Project Report

Python – International Space Station Locator

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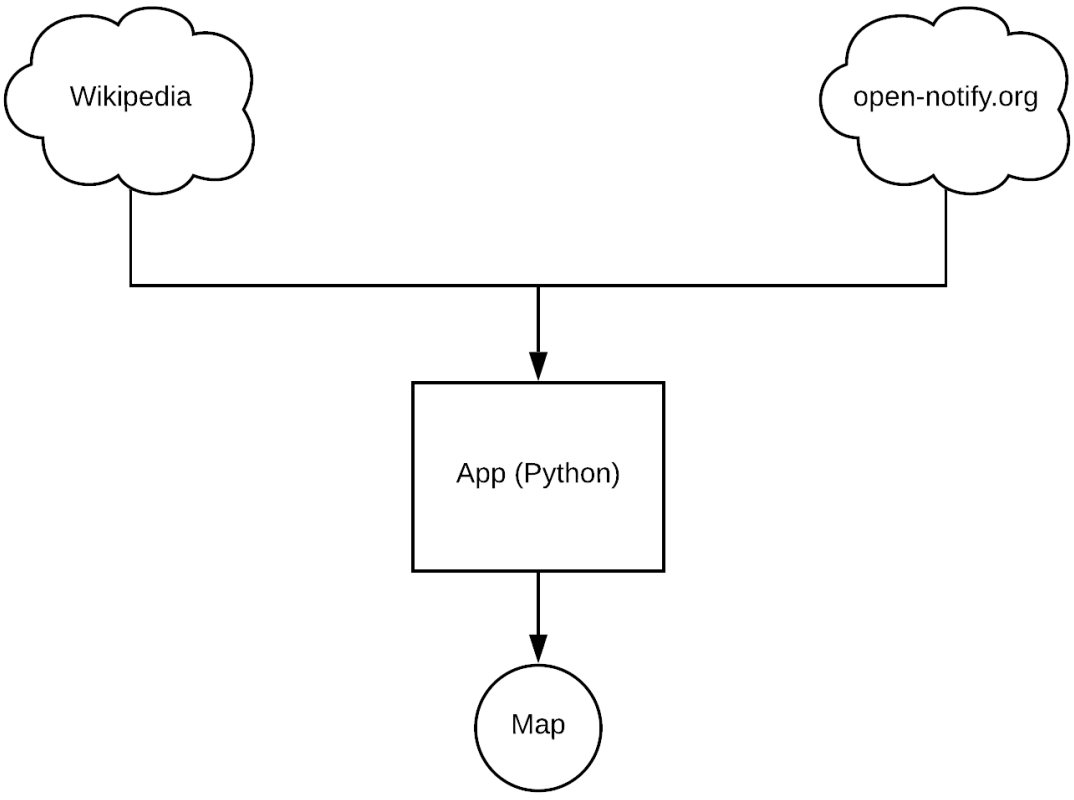
Abstract

This is a python application to fetch location and the astronauts present in International Space Station and plot its position on the map. The app will continuously mark the real-time location of the ISS and show brief details of the astronauts. In this project, I use some of the open APIs available on the internet to get the data from Wikipedia and open-notify.org and Using matplotlib and Cartopy for plotting locations on the map.

Introduction

This application uses various web APIs, and frameworks to fetch the required details from internet and plot on the world map. APIs from open-notify.org and Wikipedia are used to get the detail of the astronauts present in the International Space Station and its current location.

