Stylistical Study of Buddhist stone Sculptures of Gandhara

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Dedicated

To

My Loving Parents, My Siblings, My Teachers,
My Friends and All My Well Wishers
Their prayers and guidance is a source of strength,
and achievement for me.

ACKNOWLEDGMENT

In the name of Allah, most Beneficent, most Merciful. First of all, I thank Allah at the completion of my project, as I completed this task only by His favor and grace. At this moment, this is due on me, to thank some personalities, because without their cooperation and supervision, I was unable to complete this work. First of all, my respected teacher and supervisor, Dr. Muddassar Azam Sindhu, whose door of kindness always remains open for all his students. His advises and instructions will guide me throughout my life. Completion of my task would not be possible without his help, encouragement, dynamic supervision and constructive criticism. I am highly indebted to express my gratitude to him for his entire collaboration. Special thanks to Dr. Onaiza Maqbool, Madam Memona Afsheen, Dr. Rabeeh Ayyaz Abbassi, Sir S.M.Naqi, Dr. Shoaib Karim, Dr. Khalid Saleem, Dr. Ghazanfar Farooq, Dr. Akmal Saeed Khatak, Dr. Muazzam A. Khan Khattak, Sir Umer Rasheed, Miss Ifrah Farrukh Khan, Dr. Sadeed Sabir(Archeology) and Dr. Ayaz Hussain for their kind support, hard work and cooperation. It is also necessary to me to thank my parents whose prayers are treasure of my life. I have no words to pay gratitude to them whose affection, guidance and continuous encouragement did their best to shape my character and kept my motivation and spirit alive.

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Table of Contents

Chapter 1 2

Introduction 2

1.1 Introduction 3

1.2 Problem Definition 3

1.3 Proposed Solution 3

1.4 Scope 3

1.5 Objective 3

1.6 Report Structure 4

Chapter 2 5

Background 5

2.2 What is Archeology? 6

2.2.1 Gandhara Civilization 7

2.2.3 Gandhara Art 8

Chapter 3 9

Software Requirement Specification 9

3.1 Introduction 10

3.2 Purpose 10

3.3 Stakeholders 10

3.4 Major Functions 10

3.5 Definitions, Acronyms and abbreviations 10

3.6 Overview 11

3.7 Overall Description 11

3.8 Specific Requirements 11

3.9 Use Case Diagram 12

Figure 3.1 Use Case Diagram 12

3.10 Use Case Description 13

3.11 System Functionality 16

3.12 Domain Model 18

Figure 3.2 Domain Model 18

Chapter 4 19

Software Design Document 19

4.1 Software Design Description **20**
Figure 4.1 Architectural Diagram 21
4.2 Detailed Design **22**
Figure 4.2 Train data 23
Figure 4.3 Test data 24
Figure 4.3 Test data 25
4.3 Data Design **25**
Chapter 5 26
Interface Screens 26
5.1 Android Interfaces **27**
Figure 5.1 Home Screen 27
Figure 5.2 Load Screen 28
Figure 5.3 View Details 29
5.2 Web Interfaces **30**
Figure 5.4 Home Screen 30
Figure 5.5 Result Screen 31
Figure 5.6 About Screen 32
Chapter 6 33
Implementation 33
6.1 Introduction **34**
6.2 Language Selection **34**
6.3 Tools Selection **34**
6.4 Resources **34**
6.5 Interfaces **35**
Figure 6.1 Home Page-Web 35
Figure 6.2 About Page 36
Figure 6.3 Result Page 36
Figure 6.4 Home Page-Android 37
Figure 6.5 Result Page-Android 38
Chapter 7 39
System Testing 39
7.1 Introduction **40**
7.2 Test Approach **40**

7.3 Test Plan **40**
7.4 Test Cases **40**
Test Case: TC-1 41
Test Case: TC-2 42
Test Case: TC-3 43
Test Case: TC-4 44
Test Case: TC-5 45
Test Case: TC-6 46
Test Case: TC-7 47
7.5 Results **48**
Chapter 8 49
Conclusion and Future Work 49
8.1 Conclusion **50**
8.2 Future Work **50**

Chapter 1

Introduction

1.1 Introduction

This chapter provides an overview of the developed system. It also describes why the developed system is needed, what its advantages are, and what is new in this system. It further describes the motivation for this project. The overview of whole project is explained in the following sections.

1.2 Problem Definition

Determining a sites archeological history is not always easy, but researchers have a variety of relative techniques, methods that provide a rough chronology and absolute ones, more accurate ways to prove an artifact history after manually analyzing. In Pakistan the area around Islamabad has remained a center of ancient civilizations like Gandhara civilization. Several archeological remnants like the Utensils, coins and Sculptures found from the relevant archeological sites. For researchers and archeologist to identify these new artifacts is a very difficult and time consuming task, like which artifact belonged to which time period and reign.

1.3 Proposed Solution

To reduce the time and effort of archeologists/Researchers to identify the artifacts history on the basis of its characteristics a system is developed using Machine Learning Algorithm. The developed system is an Android and Web Application which is very helpful for archeologists and students/researchers of History and Ancient civilization of this region. To develop this system use machine learning algorithm to train it for identifying new artifacts on the basis of specific feature set and then test the algorithm by uploading new archeological artifact in the form of images to identify which time period and reign it belonged.

1.4 Scope

The scope of this system is that it will be workable for archeologist and students/researchers of history and ancient civilizations of this region. By developing this application that will use Machine Learning algorithm to identify the artifact history that will reduce the cost and time of the archeologist each time a new artifact is found during their research.

1.5 Objective

The primary objective of developing this system is to reduce the cost and time consumed in identifying new archeological artifact by using Machine Learning Algorithm.

1.6 Report Structure

The rest of the report is organized as follows: Chapter 2 describes the background. Chapter 3 describes the requirements of the system with different perspectives. Chapter 4 includes Software Design Document of the system. Chapter 5 explains interfaces screen of our system. Chapter 6 Implementation of our system. Chapter 7 explains System Testing. Chapter 8 explains Conclusion and Future Work.

Chapter 2

Background

2.1 Introduction

In this chapter we know about, what is Archeology?, Different civilization in Pakistan and particularly our focus is Gandhara civilization. Its history and the artifacts found from this civilization.

2.2 What is Archeology?

Archaeology is the study of cultures that lived in the past. It is a subfield of anthropology, the study of human cultures. The other subfields are cultural anthropology that studies living cultures, physical anthropology that studies human biology and where humans fit among the living and extinct species of our family tree, and linguistics that studies human language. Archaeology is primarily concerned with reconstructing extinct cultures from the material remains of past human behavior, or the things people made or used and left behind. These remains are called artifacts. From these artifacts archaeologists build a model of what a culture was like. Archaeologists look for patterns in the artifacts they study that give them clues about how the people who made and used them lived.

The purpose of archaeology is to learn more about past societies and the development of the human race. Over 99% of the development of humanity has occurred within prehistoric cultures, who did not make use of writing, thereby no written records exist for study purposes. Without such written sources, the only way to understand prehistoric societies is through archaeology. Because archaeology is the study of past human activity, it stretches back to about 2.5 million years ago when we find the first stone tools.

Archeology study shows that there have been 420 billion civilizations in the past 2 billion years, each one lasting a million years, then on average, about 210 million of them have existed simultaneously at any given moment.

2.2 Civilizations in Pakistan

Pakistan is a land of many different cultures and traditions. The land of Pakistan has seen many phases in its (One of the oldest) History of Pakistan. The remains of all those people, who inhabited this land and contributed their spice to its culture, are spread all over the country. There are hundreds of known archeological sites in the country and many are not even identified yet. Below are just a few of the worth seeing sites beside numerous others.

Different Civilization in Pakistan:

1. Mahar Garh 7000 BC
2. Kot DG & Amri 3300 BC
3. Moen Jo Daro & Harrappa 2500 BC
4. Post Moen Jo Daro Sites 2500-1700BC
5. Taxila 516 BC to 6 AD
6. Takht Bhai (2nd to 6th Century AD)
7. Gandhara Sites in Peshawar valley. (2nd to 6th Century AD)
8. Swat Group of Buddhist Sites.
9. Gilgit Chitral & Skardu pictographs and sites
10. Sindh & Punjab sites of Buddhist period 2 - 5th Century AD.
11. Post Buddhist period 6 to 8th century.
12. Arab or Muslim period 711AD
13. Moghul period Architecture
14. Uch & Multan Architecture
15. Cholistan Forts and Mosque in Derawar
16. Makli Thatta & Chaukundi type sites

2.2.1 Gandhara Civilization

The name of Gandhara may have several meanings, but the most prominent theory relates its name to the word Qand/Gand which means "fragrance", and "Har" which means 'lands'. Hence in its simplest form, Gandhara is the 'Land of Fragrance'.

Pakistan is the land which attracted Alexander the great from Macedonia in 326 B.C., with whom the influence of Greek culture came to this part of the world. During the 2nd century B.C., it was here that Buddhism was adopted as the state religion which flourished and prevailed here for over 1000 years, starting from 2nd century B.C., until 10th century A.D. During this time Taxila, Swat and Charsaddah (old Pushkalavati) became three important centers for culture, trade and learning.

