AI BASED TOUR GUIDE

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This Report Presented in Partial Fulfillment of the Requirements for the
Degree of Bachelor of Science in Computer Science and Engineering

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APPROVAL

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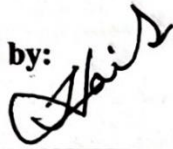Daffodil International University

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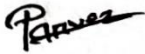Jahangirnagar University

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DECLARATION

We hereby declare that, this project has been done by us under the supervision of **Dr. Sheak Rashed Haider Noori, Associate Professor & Associate Head, Department of CSE** Daffodil International University. We also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

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ABSTRACT

According to various recent reports of WTO (World Tourism Organization), they have clarified that the number of international tourist arrivals has reached over 1235 million in 2017, which means it is indicating a significant increase rate which will beat the 3.9% increase rate compared with 2015 and a considerable increase compared with 2001. In the meantime, the rate of travelers traveling is increasing as much they depend on their tour guide to make their travel reliable. In this case, people often face various difficulties in hiring a good and reliable guide. And sometimes, because of this, people have to face multiple challenges for not hiring a well-known tour guide. And to sort this out, we have come up with an idea to build an AI-based Tour guide system that will be travelers to communicate through their phones, and it will be designed perfectly with the help of computer science technologies. A Lot of available literature has emerged about this kind of system, but many were small environment-based or not more adjustable with our idea. As we are moving ahead to the future, day by day, the technology of our systems is getting better. So, it's kind of better to hand over this system to this kind of technology.

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CHAPTER 1
INTRODUCTION

1.1 Introduction

The technology of our world is evolving day by day. At the same time, many people use various portable technologies such as mobile, laptop, mp3 player, GPS tracker, etc. Many of these already have some functionality to do something about the Digital tourism system such as Google Maps, map by Bing, here we go, and so on other websites are providing various road track and routing information over the world. This system is supported by digital technology for tourist activities before, during, and after the trip. Also, it provides real-time and personalized tour information based on information and communication technologies (ICT) such as big data, Internet of Things (IoT), cloud computing, and artificial intelligence (AI). But this kind of information relies on different platforms with different functional programs, where this paper is trying to sort out the solution of this problem and bring all of those in the same place. In the internet era, we are searching through different kinds of platforms and gaining information, and physically it could be like to acquire all of these from a tour guide who will suggest it to me, and we have to go through it. And here we are trying to bring all of these in one platform using the help of AI technologies, as we are trying to add the map functionality to find nearby tourist places according to position and using the help of GPS, show the related old pictures and view the latest update to feature new stories which will help the tourist to discover about the place; also it will train it over computer vision to give the lifelike natural feel about the actual tour guide which will access the camera of the portable device and using through machine learning and GPS at the same time it recognizes the spot and gives the pertinent information, such as tour guide it will provide storytelling services. This Personal tour guide system will derive the functionality using landmark ranking systems to offer various online travel services.

It will make the system's functionality to a whole new level. The traffic or street lights provide tour guide information using visible light communications (VLC) [10].

On the other hand, Geographic Information Systems (GIS) will provide various information of location by combining the active position data, and it will find its attribute to extract the data of the object, which includes geographical position. Thus, the pedestrian can easily follow the navigation by voice command using the power of AI, which will provide all the guidance safety.

The AI personal tour guide service platform is based on GIS and camera functionality. This tour guide app has been proposed to provide digital pre, ongoing, and post trips. Also, in Background from every state, people are interested in contributing their data to make various spots more accurate and reasonable. Thus, we can correct many historic spot details with more precise data accuracy. In the meantime, in this paper, we are going to develop its base app with more of its main priority such as we are focusing on visualizing the data, working with its accuracy, and making a real tour guide Ai which will communicate with the owner back to back using text to speech recognition with proper feedback, we must need 5G compatibility internet speed which is very rare in many states over the world. We are also working on its backup system because many systems have limited configuration to make it work to make our systems more accurate with data. Every state will have its database. Korea is building a big data platform and plans to provide intelligent tourism services by installing free Wi-Fi and Beacons at the major tourist attractions. We can use that for our systems too.

Therefore, this study aims to determine the nearest possible way to develop the perfect tour guide system, which will complete the system's core function.

1.2 Motivation

The motivation for this proposal has been gained from a Hollywood movie called 'HER'. In this movie the story has reflected a lonely person want to get rid from his loneliness life. To prevent this he bought an OS which will be controlled by a powerful AI. This AI has the ability to see objects of real world and it can justify the way of implication through the power of computer vision and it can share all of its needs through power technology by using camera and tracking location. From this concept the proposal for this system has arrived in our mind and without making it more complicated we made it in a way to guide the visitors through the power of AI. Another main motive to use this proposal for the travelers because there are many countries which has their beautiful tourist spot, also information shared on internet too, but in many case those countries don't have well known tour guide. So, to make it simpler and more reliable we have come forward with this proposal to make a new innovation.

1.3 Objectives

The proposal of our system will have similar interface like Google map and also it will include the power and use of AI, using this technology we will use this system to guide the visitors to visit in various tourist place without the help of Physical tour guide.

1.4 Expected Outcome

From this development our main target will bring the real tour guide in to a real life by the help of technology and AI. As an expected outcome it will provide us the possibility to keep the phone in our front pocket of shirt and the camera technology will scan the real world object and by matching the location track successfully, it will provide the data from the stored database. By the power of AI, it will gathered the data and will pop up all the details to the travelers and provide all information as a speech with the power of text to speech recognition.

CHAPTER 2
BACKGROUND

2.1 Introduction

To study this topic, we have tried to find many papers which have studied this title. And we have found more than 9 articles alongside research paper which were published on a web blog site, also in various journal and we have studied all of them to find various singularities and we have shared our thoughts in our documentation draft.

All the papers mostly highlighted the part to bring our thinking in more accurate way. Which was very important to establish our proper thoughts in more perfect way. Various issues were shown as an advantage and disadvantages to finalize a proper statement. And in this background story we have learned those a lot which will help us to deal with many difficulties on our ongoing journey to build this project successful. Most of the work which relates to background study has motivated our thoughts to explore more and inspired us to find a new way to face other complexities,

2.2 Related Works

After reviewing all the papers we have gathered lots of queries which is going to help to build our projects baseline. From every researchers perspective viewpoint we got to know how much implementation can be done by the help of this modern tools which is known as AI. From the paper of the first one which is titled as "Bedside Computer Vision - Moving Artificial Intelligence from Driver Assistance to Patient Safety", we got to know how computer visions are helping in various ways using its different methods alongside Image Processing. It shows some information of Google applying through their own Computer Vision algorithm, with the of itself to visit across the world the same as here in that it has described all its techniques such as radio Frequency Identification, hand hygiene behavior, and so on. In many cases it shows identification result at 95.5% and without learning according to database it can achieve at 84.6% which makes computer

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vision works really effectively to identify any object with or without learning/gaining any details of it, which will help us to ensure about the clarification our Ai Tour Guide Structure and make very safe and strong which will allow the traveler to depend her safety on this AI [1]. On the other paper which is titled as "Understanding cities with machine eyes I review of their computer vision in urban analytics", form this paper gained the knowledge of information that how researchers were trying to find out about the depth of computer vision and understanding all the material things. Here it has been shown that different layers of AI are working on different methods to produce understanding base knowledge about an urban city using the deep knowledge of AI and computer vision. And also using the power of deep learning in the methodology part it's getting ahead on it works in two different first method where one is working about the manuscript where it locates the reflect application of deep learning and computer vision understanding the cities from the previous record on the other hand it presents only the measure methodological approaches that they write and improve on this main approaches are excluded [2]. In other paper which is titled "Smart audio tour system using TTS", we gained the information like how this article describes about a traveler can benefit from an AI-powered travel assistant, which is a rapidly growing area within the tech industry. Travelers are increasingly interested in using AI to help plan trips. A travel assistant could take care of mundane tasks such as booking flights or hotel rooms. An AI-powered travel assistant would keep track of your itinerary and serve you relevant information at every step [3]. In another paper titled as "Design and development mobile campus and Android based mobile application for university campus tour guide", it refers the concept of actual way to developed a mobile app for students to help them find their way around campus easily. Where the functionality of the app uses NFC to communicate with other devices to provide information alongside with the help of the app uses a Google Map to display the location of each building [4]. On another paper, it gives the basic idea of the project including its scope, purpose and objectives, where this paper provides the definition of the project including how much time it took to complete the project, what the main components of the project were, and what skills were needed to complete the project. This paper explains the different steps involved in completing the project, and the

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tools used throughout the process [5]. Some paper suggests the discussion process of detecting and counting the total number of objects in a scene. The authors chose mango as an object. The data set consists of images taken from different angles which will help to finalize and detect the structure [6]. Another paper suggests about the concept how it tries to show the knowledge based system, expert system and the help of application of GIS and Xrm integration will enhance the tourist guide system. The intelligent tourist guide system is a combination of three systems namely knowledge based system, expert systems and the help of application integration of GIS and Xrm [7]. Another paper suggest the uses of GPS positioning, RFID and other technologies to guide tourists around the city, this project is designed to help tourists find the best places in cities It uses RFID chips to identify people who pass through its path [8]. In a different paper we reviewed about the thoughts of that how we discussed the importance of Computer Vision in the world today. It explained how Computer Vision works in real life alongside talked about the current state of Computer Vision [9]. All of these works triggered that how many concepts of work try to reflect the methodology and catch the work of our concept and these all has inspired to do more of the studies.