Methodology

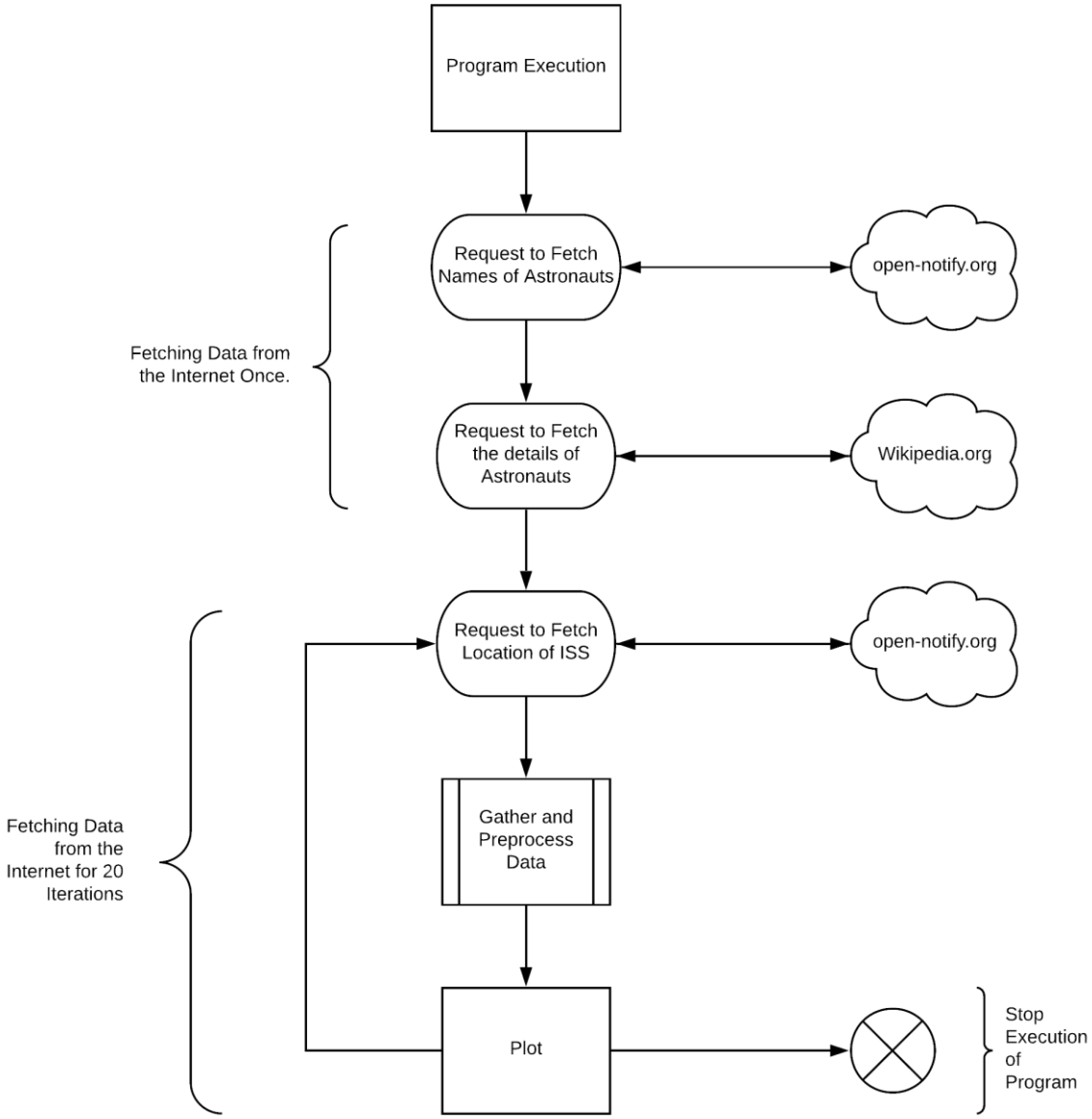


Code Implemented

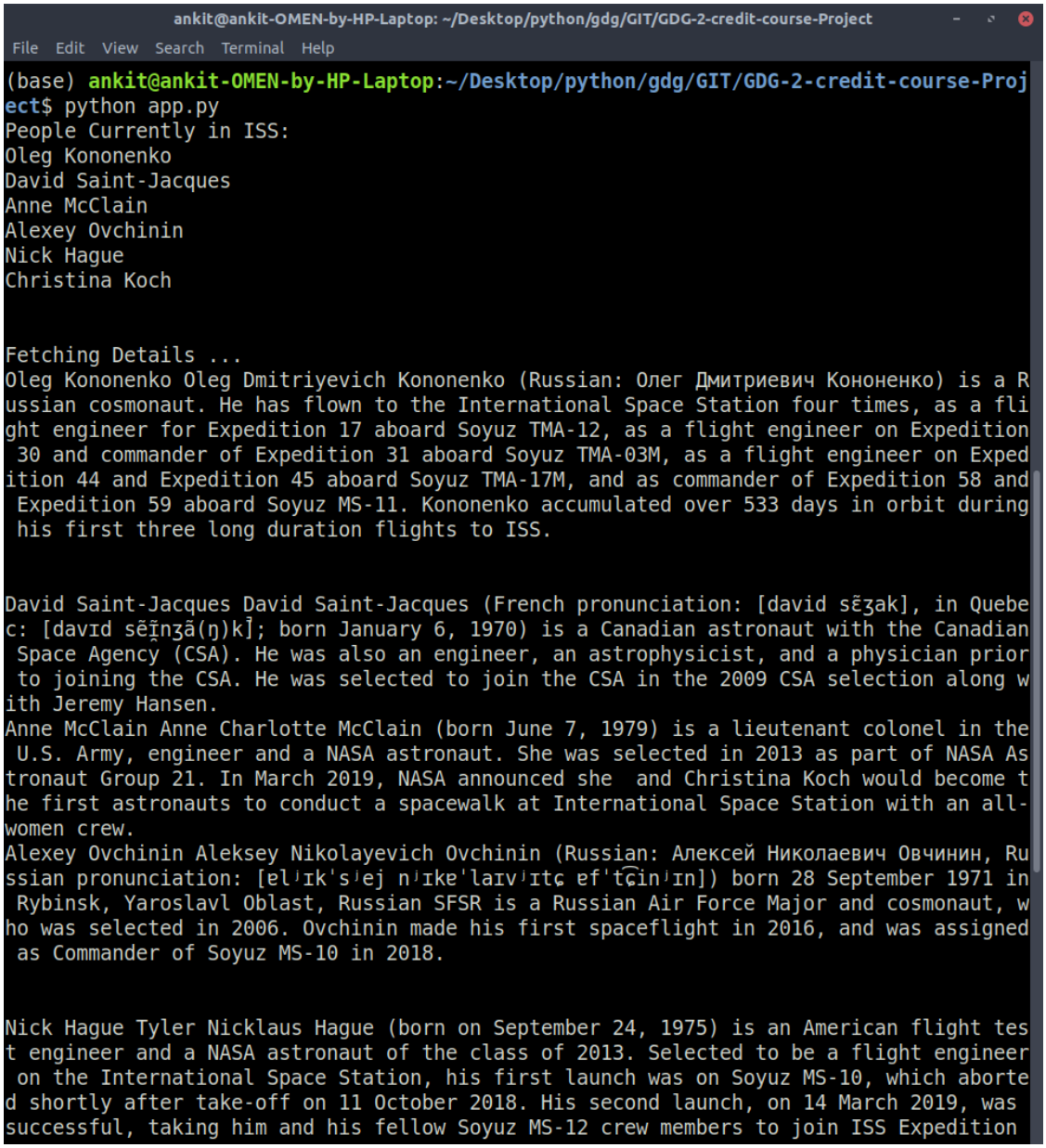
```
import requests
import json
import cartopy.crs as ccrs
import matplotlib.pyplot as plt
import wikipedia


def fetch_data(key):
    data = wikipedia.summary(key)
    return data


def astronauts_data():
    astronauts = requests.get('http://api.open-notify.org/astros.json')
    astronauts = json.loads(astronauts.text)
    return astronauts



def location_data():
    location = requests.get('http://api.open-notify.org/iss-now.json')
    location = json.loads(location.text)
    return location


def printAstronauts(astronauts):
    print("People Currently in ISS: ")
    for i in astronauts['people']:
        print(i['name'])
```

```
def get_names(astronauts_data):
    names = []
    for i in astronauts_data['people']:
        names.append(i['name'])
    return names
def liveTrack():
    for i in range(20):
        location = location_data()
        longs = location['iss_position']['longitude']
        lats = location['iss_position']['latitude']
        lats = float(lats)
        longs = float(longs)
        print('latitude: ', lats, 'longitude: ', longs)
        fig = plt.figure()
        ax = fig.add_subplot(1, 1, 1,projection=ccrs.PlateCarree())
        ax.scatter(longs, lats, c = '#FF0000')
        ax.stock_img()
        ax.coastlines()
        ax.gridlines()
        plt.show(block= False)
        plt.pause(1)
        plt.close()
if __name__ == "__main__":
    astronauts = astronauts_data()
    names = get_names(astronauts)
    printAstronauts(astronauts)
    print("\n\nFetching Details ...")
    details = {k:v for k,v in zip(names, [fetch_data(i) for i in names])}
    for i in details:
        print(i, details[i])
    liveTrack()
```

