*A Mini Project Synopsis on*

# Folium-based Interactive Maps

**S.E. – Computer Science and Engineering-Data Science**

**Submitted By**


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# CERTIFICATE

This to certify that the Mini Project report on **FOLIUM-BASED INTERACTIVE MAPS** has been submitted by **Arya Patil(21107009) , Rohan Waghode(21107008) , Rutuja Patil (21107012)** and **Tanvi Panchal(21107006)** who are a Bonafede students of A. P. Shah Institute of Technology, Thane, Mumbai, as a partial fulfilment of the requirement for the degree in **Computer Science and Engineering(Data Science)**, during the academic year **2022-2023** in the satisfactory manner as per the curriculum laid down by University of Mumbai.

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# CHAPTER 1

## INTRODUCTION

Folium is a powerful Python library used for creating interactive maps using Leaflet.js. The library is built on top of Pandas and allows you to create a variety of map types with custom overlays, markers, and layers. Folium is widely used by data scientists and analysts to visualize geospatial data and share their findings with others.

One of the key benefits of using Folium is its simplicity. The library provides a user-friendly interface to create maps, and we don't need to be an expert in web development to use it. Folium also allows to easily add markers, shapes, and layers to your map, making it easy to customize your map to your needs.

Folium also supports a variety of map tiles, including OpenStreetMap, Mapbox, and Stamen, allowing you to choose the best map tile for your use case. Additionally, Folium supports various interactive features, such as zooming, panning, and tooltips, making it easy for users to explore the map and interact with the data.

### 1.1 PURPOSE

The purpose of Folium-based interactive maps is to provide an intuitive interactive way to visualize, analyze, and communicate spatial data. These maps allow users to explore and understand geographic data by displaying it in a visually appealing and interactive format.

### 1.2 OBJECTIVES

The main objective of using Folium is to create interactive maps that can visualize spatial data in an easy and efficient way. It allows users to create maps that can display various types of data in different formats such as markers, lines, polygons, and heat maps. Interactive maps created using Folium can be used to communicate spatial data to a wider audience.

