KATHMANDU UNIVERSITY

Department of Computer Science and Engineering
Dhulikhel,Kavre

A Project Report
on
"Covid-19 Situation Analysis Application"

[Code No. : COMP 206]
(For partial fulfillment of 2nd Year/ 3rd Semester in Computer Science)

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Bonafide Certificate

This project work on “Canteen Management System” is the bonafide work of
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who carried out the project work under my supervision.

Project Supervisior

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Acknowledgement

We wish to express our sincere thanks to the Department of Computer Science and Engineering for including the COMP 206 project into our curriculum. We would like to express our heartfelt gratitude to our project coordinator Mr. Nabin Ghimire and our supervisor Mr. Santosh Khanal for their regular guidance and encouragement throughout the project. Taking this opportunity, we would like to thank all those individuals who directly or indirectly helped us in making this project successful one be it by encouraging us throughout the project or else through their valuable suggestions which we have tried our best to assimilate within our work.

Abstract

The project ‘Covid-19 Situation Analysis Application’ proposal is drafted to meet the prerequisites to partially fulfill the COMP 206 course offered by the Department of Computer Science and Engineering at Kathmandu University and to cover for the pitfall of previously proposed Project ‘Portfolio Management and Finance Management Application’ . This project is designed to overcome the lack of centralized facility to deeply analyse COVID-19 situational data on international and national level. We, the involved project members, have decided to create a compact application that can run on Windows platform which scrapes data from multiple sites like worldometer.info, mohp.gov.np, covidnepal.org, covid19.wh.int allowing us to work on the dataset and plot various diagrams and charts necessary for in depth demographic analysis. It will allow customizing the charts based on demographic factors like age sex, population density, country etc and also present trends before, during and after a major wave. We are accomplishing this project by using dynamically typed object oriented programming language(Python) and Qt framework to handle the GUI portion of the application, Selenium and Scrapy to scrape web data, pandas for handling dataset and matplotlib and QTGraph to finally plot the data. The main goal of this project is to develop an efficient set of python code that can stand up to real world scenarios while increasing the programming skill of involved project members in hope of tackling harder projects in the forthcoming days.

Keywords: Python,Qt framework, Selenium, Scrapy

Contents

List of Figures

1 CHAPTER 1: INTRODUCTION

1.1 Background

COVID-19 pandemic is a global problem which has led to a dramatic loss of human life worldwide and presents an unprecedented challenge to public health, food systems and the world of work. It has stifled the global economy, caused untold amounts of grief among family members and friends, and forced people into social distancing and lockdown as means of virus transmission prevention.

Compared to some other countries, Nepal was still in a better situation during the first wave of the pandemic but during the second wave,it was hit quite worse. The lack of accessible and accurate information have caused people to be unaware of Covid-19 risks and the need to protect themselves, get tested and vaccinated. The crisis, illness, death and isolation have increased the vulnerability of the population as a whole.

There are few available sites that publish information on the covid situation but any data required for an in depth analysis based on different demographic factors are needed to be sourced from different websites. The lack of standardization of data between different websites causes cross referencing to be very difficult. To challenge this difficulty, we are aiming to make an open source program that is available to everyone with no cost overhead for operation. This system will be used by end users for the purpose of analyzing the COVID-19 situation on an international as well as on national level based on various demographics. Furthermore, this application shall also report on the availability of medical infrastructures available in Nepal to COVID-19 patients based on geographical region.

1.2 Objectives

The main objective of this project is to understand the intermediate concepts of dynamically typed language and web scraping for enhancing our knowledge to solve real life problems using an Object-oriented paradigm. Besides, the other objectives are listed below:

- To make various configurable graphs of multiple demographic indicators to facilitate technical analysis.
- To make an app which can keep people updated about the COVID-19 situation at local,national and international level.
- To create a database that allows user to know about the current medical facilities near them.

