PROJECT REPORT

ON

Image Reconstruction

AT

In the partial fulfillment of the requirement
for the degree of
Bachelor of Technology
in
Information Technology

PREPARED BY

Shikha Patel (IU164100034)

UNDER GUIDANCE OF

External Guide

Mr. Shyam Parmar
Team Leader
AI Developer
(Digimation Technologies Private Limited)

Internal Guide

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SUBMITTED TO

INSTITUTE OF TECHNOLOGY AND ENGINEERING

INDUS UNIVERSITY CAMPUS, RANCHARDA, VIA-THALTEJ

AHMEDABAD-382115, GUJARAT, INDIA,

WEB: www.indusuni.ac.in

MAY 2020

PROJECT REPORT

On

Image Reconstruction

Submitted by

Shikha Patel (IU1641100034)
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In fulfillment for the award of the degree

Of

BACHELOR OF TECHNOLOGY

In

Information Technology

INSTITUTE OF TECHNOLOGY AND ENGINEERING
INDUS UNIVERSITY CAMPUS, RANCHARDA, VIA-THALTEJ
AHMEDABAD-382115, GUJARAT, INDIA,
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MAY 2020

CANDIDATE'SDECLARATION

I declare that final semester report entitled "**Image Reconstruction**" is my own work conducted under the supervision of the guide **Sejal Thakkar.**

I further declare that to the best of my knowledge, the report for B. Tech final semester does not contain part of the work which has been submitted for the award of B. Tech Degree either in this university or any other university without proper citation.

_____

Candidate's Signature

Shikha Patel (IU1641100034)

_____

Guide: Sejal Thakkar
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DIGIMATION
TECHNOLOGIES
Quality | Creativity | Excellence

Date: 1st May, 2020

PROJECT COMPLETION LETTER

This is to certify that **Ms. Shikha Patel (IU1641100034)**,a student of BE (Bachelors of Technology- information Technology), Indus University has successfully completed her final year Project called **Image Reconstruction** in our Organization (**Digimation Technologies Pvt. Ltd**.). During the period of internship program (From 10th December, 2019 to 1st May, 2020) with us, she was found punctual, hardworking and inquisitive. We wish her all the best in her future endeavors.
The Student reported to **Ms. Krupa Rathod**.
The details of the project are given below:

Project Title	Image Reconstruction
Front End Technology	HTML, CSS, JS, jQuery
Back End Technology	Python3 and flask

With Warm Regards,
For, Digimation Technologies Pvt. Ltd.

Ms. Krupa Rathod
IT Project Manager
Royal Technosoft Pvt. Ltd.

INDUS INSTITUTE OF TECHNOLOGY AND ENGINEERING
INFORMATION TECHNOLOGY
2019 -2020

CERTIFICATE

Date: 01/05/2020

This is to certify that the project work entitled "**Image Reconstruction"** has been carried out by **Shikha Patel** under my guidance in partial fulfillment of degree of Bachelor of Technology in **INFORMATION TECHNOLOGY (Final Year)** of Indus University, Ahmedabad during the academic year 2019 - 2020.

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ACKNOWLEDGEMENT

I have put in all my efforts to learn about a completely new topic which was out of our curriculum and work on a project which captivated my interest. However, it would not have been possible without the kind support and help of Digimation technologies who provided me an opportunity of interning at their firm and supervising me throughout the project. I would like to extend my sincere thanks to all of them.

I convey thanks to my project guide Professor Sejal Thakkar, Computer engineering department for providing encouragement, constant support and guidance, which was of great help to complete this project successfully. Also, Sejal ma'am had a great role to play in inspiring us to work hard and write a review paper for our project.

I would like to express my gratitude towards my mentor Mr. Shyam Parmar at Digimation technologies for their kind co-operation and encouragement which helped me in completing this research work project.

My thanks and appreciations also go to my colleagues in developing the project and people who have willingly helped me out with their abilities.

-Shikha Patel

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ABSTRACT

Image reconstruction, or image restoration, refers to recovering the original clean images from corrupted ones. The corruption arises in various forms, such as motion blur, low resolution, and noise. Image noise is ubiquitous due to lack of light, or imperfect camera sensors. Image denoising is a frequently used technique under the large domain of image processing.