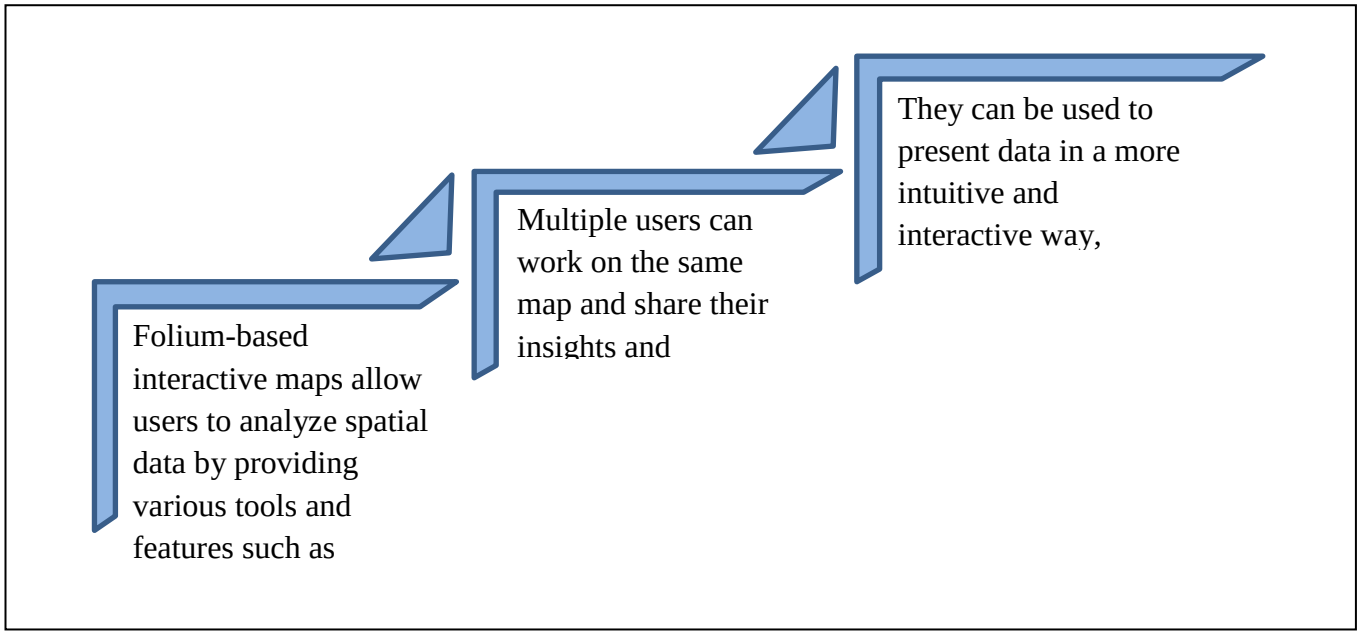



Fig 1.1 : Objectives

## 1.3 SCOPE

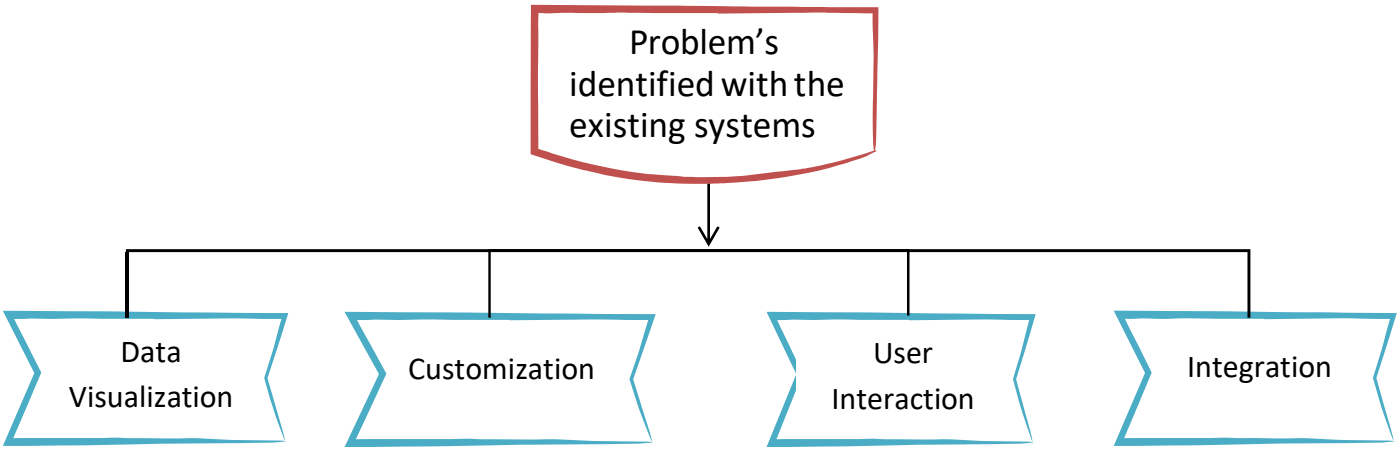
One of the primary applications of folium is data visualization. It can be used to visualize geospatial data, such as population density, weather patterns, or disease outbreaks. Folium can also be used to build location-based services, such as restaurant finders or store locators, by overlaying the location data on a map and allowing users to search for nearby locations. In addition, folium-based interactive maps can be used to plan fieldwork by overlaying the map with information about terrain, natural resources, and infrastructure. This can be useful for field researchers to plan their route and identify potential hazards.