2.3 Comparative Studies

In our comparative study we have find out various way of similarities to justify every works which is seemingly connected with our related works. In various paper such as we have seen some paper indicating the concepts of detecting any objects which will determine the every edge of detection on that object through the help of Computer vision which will help to understand the machine which object is that but our goal is to detect the structure or constructed building or other urban analytical objects which has more complexity to define with real time fixed location. Some of the paper has uniquely mentioned about the GIS and Xrm integration and still we are finding out how we can relate with tools to improve our progression about the projects statement. In another paper it has drawn the attention of the concept how the AI can monetize all the activities of the traveler which will help from first to end to book a ticket and safely landed to home. This concept can suit very well as we must have to ensure about our travelers

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safety alongside helping them to visit the spot and informing about the wiki info's. So, this point is really good and we are interested to have some kind of integration on this.

One paper has also indicate about the tour on different sector of any academic which inspires us to study more to explain the spot on different sub section. So, all of this comparative studies were very helpful because using this kind of case study reflects how their works can be defined according to our one and only concepts.

2.3 Scope of the Problem

After doing all the background study we have gathered various information which is going to describe the queries that how this all studies going to cover our flows and how it's going to focus all the works on our project pipeline. Various paper studies has indicated various thoughts based on their research. Some has shown the importance of the workflow of computer vision and its working methodology which helps us to use this technology and get the proper functionalities. On the other hand we are going for the case study about the difficulties gone through in all those research, thus we can be more careful while building our project without facing any difficulties. We are going to use all the basic requirements which they have used on their development process such as building all the user friendly components, make a better data set with better accuracy and also use the proper connectivity in each and every segment of its function to get a better outcome.

2.4 Challenges

There will be always some difficulties and drawbacks to gain success in any development process. And yes, to gain the success in our development there has been many drawback and issues will pop up like we find out in the related works section. All the way through we have identified all those drawbacks as our main target to execute them properly. We have to maintain all the user ability and its behavior very fluent. We have to use every line of code with proper meaning of understanding and usability or otherwise it will affect many complexity in various way. So, we should avoid all the drawbacks to maintain our project development that should be our main challenge.

CHAPTER 3
REQUIREMENT SPECIFICATION

3.1 Business Process Modelling

As much technologies getting better day by day people are also getting unemployed rapidly. In various way many technicians and other platforms jobs are taken over by an AI. So, now the question is how this project of ours are going to make an impact on our future business models. In many particular way it can not only change the revolution of tour guide but also its going to change the way of turnaround of the future business models such as the physical tour guide persons are going to get hired by the project investor. And when they are sufficiently wanted a better tour guide than AI, it will provide in just couple of sec. Thus many tourist and outside visitors will get the curiosity and intention to use this project as their favorite platform before making any tour plan decision. As long as we gain the trust of the users it will make a great impact to the investors to invest in it and the team will get the opportunity to make this system better and more efficient to do the best. On the other hand when the time will to make system wider then we can hire other open source developer who will share their contribution more gently to make this system more contently with more accurate data. Thus various freelance developer will join in this system house and will work hard to make system better to bring better features. As long as it develops other fake tour guide will be removed and it will make a strong move in the future business models.

3.2 Requirement Collection and Analysis

To establish and build this project we have collected whole lot of info's and queries which will help us to study to know about the data that will reflect our work that how our system is going to prevent various issues that is happening over and over again in many tourist section of the world. Such as in various country they have no proper securities for their tourist. For a long time tourist are facing various issues such theft, harassment, rape, poor transport service, poor communication status, no taking action from legal authorities

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and so on. Various news reports claimed about the safety issues of the tourists alongside in South Asia Tourist are facing many problems. Most of Security issues of tourism sector reflects the South Asia, because they actually don't have the proper facility to provide a good consultant about route guide to the tourist. In a research paper "Tourism and need for tourist's protection in India" it was mentioned that Foreigners are harassing Indians and will affect India's economy Tourism is growing and should be promoted further Employment and economic benefits are linked to tourism. Although because of lack security tourist are not getting their interest to pay a visit in this region, which may cause a huge level of GDP drop [12]. And not only this if we take a look back at the previous history we can see various incident which has caused many issues because of lack security issues such as, in February 2015, a complaint has been lodged against a man by a Chinese woman, who allegedly raped her at a night spot in South Delhi. In March, 2015, a Swiss woman was rang raped by six men in Madhya Pradesh.

Also in night July 1st, 2016 five militants took hostages and opened fire on the Holey Artisan Bakery in Gulshan. They took down several dozen hostages included foreigners and locals. 29 people were killed, including 20 hostages (17 foreigners and 3 locals), two police officers, five gunmen, and two bakery staff [13].

All of this incidents and various Journal reports reflects that how unbalanced and unsafe our security issues are. To prevent this kind of issues we have gathered lots of ways to make our system more reliable and function able which can prevent this kind of casualties.

3.3 Use Case Modelling and Description

To build a successful system we must have to study various concepts and the study of its every interaction that in which way every action will interact with its user. All the basic components of the systems to track to show every tourist spot have been highlighted in its concept. All the basic motive of this system have visualize on its concept. Thus the systems conceptual has been tried to visualize through the use of Use case modelling given down below
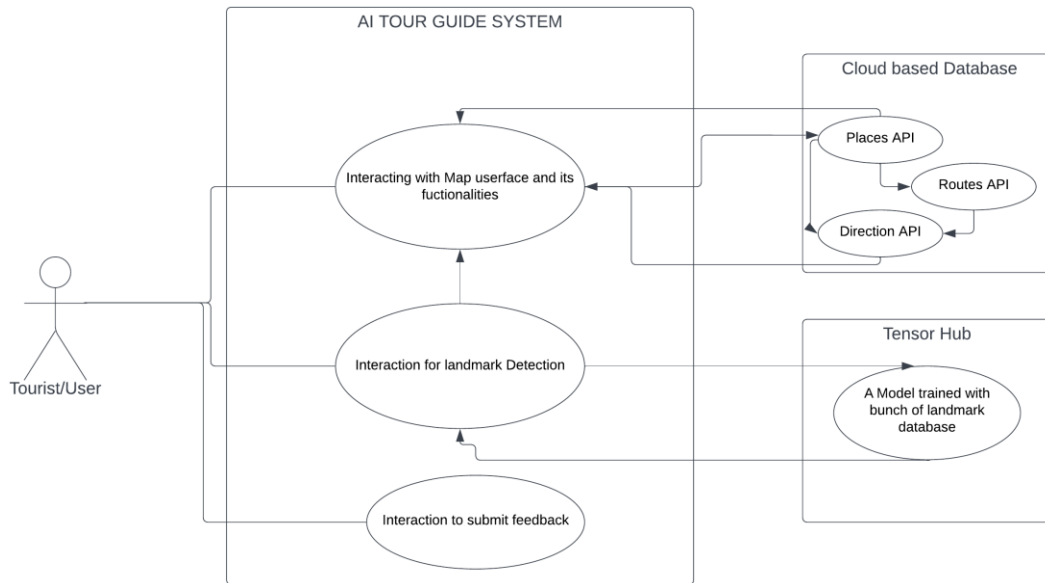
Figure 1: Use Case Modelling Scenario of overall AI based Tour Guide System