It has been speculated that Gandhara was a triangular tract of land about 100 kilometers east to west and 70 km north to south, lying mainly to the west of the Indus River and bounded on the north by the Hindukush Mountains. The extent of Gandhara proper actually included the Peshawar valley, the hills of Swat, Dir, Buner, and Bajaur, all of which lie within the northern boundaries of Pakistan.

2.2.3 Gandhara Art

Gandharan art can be traced to the 1st century BCE and included painting, sculpture, coins, pottery, and all the associated elements of an artistic tradition. It really took flight during the Kushan era and especially under King Kanishka in the 1st century CE, who deified the Buddha and arguably introduced the Buddha image for the first time. Thousands of these images were produced and were scattered across every nook and cranny of the region ranging from handheld Buddhas to monumental statues at sacred sites of worship.

Chapter 3

Software Requirement Specification

3.1 Introduction

This chapter presents a detailed analysis of functional and non-functional requirements of the developed application. The deliverable result, at the end of this phase, is Software Requirement Specification (SRS) document. The detailed requirements analysis phase should be carried out carefully because it decides what to build. “No other part of the work so cripples the resulting system if done wrong. No other part is as difficult to rectify later”.

3.2 Purpose

The purpose of this Requirement Specification document is to clear the requirements of the system and to decide what the system should do and what the system should not do. The Archeologist, students/researchers of history and ancient civilizations are the audience of the application or simply they are “end users”.

3.3 Stakeholders

There are following stakeholders

- Archeologist
- Students
- Researcher

3.4 Major Functions

There are following major functions of the application

- Take picture from the mobile camera
- Upload picture from gallery
- Display information related to the artifact image

3.5 Definitions, Acronyms and abbreviations

User	Admin
NN	Neural Network
CNN	Convolutional Neural Network
RNN	Recurrent Neural Network
LSTM	Long Short-Term Memory
SGD	Stochastic Gradient Descent

3.6 Overview

The rest of the topics discussed in this chapter are the detailed information about functional, nonfunctional and performance requirements, overall functionality of the system, use cases and their description, state diagrams, and description of system functionality.

3.7 Overall Description

3.7.1 Product Perspective

3.7.1.1 System Interfaces

Gandhara civilization is an android application. Users can access the application by installing it on their smart phone.

3.7.1.2 User Interfaces

An android application will be provided to the user. Once user installed it on its mobile phone can access and use it.

3.7.1.3 Hardware Interfaces

No hardware interface is required.

3.7.1.4 Software Interfaces

System requires

- Android Operating System

3.7.2 User Characteristics

User must have knowledge how to use application on smart phone.

3.7.3 Constraints

User must have smart phone.

3.8 Specific Requirements

3.8.1 Functional Requirements

- The system should allow the user to upload image file.
- The system should allow the user to take picture using smart phone camera.
- System should display the result

3.9 Use Case Diagram

The use case diagram is a graphical representation of user's interaction with the system. A use case diagram can portray the different types of users of a system and ways that they interact with a system. The list of use-cases mentioned in use-case diagram are described in detail, so that we are able to look more precisely that how user can interact with system to perform tasks.

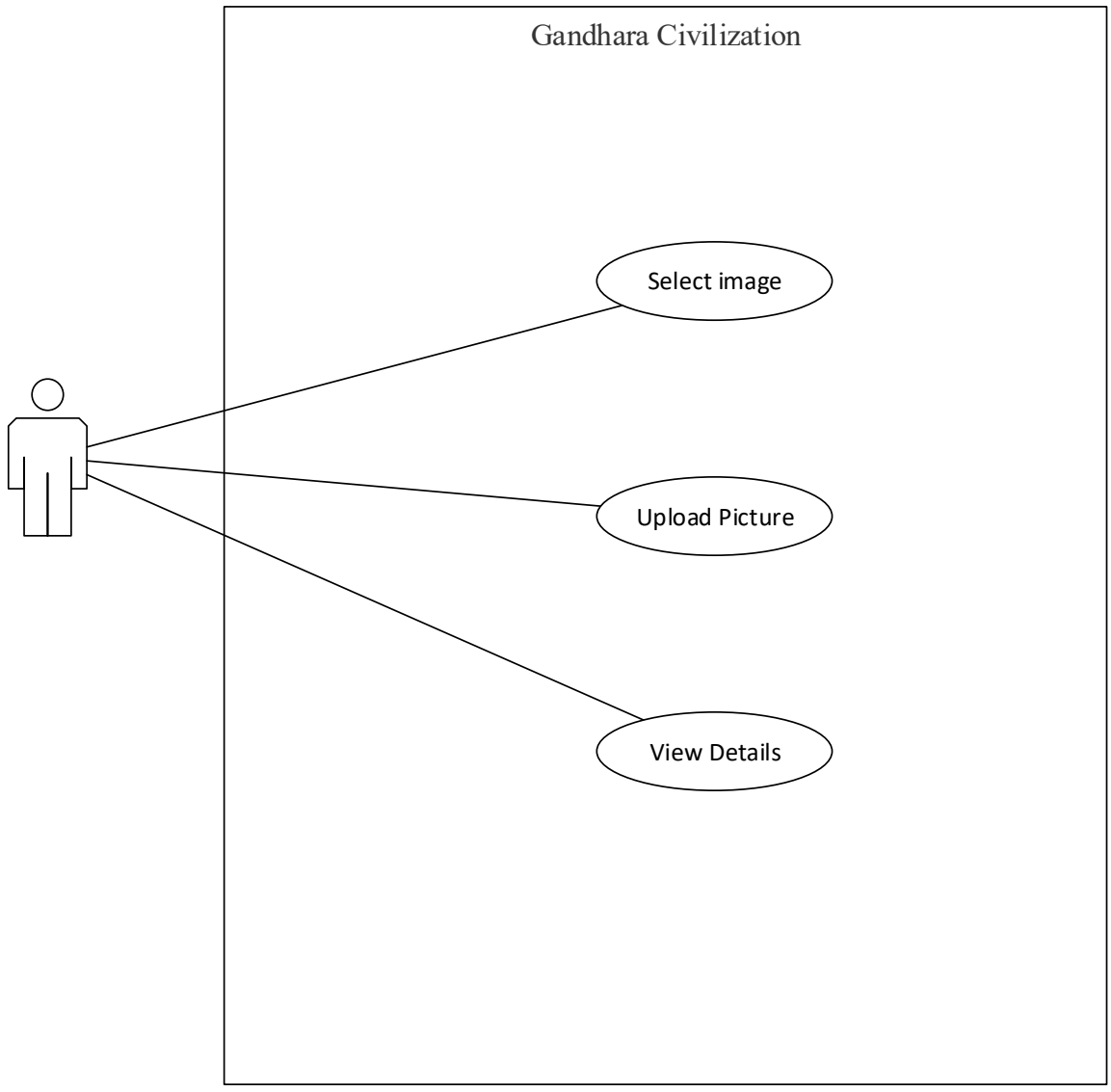

Figure 3.1 Use Case Diagram

3.10 Use Case Description

The use case is a list of actions or event steps which define the interaction between the actor and a system to achieve a goal. The use case description contains the components of the developed project step by step so that the other people or stakeholders can understand the flow of the application.

3.10.1 Use Case 1: Select Image

ID	**UC1**
Name	Select image
Primary Actor	User
Stakeholder	• Archeologist • Students • Researchers
Pre-Condition	Application should be running.
Post-Condition	File uploaded successfully.
Main Success Scenario	1. User run the application. 2. Click on choose file. 3. Select image file. 4. User clicks on “upload” button. 5. File will be uploaded.
Extensions	3. User may select file other than image file A).System shows pop-up message for invalid file .
Special Requirements	None.
Frequency	Many times a day.

3.10.2 Use Case 2: Take Picture

ID	**UC2**
Name	Upload Picture
Primary Actor	User
Stakeholder	• Archeologist • Students • Researchers
Pre-Condition	Application should be running.
Post-Condition	Picture taken successfully
Main Success Scenario	1. User opens the application. 2. User open the mobile camera and take picture of artifact. 3. User clicks on “upload” button.
Extensions	None.
Special Requirements	None.
Frequency	Many times a day.

3.10.3 Use Case 3: View Details

ID	**UC3**
Name	View Details
Primary Actor	User
Stakeholder	• Archeologist • Students • Researchers
Pre-Condition	Application should be running.
Post-Condition	File uploaded Successfully
Main Success Scenario	1. User opens the application. 2. User clicks on “view details” button. 3. System shows the artifact details to the user.
Extensions	None.
Special Requirements	None.
Frequency	Many times a day.

3.11 System Functionality

In this system, we use two models.

1. Convolutional Neural Network
2. Recurrent Neural Network

We use convolutional neural network for extracting features from our given image which mostly capture high-level image extraction and not the low level object specific detail. That high-level features are top-down in nature. Recurrent neural network translates the features and objects given by our image based model to natural sentence. Usually, the feature vector is linearly transformed to have the same dimensions as the input dimension of the RNN/LSTM network. This network is trained as the language model on our feature vector.

3.11.1 Extract Feature

The input of the model is single raw image and the output is the caption y encoded as a sequence of 1-of-k encoded words.

