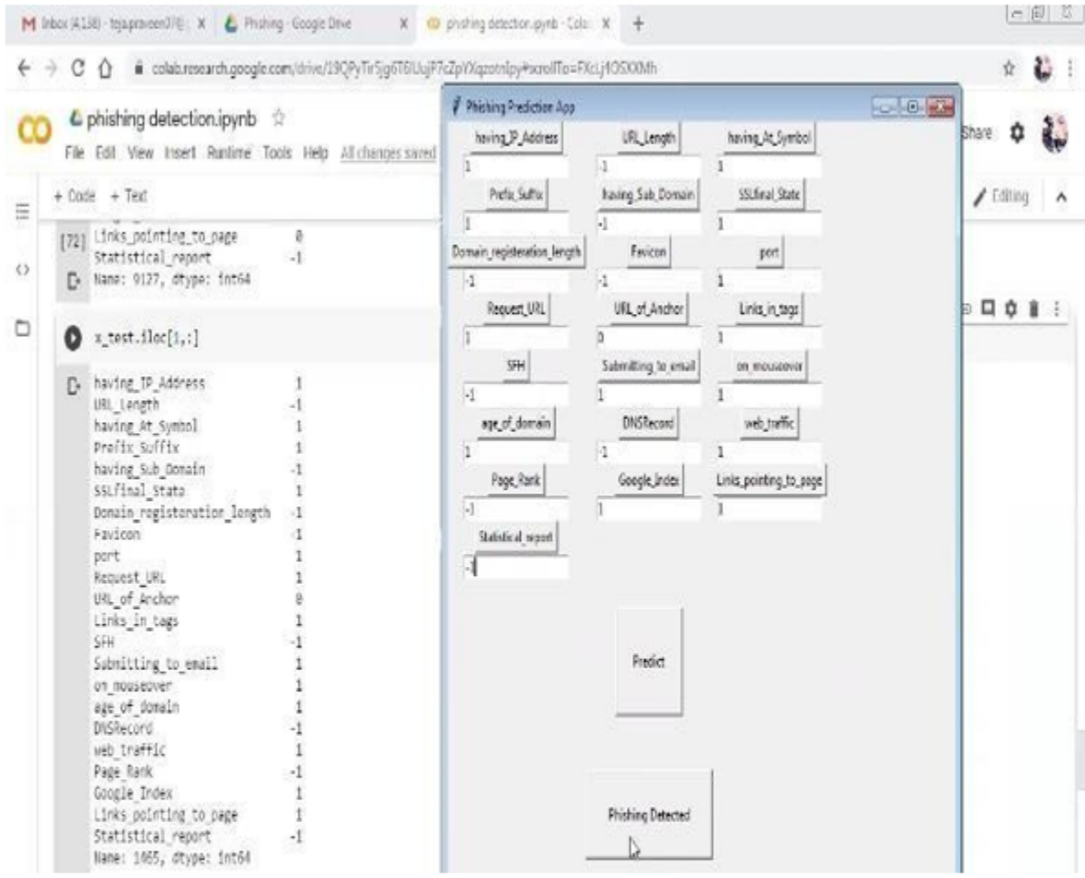
File Edit Format Run Options Window Help

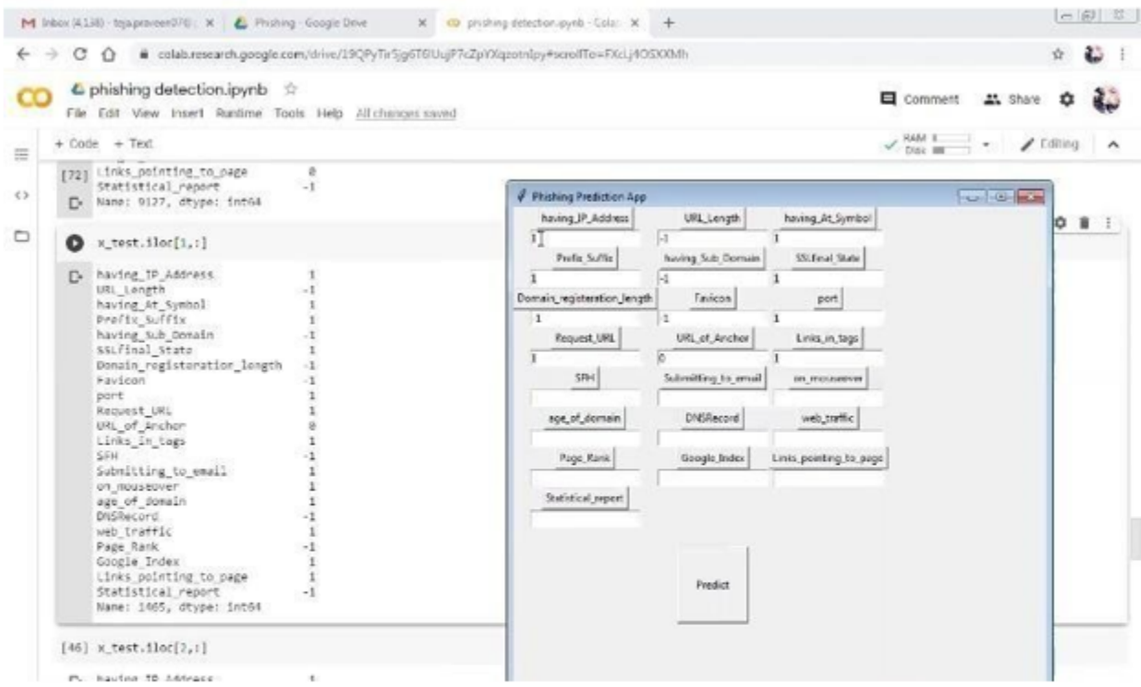
```
from __future__ import print_function

from tkinter import *
from tkinter import messagebox

# import tensorflow as tf
import pickle
import dill
import numpy as np

import pandas as pd
from sklearn.preprocessing import LabelEncoder

window = Tk()

window.title("Phishing Prediction App")
window.geometry('400x600')

sample = []

def clicked():
    pass

def button_func():
    txt = tbl.get()
    print(txt)

def predict():
    #---------- Predictions --------------------------------
    sample = [int(tb.get()) for tb in tb_list]

    model_KLN = pickle.load(open("model.pk", "rb"))
    pred_lab = model_KLN.predict(np.array(sample).reshape(1, -1))

    print("\n\nPredicted :", pred_lab)

    if (pred_lab[0] == 1):
        pred = "Phishing Detected"
    else:
        pred = "No Phishing Detected"
```