Figure 1 shows the exact outline scenario of our system that how it will perform overall. The user can interact his status with the help of maps functionality which will use the cloud based API, which stored lots of landmarks identification and it will forward the result in the systems interface and it will have the connection to integration part where landmark detection will help the system to learn about the place through the help of deep learning process.
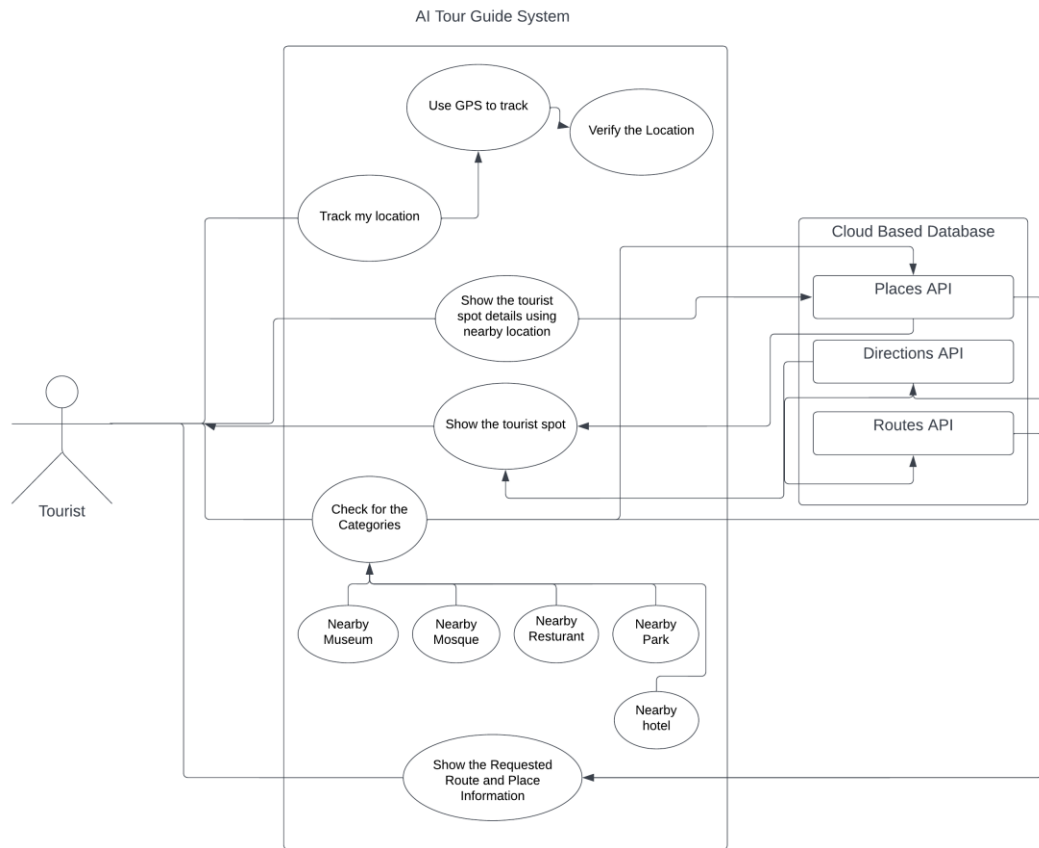
Figure 2: Use Case Modelling of system's Map functionality

In this use case diagram we can a tourist, a system containing bunch of process and another cloud based system which operates API's. Here we can see the user can access the process of track my location which will access the track the GPS request after the verified process it will allow the user to visualize its current location after that using the places API it can show the nearby spot which will has its own categories of section which contains different spot such as parks, mosque, park, museums, historical spot and so on. Accessing those using routes and direction API we can easily visualize any spots direction. Every process of each API are internally connected with every system process. Which will make systems workflow more reliable such as it has been shown in this use case diagram.

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Before moving into the landmark detection section we have to know that how a trained model works, because a trained model has its own definition to train any dataset with its every process. And it gives the system a proper outcome with proper functionality, that how a system needs to interact with this outcome, and how any data could get proceed step by step. From a resource we have find out a proper explanation about trained models program through use case modelling,
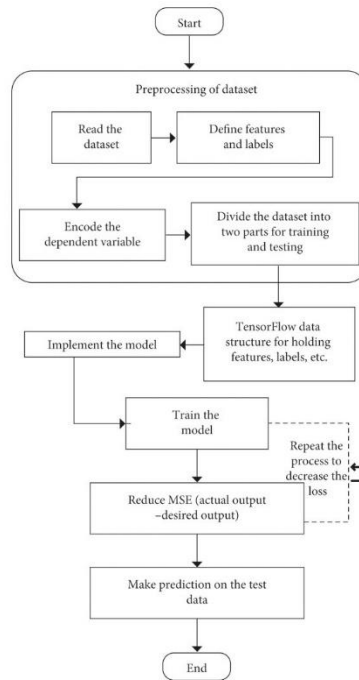

Figure 3: Use Case Modelling of a trained model workflow in TensorFlow [14]

As long as we have learned about the process of a trained model of Tensorflow from figure 3, now we can easily move to the section where we can define our programs where landmark detection performs its best to locate every data that has been provided through real time data or as a pre captured image which will perform all of its process according to the use case diagram that has been shown down below

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Figure 4: Process of landmark detection through the use case diagram using TensorFlow

Landmark detection is the main priority to build of our system with proper functionalities. And if we take a look closely we would see various process which is already has referred and inspired from the figure 3 process. In this figure 4 diagram we can see at first tourist who is a user of our Tour Guide System access the request of the image which will forward for the process it could be a real time image or it could be a pre captured image it will process and transfer to the python environment which is already started his program with his libraries than it will access the trained model and provided .csv file and transfer to the tensorflow which will train the image using the algorithm which has been already used for the trained datasets after that it will provide the output result with its other details and it transfer the landmark results to the user the interface of our system.

3.4 Logical Data Model

After analyzing the study of the systems use case scenario we have studied more about its logical work flow that how it will get interact with every each of its process with the help of this bunch of API's. Using this logical data model concepts we can easily establishes the structure of various data elements which will connect to each other processes and it will combine the all of its relationships among them. This concept is independent of the physical database which implies the details that how the data will be implemented. The logical data model of this system will serve as a blueprint for used data. Thus the logical data model will take the elements of conceptual data modeling a step further by adding more information to them.
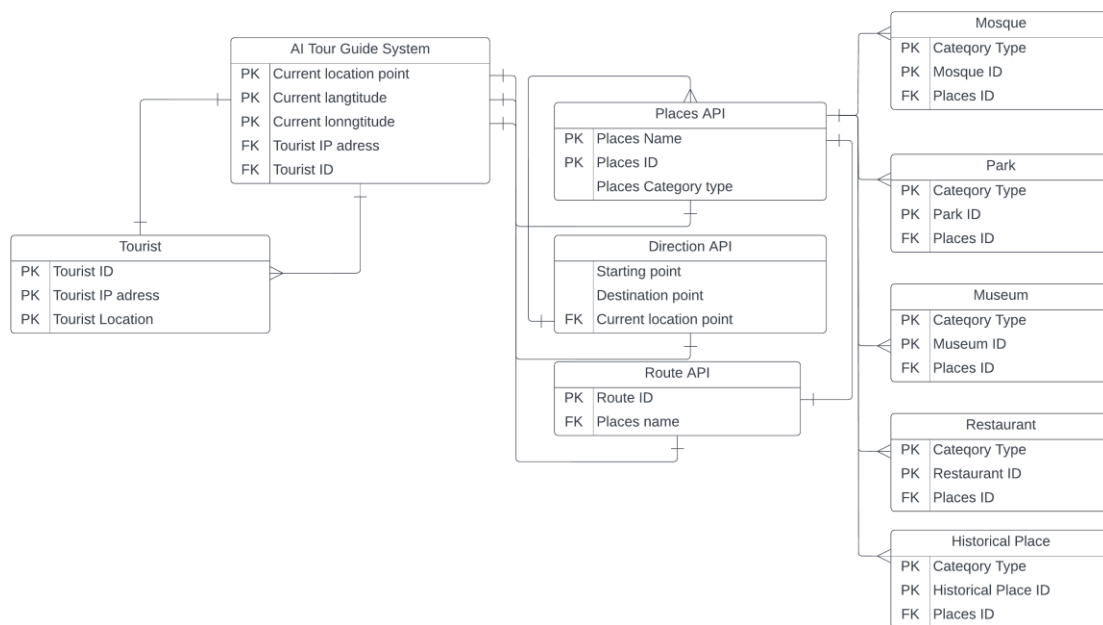

Figure 5: Logical Data Model of Systems map configuration

So, in this logical data model we have represent various entity points relationship, which starts with our User known as tourist who will has own Tourist ID, IP address and current location both will work as primary key to make an unique identification, on the other hand the tour system will include the current location point with unique longitude and longitude as a primary key also including tourists IP and ID as a foreign key. It has also a relation as one to one for places, direction and route API. Both has their unique keys as primary key to work on its function properly and also at last places API includes a various connections with different categories of entities such as Mosque, Park, Museum, Restaurant, Historical place and all are connected with as a one to many connections which implies that one place can more than one or many category based spots.