$y = \{y1,\ldots\ldots\ldots\ldots,, y_C\}, y_i \in \mathbb{R}$

where k is the size of the vocabulary and C is the length of the caption. To extract a set of feature vector we refer to as annotation vectors, we use a CCN.

$a = \{a1, \ldots\ldots\ldots\ldots, a_L\}, ai \in \mathbb{R}$

The extractor produce L vectors and each element corresponds to a part of the image as D-dimensional representation.

3.11.2 Caption generator

The model uses long short-term memory(LSTM) network that produces a cation. At every time step we will generate one word conditioned on a context vector, the previous hidden state and the previously generated words.

Using $T_{s,t} : \mathbb{R}^s \rightarrow \mathbb{R}^t$ to denote a simple affine transformation with parameters that are learned.

$$\begin{pmatrix} 1 \\ 2 \\ 3 \\ 4 \end{pmatrix} = \begin{pmatrix} \sigma \\ \sigma \\ \sigma \\ \tanh \end{pmatrix} T_{D+m+n,n} \begin{pmatrix} Eyt-1 \\ ht-1 \\ \hat{z}t \end{pmatrix}$$

$c_t = f_t \odot c_{t-1} + i_t \odot g_t$

$h_t = o_t \odot \tanh(c_t)$

Where respectively i_t, f_t, c_t, o_t, h_t are the input, forget memory, output and hidden state of the LSTM. The vector $\hat{z} \in \mathbb{R}^D$ represents the context vector capturing the visual information related to a particular input location.

$E \in \mathbb{R}^{m*k}$ is an embedding matrix, m and n is the embedding and LSTM dimensionality. σ and $\odot$ are the logistic sigmoid activation and element-wise multiplication respectively.

3.11.3 Loss Function

We use a word-wise cross entropy as the basic loss function l_0. Further more, to encourage the attention function to produce more expressive output, we define l_1, l_2 as the variance of α_t along the sepence axis and special axis correspondingly. Then define the overall loss function as $l = l_0 + \lambda_1 l_1 + \lambda_2 l_2$ where λ_1 and λ_2 are hyper parameters.

3.12 Domain Model

Domain model is the conceptual model of the domain that incorporates both behavior and data. Domain describes that system will test data after the training from data.

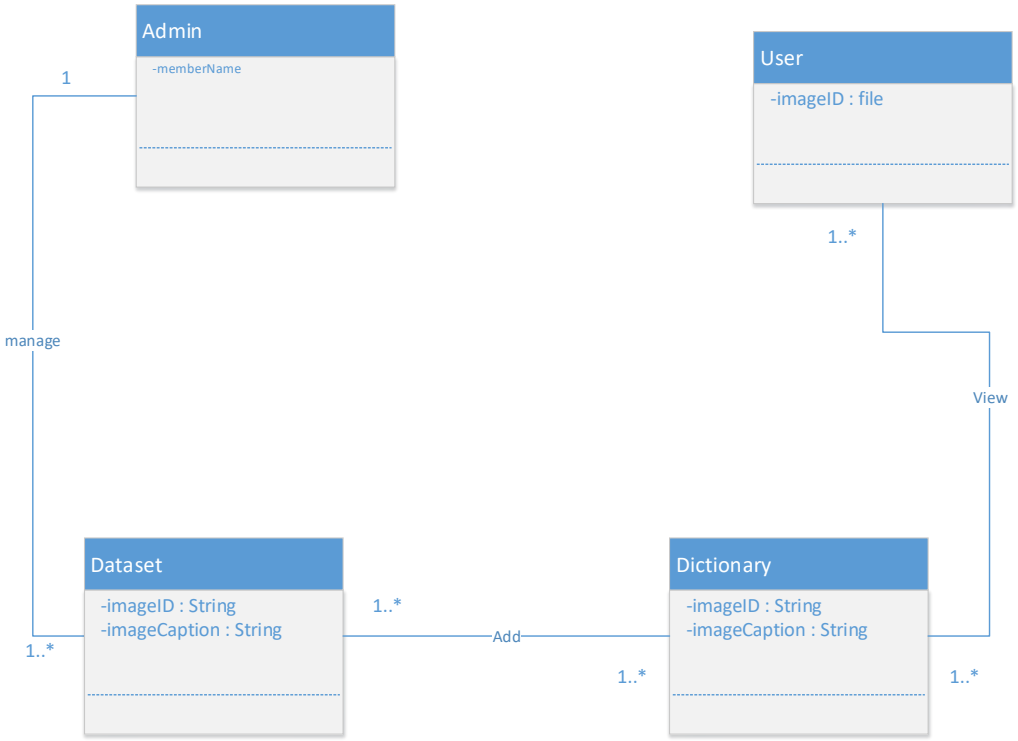

Figure 3.2 Domain Model

Chapter 4

Software Design Document

4.1 Software Design Description

4.1.1 Introduction

Software design document describes design of the system. Systems design is the process of defining the architecture, components, modules, interfaces, and data for a system to satisfy specified requirements. Designing of system is very essential phase before coding. Design emphasizes a conceptual solution that fulfills the requirements, rather than its implementation.

4.1.2 Design Overview

The system will generate caption for the artifact given to it in the form of image, by using machine learning algorithm.

4.1.3 Architecture Design

Architecture is structure of packages, components and the manner they interact with each other. Architecture is a design process of defining a collection of hardware and software component and their interaction to establish the framework for development of a computer system. It is used to design a model providing implementation details. These details specify the component of the system also input, output, function and interaction between them.

I choose ‘Three Tier’ architecture pattern (MVC). The usage of this architecture makes the system more understandable.

- First layer is presentation layer that contains user interface.
- Second layer is controller that handles the interaction of application and presentation layer.
- Third layer is application layer that contains the business logic.

4.1.3 Input/Output

In this system we will give an image of an artifact of sculptures or coins from history as input, CNN model extract the features from that image The feature extracted by using CNN model are used by RNN model for generating caption of that image artifact. The caption is shown as a sentence as output to the user.

4.1.4 Architectural Diagram

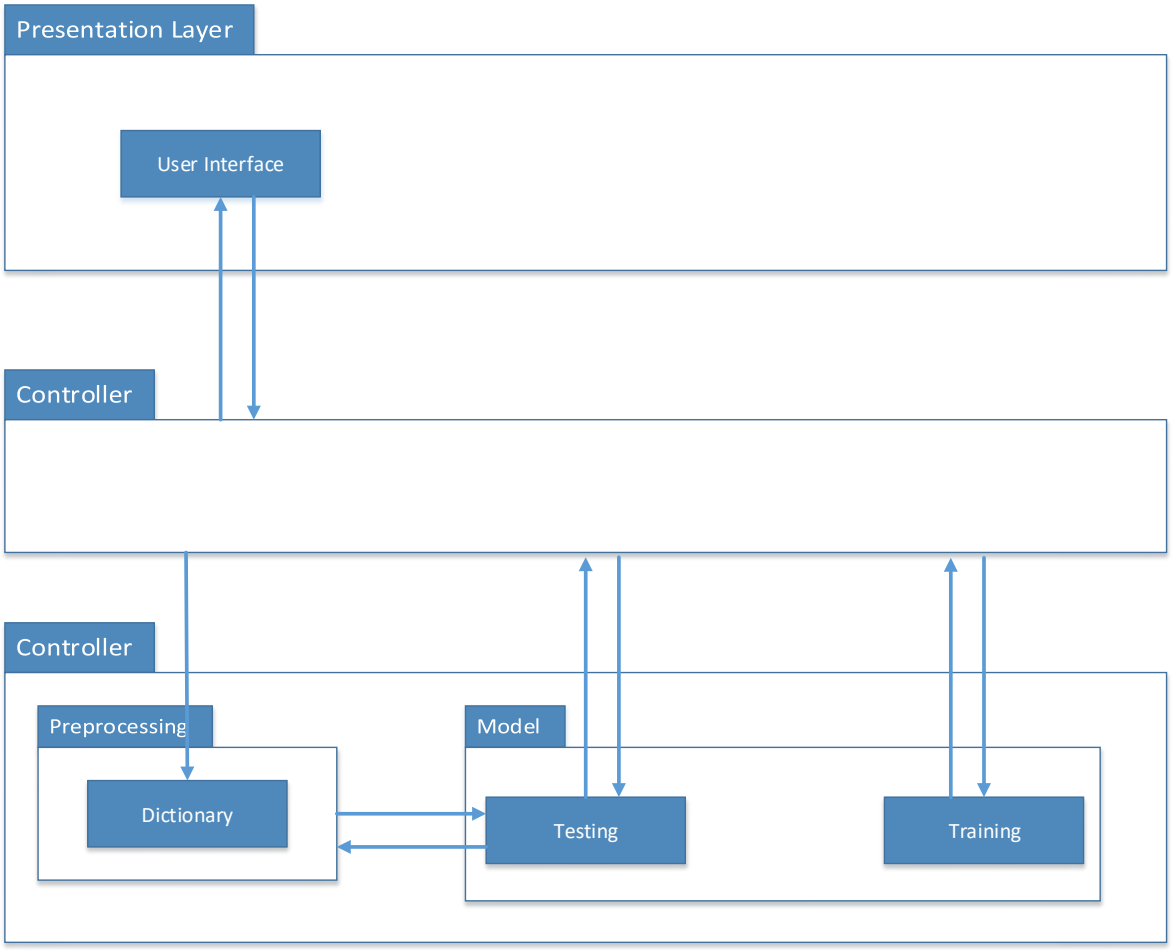

Figure 4.1 Architectural Diagram

4.2 Detailed Design

4.2.1 Convolutional Neural Network

CNN is used as for extracting feature of the image given as input to the system.