phishing detection.ipynb

```
[53] Statistical_report          0
     Result                      0
     dtype: int64

df.iloc[:,-1].value_counts()

 1    6157
-1    4898
Name: Result, dtype: int64

[48] corr=df.corr()
     corr.nlargest(30,"Result")["Result"]

Result                  1.000000
SSLfinal_State          0.714741
URL_of_Anchor           0.692935
Prefix_Suffix           0.348606
web_traffic             0.346109
having_Sub_Domain       0.298022
Request_URL             0.253372
Links_in_tags           0.240220
SFH                     0.221419
Google_Index            0.128950
age_of_domain           0.121496
Page_Rank               0.104645
having_IP_Address       0.096150
Statistical_report      0.079857
DNSRecord               0.075718
URL_Length              0.057430
having_At_Symbol        0.052048
on_mouseover            0.041838
```


phishing detection.ipynb
File Edit View Insert Runtime Tools Help All changes saved
+ Code + Text
[72] Links_pointing_to_page 0
Statistical_report -1
Name: 9127, dtype: int64
x_test.iloc[1,:]
having_IP_Address 1
URL_Length -1
having_At_Symbol 1
Prefix_Suffix 1
having_Sub_Domain -1
SSLfinal_State 1
Domain_registeration_length -1
Favicon -1
port 1
Request_URL 1
URL_of_Anchor 0
Links_in_tags 1
SFH -1
Submitting_to_email 1
on_mouseover 1
age_of_domain 1
DNSRecord -1
web_traffic 1
Page_Rank -1
Google_Index 1
Links_pointing_to_page 1
Statistical_report -1
Name: 1665, dtype: int64
Phishing Prediction App
having_IP_Address
URL_Length
having_At_Symbol
Prefix_Suffix
having_Sub_Domain
SSLfinal_State
Domain_registeration_length
Favicon
port
Request_URL
URL_of_Anchor
Links_in_tags
SFH
Submitting_to_email
on_mouseover
age_of_domain
DNSRecord
web_traffic
Page_Rank
Google_Index
Links_pointing_to_page
Statistical_report
Predict
Phishing Detected



CHAPTER 8

CONCLUSION

It is outstanding that a decent enemy of phishing apparatus ought to anticipate the phishing assaults in a decenttimescale. We acceptthat the accessibility of a decentenemy of phishingdevice at a decent time scale is additionally imperative to build the extent of anticipating phishingsites. This apparatus ought to be improved continually through consistent retraining. As a matter of fact, the accessibility of crisp and cutting-edge preparing dataset which may gainedutilizing our very own device[30, 32] will help us to retrainour model consistently and handle any adjustments in the highlights, which are influential in deciding the site class.Albeit neural system demonstrates its capacity to tackle a wide assortment of classification issues, the procedure of finding the ideal structure is verydifficult, and much of the time, this structure is controlled by experimentation.Our model takes care of this issue via computerizing the way toward organizing a neural system conspire; hence,on the off chance that we construct an enemy of phishing model and for any reasons we have to refresh it, at that point our model will encourage this procedure, that is, since our model will mechanize the organizing procedure and will request scarcelyany client definedparameters.

CHAPTER 9

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DEMO LINK

https://drive.google.com/file/d/1-7aeDQxKe4I3btqEx3YXvIlSevF0ORiR/view?usp=drivesdk