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3.5 Design Requirements

So in this design specification we must have to imply that how our overall system will operate the successful program. User has to provide his real time location on base GPS. Such as our system will track down the info's and it will deliver all the queries based on its location and API's. So as per our design requirements successful implementation we have to follow the road map that we have overall come through our use case and data model. This design will help us to meet our goal needs. As long as Design requirements means to meet those specifications and criteria contained in the road map which will help to maintain the minimum acceptable technical standards and define the limitation within which of the design of the Project shall be developed and constructed more efficiently.

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CHAPTER 4

DESIGN SPECIFICATION

4.1 Front-end Design

An Innovation is the turning point where all the opportunities and decisions are finalize and identified which confirms to construct a concepts that can be developed in prior to entering the formal product for further development process. In this section developers got the opportunity to establish a well-known design that match up with user friendly design and also turning those designs into reality. In the context of web development, front-end development is the practice of producing HTML, CSS, and presentational JavaScript code for a web or web app thus user can have a taste which will to make a desire with other developers whether it is okay to go with the design or not. As long we are building this system in both platform whether that's on phone or web application we have to make a prototype where it shows the concepts to build up a proper design for both. As long as we are working with the front end development it has a study to do which is known as UI UX study. UI represents how the user interface will interact with every action and the UX study represents about the user experience which requires the goal to study how better experience we could achieve through the help of this study, An app whether it's about smartphone , web app or others all needs a better user experience. If any apps or system fails to give a better experience that can even stand out in any perspective way. To build a better system there is no lack of UI and UX study

4.2 Back-end Design

After the frontend to build the app in more structural way that can be covered by back end development. It's the main backbone of any system because it has the many connections with every component in more constructed way. Without a perfect backend design a system has no function to program and develop. And to build a perfect system it needs a better connection with database, better interaction with every MVC controller and also it needs a perfect language to operate all of its functionality as it programs each and every algorithm more precisely.

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Also Hardware refers to the physical computer system that makes it possible for a web browser to communicate with an internet server. Software refers to the set of instructions that run on the server side. A web server is a program that acts as a gateway between a web browser and the rest of the internet, where the back-end is the code that runs on the server, and that receives the requests from the users, and contains the logical explanation and performs to send the appropriate data back to the user.

4.3 Interaction Design and UX

A perfect system utilizes with its proper functionality when it is success to deliver a better interaction with its user which is better user experience and it can be through a better UX study. To build a better user experience we have to go through various case studies which has pretty similar interface with our development projects so, we have tried to find out various designs, after studying all those similarities we tried to make some hand sketches with every required functionalities.
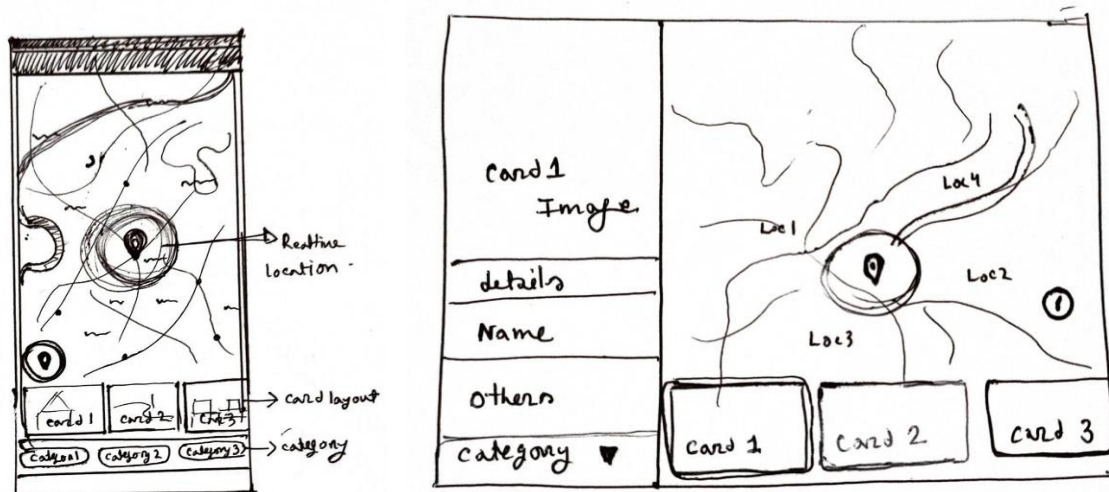
Figure 6: Hand sketch figure as UX study research for mobile app and web app

Thus we have sketched all of its components to match all of our criteria, also in a proper perspective way. Every designed has been studied from various resources to make more

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better user experience, many of its components has taken the inspiration from Google maps but also in many place we tried to give better user experience touch. In the web version we tried to give the wider view to visualize every destination more precisely. And in mobile app we tried to view all the components in more handful way, all the card layout and category sections were set to down below to make it more user friendly as user can interact with any function in more easy way.

4.4 Implementation Requirements

In set of implementation requirements at first we have to visualize our literature review with our actual evolved study. As long as we have covered with our literature review if we compare with those status with our system there are various upside and down to be noticed because many researches has covered the knowledge of theoretical and also showed very different perspective of example. But if we talk about our implementation according to those studies than there are some connection such as one of the has mentioned to track down all the academic building using the same concept of consulting features, on the other hand various papers have mentioned about implementing new technologies such computer vision and image processing and so on. Behind all of these all of these studies actually made many path clear to us to move forward with our perfect requirements. So, in this implementation we can imply that we have various pro and cons which can lead us in various way to finalize our system.

CHAPTER 5

IMPLEMENTATION AND TESTING

5.1 Implementation of Database

As in the Back-end part at first, we started to develop an app from scratch. According to our supervisor we have to make an application which will display a live map on the home screen. So, to develop this application we choose Flutter (Dart) language which is developed by Google. Flutter is an open source framework by Google building beautiful, natively compiled, multi-platform applications from a single codebase. It is fast and also very productive. And also using this language we can easily develop an application for android and IOS both platforms. So, at first, we learned some basics about the flutter language and then I started to pull off some lessons to learn to integrate flutter plug-ins and packages of Google maps and location. Then we have to generate an API key from Google cloud enabling places API, maps SDK for android, maps SDK for IOS.