Image noise is random variation of brightness or color information in images. There are various types of noises that can occur in an image due to electrical fluctuations, poor lighting or other sources of disturbance. The main aim of image restoration is to remove the noises and get an output image as close as possible to the original image. This project intends to focus on feed-forward denoising Convolutional Neural Networks (i.e. DnCNN) that work on blind gaussian denoising (i.e. handling denoising with unknown noise level), Super resolution and JPEG image deblocking. This algorithm can be used to remove various types of noises that are present in a picture captured from a satellite and other medical images.

COMPANY PROFILE

INTRODUCTION

Established as a development and training company, Digimation Technologies is dedicated to developing apps and software for different platforms. They primarily specialize in working on Apple, Amazon, Android, Windows and other web-based platforms. It has been a constant endeavor at Digimation technologies to help their customers achieve targeted results and get the best value they have paid for. They have resources from all over the globe and a team with immense experience with the changing environments and the particular requirements in this era of stiff competition.

Their vision is activating young leaders in the field of IT using their distinct model of learning, strong research performance and a leading reputation for engagement with industry and the professionals.

COMPANY OVERVIEW

Digimation Technologies is a leading IT company which believes in creativity, Quality and Perfection. Our team continually engages in updating itself and staying ahead with the growing needs of the ever-changing technological world. We prioritize our timelines and have been continually delivering projects on time and some even before.

Here are some of the compelling reasons why to select Digimation as your global software outsourcing partner:

- A-grade consultation planning and developmental advisory
- supportive and incremental in their approach
- builds quality standalone modules which integrated just fine with the pre-existing products platform.

Digimation Technologies have successfully completed 234+ projects with 165+ customers in multiple industries, like Medicine,Journalism, Healthcare, Healthcare, Media & Entertainment, Environment etc.

WHAT COMPANYDOES

This are the services provided byDigimation Technologies:

- Product Development & Maintenance
- Big Data &Analytics
- Cloud Services
- Mobile Apps
- Testing &QA
- UI / UXDesign
- Dedicated DevelopmentCenter
- ERP/CRM development
- SEO and digital marketing
- Integration

Technologies in which Digimationwork:

- PHP
- Java
- Python
- Laravel
- Magento
- WordPress
- iOS
- Android
- ASP.Net
- React
- CodeIgnitor or CakePHP
- Flutter

LIST OF FIGURES

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ABBREVIATION

Abbreviations used throughout this whole document are:

ANN	Artificial Neural Network
CNN	Convolutional Neural Network
ConvNet	Convolutional Neural Network
CRNN	Convolutional Recurrent Neural Network
DAE	Denoising AutoEncoder or Deep AutoEncoder
DL	Deep Learning
DNN	Deep Neural Network
FC	Fully Connected
FCN	Fully Convolutional Network
FC-CNN	Fully Convolutional Neural Network
ML	Machine Learning
MSE	Mean Squared Error
ReLU	Rectified Linear Unit
RNN	Recurrent Neural Network
DnCNNs	Denoising convolutional neural networks
AWGN	Additive white Gaussian noise
GPU	Graphics Processing Unit
SISR	single image super-resolution
CSS	Cascading StyleSheet
DFD	Data Flow Diagram
ER	EntityRelation
HOD	Head of the Department
HTML	Hypertext Markup Language
JS	JavaScript

CHAPTER1

INTRODUCTION

- **PROJECTSUMMARY**
- **PROJECTPURPOSE**
- **PROJECTSCOPE**
- **OBJECTIVE**
  - **MAIN OBJECTIVE**
  - **SECONDARY OBJECTIVE**
- **TECHNOLOGYAND LITERATUREOVERVIEW**
  - **FORNT END TECHNOLOGY**
  - **BACK END TECHNOLOGY**
  - **TOOLS USED**
  - **LITERATUREOVERVIEW**

1.1 PROJECTSUMMARY

A Convolutional Neural Network (ConvNet/CNN) is a Deep Learning algorithm which can take in an input image, assign importance (learnable weights and biases) to various aspects/objects in the image and be able to differentiate one from the other.We have created our own model of networks for training the noisyimages by mapping and comparing them with respective clear images.