Folium can also be used for environmental monitoring by overlaying the map with data collected from sensors or other monitoring devices. Lastly, in disaster response, folium-based interactive maps can assist in mapping affected areas and identifying critical infrastructure such as hospitals and evacuation centers. Overall, the scope of folium-based interactive maps is diverse and can be used for numerous applications, making it an excellent tool for various industries

# CHAPTER 2

## PROBLEM DEFINITION

Some specific challenges or requirements that might need to be addressed in this problem definition include:

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# CHAPTER 3

## PROPOSED SYSTEM

A proposed system for a folium based interactive map would involve defining the requirements, selecting the appropriate tools and libraries, designing the map's features and interface, and implementing and testing the system. Overall, a folium based interactive map can provide a powerful tool for visualizing and analyzing geospatial data, and with careful planning and execution, can deliver an effective and user-friendly experience for users.

## 3.1 FEATURES AND FUNTIONALITY

All users of the system, are required to first login to the accounts with their credentials and if a user is a new customer he is required to create a new account. This section lists the activity diagram and describes the flow of the activities in the system. A detailed description is given for each activity which provides an overview of the activity of the Folium based Interactive Maps.

- Users of Folium based Interactive Maps will interact with the system through an easy to use interface which includes the search option, markers to display information and various map styles.

1. **Map Display**: Different tilesets, including OpenStreetMap, Mapbox, and Stamen, etc. is available in the map. User can choose from various map styles, such as street view, satellite view, terrain view, and more.

2. **Marker Placement**: Folium allows you to add markers to your maps to mark specific locations. User can customize the markers with different icons, colors, and sizes, and add tooltips and popups to provide additional information.

3. **Zoom and Pan Controls**: Folium provides zoom and pan controls, which allow users to zoom in and out of the map, and pan to different areas.

4. **Mini Map**: In the map interface there is a mini map at the bottom which provides an overview of the map to the user.

5. **Map Interactivity**: Folium allows you to add interactivity to your maps. User can add event handlers to respond to user interactions, such as clicking on markers, panning, and zooming. This allows to create dynamic and interactive maps that respond to user actions.

6. **Geospatial Data Visualization**: User can plot various types of data, such as points, lines, and polygons, on the map using Folium's functions. User can also customize the appearance of the data, such as colors, opacity, and tooltips, to create visually appealing and informative maps.

7. **Export and Embedding**: Folium allows you to export your interactive maps as standalone HTML files, which can be easily shared and embedded in web pages or notebooks. User can also customize the size, width, and height of the map to fit their respective needs.

- The main objective of using Folium is to create interactive maps that can visualize spatial data in an easy and efficient way. It allows users to create maps that can display various types of data in different formats such as markers, lines, polygons, and heat maps. Interactive maps created using Folium can be used to communicate spatial data to a wider audience.

1. **Customizable maps**: Folium allows users to create custom maps with different tile sets (OpenStreetMap, Mapbox, Stamen, etc.) and customize the map's zoom level, center location, and size.

2. **Markers and popups**: Users can add markers to their maps to indicate specific locations and attach popups that display additional information when the marker is clicked.

3. **Layers control**: Folium maps can have multiple layers, and users can add a layer control to their maps, allowing users to turn different layers on and off.

4. **Routing**: Folium supports routing between two or more locations on the map, providing directions, distance, and travel time information.

# CHAPTER 4

## PROJECT OUTCOMES

1. Folium maps allow for interactive user experiences, where users can interact with the map by zooming, panning, clicking on markers, and exploring the data.
2. This interactivity can engage users and provide them with a dynamic and intuitive way to explore geospatial data, which can enhance their understanding and engagement with the project.
3. You can customize the map styles, markers, overlays, tooltips, and other visual elements to match your project's branding or design aesthetic. This customization can help you create unique and personalized maps that align with your project's goals and objectives.
4. Folium maps can be used as effective communication and presentation tools. You can use Folium maps to create visually appealing and informative maps that can convey complex information in a clear and compelling way.
5. Whether it's for presentations, reports, or sharing with stakeholders, Folium maps can help you communicate your findings, insights, and results in a visually appealing and interactive manner.
6. Folium maps can support decision-making and planning processes by providing spatial context to data. You can use Folium maps to analyze and visualize data in relation to geographic features, such as locations of customers, competitors, resources, or infrastructure.
7. This can help you make informed decisions, identify opportunities or risks, and plan strategies or interventions based on the spatial insights gained from the maps.
8. Folium maps can facilitate collaboration and sharing among team members or stakeholders. You can easily share Folium maps as standalone HTML files or embed them in web pages or notebooks. This allows for easy sharing of maps and data visualizations with others, promoting collaboration and communication among team members, partners, or clients.