4.2.2 Recurrent Neural Network

RNN used the feature extracted using CNN model to generate caption of that image.

4.2.3 Neural Network

I'm using VGG16 model as encoder to generate a one dimensional vector representation of the input images. To generate the description sentence, adopt the LSTM as the language model for the decoder to decode the vector into sentence.

The Hyper Parameter for this model are:

Embedding Dim

Number of neurons in input layer.

Hidden Dim

Number of neurons in hidden layer.

Learn-rate

Learning factor of Model.

Hidden Layers

Number of hidden layers.

Training Data

The factor that define division of both training and testing data.

Epochs

How many times iterate forward and backward.

Loss Function

With stochastic gradient descent (SGD), we can not calculate the loss on entire dataset to update the gradient. Rather in every iteration, we calculate the loss on a batch of data points to update the gradients.

4.2.4 Sequence Diagrams

A sequence diagram shows the interaction that how object operate with one another and in what order. It shows the flow and sequence of messages between Software objects.

Train Data

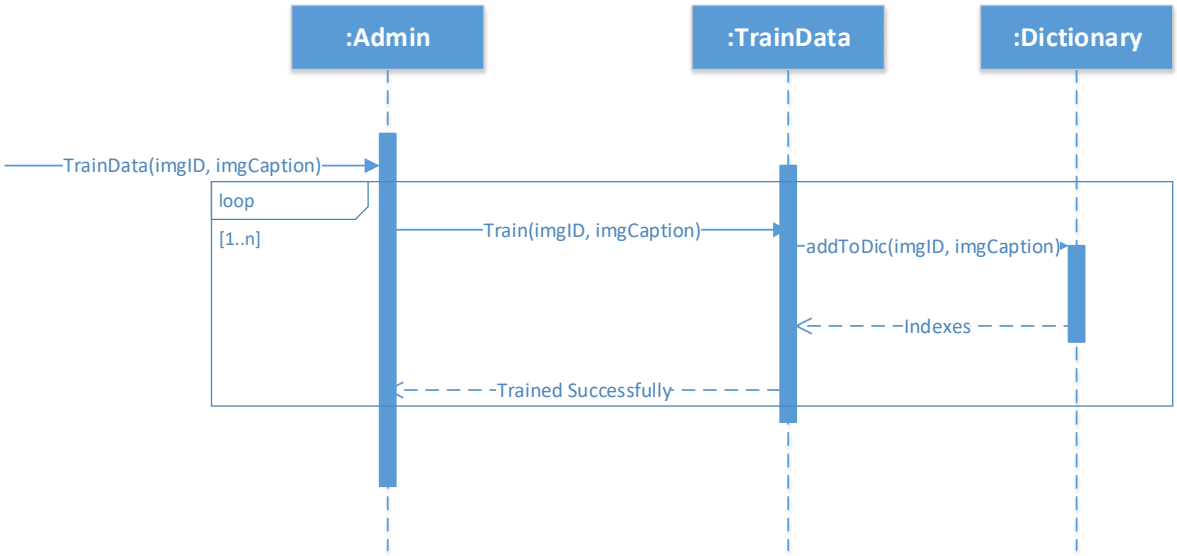

Figure 4.2 Train data

Test Data

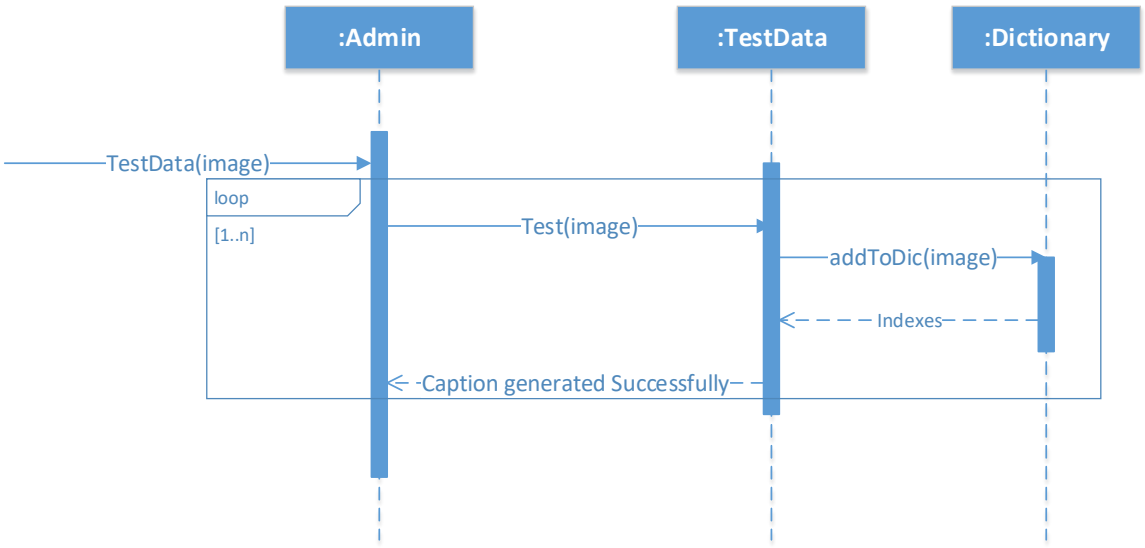

Figure 4.3 Test data

4.2.5 Design Class Diagram

Design class diagram describes the attributes and methods of class and also constraints imposed on a system. It shows the collection of classes and also their association and interaction. This diagram can be directly mapped with object oriented languages and thus widely used at the time of construction.

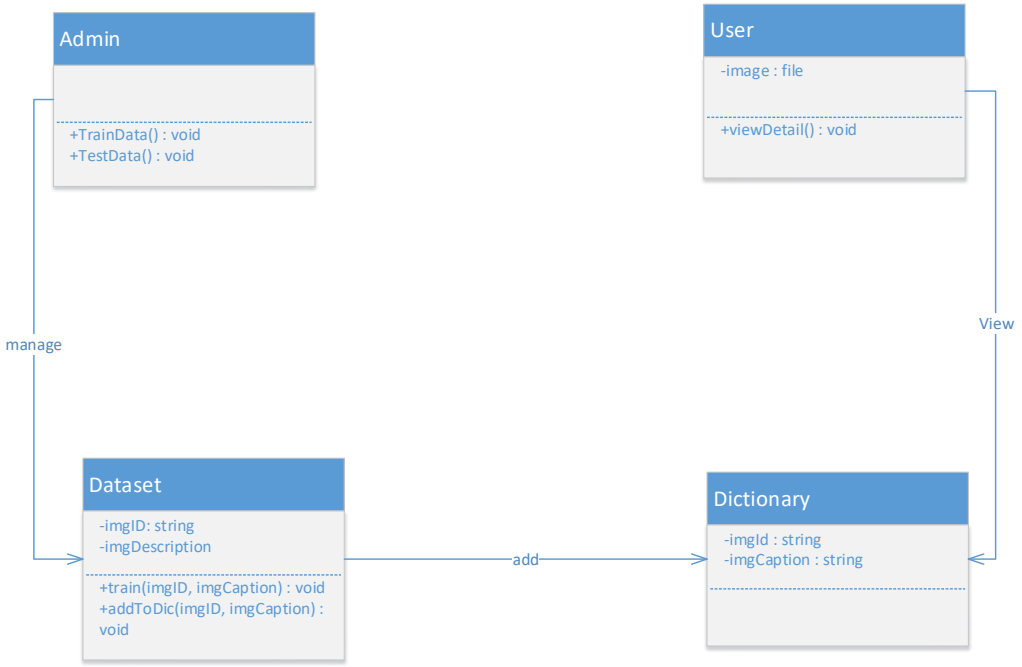

Figure 4.3 Test data

4.3 Data Design

In this system we used a data set consisting of images and their captions. We use this data set for training and testing of the system.