1.3 Motivation and Significance

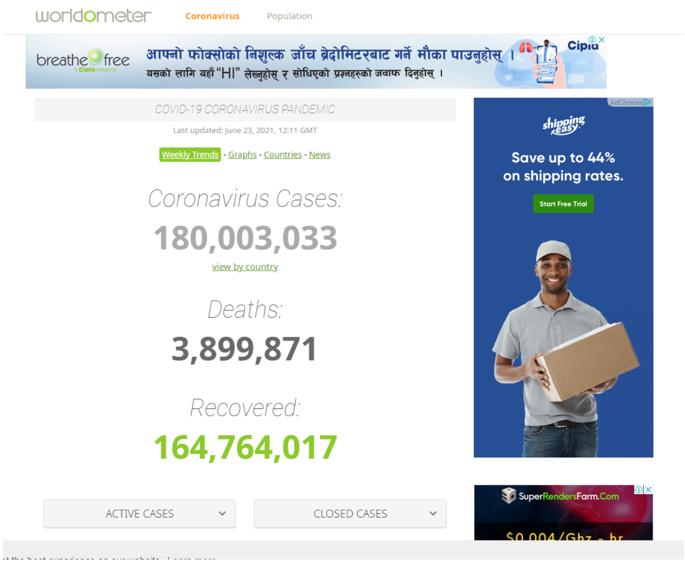
Our project is particularly inspired by various sites like Worldometer and covid19.mohp.gov.np. This program is being designed with an aim of collecting data that are available on different sites with our prior experience of the struggle of getting information in an intuitive manner. This will present a relevant user interface which provides easy, enjoyable and effective interaction between the user and the application along with the explanation of various graphs and their trends. Most notably, it will allow for analysis of transmission and mortality trends with cross reference to health infrastructures via line graph, making it more accessible for in depth understanding of the pandemic situation to a person untrained in technical analysis. Furthermore, this program presents features such as Vaccine development situations, local governmental updates, etc to facilitate understanding about the pandemic among users as a means to combat its spread.

2 CHAPTER 2: RELATED WORKS

There are similar sites available which are being used globally as well as nationally which are being operated by different NGO and governmental organizations and to keep track of the COVID-19 pandemic.

Some of such sites that are in use are:

2.1 worldometer.info



worldometer
Coronavirus
Population
breathe free
A Cipla INITIATIVE
आफ्नो फोक्सोको निशुल्क जाँच ब्रेदोमिटरबाट गर्ने मौका पाउनुहोस् ।
यसको लागि यहाँ "HI" लेख्नुहोस् र सोधिएको प्रश्नहरुको जवाफ दिनुहोस् ।
Cipla
AdChoices
shipping easy
Save up to 44% on shipping rates.
Start Free Trial
SuperRendersFarm.Com
$0.004/Ghz - hr

COVID-19 CORONAVIRUS PANDEMIC

Last updated: June 23, 2021, 12:11 GMT

Weekly Trends - Graphs - Countries - News

Coronavirus Cases:
180,003,033

view by country

Deaths:
3,899,871

Recovered:
164,764,017

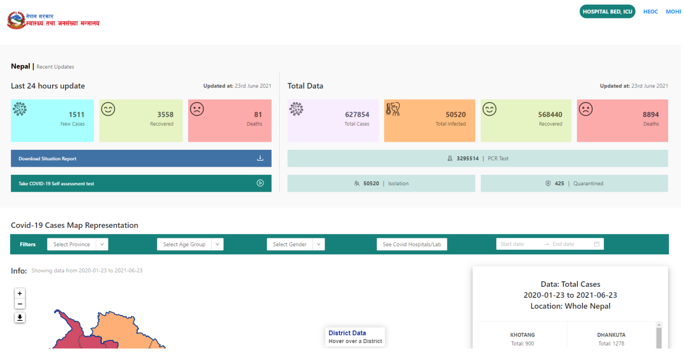
ACTIVE CASES

CLOSED CASES

Figure 1: Worldometer Website

Worldometer is a website which manually analyzes, validates, and aggregates data from thousands of sources in real time and provides global COVID-19 live statistics for a wide audience of caring people around the world. It's sources include official websites of Ministries of Health or other Government Institutions and Government authorities' social media accounts. It collects and processes data around the clock, 24 hours a day, 7 days a week and performs multiple updates per minute.