After that we have put that API key in the android manifest file which will connect our codes with the server. Then after finishing the interface work, we got instructed by our supervisor to add some live location tracking and also feature nearby historic locations and spots using GPS functionality in a card view. After implementing location packages, we were able to view the live location tracking with a live circular area. And then we tried to connect Places API with the proper method. But it requires a billing issue that's why we have to put our data manually and, in the meantime, we have to start planning to start on with JSON data where all the data will be provided by the moderator and it will get updated through synchronization. And also use the markers to highlight those nearby spots. Also in this development process we have used Location tracker package to identify its exact location with its accessing permission and created a section which will highlight all the spot nearby areas and we have also integrated the functionality to filter out the choosing based location, So user can easily filter out what they want to find out in nearby areas.
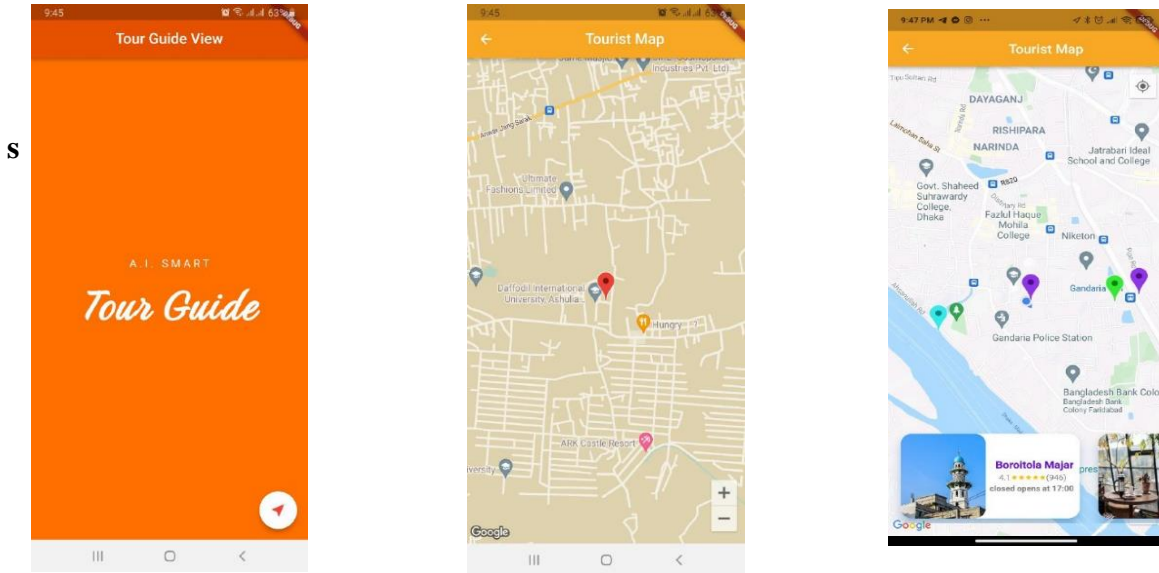
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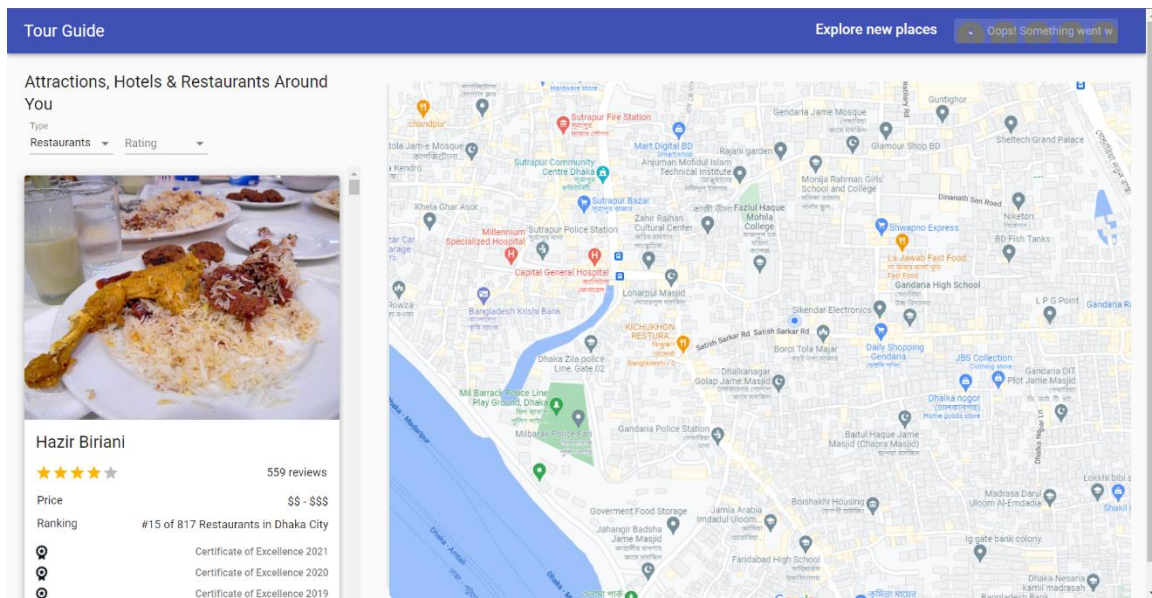Figure 7: Overview of the application made for Smartphone

Figure 8: Overview of the Web Application

Alongside using the flutter sdk we are using other languages such as html, CSS, JavaScript, other API's to build a similar platform to generate same kind of flexibility and give the better outcome whether that's an android, IOS or web-platform, it will help

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us to connect both platform with more seamless functionality to have a better experience about understanding through visualization.

To make this system work we have used Places API. This API service does play a great role to make this system work with proper functionality, this API is a way of service that provides the information about various places using through HTTP requests. Several of this Places are defined within this API as various establishments, it also contains not only many geographic locations but also prominent points of interest [15]. This API service stores various places data which contains name, latitude, longitude, place ID etc. which means this API itself acts as a database of many places.

On the other hand to predict and identify the landmark we have a whole dataset which contains various tourist points' title as a label. And it will act as another level of database as because it will referred many landmark's title through the help of trained model. The trained model will also have the access of this dataset. After predicting an image it will find its label which will referred as title later for the landmark.

5.2 Implementation of Front-end Design

To study this paper as I have mentioned before, we have collected all relevant research papers, which goes with our title and its motive. Then we started our first step to find out all the interesting parts or details which will help us to highlight those while we compile our work with proper steps. After that we started to represent those parts in our site as a written draft. After that we first move to develop a base app which will focus our apps main priority to work as a map. As a front-end part at first we have to design and sketch our apps interface in the hand written documentation and by the use of UX study we tried to find out various ways and techniques to make apps look more better and user friendly. And after that we aggressively move forward to make a useful UI study. In this segment we have properly identified the part of our UX study and use the software called 'Adobe XD'. By the help of this tools we have tried to make the prototype that how can the apps have all of its movement and perform every interactions with proper queries as it looks like and it also defines how it will interact with all the steps in a user friendly way. After

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the successful front-end development we are ready to move ahead to study in our back-end development.

5.3 Implementation of Interaction

To build this system we are working in both platform in flutter for smartphone and also in web platform using various languages such html, CSS, JavaScript, react and so on. And in this implementation section we are going to interact with the web-app at first. So, if we run our web application at first we will interact with this minimal web interface shown down below
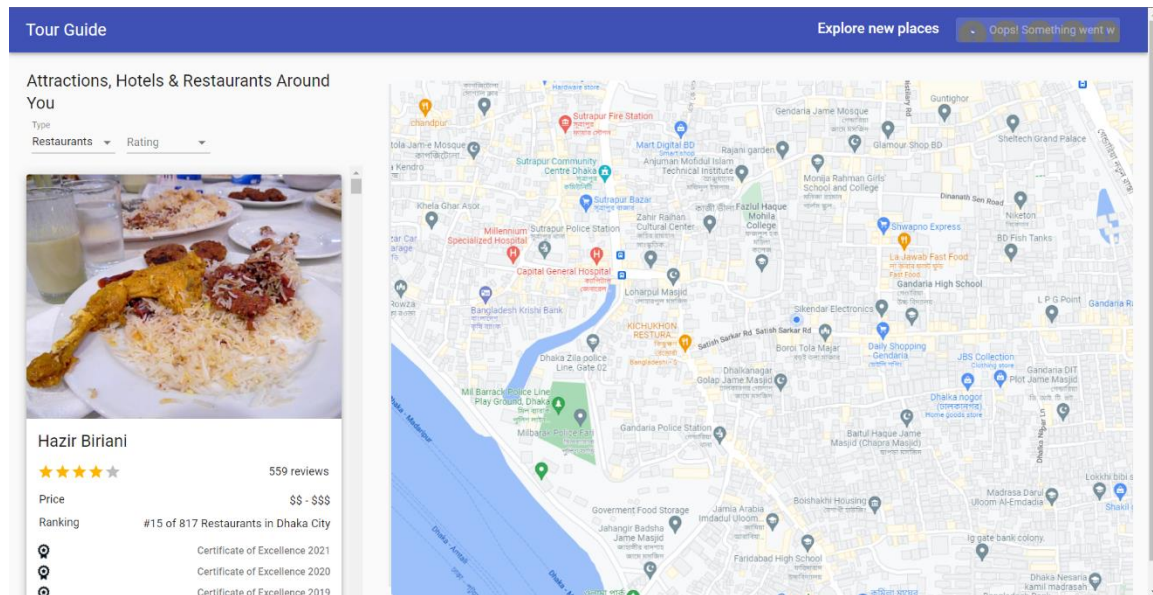

Figure 9: Viewing Interaction of AI Tour Guide at first glance

In the above picture we can see that this web interface is showing a beautiful map interaction with two divided section in left section there has been suggested interactions nearby me and in the right it's showing a detailed map view of the current location

In the left up corner we can see a top drop drown section, not only one but also two which contains category of spots such as shown down below
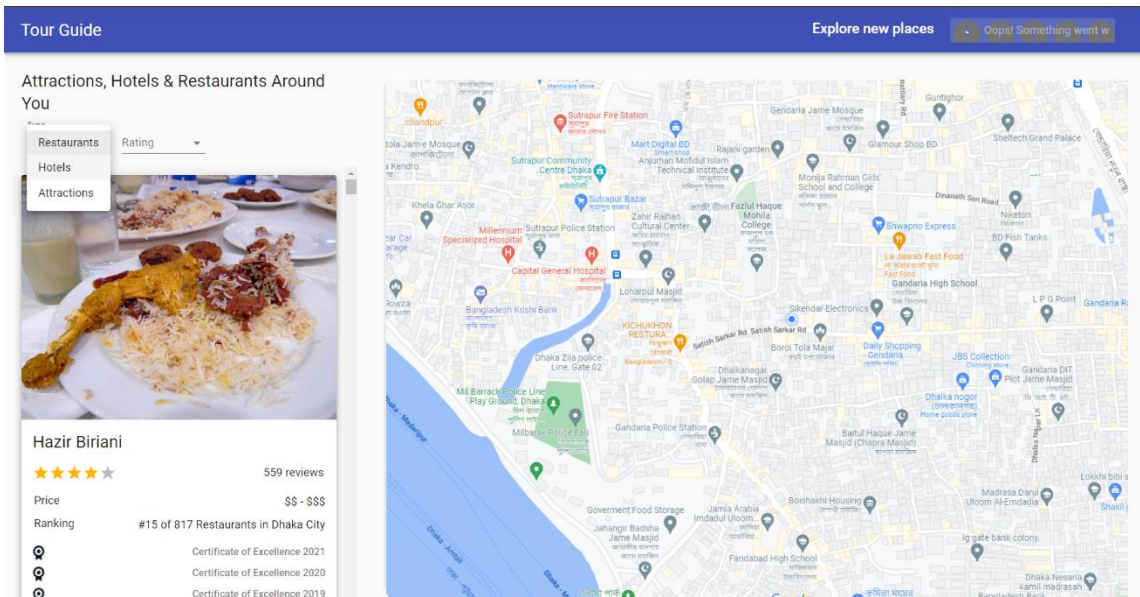
Figure 10: Category Selection for visualizing the service