It utilizes Batch Normalization and Residual Learning thereby boosting the denoising performance as well as reducing the computation time. The data (i.e. Images) is divided into patches to avoid the redundancies thereby improving the feature extraction.

FEATURES:

- Users can denoise as many images as they want.
- Removal of noise is free of cost.
- We provide a user-friendly interface, a novice in this field can use.
- The process of image denoising is very fast and gives the output in seconds.
- Detailed information about the uses of image denoising is provided on the website. So, any person who is new to the field can also gain knowledge from the website.
- We make sure that the images uploaded by the users are safe.

1.2 PROJECTPURPOSE

The purpose of this project is to contribute towards the research work in the domain of image processing. We are doing this quite simply because as far as we can find, no one has done this to any great degree, or at least, as much as this project willattempt. Our main purpose was to learn about image reconstruction, and about application of deep learning in image processing.

1.3 PROJECTSCOPE

- It can be widely used in computer vision ranging from security and surveillance imaging.
- Image reconstruction can be used in both research and practical applications.
- Biomedical applications, astronomy, and scene analysis for robotic vehicles are also pertinent areas for image reconstruction.
- The satellite application programs in future will be highly based on image processing.

1.4 OBJECTIVE

1.4.1 MAINOBJECTIVE

This can enable users to denoise images and generate a visually pleasing high quality image.

1.4.2 SECONDARYOBJECTIVE

To conduct a research on residual dense convolutional networks and their working on image denoising.

1.5 TECHNOLOGY AND LITERATUREOVERVIEW

1.5.1 FORNT ENDTECHNOLOGY

- HTML5
- Angular Java
- CSS 3
- BOOTSRAP4

- JAVASCRIPT
- jQuery

1.5.2 BACK ENDTECHNOLOGY

- Python
- TensorFlow
- Keras
- Flask
- OpenCV

1.5.3 TOOLS USED

- Google Colab
- Spyder (Anaconda)
- Brackets

1.5.4 LITERATUREOVERVIEW

http://www4.comp.polyu.edu.hk/~cslzhang/paper/DnCNN.pdf

In this paper, we take one step forward by investigating the construction of feed-forward denoising convolutional neural networks (DnCNNs) to embrace the progress in very deep architecture, learning algorithm, and regularization method into image denoising. Specifically, residual learning and batch normalization are utilized to speed up the training process as well as boost the denoising performance.

https://arxiv.org/pdf/1812.10477.pdf

In this work, we propose a novel and efficient residual dense network (RDN) to address this problem in IR, by making a better tradeoff between efficiency and effectiveness in exploiting the hierarchical features from all the convolutional layers.We demonstrate the effectiveness of RDN with several representative IR applications, single image super-resolution, Gaussian image denoising, image compression artifact reduction, and image deblurring

https://arxiv.org/ftp/arxiv/papers/1807/1807.08176.pdf

In this paper, we propose a non-local switching filter convolutional neural network denoising algorithm, named NLSF-CNN, for salt and pepper noise. As its name suggested, our NLSF-CNN consists of two steps, i.e., a NLSF processing step and a CNN training step.Experimental results show that NLSF-CNN outperforms the state-of-the-art denoising algorithms with a few training images.

CHAPTER2

LITERATURESURVEY

- **INTRODUCTION OF SURVEY**
- **WHYSURVEY?**

2.1 INTRODUCTION OFSURVEY

Primary techniques in the field of image denoising are spatial domain filtering and transform domain filtering. Linear filters were adopted to remove noise in the spatial domain, but they failed to preserve image textures. Recently, CNN-based methods have been developed rapidly and have performed well in many low-level computer vision tasks. CNN can be divided into MLP and deep learning

MLP-based image denoising models include auto-encoders and a feed-forward deep network called the trainable nonlinear reaction diffusion (TNRD) model, which achieved a better denoising effect. Its goal is to train a diffusion network with T stages.