# CHAPTER 5

## SOFTWARE REQUIREMENTS

The Software Requirements Specification is produced at the culmination of the analysis task. The function and performance allocated to software as part or system engineering are refined by establishing a complete information description, a detailed functional and behavioural description, an indication of performance requirements and design constraints, appropriate validation criteria, and other data pertinent to requirements.

- **The proposed system has the following requirements:**

1. System needs store information about new entry of User
2. System need to maintain quantity record.
3. System need to update and delete the record.
4. System also needs a search area.
5. It also needs a security system to prevent data

Table 5.1 – Software Requirements

| Name of Component | Specification |
|---|---|
| Operating System | Windows 10, Windows 11 |
| Language | Python 3.11 |
| Database | MySQL Server |
| Browser | Chrome, Microsoft Edge, etc. |
| Graphical Interface | Pycharm, TKinter |

# CHAPTER 6

## PROJECT DESIGN

In this phase, a logical system is built which fulfils the given requirements. Design phase of software development deals with transforming the user's requirements into a logically working system. Normally, design is performed in the following in the following two steps:

- **Primary Design Phase**: In this phase, the system is designed at block level. The blocks are created on the basis of analysis done in the problem identification phase. Different blocks are created for different functions emphasis is put on minimizing the information flow between blocks. Thus, all activities which require more interaction are kept in one block.
- **Secondary Design Phase**: In the secondary phase the detailed design of every block is performed. The general tasks involved in the design process are the following:
    1. Design various blocks for overall system processes
    2. Design smaller, compact and workable modules in each block.
    3. Design various database structures.
    4. Specify details of programs to achieve desired functionality.
    5. Design the form of inputs, and outputs of the system
    6. Perform documentation of the design
    7. System reviews

### 6.1 DESIGN STANDARD

The system is designed with several interaction cues on each page that makes up the Folium based Interactive Maps. These cues are well-defined such as to make several functionality that the system exposes to collect, process and output data. Access to these functionalities is made possible by the well designed user interface which embodies several technologies to process data. The system is built in a modular form where these functionalities are built into modules.

## 6.2 OUTPUT SPECIFICATION

The system is designed in such a way that it efficiently provides output to the user promptly and in a well organized manner. The format for the several output are made available on the output pages. Output can be relayed using the following page modules:

1. Folium allows you to add markers to your maps to mark specific locations. User can customize the markers with different icons, colors, and sizes, and add tooltips and popups to provide additional information.

2. Folium provides zoom and pan controls, which allow users to zoom in and out of the map, and pan to different areas.

3. Folium maps can have multiple layers, and users can add a layer control to their maps, allowing users to turn different layers on and off.

4. In the map interface there is a mini map at the bottom which provides an overview of the map to the user.

5. Users can add markers to their maps to indicate specific locations and attach popups that display additional information when the marker is clicked.