One category contains the spots category such as hotels, restaurants, attractions spot which will categorized all the spot simultaneously according to the current location. On the other hand we can see other category which has the ratings of any individual locations
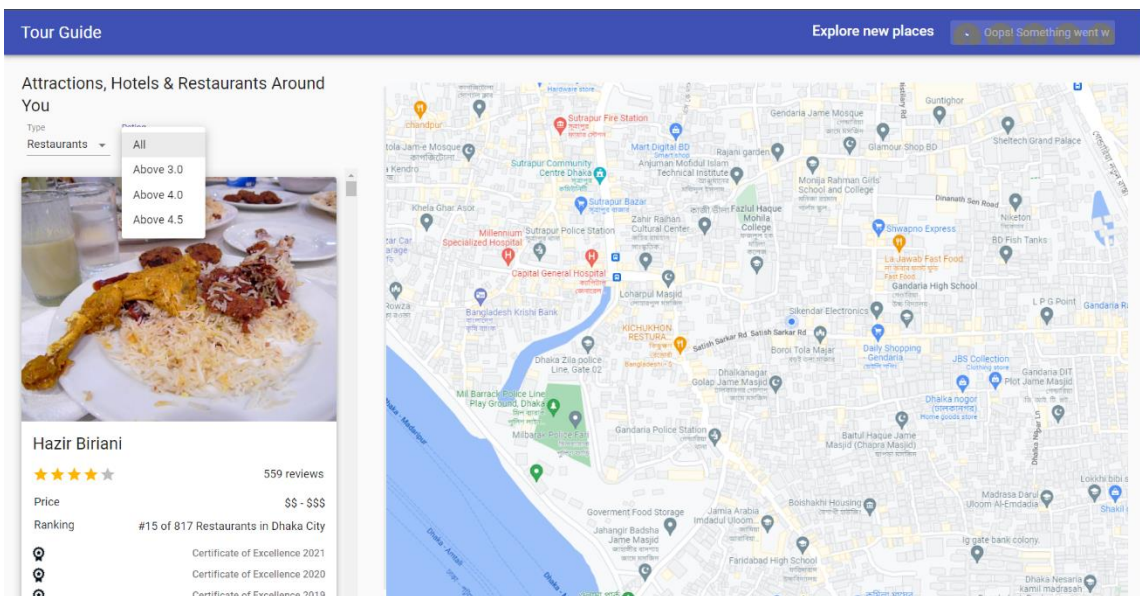
Figure 11: Rating Selection for choosing the route

In this drop down section we can choose our desired ratings and we can easily find out our favorite spot that could be restaurants, hotels, park or many interactions using this rating category section.
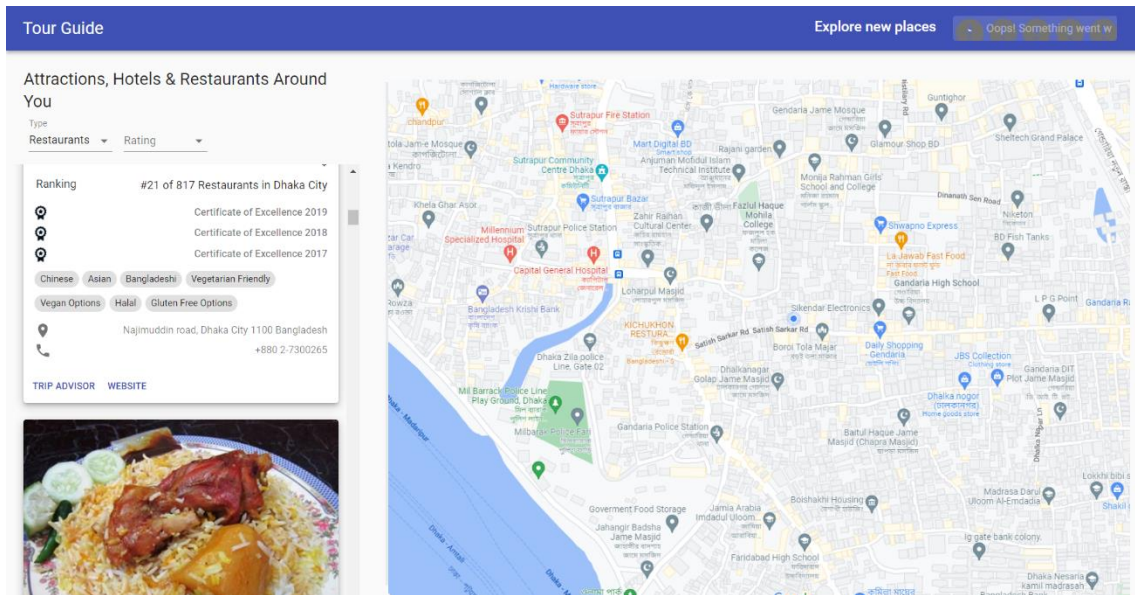
Figure 12: Viewing the Output in the base of selection

And if we scroll through the left section it will provide me more other suggestions of various points as the categories has been set to, it will not only contain the details of the store but also reward and review score could show as we can see in the above capture. On the other side the landmark detection has been programmed in python IDE as long as it has no GUI interface so we haven't shown any interaction details.

5.3 Testing Implementation
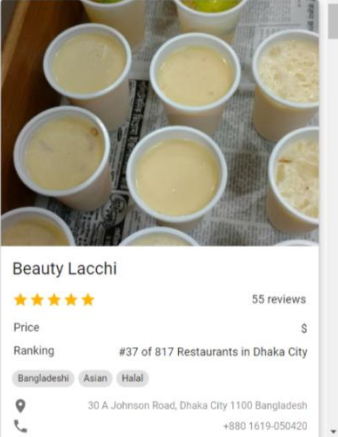
In the above section we have shown the interaction implementation of our system which shows that how every components of every function of our system are working with different perspective sections. So, now in this section we will test those implementations for various way in many directions

Such as let's find restaurants, hotels and attractions for different ratings in the visualized current path. All the results given down below
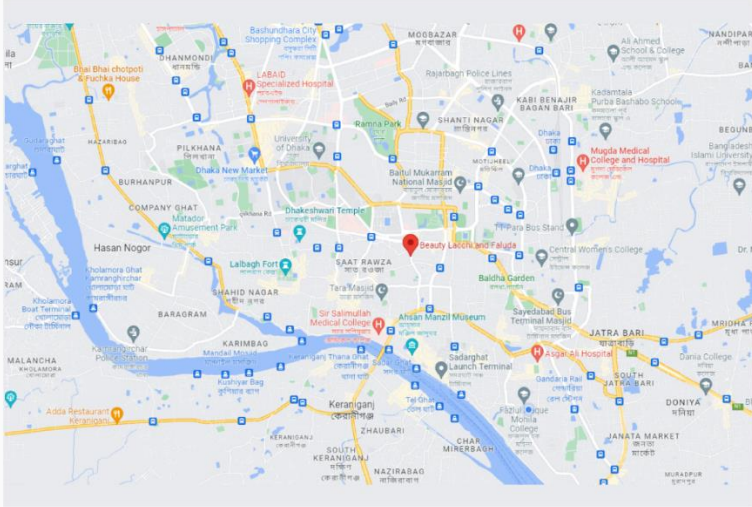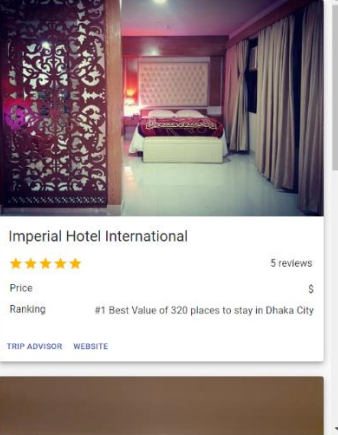
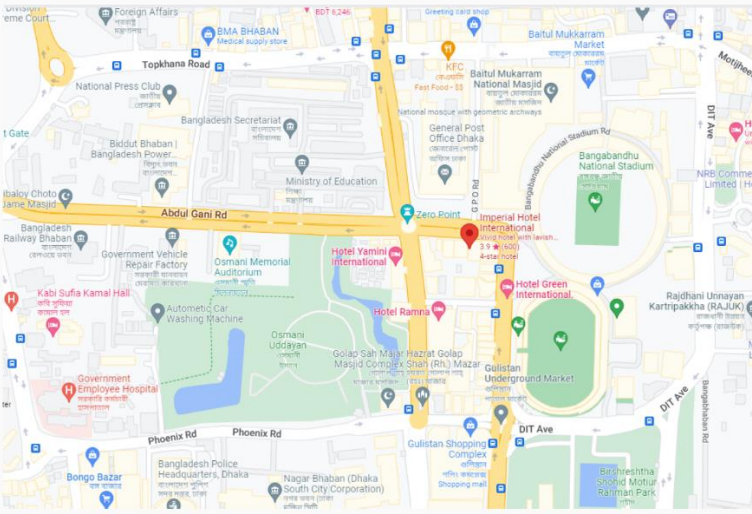Figure 13: Finding Restaurants in the base of rating 4.0