The sparse representation models code an image patch as a linear combination of a few atoms chosen out from an over-complete dictionary, and they have shown promising results in various image restoration applications. However, due to the degradation of the observed image (e.g., noisy, blurred and/or down sampled), the sparse representations by conventional models may not be accurate enough for a faithful reconstruction of the original image. (NCRS)

2.2 WHYSURVEY?

The literature review plays a very important role in the research process. It is a source from where research ideas are draw n and developed into concepts and

finally, theories. It also provides the researcher a bird's eye view about the research done in that area so far.

Unlike traditional discriminative models which train specific models for certain noise levels, DnCNN model has the capacity to handle the blind Gaussian denoising with unknown noise level. Moreover, it has showed the feasibility to train a DnCNN model to handle three general image denoising tasks, including Gaussian denoising with unknown noise level, single image super-resolution with multiple upscaling factors.

Gaussian Denoising				
Dataset	Noise Level	BM3D	TNRD	DnCNN-3
		PSNR / SSIM	PSNR / SSIM	PSNR / SSIM
BSD68	15	31.08 / 0.8722	31.42 / **0.8826**	**31.46 / 0.8826**
	25	28.57 / 0.8017	28.92 / 0.8157	**29.02 / 0.8190**
	50	25.62 / 0.6869	25.97 / 0.7029	**26.10 / 0.7076**
Single Image Super-Resolution				
Dataset	Upscaling Factor	TNRD	VDSR	DnCNN-3
		PSNR / SSIM	PSNR / SSIM	PSNR / SSIM
Set5	2	36.86 / 0.9556	37.56 / **0.9591**	**37.58** / 0.9590
	3	33.18 / 0.9152	33.67 / 0.9220	**33.75 / 0.9222**
	4	30.85 / 0.8732	31.35 / **0.8845**	**31.40 / 0.8845**
Set14	2	32.51 / 0.9069	33.02 / **0.9128**	**33.03 / 0.9128**
	3	29.43 / 0.8232	29.77 / 0.8318	**29.81 / 0.8321**
	4	27.66 / 0.7563	27.99 / 0.7659	**28.04 / 0.7672**
BSD100	2	31.40 / 0.8878	31.89 / **0.8961**	**31.90 / 0.8961**
	3	28.50 / 0.7881	28.82 / 0.7980	**28.85 / 0.7981**
	4	27.00 / 0.7140	27.28 / **0.7256**	**27.29** / 0.7253
Urban100	2	29.70 / 0.8994	**30.76 / 0.9143**	30.74 / 0.9139
	3	26.42 / 0.8076	27.13 / **0.8283**	**27.15** / 0.8276
	4	24.61 / 0.7291	25.17 / **0.7528**	**25.20** / 0.7521

Figure 2.1 Model comparison

CHAPTER3

PROJECTMANAGEMENT

- **PROJECT PLANNINGOBJECTIVE**
  - **SOFTWARESCOPE**
  - **RESOURCE**
- **HUMAN RESOURCES**
- **PROJECT DEVELOPMENT APRPROACH**
  - **MODEL**
  - **ADVANTAGES**
- **PROJECTSCHEDULING**
  - **WORK BREAKDOWN STRUCTURE**
  - **PROJECTORGANIZATION**
  - **TIMELINECHART**
  - **TIMEALLOCATION**
  - **TASKSETS**
- **RISK MANAGEMENT**
  - **RISK IDENTIFICATION**
  - **RISK PROJECTION**

3.1 PROJECT PLANNINGOBJECTIVE

Project management objectives are the successful development of the project's procedures of initiation, planning, execution, regulation and closure as well as the guidance of the project team's operations towards achieving all the agreed upon goals within the set scope, time, quality and budget standards

.

3.1.1 SOFTWARESCOPE

- We can induce more types of noises such as gaussian, Poisson, filmy grain, Speckle, etc
- This will increase the efficiency and accuracy of model in long run
- We can introduce various other functionalities to enhance the working of this project by increasing the resolution of the images, getting an HD image from a low-resolution image, etc

3.1.2 RESOURCE

In project management, resources are required to carry out the project tasks. They can be people, equipment, facilities, funding, or anything else capable of definition required for the completion of a project activity

3.1.3 HUMANRESOURCES

Human resources are the people who make up the workforce of an organization, business sector, or economy. "Human capital" is sometimes used synonymously with "human resources", although human capital typically refers to a narrower effect.