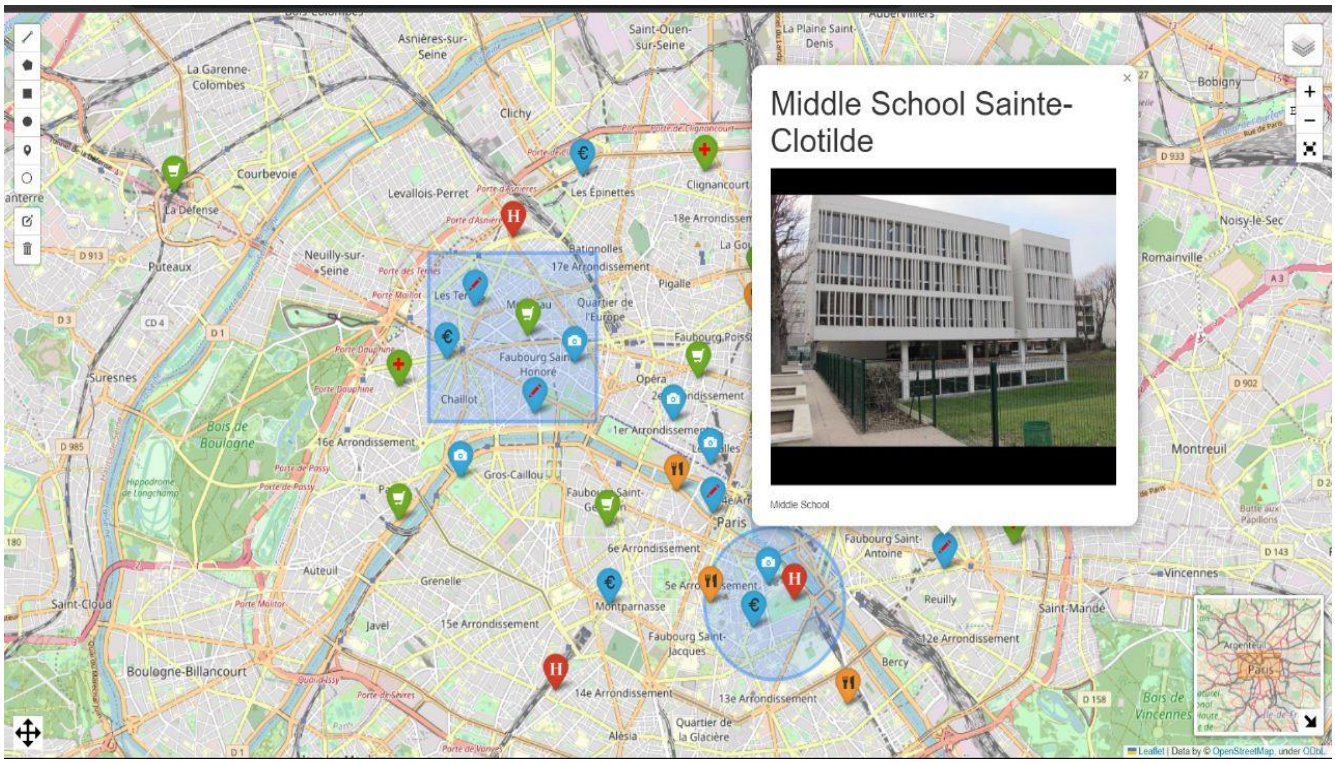
6. Folium supports routing between two or more locations on the map, providing directions, distance

## 6.3 INPUT SPECIFICATION

The system is designed to accept several input details efficiently through input forms and user clicks. The data captured through the user keystrokes and clicks are received by specific modules on the system and relayed to the back-end of the system for processing. Input is collected using the following page modules:

1. User Profile : This is used to view the account details like - name , mobile no., address, email id. Also user is provided with the options of reset profile and new registration.