Chapter 5

Interface Screens

5.1 Android Interfaces

5.1.1 Home Screen: Sculptures

Use Case 1: Select Image

Use Case 2: Upload Image

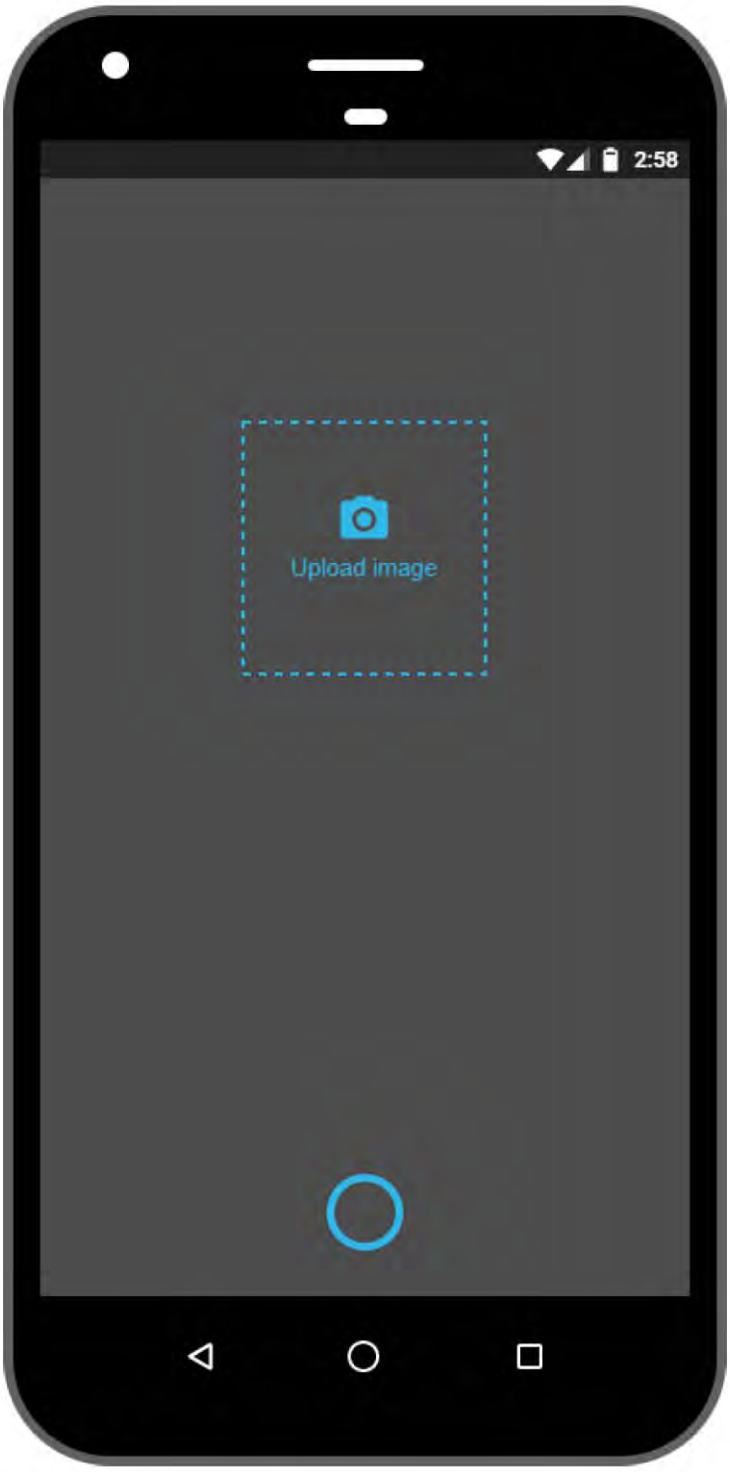

Figure 5.1 Home Screen

5.1.2 Load Screen

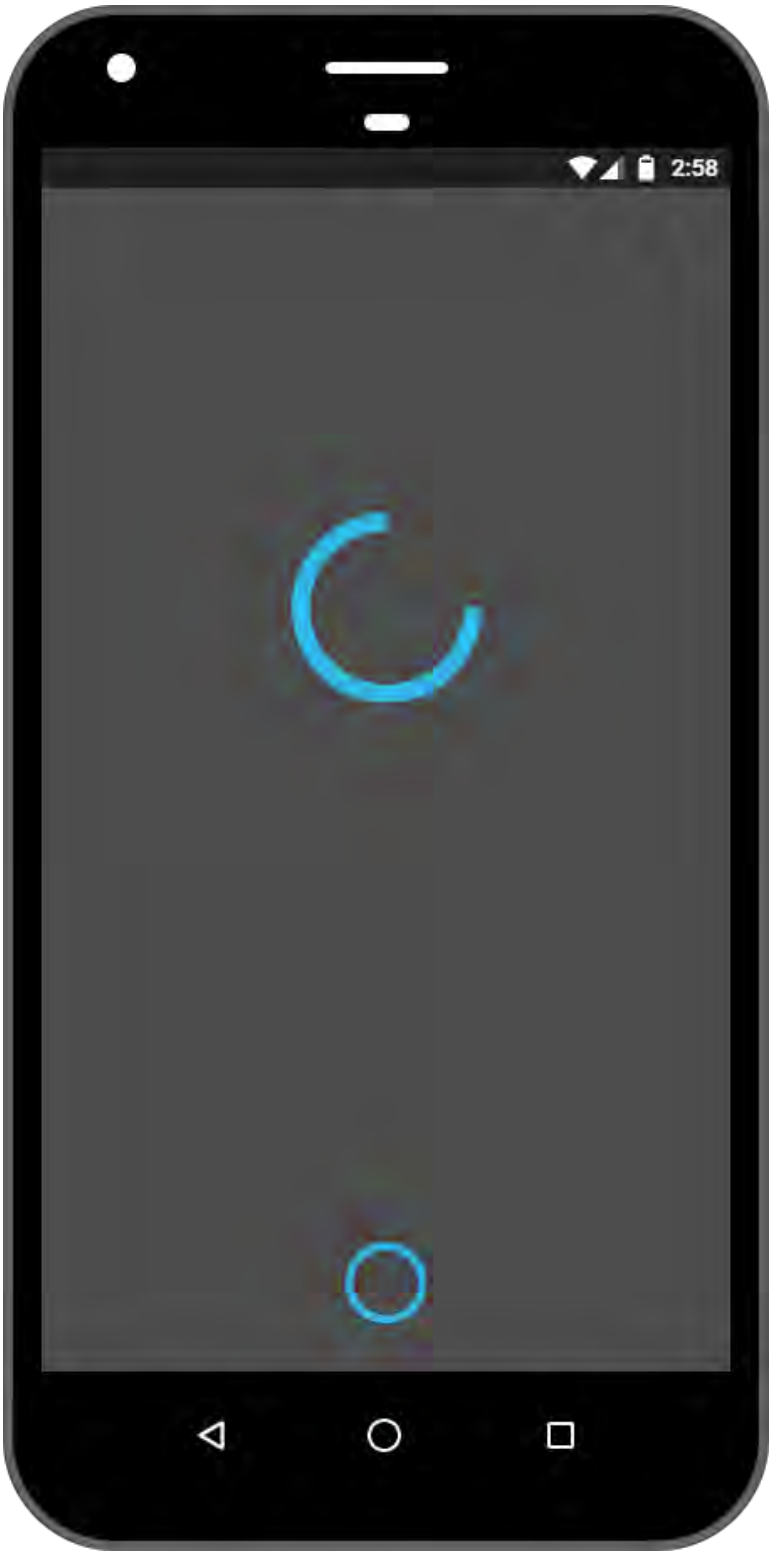

Figure 5.2 Load Screen

5.1.3 Details Screen

Use Case 1: View Details

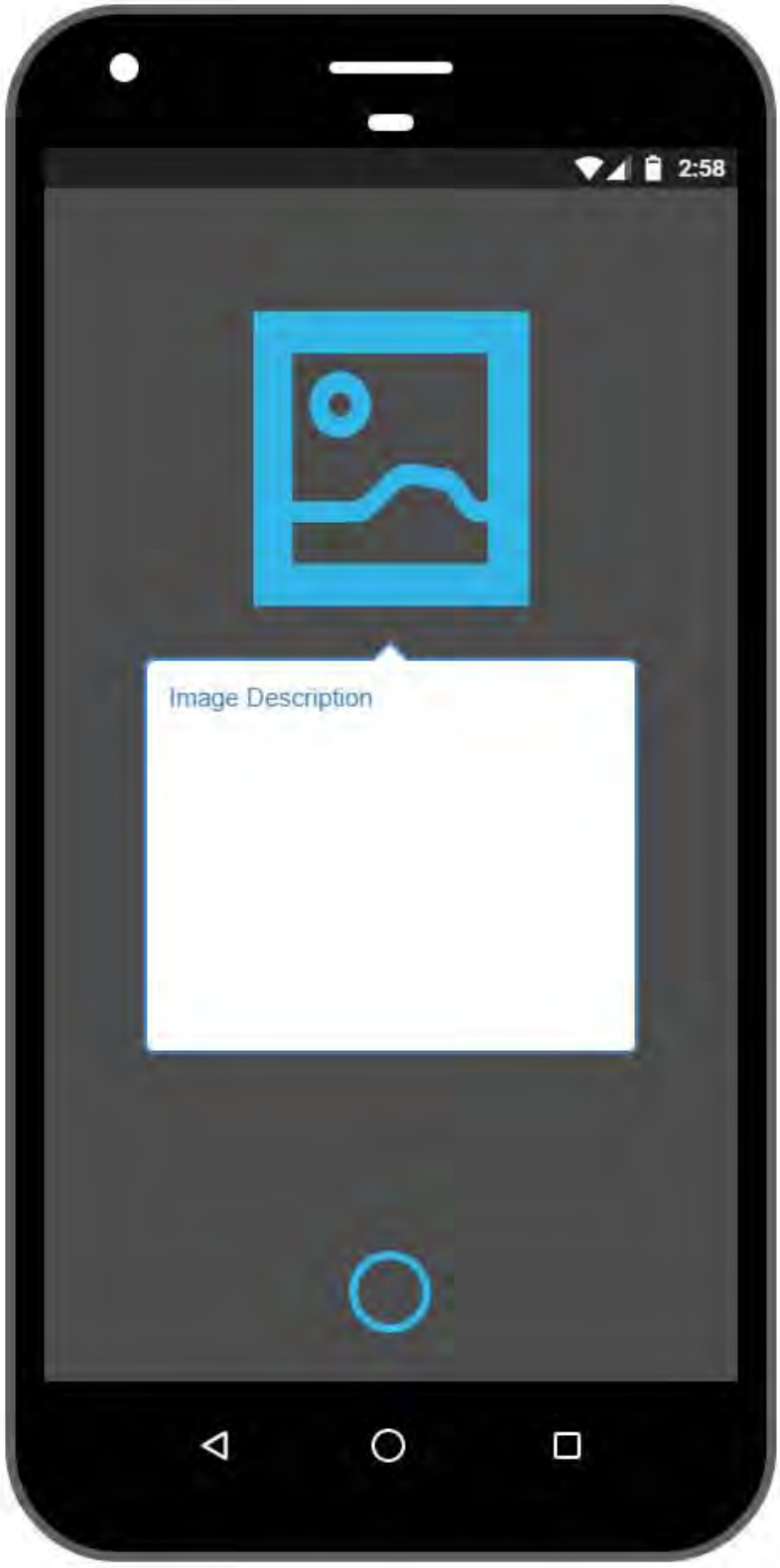

Figure 5.3 View Details

5.2 Web Interfaces

5.2.1 Home Screen: Sculptures

Use Case 1: Select Image

Use Case 2: Upload Image

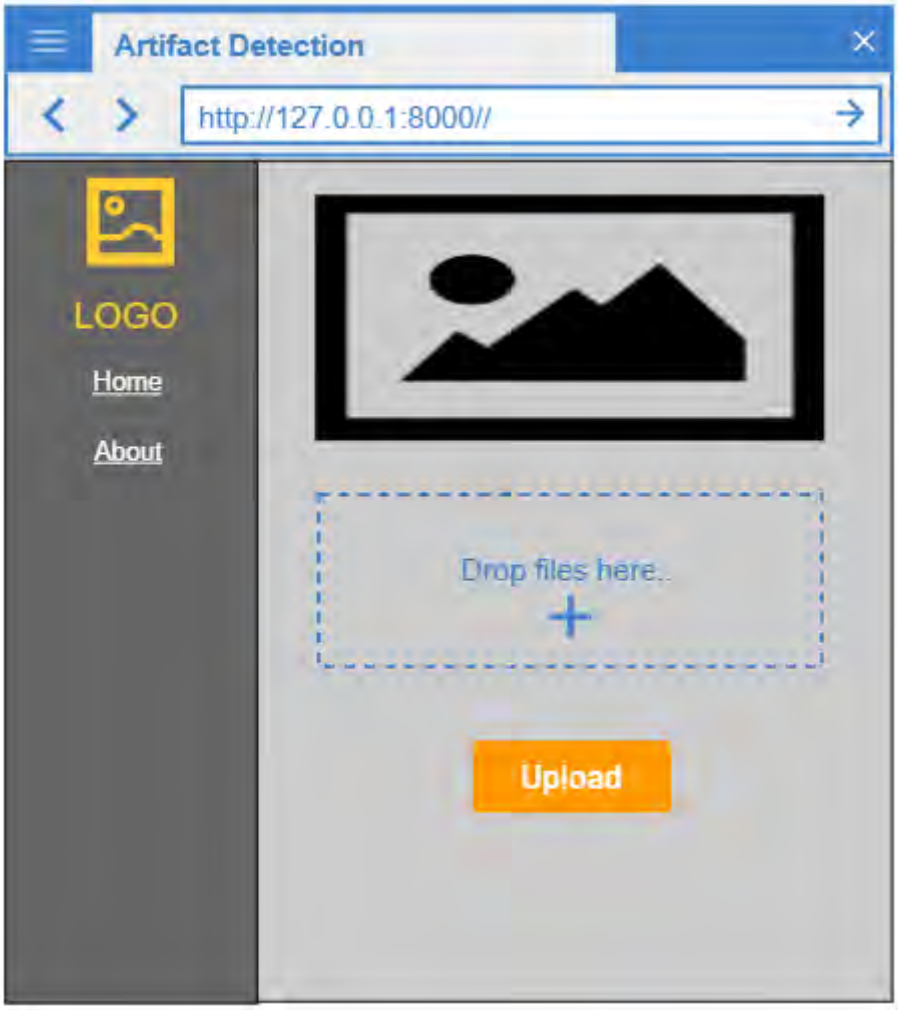

Figure 5.4 Home Screen

5.2.2 Details Screen

Use Case 3: View Details

Figure 5.5 Result Screen

5.2.3 About Screen

About us

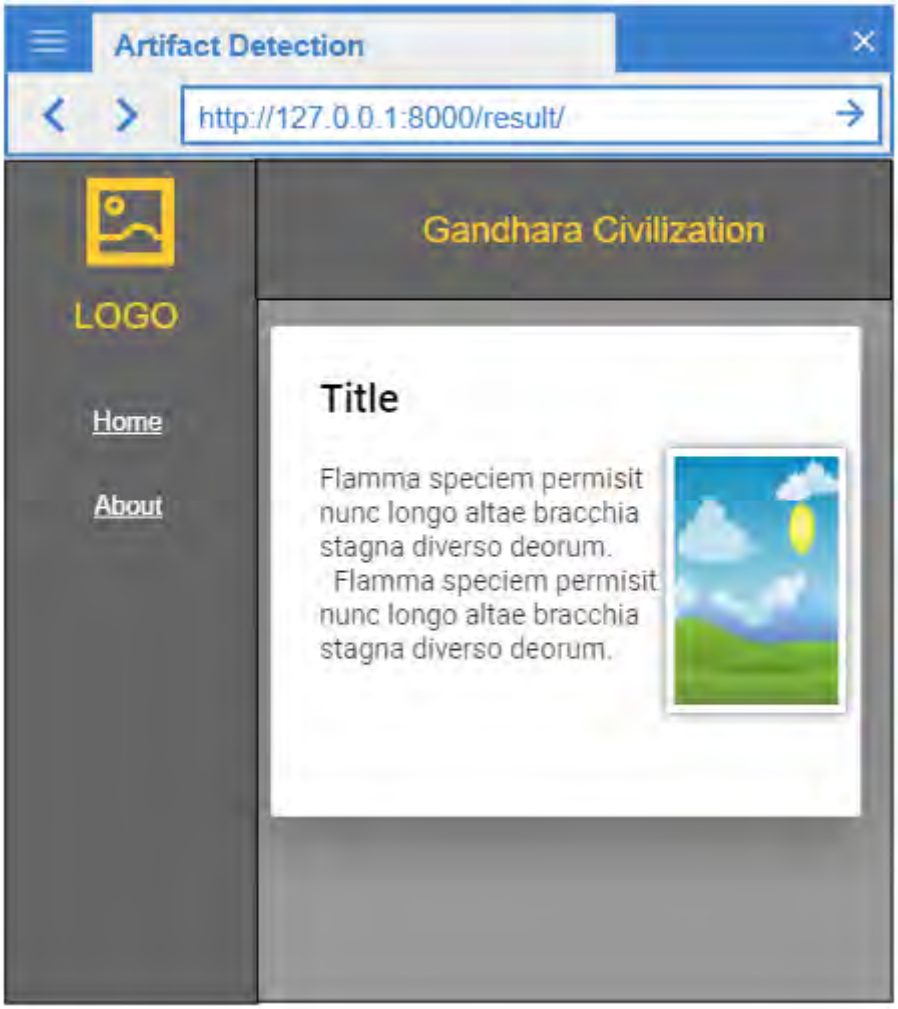

Figure 5.6 About Screen

Chapter 6

Implementation

6.1 Introduction

This document describes the tools and technology use to develop the software. After the detailed design phase, the next phase is implementation. The main purpose of the implementation is to execute a plan, design or idea for doing something. In this phase we also take other selection decisions such as language selection, tool selection etc. This chapter will explain all steps that are necessary for the system development.

6.2 Language Selection

The project is implemented in the following languages:

Python 3.8.8

Python 3.8.8 is an interpreted high-level programming language for general-purpose programming. In our system it is used to implement machine learning algorithm for detection of artifacts.

Django

Django is a high-level Python Web framework that encourages rapid development and clean, pragmatic design. It takes care of much of the hassle of Web development, so you can focus on writing your app without needing to reinvent the wheel. It's free and open source.

Bootstrap 4

Bootstrap is the most popular HTML, CSS, and JavaScript framework for developing responsive, mobile friendly websites. Bootstrap is a free and open-source CSS framework and it contains CSS- and JavaScript-based design templates for typography, forms, buttons, navigation, and other interface components.

React Native

React Native is an open-source mobile application framework. It is used to develop cross-platform applications for Android and iOS by enabling developers to use React's framework along with native platform capabilities.

6.3 Tools Selection

- Jupyter Notebook
- Visual Studio Code
- Web Browser

6.4 Resources

Anaconda

Anaconda is a distribution of the Python programming languages for scientific computing, that aims to simplify package management and deployment. The distribution includes data-science packages suitable for Windows, Linux, and macOS.