This knowledge is composed of the following processes:

- Plan Human Resource Management
- Acquire Project Team
- Develop Project Team

3.1.4 PROJECT DEVELOPMENTAPRPROACH

3.1.4.1 ITERATIVE MODEL

In the Iterative model, iterative process starts with a simple implementation of a small set of the software requirements and iteratively enhances the evolving versions until the complete system is implemented and ready to be deployed.

An iterative life cycle model does not attempt to start with a full specification of requirements. Instead, development begins by specifying and implementing just part of the software, which is then reviewed to identify further requirements. This process is then repeated, producing a new version of the software at the end of each iteration of the model

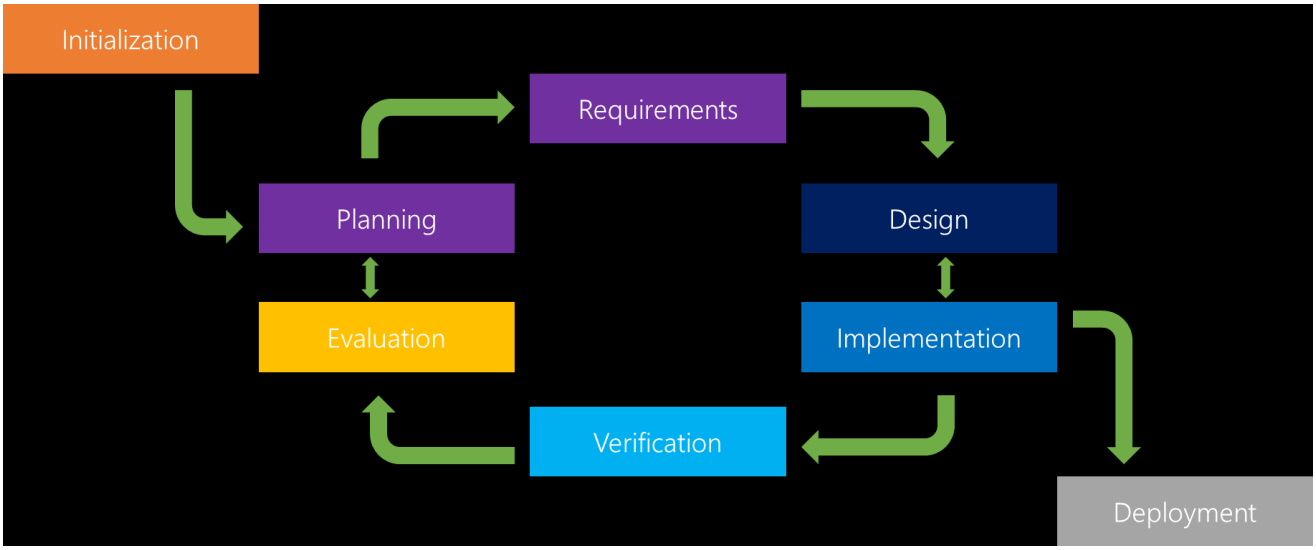


Figure 3.1Iterative Model

3.1.4.1 Advantages of Iterative Model

- Some working functionality can be developed quickly and early in the life cycle.
- Results are obtained early and periodically.
- Parallel development can be planned.
- Progress can be measured.
- Less costly to change the scope/requirements.
- Testing and debugging during smaller iteration are easy.
- Risks are identified and resolved during iteration; and each iteration is an easily managed milestone.
- Easier to manage risk - High risk part is done first.
- With every increment, operational product is delivered.
- Issues, challenges and risks identified from each increment can be utilized/applied to the next increment.
- Risk analysis is better.
- It supports changing requirements.
- Initial Operating time is less.
- Better suited for large and mission-critical projects.

3.2 PROJECTSCHEDULING

Software project scheduling is an activity that distributes estimated effort across the planned project duration by allocating the effort to specific software engineering task.