2.2 covid19.mohp.gov.np



Nepal | Recent Updates

Last 24 hours update — Updated at: 23rd June 2021

1511 New Cases | 3558 Recovered | 81 Deaths

Total Data — Updated at: 23rd June 2021

627854 Total Cases | 50520 Total Infected | 568440 Recovered | 8894 Deaths

3295514 | PCR Test

50520 | Isolation

425 | Quarantined

Covid-19 Cases Map Representation

Info: Showing data from 2020-01-23 to 2021-06-23

Data: Total Cases
2020-01-23 to 2021-06-23
Location: Whole Nepal

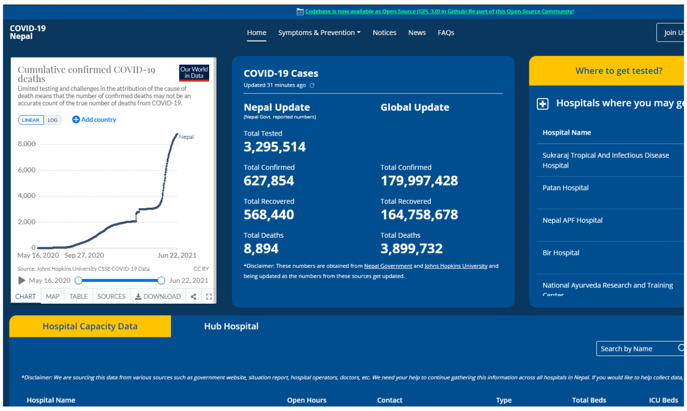
KHOTANG Total: 900

DHANKUTA Total: 1278

Figure 2: Ministry of Health and Population Website

It is an official website of Ministry of Health and Population (MoHP) designed to provide authentic information about covid situation in Nepal. It consists of all the covid related data like active cases, death cases, recovered cases classified on the basis of district, province, age, sex and compares them . It also provides information about the hospital bed availabilty for different regions to help people find proper care in time.

2.3 covidnepal.org



Codebase is now available as Open Source (GPL 3.0) in Github! Be part of this Open Source Community!

Cumulative confirmed COVID-19 deaths

Limited testing and challenges in the attribution of the cause of death means that the number of confirmed deaths may not be an accurate count of the true number of deaths from COVID-19.

Source: Johns Hopkins University CSSE COVID-19 Data

COVID-19 Cases

Updated 31 minutes ago

Nepal Update (Nepal Govt. reported numbers)

Total Tested 3,295,514

Total Confirmed 627,854

Total Recovered 568,440

Total Deaths 8,894

Global Update

Total Confirmed 179,997,428

Total Recovered 164,758,678

Total Deaths 3,899,732

*Disclaimer: These numbers are obtained from Nepal Government and Johns Hopkins University and being updated as the numbers from these sources get updated.

Hospitals where you may g

Hospital Name
Sukraraj Tropical And Infectious Disease Hospital
Patan Hospital
Nepal APF Hospital
Bir Hospital
National Ayurveda Research and Training Center

*Disclaimer: We are sourcing this data from various sources such as government website, situation report, hospital operators, doctors, etc. We need your help to continue gathering this information across all hospitals in Nepal. If you would like to help collect data,

Hospital Name	Open Hours	Contact	Type	Total Beds	ICU Beds

Figure 3: CovidNepal.org Website

It is an open source platform that provides reliable information about Covid-19 in Nepal along with global cases update. It also provides a general information about where and when to get tested and covid hospitals for a particular region in Nepal to get admitted along with the information about its symptoms and prevention methods.