Visio 2013

It is free diagram software for making flowcharts, process diagrams and UML diagrams.

Pencil

It is free diagram software for designing interface screens.

Tensorflow

TensorFlow is a free and open-source software library for machine learning. It can be used across a range of tasks but has a particular focus on training and inference of deep neural networks.

6.5 Interfaces

Graphical User Interface (GUI) provides the user graphical means to interact with the system. User interfaces are designed in such a way that minimum number of steps will give the maximum results. The image buttons are used that makes the system more users friendly. User interface designs shows that how an end user will interact with the system through screens to perform their tasks. A user interface is the means by which a user controls a software program or hardware device.

6.5.1 Web Interfaces

6.5.1.1 Home Page

Figure 6.1 Home Page-Web

6.5.1.2 About Page

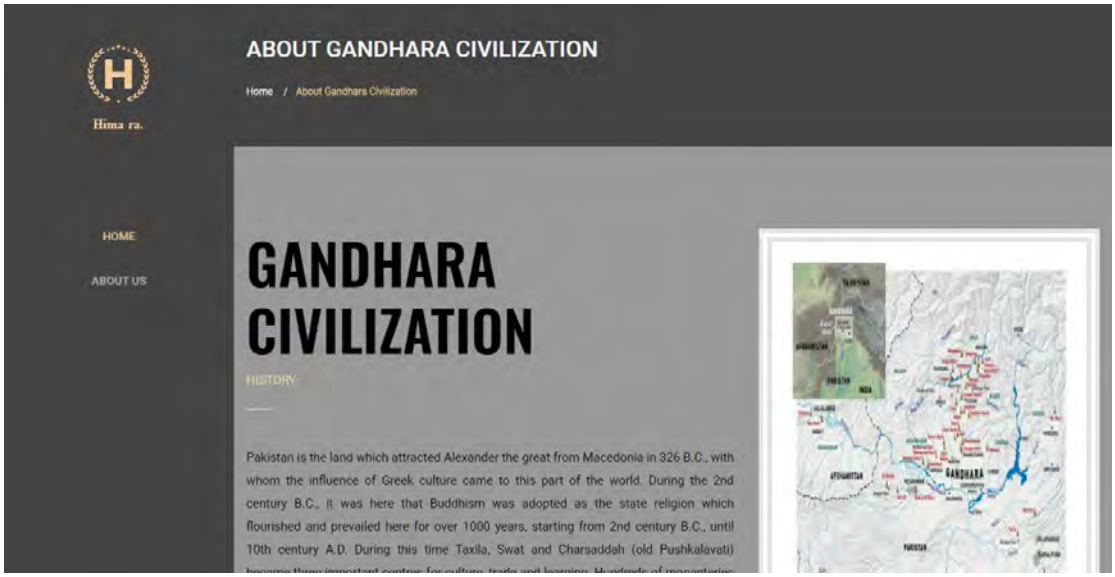

Figure 6.2 About Page

6.5.1.3 Result Page

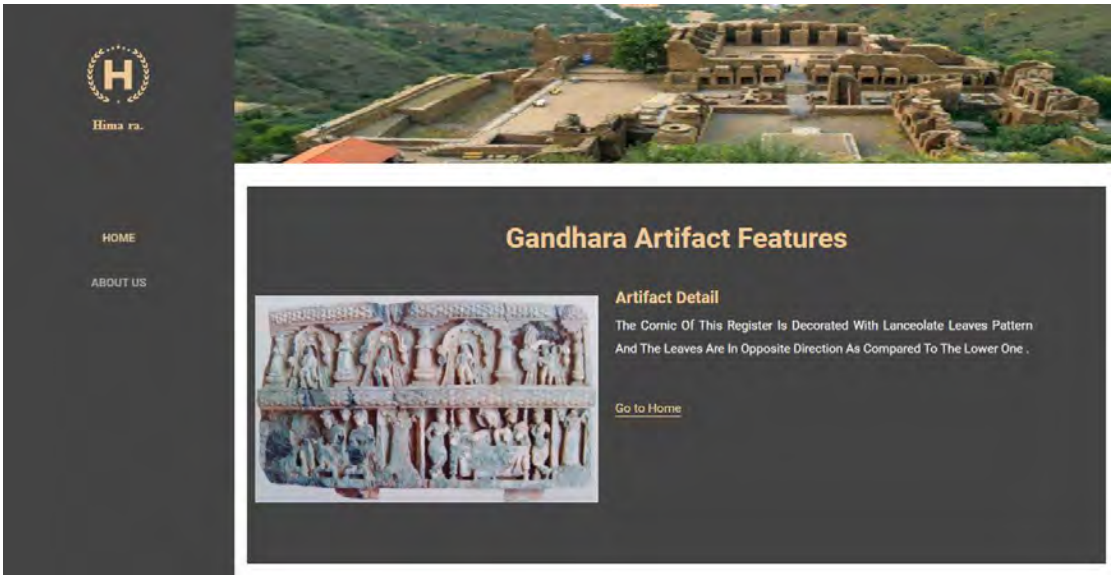

Figure 6.3 Result Page

6.5.2 Android Interfaces

6.5.2.1 Home Page

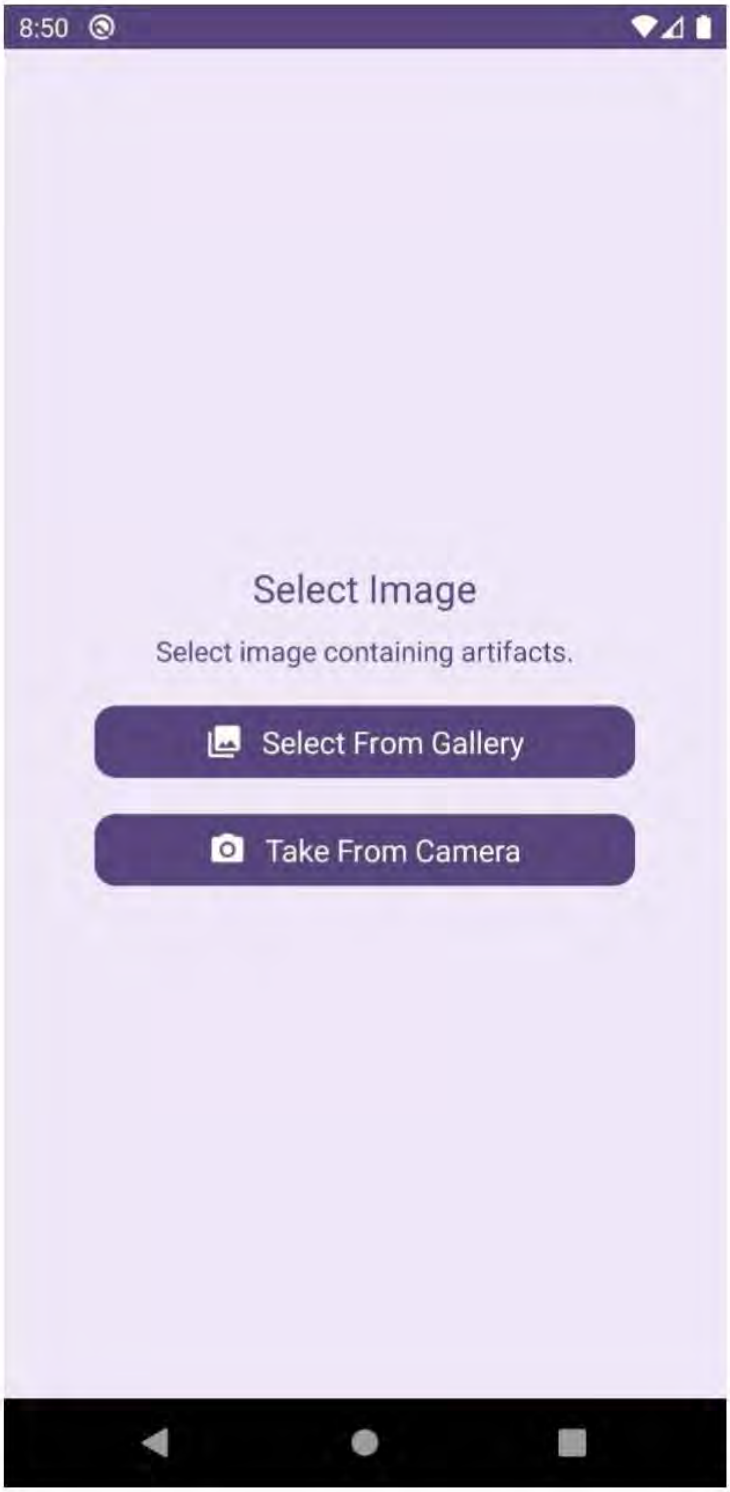

Figure 6.4 Home Page-Android

6.5.1.3 Result Page

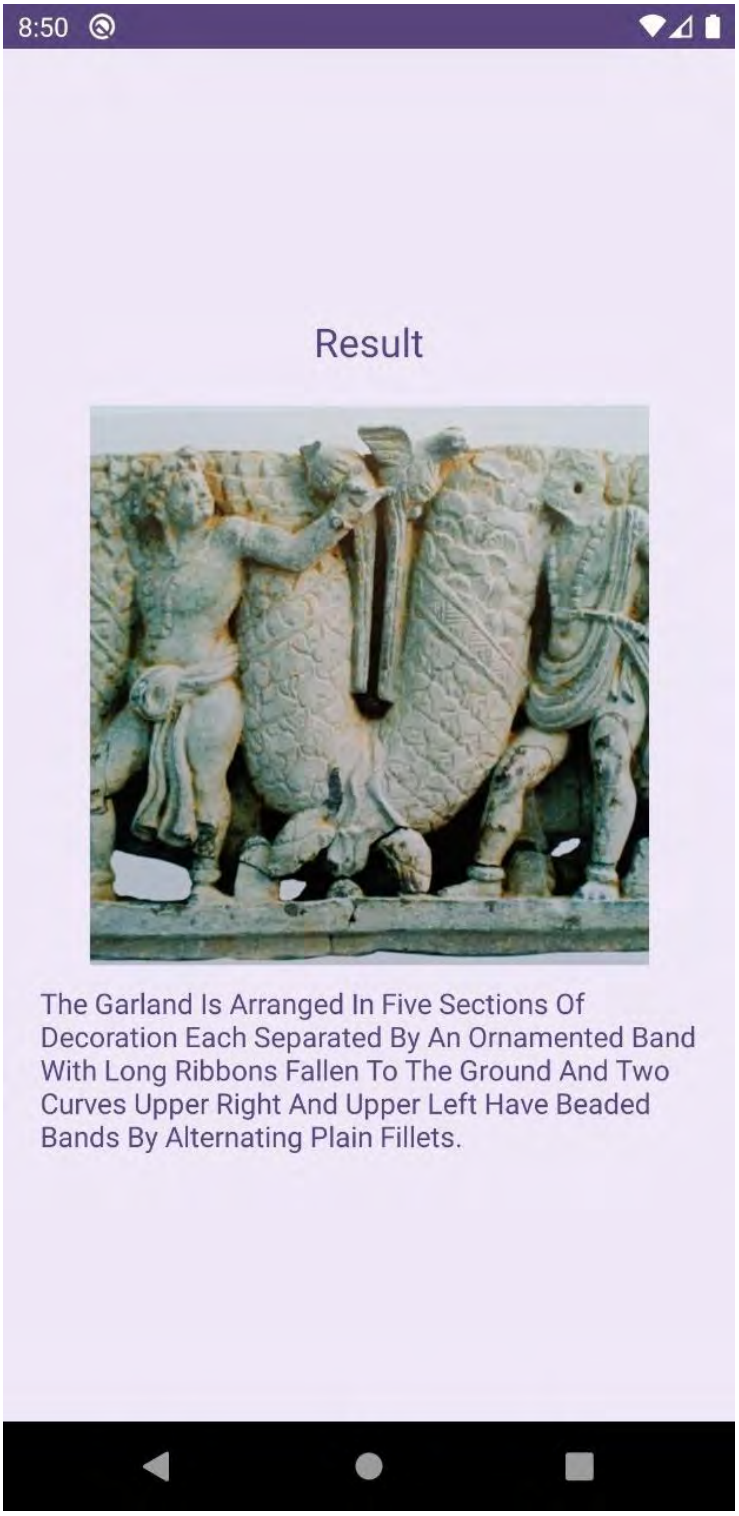

Figure 6.5 Result Page-Android

Chapter 7

System Testing

7.1 Introduction

Testing is the process of evaluating a system or its components with the intent to find whether it satisfies the specified requirements or not. In simple words, testing is executing a system in order to identify any gaps, errors, or missing requirements in contrary to the actual requirements. According to ANSI/IEEE 1059 standard, Testing can be defined as - A process of analyzing a software item to detect the differences between existing and required conditions (that is defects/errors/bugs) and to evaluate the features of the software item.

7.2 Test Approach

User acceptance testing (UAT) is the last phase of the software testing process. During UAT, actual software users test the software to make sure it can handle required tasks in real-world scenarios, according to specifications.

7.3 Test Plan

The test plan focuses on the functional aspects of testing. It identifies all features and combinations of features to be tested along with all those features that are not to be tested and the reasons for not testing them.

7.3.1 Features to be Tested

- Upload Image
- View Image detail

7.3.1 Testing Tools and Environments

- Mobile
- Laptop
- Web Browser
- Server

7.4 Test Cases

A test case is a specification of the inputs, execution conditions, testing procedure, and expected results that define a single test to be executed to achieve a specific testing objective. A test case may contain particulars such as test case id, test case name, purpose, input data requirements, steps, and expected results. The level of detail may vary significantly depending on the organization and project context.

ID	TC-1
Actors	Admin
Description	Upload Image of the artifact and view artifact details.
Input	
Expected Output	The cornic of this register is decorated with lanceolate leaves pattern and the leaves are in opposite direction as compared to the lower one.
Observed Output	The cornic of this register is decorated with lanceolate leaves pattern and the leaves are in opposite direction as compared to the lower one.
Verdict	pass

Test Case: TC-1

ID	TC-2
Actors	Admin
Description	Upload Image of the artifact and view artifact details.
Input	
Expected Output	The Buddha is seated cross legged on a rectangular throne with plain halo behind head, wearing a robe that covers his whole body and neckline and the right hand is raised in abhaya pose and the left securing a hem of the drapery .
Observed Output	The Buddha is seated cross legged on a rectangular throne with plain halo behind head, wearing a robe that covers his whole body and neckline and the right hand is raised in abhaya pose and the left securing a hem of the drapery .
Verdict	pass