3.2.1 WORK BREAKDOWN STRUCTURE

Creating a work breakdown structure for any plan or set of tasks helps you get granular about the work that needs to be done on any given project. If you estimate your projects based on units—whether it's weeks, days, or hours—using a work breakdown structure will help you understand very quickly if your estimate will exceed the intended budget or deadline.

- Getting the image dataset using web scrapping, in python.
- Pre-processing: Resizing and renaming the images.
- Inducing different noisesto the images.
- Creating 2 folders with same names: one with noisy images and other with original Images
- Loading the images as a NumPy array and feeding it to DnCNN model for training.
- Model deployment using Flask.
- Testing and debugging.

3.2.2 PROJECTORGANIZATION

A project operates in with people, process and technology of an organization. Projects have an impact on the culture, policies, procedures and other aspects of an organization. The organizational structure has a major influence on the execution of the project. The organizational structure decides the resources, communication methods and other aspects of project management.

Different types of organizational structures include:

- Functional
- Projectized
- Matrix
- Smart Study

3.2.3 TIMELINECHART

3.2.3.1 TIMEALLOCATION

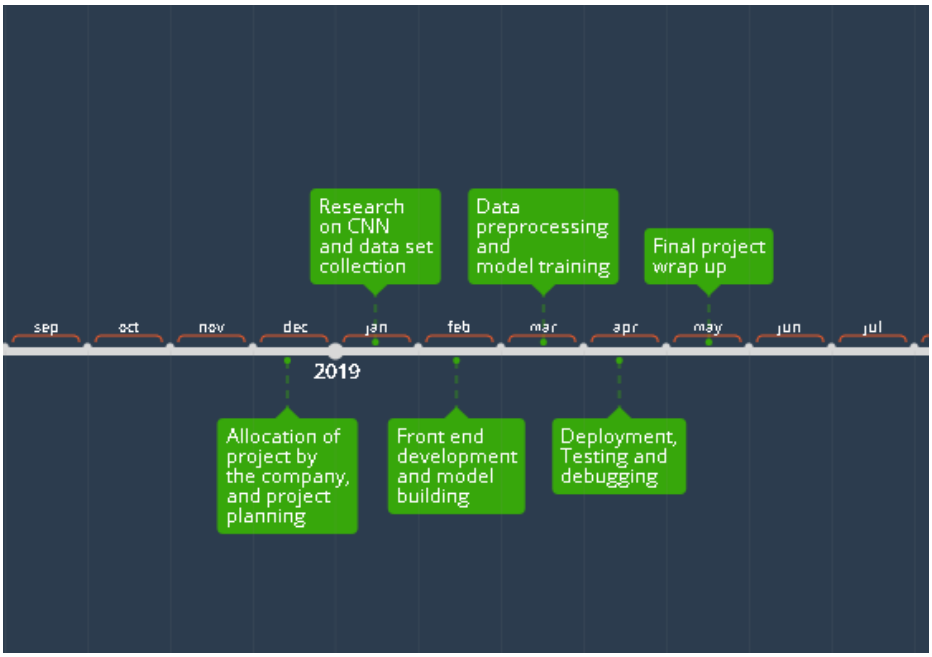


Figure 3.2 Timeline Chart

3.2.3.1 TASKSETS

- **Planning –** Research on CNN and project planning.
- **Design –** Create the front-end design
- **Coding –** Creating model for training.
- **Testing –** Test the model with various types ofinput
- **Delivery –** Deployment of model using flask.

3.3 RISKMANAGEMENT

Risk management is the human activity which integrates recognition of risk (Identification), risk assessment (Analysis), developing strategies to manage it (Planning) and mitigation of risk using managerial resources. Some categories of risk include product size, business impact, and customer-related process, Technology, Development Environment, Staffing, Schedule, and cost.

3.3.1 RISK IDENTIFICATION

- Understanding the words "if you do not actively attack the risk they will attack you", we tried to find all possiblerisks.
- Risk means a danger to the project. By developing an application or a project there are many risks so the risk should have been calculated before the whole application can be accomplished. Risk must be calculated before it spoils the wholesystem.