Step – by – Step Execution of Program:



Screenshots:



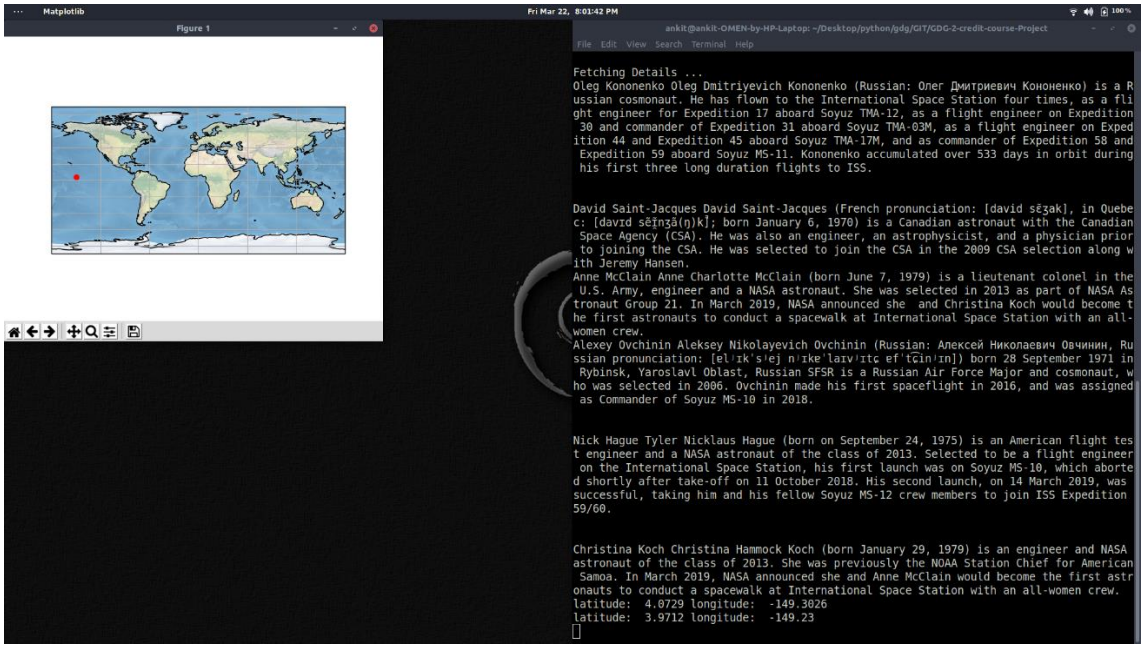

Matplotlib
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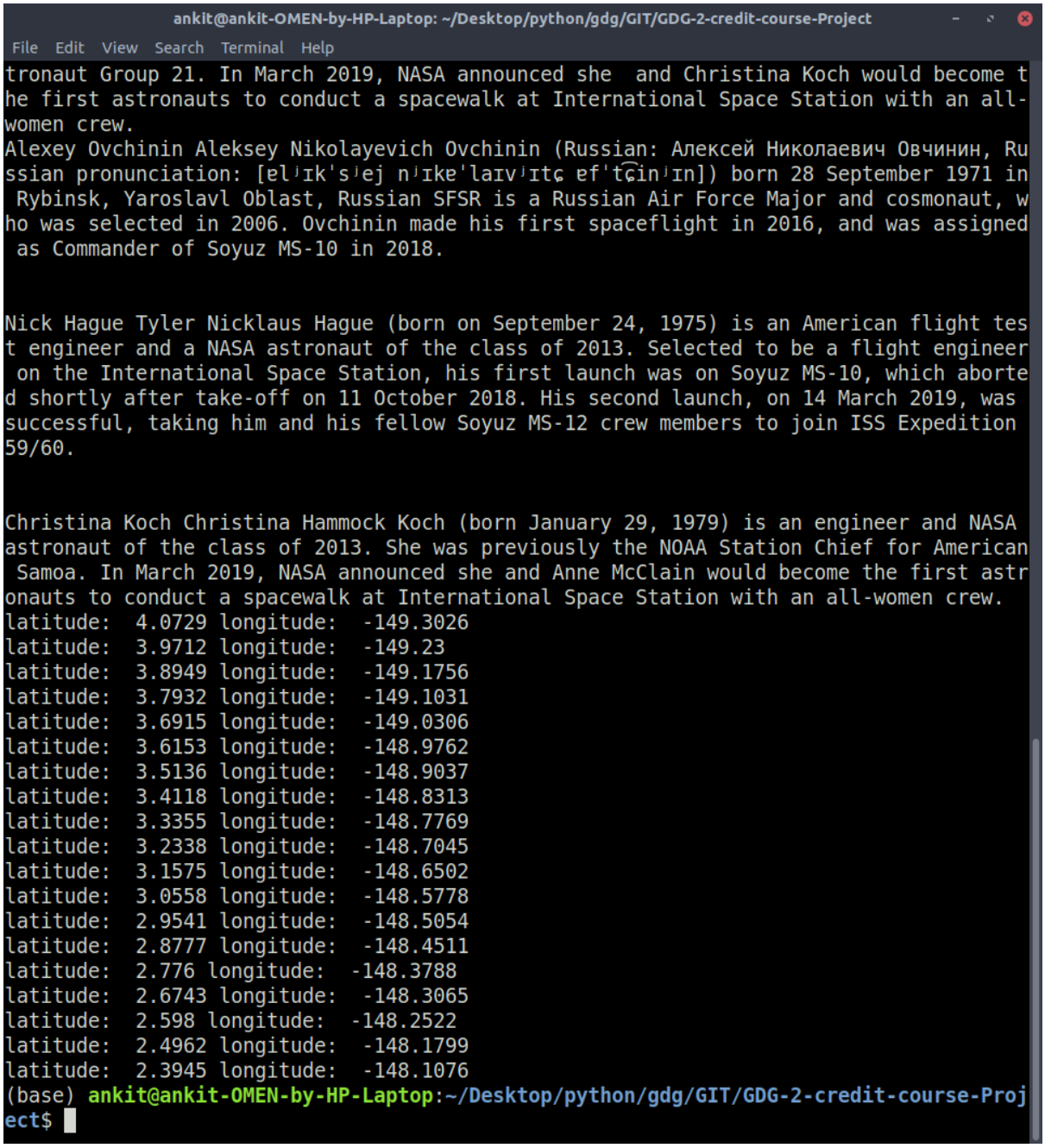
Figure 1
ankit@ankit-OMEN-by-HP-Laptop: ~/Desktop/python/gdg/GIT/GDG-2-credit-course-Project
File Edit View Search Terminal Help
Fetching Details ...
Oleg Kononenko Oleg Dmitriyevich Kononenko (Russian: Олег Дмитриевич Кононенко) is a Russian cosmonaut. He has flown to the International Space Station four times, as a flight engineer for Expedition 17 aboard Soyuz TMA-12, as a flight engineer on Expedition 30 and commander of Expedition 31 aboard Soyuz TMA-03M, as a flight engineer on Expedition 44 and Expedition 45 aboard Soyuz TMA-17M, and as commander of Expedition 58 and Expedition 59 aboard Soyuz MS-11. Kononenko accumulated over 533 days in orbit during his first three long duration flights to ISS.
David Saint-Jacques David Saint-Jacques (French pronunciation: [david sɛ̃ʒak], in Quebec: [davɪd sɛ̃ʔnʒã(ŋ)k]; born January 6, 1970) is a Canadian astronaut with the Canadian Space Agency (CSA). He was also an engineer, an astrophysicist, and a physician prior to joining the CSA. He was selected to join the CSA in the 2009 CSA selection along with Jeremy Hansen.