3 CHAPTER 3: DESIGN AND IMPLEMENTATION

3.1 Architectural Design

3.1.1 Flow Chart

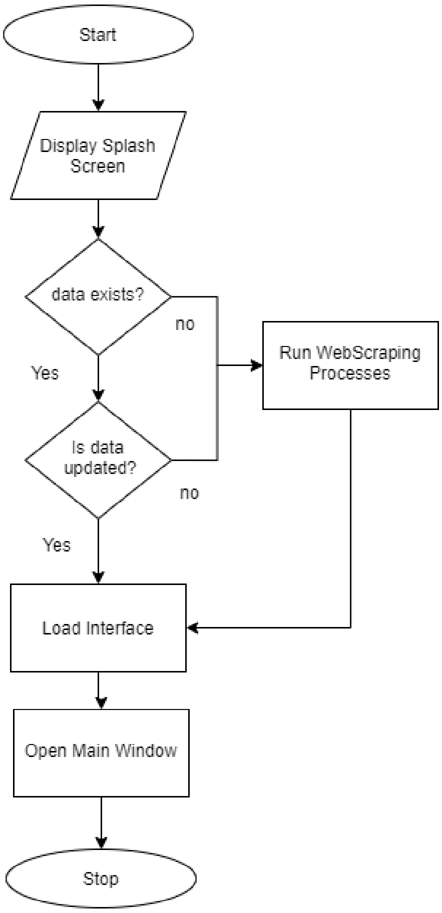


Figure 4: SplashScreen FlowChart

This flowchart shows the inner working of the Splash Screen Logic of the program. It checks if various data files are present and are upto date. If it doesn't find it, it runs the necessary Webscraping processes to scrape the data.

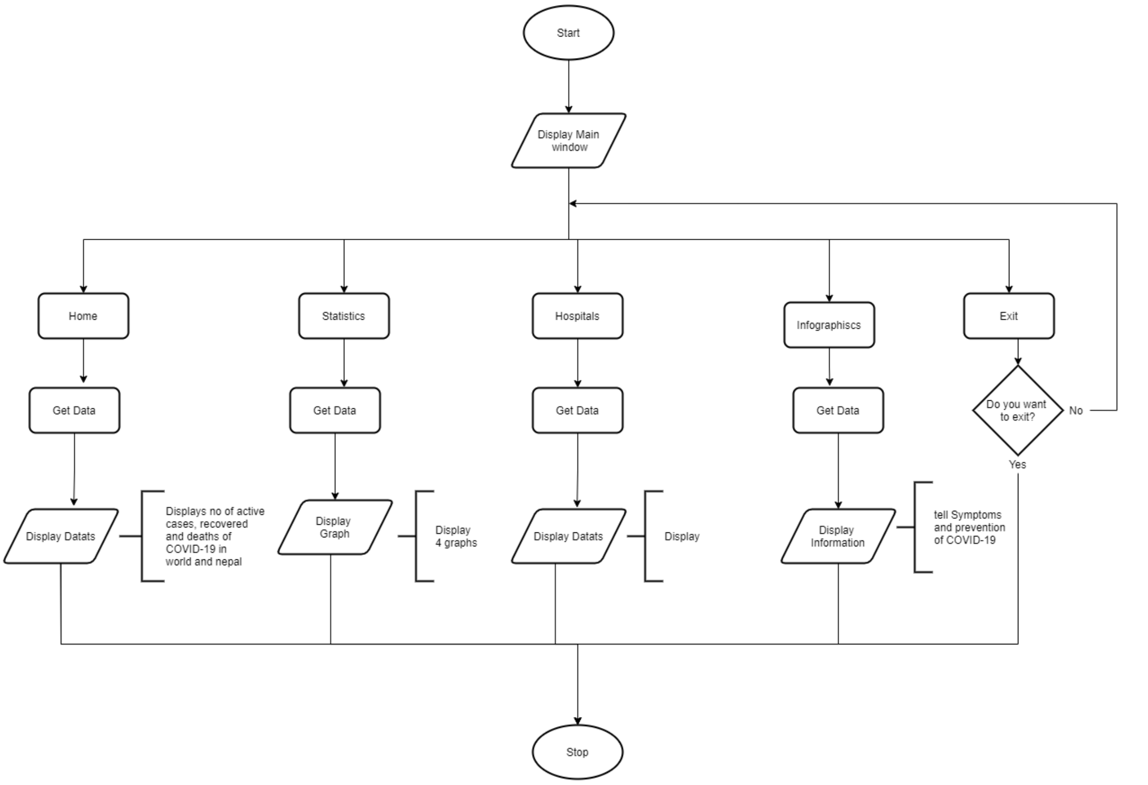


Figure 5: MainScreen FlowChart

This flowchart shows the inner working of the Main Window and the logic of the program when user interacts with the GUI. It displays and updates graphs, charts, tables based on filters configured by the user.