Id	Risk	Description
1	Failure of internet Connection	Internet connection is also one of the prime requirements for this project. If it fails then one cannot upload the image to denoise.
2	Illiteracy in users	If the users who are going to use this application, if they are not familiar with web applications then also it is a one of the risks that they cannot use the website sufficiently.

Table 3.1 Risk Identification

3.3.2 RISK PROJECTION

Risk Projection is developing and documenting organized, comprehensive, and interactive strategies and methods for identifying risks. The risk planning process considers each of the key risks which have been identified and identifies strategies to manage the risk. Again, there is no simple process which can be followed to established risk management plans. It relies on the judgment and experience of the project development team.

Below table describes the risk and the strategies identified.

These strategies fall into three categories.

- Avoidance strategies: The probability that the risk will arise, will be reduced
- Minimization strategies: Impact of the risk will be reduced.

Contingency plans: If the worst happens, you are prepared for it and have a strategy in place to deal with it.

Id	Risk	Description
1	If project is lagging behind schedule	We need to work more hours than the usual time so we can complete project as soon as possible.
2	If Current Features won't work	We need to analyze new features and understandthe requirements of the People.

Table 3.2 Risk Management

CHAPTER4

SYSTEMREQUIREMENT

- **USERCHARACTERISTICS**
- **FUNCTIONALREQUIREMENT**
- **NON-FUNCTIONALREQUIREMENT**
- **HARDWARE AND SOFTWARE REQUIREMENT**
  - **HARDWAREREQUIREMENT**
  - **SOFTWAREREQUIREMENT**

4.1 USER CHARACTERISTICS

- **Admin**- The admin adds or update or delete any functionalities of the project. It also provides the details of activities, categories and can view contact inquiries.
- **Organization**- The organization can add, update or delete the project which is under that organization.
- **User**- The user can see the list of functionalities and can also gain knowledge about the application of the project.

4.2 FUNCTIONALREQUIREMENT

Functional requirements may involve calculations, technical details, data manipulation and processing and other specific functionality that define what a system is supposed to accomplish. Behavioral requirements describe all the cases where the system uses the functional requirements, these are captured in use cases

- Function requirement means the main requirement that should be satisfied via this project, so the following are the Functional requirement of this system.
- Effective system.
- Maintaining the accuracy and constantly updating to a better model to increase functionalities.
- Regularly checking and replying to the inquiries.

4.3 NON-FUNCTIONALREQUIREMENT

- Should work efficiently even on slow internet Connections.
- Should work accurately for highly corrupted images as well.
- Secure user data.
- Allow requirements changes and can request for updating.
- Provide detailed information about the project on website.

- Provide customer support and feedback facilities.
- Customer Satisfaction.

4.4 HARDWARE AND SOFTWAREREQUIREMENT

4.4.1 HARDWAREREQUIREMENT

Computer
4 GB RAM or More
8 GB GPU
256 HDD or More
i5 Core Processor or Higher

Table 4.1 Hardware Requirement

4.4.2 SOFTWAREREQUIREMENT

Operating System	Linux, windows, iOS, Android, Chrome os
Chrome Browser	Version 64 or above
Safari Browser	Version 9 or above
IE Browser	Version 10 or above
Firefox Browser	Version 24 or above

Table 4.2 Software Requirement

CHAPTER5

SYSTEMANALYSIS

- **STUDY OF CURRENTSYSTEM**
- **PROBLEM IN CURRENTSYSTEM**
- **REQUIREMENT OF NEWSYSTEM**
  - **FUNCTIONALREQUIREMENT**
  - **NON-FUNCTIONALREQUIREMENTS**
- **PROCESSMODEL**
  - **PURPOSE**
  - **CLASSIFICATION OF PROCESSMODELS**
- **FEASIBILITYSTUDY**
  - **TECHNICALFEASIBILITY**
  - **RESOURCE AND TIME FEASIBILITY**
- **FEATURES OF NEWSYSTEM**

5.1 STUDY OF CURRENTSYSTEM

Doing system analysis identifies the overall role of software in a larger system. It is necessary to take a harder look at the software's role – To understand the unspecific requirement that must be achieved to build high-quality software.