Anne McClain Anne Charlotte McClain (born June 7, 1979) is a lieutenant colonel in the U.S. Army, engineer and a NASA astronaut. She was selected in 2013 as part of NASA Astronaut Group 21. In March 2019, NASA announced she and Christina Koch would become the first astronauts to conduct a spacewalk at International Space Station with an all-women crew.
Alexey Ovchinin Aleksey Nikolayevich Ovchinin (Russian: Алексей Николаевич Овчинин, Russian pronunciation: [ɐlʲɪkˈsʲej nʲɪkɐˈlajvʲɪtɕ ɐfˈtɕinʲɪn]) born 28 September 1971 in Rybinsk, Yaroslavl Oblast, Russian SFSR is a Russian Air Force Major and cosmonaut, who was selected in 2006. Ovchinin made his first spaceflight in 2016, and was assigned as Commander of Soyuz MS-10 in 2018.
Nick Hague Tyler Nicklaus Hague (born on September 24, 1975) is an American flight test engineer and a NASA astronaut of the class of 2013. Selected to be a flight engineer on the International Space Station, his first launch was on Soyuz MS-10, which aborted shortly after take-off on 11 October 2018. His second launch, on 14 March 2019, was successful, taking him and his fellow Soyuz MS-12 crew members to join ISS Expedition 59/60.
Christina Koch Christina Hammock Koch (born January 29, 1979) is an engineer and NASA astronaut of the class of 2013. She was previously the NOAA Station Chief for American Samoa. In March 2019, NASA announced she and Anne McClain would become the first astronauts to conduct a spacewalk at International Space Station with an all-women crew.
latitude: 4.0729 longitude: -149.3026
latitude: 3.9712 longitude: -149.23