## 6.4 MAIN DESIGN

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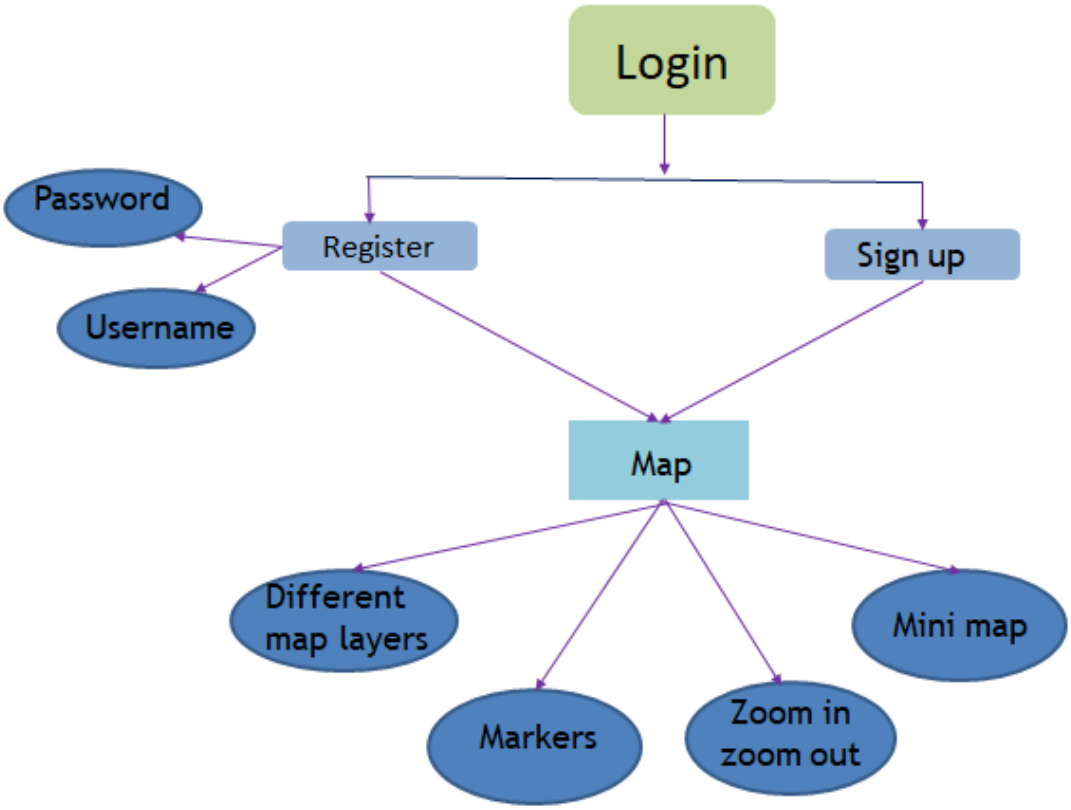
5. Folium supports routing between two or more locations on the map, providing directions, distance, and travel time information.

## 6.6 PROGRAMMING LANGUAGE

So many programming languages were put into consideration in the cause of designing this software. A lot of factors were also considered which includes the online database access, data transmission via networks, online database retrieval, online data capture, multi user network access database security, etc. The database system used to implement the back-end of this system is MySQL. MySQL database is a robust database that can guarantee database integrity, database protection and accommodate large database. The database system used to implement the back-end of the Folium based Interactive Maps is MySQL. Access to the system was made possible by a graphical interface (Pycharm) with Python 3.11 packages. The database name is SQL Schemas. Pycharm is very user friendly and can be modified programmatically.

## 6.6 PROGRAM FLOWCHART



# CHAPTER 7

## PROJECT SCHEDULING

# CHAPTER 8

## CONCLUSION

The development of Folium based Interactive Maps involved many phases. The approach used is a top-down one concentrating on what first, then how and moving to successive levels of details. The first phase started with a detailed study of the problems and prospects of Folium based Interactive Maps. The design phase was concerned primarily with the specification of the system elements in manner that best met the user's needs. During this phase, strict adherence was made on proven software engineering principles and practices. To implement this design, a computer program was then written and tested in Pycharm environment. It is hoped that effective implementation of this software product would eliminate many problems discovered during systems investigation.

- **At the end it is concluded that we have made efforts on following points:**

1. A description of the background and context of the project and its relation to work already done in the area.
2. Made statement of the aims and objectives of the project.
3. The description of Purpose, Scope, and applicability.
4. We describe the requirement Specifications of the system and the actions that can be done on these things.
5. We understand the problem domain and produce a model of the system, which describes operations that can be performed on the system.
6. We included features and operations in detail, including screen layouts.
7. We designed user interface and security issues related to system.
8. Finally the system is implemented and tested according to test cases.

# REFERENCES

# ACKNOWLEDGEMENT

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