3.1.2 Use Case Diagram

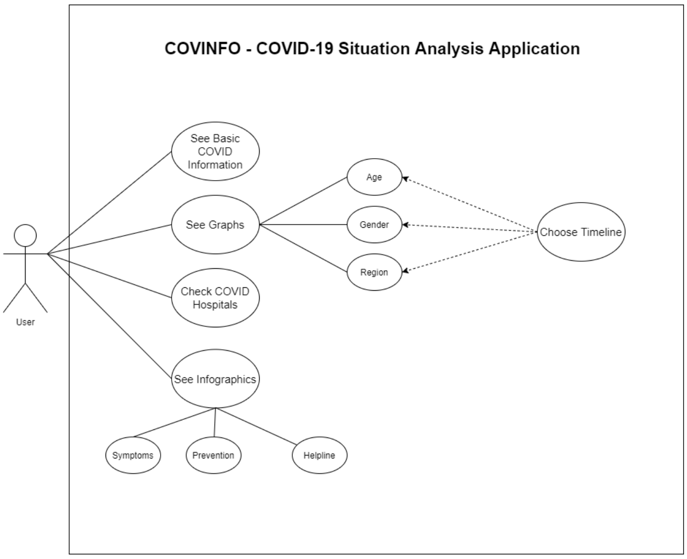


Figure 6: UseCase Diagram

This use case diagram illustrates the various UI elements and its functions on Main Window of the application.

3.2 System Requirement Specification

3.2.1 Software Requirements:

- **Front End Tools**
  - The program is created using Python.
  - Development Tools : QT frameworks
- **Back End Tools**
  - Selenium and Scrapy modules used for scraping web information.
  - Pandas module used to make datasets.
  - Matplotlib and QTGrapgh used for plotting.
  - Web Browser supporting Selenium WebDriver *(Here, Google Chrome v92.0.4515.131)*

3.2.2 Hardware Requirements:

- Compatibility: Compatible with all PCs running on Windows platform.

Python : A dynamically typed multi paradigm general purpose programming language.

QT frameworks : An open source cross platform multi language widget toolkit that helps in developing GUI Application.

4 CHAPTER 4: DISCUSSION AND ACHIEVEMENT

4.1 Methodology

The whole process of developing the software has been divided into following aspects:

- Research and study
- UI Design and prototyping
- Core programming
- Program Testing
- Documentation

4.1.1 Research and Study

This project being the first of the kind we have ever done, we decide to choose a subject matter that we clearly know and have experience with ie. the plotting graph using matplotlib. We have interacted with the various software/sites mentioned above in chapter 2 on a semi-regular basis and have experienced its strength and pitfall. We are trying to compile the information on nation and international stagee and present it on a singular platform.

4.1.2 UI design and Prototyping

The initial designs are sketched on A4 papers by our members and shared on group chat for peer review and then use QT Creator's design tab to stub test the look of our UI before adding any functionality to the various widgets.

4.1.3 Core Programming

The most amount of project time is going to be spent in this stage. We are using the Python language to write our program. QT framework provides the necessary tools to create the GUI. Selenium is being used to surf the web and get html of webpages and scrapy is being used on the html file to parse and extract data which is converted into datasets via Pandas for easy import and manipulation as per end user requirement; for instance, getting data of certain dates only. Finally the QTGraph and matplotlib library is used to plot the dataset.

4.1.3.1 Issues Encountered

- ***Change of project halfway***
  The project was after the initial project was not upto par with our Supervisior. Since more than half of the work was already completed in the initial project, starting anew on a different topic was difficult to adjust.

- ***Deciding which UI language to use (QML or Qt XML)***
  Due to the confusing nature of multiple libraries providing python binding for QT, we had problems choosing the approach to build the User interface. Initially we tried with QML to have dynamic and easily configurable UI for easier iteration but due to different OS platform present in team members' PC, getting there was version mismatch of the available library between each team members. Next we tried with PySide6 but due to lack of support for Matplotlib embedding, we ultimately had to choose PySide2.