Web APIs being used:

1. http://api.open-notify.org/astros.json
2. http://api.open-notify.org/iss-now.json
3. https://pypi.org/project/wikipedia/

Python Packages Used:

1. Cartopy: used to plot on maps using latitude and longitude.
2. Requests: To do http get requests.
3. Json: To convert Json files to python dictionary
4. Matplotlib: as the base of cartopy
5. Wikipedia: To fetch Data from Wikipedia website

Problems faced while making this project:

The recommended plotting package was basemap, but while installing the package, I faced many problems with the dependencies of this package. I tried installing every external package required by basemap while installing these packages I noticed that one of the libraries called GEOS - Geometry Engine - Open Source) was giving an error during the build. I tried searching on Stack Overflow, GitHub Issues section, and other forums. So, after searching for hours, I got an alternative of basemap, that is cartopy. This package was very lightweight and did not have many dependencies. Its documentation was simple and easy to implement for small projects.

Conclusion

This project has introduced me to web APIs and how to work with graphical map plots. Fetching data and converting it into a dictionary in python, and then producing graphical plots and printing information. This application does a live track of the International Space Station and the astronauts present in it.

References

https://scitools.org.uk/cartopy/docs/latest/

https://matplotlib.org/users/index.html

https://docs.python.org/3/library/index.html

http://docs.python-requests.org/en/master/