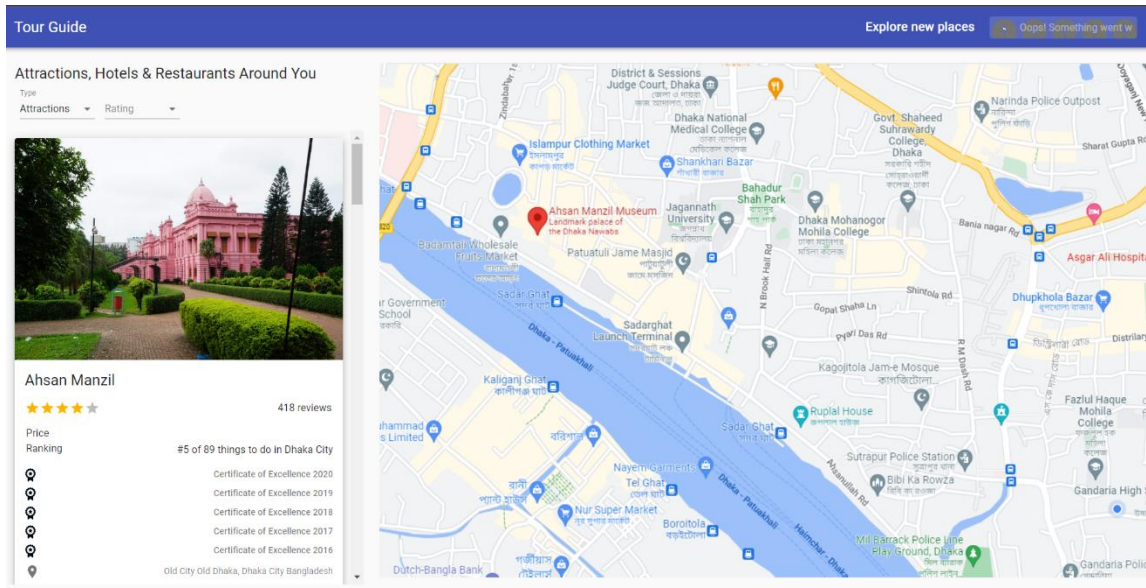Figure 14: Finding Hotels in the base of rating 4.5

Figure 15: Finding Tourist Spots in the base of rating all

In the above previewed capture we can see there are three captures which has visualized every way of configuration for various interaction which has performed for test. In the first image we have selected restaurants with the rating above 4.0 which brings out all the popular restaurants nearby current path the most famous one spotted on the first, then we can see in the second testing we have gone for the hotel section and this time we have set the rating above 4.5 which means it will find out most popular in the Dhaka city. And as we have though the result comes in three card means three most popular in the Dhaka city shown up according to the current path. And for the last test implementation we have gone for the Attractions category which will go for the no rating, in this case the system didn't take any time and just in a sec it shows the results of tourist attraction point with various wish list as because it has no rating categorize to terminate any nearby spots.

So, in all of these testing every single input were forwarded in different perspective way, and as it was hoped all of the outputs for every category according to the rating comes with its perfection. On the other hand we have also tried to misdirect the location using VPN set to London, but the thing is as long as it has the access the GPS the location can't be tracked as fool and can't get the wrong location.

On the other hand let's dive into the section of landmark detection part. In this section we are going to test our implementation in a significant Python IDE. And for this we have

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chosen for the Google Collab. Let's visualize the interaction of our python ide section with organized code base
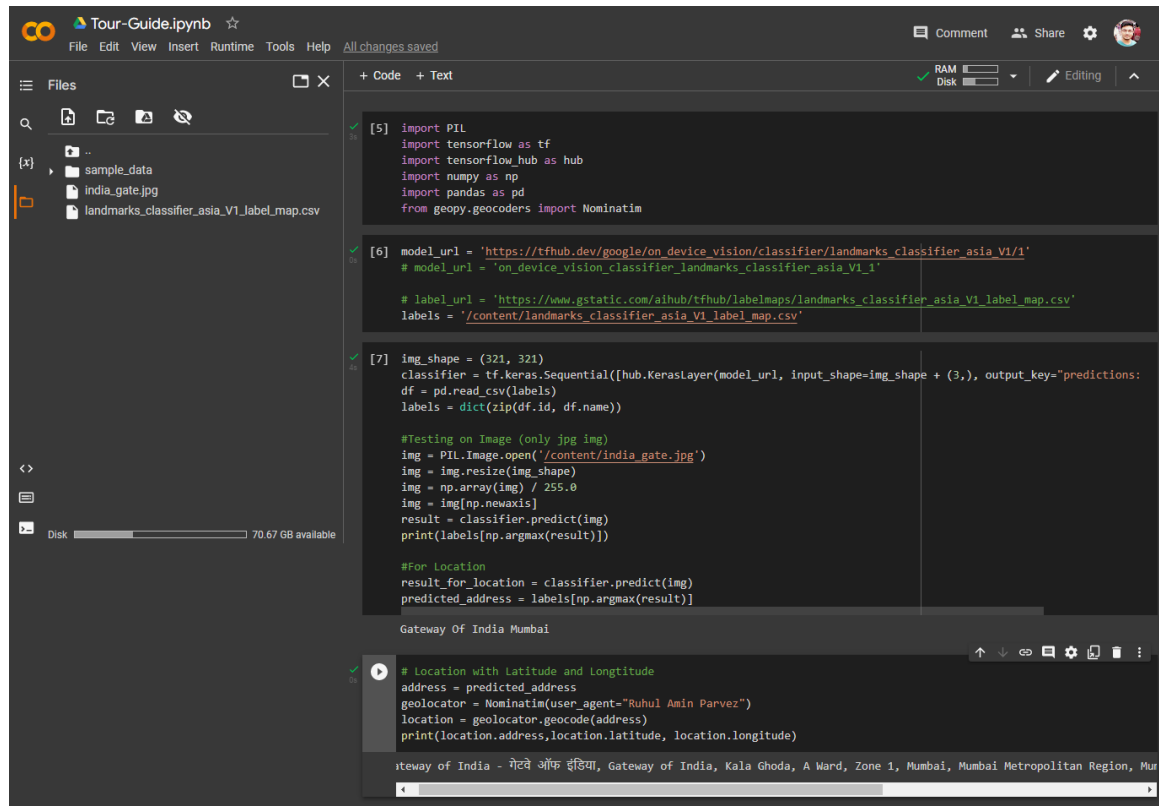

Figure 16: Overview Development look for Landmark Detection

Here we can see all the baseline of code and the IDE has organized perfectly. On the other hand let's talk about the other sections how the workflow of landmark detection begins
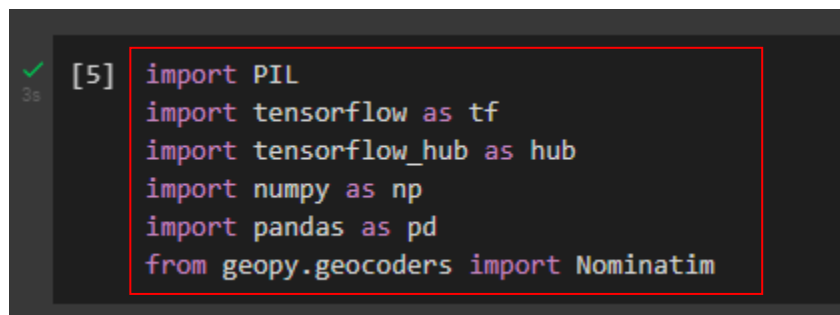

Figure 17: Necessary Libraries to import to run the Landmark Detection

As we can see in the above picture here various python libraries has been defined to start all of its attributes process perfectly. We can see there is a numpy, pandas tensorflow and so on. All of these libraries are important and needed to initialize any python pogram.