- ***Python library Setup***
  Due to lack of proper experience in working with Command Line Interface, Team members needed to be brought up to knowledge regarding python virtual environments and pip along with teaching relevant commands in Powershell and Bash.

- ***Brainstorming features to be added***
  Initially the project was on different trajectory and due to amount of time invested, team members were locked in a certain direction. When the project topic was changed, the team had great difficulty in comming up with new ideas.

4.1.4 Program Testing

Unit testing was done as soon as we completed the code of a single widget to check its functioning properly. This was repeated multiple times during the development period to create a robust system and once the core programming is completed, alpha testing was done to find different types of bugs or ill optimised issues.

4.1.4.1 Bugs found and Debugged

- Graph wasn't being updated when the timeline was being changed.

- Program was loading old data files in Splash screen instead of running scraping command.

- Scrapy wasn't making files in proper location after scraping was complete.

- Blank information was being scraped from the website of MOHP until the issue was identified.

4.2 Features

To make a robust application, alot of features were added to the program. Both Backend Webscraping and Frontend GUI have access to a wide array of features and some of them are as follows.

4.2.1 Web Scraping

- WebPages were controlled through the use of Selenium WebDriver.
- Scrapy was used to scrape data from webpages.

4.2.2 GUI

- Basic COVID statistics of Nepal and World.
- Custom graphical representation of chosen timeline
- Information regarding available COVID hospitals in the country
- Infographics to know the symptoms, prevention for the virus with helpline

5 CHAPTER 5: CONCLUSION AND RECOMMENDATION

With the constant supervision of the supervisor and hard work of team members, the project is finally complete. After this project we believe our team is ready to tackle more sophisticated projects in the future.

5.1 Limitations

The program has the following limitations:

- ***Making Covid Cases Predictions***
  The project supervisior suggested to make a feature to make a prediction for the future as per current data. The initial idea was for the team to get an average of cases each months and calculate deviation. But the team couldn't have a proper idea to solve it and due to the rush and other obligations the feature was scraped to focus on other features.

- ***Selenium WebDriver***
  The project uses Selenium WebDriver so the Browser must match the WebDriver available. This can easily be solved by the end user by copying the webdriver file for their Browser into the relevant directory from the web.

- ***Making the project's Executable file***
  The documentation for creating a .exe file from a python sript was confusing and resources available online pointing to differnt and confusing solutions. Since it's easy enough to create a virtual environments and run a python script in it. This step was ignored.

5.2 Further Enhancements

The following action could be untaken to improve the program.

- ***Making a proper prediciton model using Machine Learning***
  None of the team members had any experience with Machine Learning and so were unable to make a proper data prediciton functionality. In the next Semester, if given time the team members could focus on learing ML and working to make a prediciton model.

- ***Making an Executable file***
  Due to the confusing nature of the the prcocess and the ease of just running a python script via the command line. Importance wasn't given to make a executable file (.exe) due to the time constraints and differint OS present in team members' PC.