Test Case: TC-2

ID	TC-3
Actors	Admin
Description	Upload Image of the artifact and view artifact details.
Input	
Expected Output	This broken and defaced relief depicts the standing Bodhisattva at the right of Buddha who is missing here Though mostly damaged, the layout of this panel illustrates the miracle of Sravasti .
Observed Output	The Scene On The Right Shows Guards And The Scene To The Right Shows Two Wrestlers Are Depicted On Either Side Of The Buddha The One To Pay Farewell To Buddha .
Verdict	Fail

Test Case: TC-3

ID	TC-4
Actors	Admin
Description	Upload Image of the artifact and view artifact details.
Input	
Expected Output	The scene on the right shows guards and The scene to the left represents two worshipers in anjali mudhra venerating a Bodhi tree.
Observed Output	The Scene On The Right Side Shows Queen Maya Standing Under The Sal Tree And Figures Of Reduced Which Symbolizes Many Images Siddhartha .
Verdict	Fail

Test Case: TC-4

ID	TC-5
Actors	Admin
Description	Upload Image of the artifact and view artifact details.
Input	
Expected Output	The garland is arranged in five sections of decoration, each separated by an ornamented band with long ribbons fallen to the ground and two curves lower right and upper left have beaded bands by alternating plain fillets and two curves upper right and lower left four-petalled rosettes and the lower central curve overlapping lanceolate leaves pattern.
Observed Output	The Garland Is Arranged In Five Sections Of Decoration Each Separated By An Ornamented Band With Long Ribbons Fallen To The Ground And Two Curves Upper Right And Upper Left Have Beaded Bands By Alternating Plain Fillets .
Verdict	Pass

Test Case: TC-5

ID	TC-6
Actors	Admin
Description	Upload Image of the artifact and view artifact details.
Input	
Expected Output	The Buddha Is Seated Cross Legged On Rectangular Throne With Thick Base And Cornice Wearing Neckline And Long Robe Covering His Whole Body While The Right Hand Is In Abhaya Pose And The Left Securing Hem Of The Drapery Before His Chest .
Observed Output	The Buddha Is Seated Cross Legged On Rectangular Throne With Thick Base And Cornice Wearing Neckline And Long Robe Covering His Whole Body While The Right Hand Is In Abhaya Pose And The Left Securing Hem Of The Drapery Before His Chest .
Verdict	Pass

Test Case: TC-6

ID	TC-7
Actors	Admin
Description	Upload Image of the artifact and view artifact details.
Input	
Expected Output	Gandharan Corinthian pilaster, enclosed within a recessed rectangular frame and The pilaster is composed of a pyramidal base and square tapering shaft topped by a capital having acanthus leaves each with a drooping lobe motif and the shaft has a long vertical oblong slit with top and bottom curved inwardly and sunk into the centre.
Observed Output	The Columns Have Stepped Base With Plain Tapering Shaft Which Is Terminated With Vertical Oblong Slit With Top And Bottom Curved Inwardly And Sunk Into The Centre .
Verdict	Pass

Test Case: TC-7

7.5 Results

To check the system upload image, The pre-trained VGG-16 model is used to extract features and The encoder-decoder image captioning system would encode the image feature, using pre-trained Convolutional Neural Network that would produce a hidden state. Then, it would decode this hidden state by using an LSTM and generate a caption.

Chapter 8

Conclusion and Future Work

8.1 Conclusion

The Fundamental purpose of the developed system is to help the archeologist and researcher in identifying the artifact. In manual system of identification so much time consumed to identify any new artifact found during their research. To overcome this effort and save their time this developed system identify the artifact by uploading the image of the artifact.

8.2 Future Work

As this system identify the sculptures artifact based on their features. In future it can be used to identify the Coins and Utensils artifact by training on their dataset. At present it is android and web based application, but in Future it can be Desktop Application.