Figure 18: Logical Data Model of Systems map configuration

After that we have to upload the .csv dataset which contains various historic attractions and spots label which we are going to declare in the next step

Figure 19: Configure the CSV files for extracting the data's about various spots

Here we can see as we have uploaded the .csv label dataset and we are declaring that label dataset into the IDE which will redirect to tensor flow hub. Speaking of tensor flow before that we must have to introduce the trained model in this section.

Figure 20: Testing the trained model in tensor flow

In this very next step we are going to upload a jpg file of an image just like we have did in the stage where we have uploaded .csv file, now in this highlighted section we have to declare that sample image and it will redirect the image into the tensor hub where trained model will analyze the image and distribute the output and at very last it will provide the output label such as down below

```
#Testing on Image (only jpg img)
img = PIL.Image.open('/content/india_gate.jpg')
img = img.resize(img_shape)
img = np.array(img) / 255.0
img = img[np.newaxis]
result = classifier.predict(img)
print(labels[np.argmax(result)])

#For Location
result_for_location = classifier.predict(img)
predicted_address = labels[np.argmax(result)]

Gateway Of India Mumbai
```

Figure 21: Process the input in trained model

Thus we will get the output result of landmarks label with the help of trained model and in the very next stage we got our much needed details.

```
[8]  # Location with Latitude and Longtitude
     address = predicted_address
     geolocator = Nominatim(user_agent="Ruhul Amin Parvez")
     location = geolocator.geocode(address)
     print(location.address,location.latitude, location.longitude)

Gateway of India - गेटवे ऑफ इंडिया, Gateway of India, Kala Ghoda, A Ward, Zone 1, Mumbai, Mumbai Metropolitan Region, Mumbai City, Maharashtra, 400023, India 18.92
```

Figure 22: Viewing the output from trained model

Here in this section using the landmark detected label we have used other attributes such as geolocator function with its geocode which will find that labels exact location with its latitude and langitude data, which will provide the accurate remarkable location in the map interface.
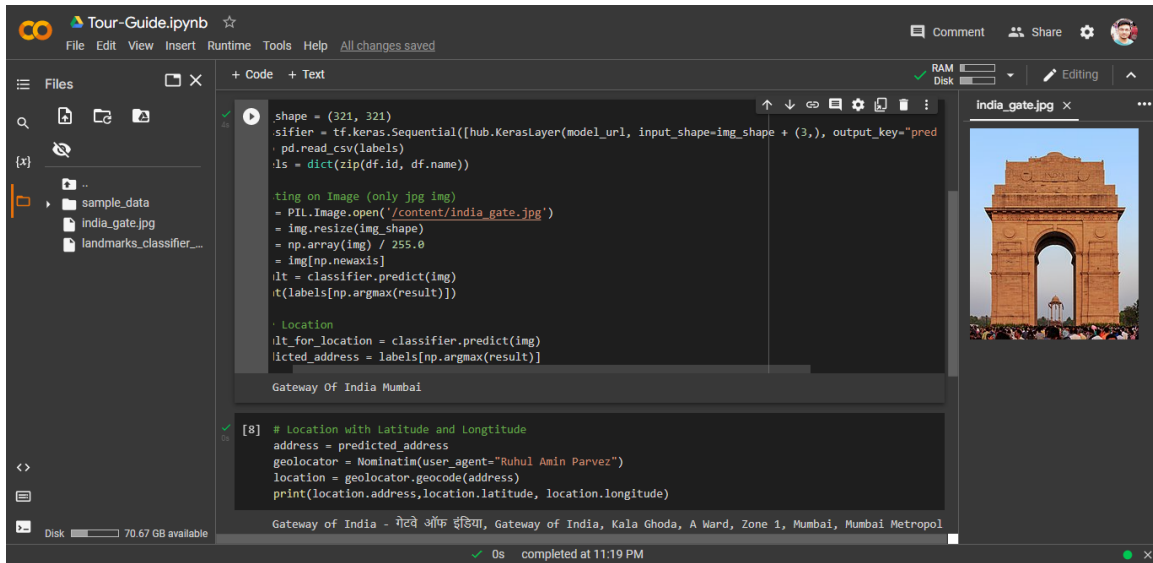
Figure 23: Overview of the trained model Output

And now its term to deploy all of its algorithm in to a user interface which will provide all the facilities with clean look. Thus the user will get a better experience while providing data to get the details of the output. It has been deployed in the python markup which is also known as python markdown language streamlit. All the trained models output pass though this platform and visualize all the information with a informative look.
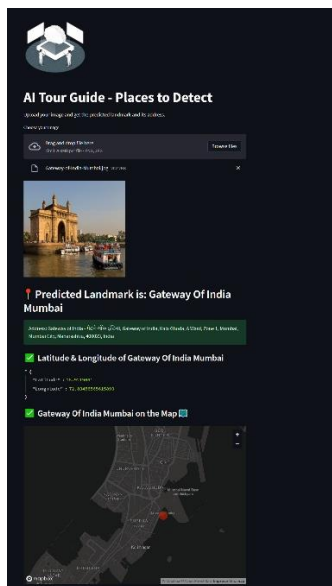

Figure 24: Final Look of AI based Tour Guide to Detect Landmark with proper Output

5.4 Test Results and Reports

After the interaction and test implementation now it's time to talk about what are the results from all of this process of testing. At first we must have to talk about the map interface and all about its interaction through the user interface. The user interface of this system has heavily inspires from Material UI design and it's a very minimalistic and clean design which makes more comfortable to use the system.

As much system progress for its next process it feels so smooth and makes user experience more comfort. Thus user will feel free to understand the process and execute any kind of process in any environment. Every details of every output were presented with a better look and feel. It will help the user to make a good choice for a better payroll. On the other hand we have tried VPN to misdirect the track but as long as GPS detecting the current location path it can't provide wrong route details.

Now let's talk about the landmark detection. As long it hasn't integrated its program with the systems functionality it's a big cons but the detection process for the system in IDE represents it has a stronger base which can detect any landmark based on its trained model. Separate giving various pictures just made a good detection with proper information.

To make this testing implementation more complicated we have gathered 9 Different photos of Taj Mahal, which is a very famous tourist in the Asia, So, one by one we have provided all the images in the IDE after that those images were analyzed in the Tensor Hub trained model. And all of those tests results were shown down below

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Figure 25: A summary of a models output in various perspective

In the above image has shown that only 1 out of 9 got false detection through the trained Model, that refers others 8 images passed in the test and got detected by the model as the famous attractions spot known as Taj Mahal. This test represents that our system has scored most of the number to detect the landmark. As now if talk about accuracy for most it will hit the exact 90.99 % accuracy. Which means the land mark detection just fine on its mark to detect any kind of landmark detection and the system will get strong if it get integrated into the systems user interface.

CHAPTER 6

CONCLUSION AND FUTURE SCOPE

6.1 Discussion and Conclusion

As long as we are evolving and heading to the future scopes every problems solution is coming on our hand. In perspective of that various country reports claimed before that because of lack security and issues tourist are losing their interests to visit different places of the world which will cause many country's belief of trust an also will lose the control over the tourism sector.

So, if we bring such a system like these it will bring back tourists trust, which will help them to guide in a proper way and also it will give an opportunity to tourists to provide a feedback how a nation or its tourism sector can make its statement sector so strong which will help to fix their drawbacks and get over from this issues and can make a good stand. This AI based Tour Guide System is just a start and if it can bring some amazing opportunities alongside with landmark detection in a real world. Then it will be a great era to visualize a new age of AI.

6.2 Scope for Further Developments

A system always needs an update to monetize its functionality and upgrade its interaction better than before, which takes us here to talk about the further development to visualize its performance in a better way. This system has a lots of potential to update its performance and makes it better. First of all we can make service assurance by the trusted and verified physical tour guide if they find any casualties using system. In further development we can make this system project as open source which will create an opportunity for other developers to contribute their works in this project which help to create a big community. Then the system can contain more trained data which will define its landmark detection in more perfection and will give a proper accuracy result for better outputs. we can also provide other function able programs through the use of AR and with the help of other technologies using social media and hub and marketplace we can

ensure our systems reach, And a new modern design can also do a lots of benefits to gain its user. So, there are lots of opportunity to make its system wider and better.

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