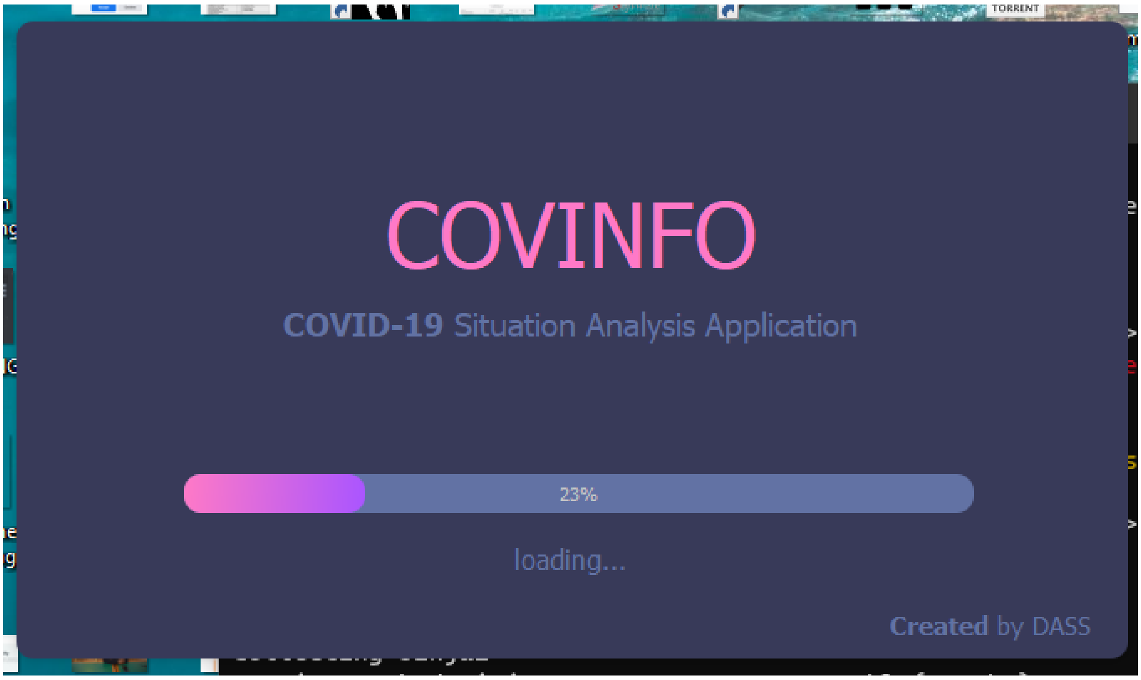
6 Refrences

Worldometer.(n.d.). COVID-19 CORONAVIRUS PANDEMIC.
https://www.worldometers.info/coronavirus/

Government of Nepal Ministry of Health and Population. (n.d.). https://covid19.mohp.gov.np/

COVID-19 Nepal. (n.d.) https://covidnepal.org/

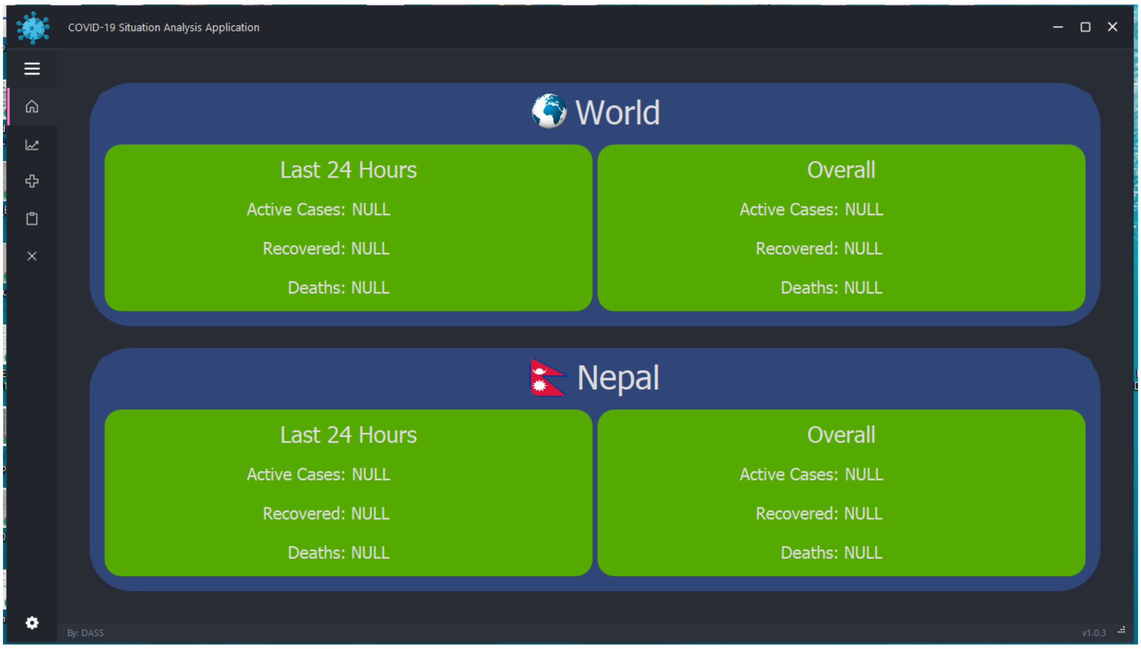
7 Appendix



COVINFO

COVID-19 Situation Analysis Application

Figure 7: Splash Screen



COVID-19 Situation Analysis Application

World

Last 24 Hours

Active Cases: NULL

Recovered: NULL

Deaths: NULL

Overall

Active Cases: NULL

Recovered: NULL

Deaths: NULL

Nepal

Last 24 Hours

Active Cases: NULL

Recovered: NULL

Deaths: NULL

Overall

Active Cases: NULL

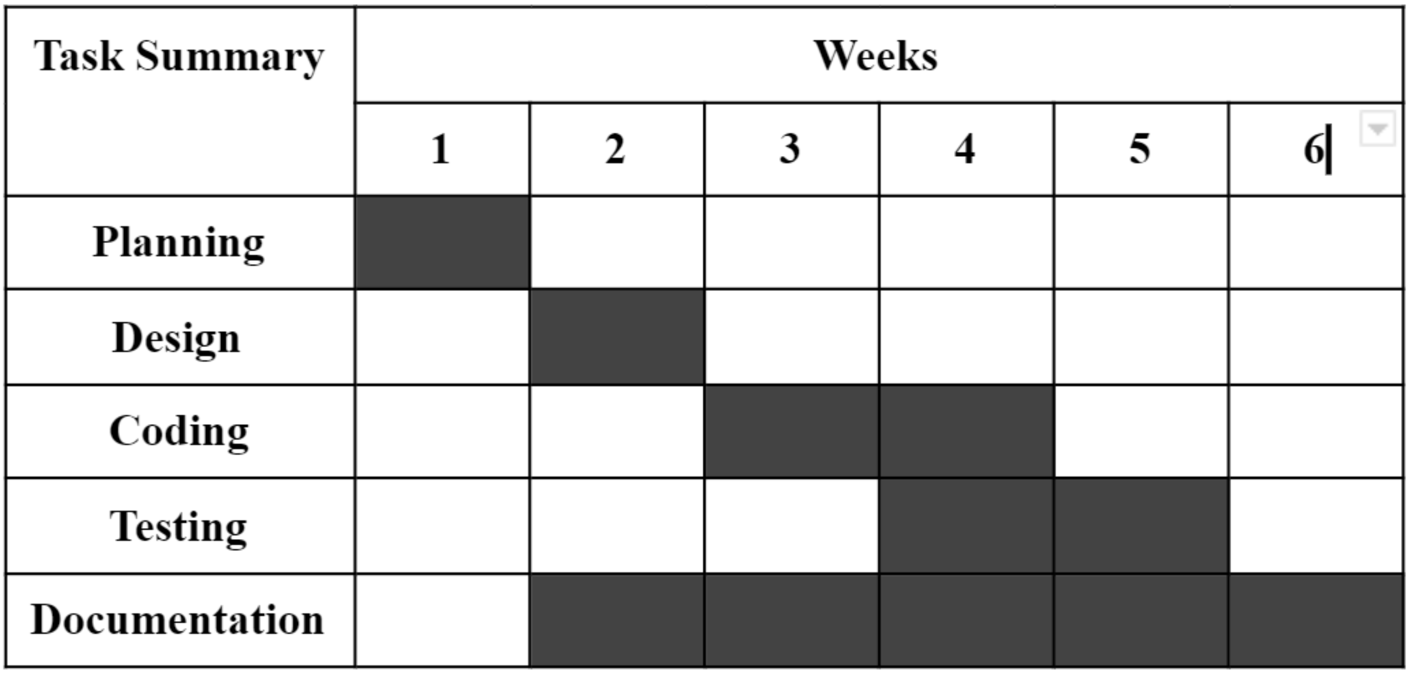
Recovered: NULL

Deaths: NULL

By: DASS

v1.0.3

Figure 8: Main Window - Dashboard



Task Summary	Weeks					
	1	2	3	4	5	6
Planning	■					
Design		■				
Coding			■	■		
Testing				■	■	
Documentation		■	■	■	■	■

Figure 9: Gant Chart

Index

■

Task Completed