Currently, not many websites are available which provide such kind of service in which user can denoise the images.

5.2 PROBLEM IN CURRENTSYSTEM

- It is limited to some noises.
- Also, it has a certain limit for the intensity of the noises. (except gaussian)

5.3 REQUIREMENT OF NEWSYSTEM

5.3.1 FUNCTIONALREQUIREMENT

In this portion we discover all the functionality of our system according to users need like:

- Provide better security mechanism.
- This system has added functionalities like super resolution, jpeg deblocking and deblurring.
- This system saves the time of the user.
- User is able to save the image directly from the output page.
- Allow the visitor to view the demo.

5.3.2 NON-FUNCTIONALREQUIREMENT

- It is web application so there is a risk of unauthorized access. So, in this system, we have to give an appropriate username and password.
- System must beuser-friendly.
- The system must be reliable, accurate and specific.

5.4 PROCESSMODEL

A software process model is a simplified representation of a software process. Each model represents a process from a specific perspective.

5.4.1 PURPOSE

From a theoretical point of view, the meta-process modeling explains the key concepts needed to describe what happens in the development process, on what, when it happens, and why. From an operational point of view, the meta-process modeling is aimed at providing guidance for method engineers and application developers.

5.4.2 CLASSIFICATION OF PROCESSMODELS

- By coverage
- By alignment
- By granularity
- By flexibility

5.5 FEASIBILITYSTUDY

5.5.1 TECHNICALFEASIBILITY

Image Reconstruction is a complete web-based application. The main technology and tools that are associated with it are:

- Python
- HTML

- CSS
- Google Colab
- jQuery
- TensorFlow
- Keras
- JS
- Flask

5.5.2 RESOURCEFEASIBILITY

Resources those are required for Image Reconstruction project includes

- Programming device(Laptop)
- Hosting space (FreelyAvailable)
- Programming tools (FreelyAvailable)
- Programming individuals

So, it’s clear that the project has the required resource feasibility.

5.6 FEATURES OF NEWSYSTEM

- Provide better security mechanism.
- This system has added functionalities like super resolution, jpeg deblocking and deblurring.
- This system saves the time of the user.
- User is able to save the image directly from the output page.
- Allow the visitor to view the demo.
- It is web application so there is a risk of unauthorized access. So, in this system, we have to give an appropriate username and password.
- System must be user-friendly.
- The system must be reliable, accurate and specific.

CHAPTER6

DETAILDESCRIPTION

- **USER/EMPLOYEE MODULE**

6.1 USER/EMPLOYEEMODULE

The User Administration gives the administrator access to perform a number of important actions related to system users.

From the user admin module, you can:

- The admin adds or update or delete any functionalities of the project.
- It also provides the details of activities, categories and can view contact inquiries.

From the user organization module, you can:

- The organization can add, update or delete the project whichis under that organization.

CHAPTER7

TESTING

- **TESTCASES**
  - **ADMINSIDE**
  - **USERSIDE**

7.1 TESTCASES

In software engineering, the most common definition of a test case is a set of conditions or variables under which a tester will determine if a requirement or use case upon an application is partially or fully satisfied.

It may take many test cases to determine that a requirement is fully satisfied. In order to fully test that all the requirements of an application are met, there must be at least one test case for each requirement unless a requirement has sub requirements. In that situation, each sub requirement must have at least one test case.

7.1.1 ADMINSIDE

Id	Test Case Description	Pre-condition	Test Step	Expected Output	Actual Output	Result
1	Dataset testing	Same size images for dataset.	Enter normal images and get images with different noises induced.	Noisy images for every corresponding clean image.	Noisy images for every corresponding clean image.	PASS
2	Unzipping and loading images as a list.	The drive is mounted to colab. "Images.rar" should be present in the "content" folder.	Enter Linux command for unzipping and loading of images.	Two folders created under "content". 1) Noisy_images 2) Orig_images	Two folders created under "content". 1)Noisy_images 2)Orig_images	PASS
3	Testing noisy images dataset after training it with simple CNN.	Images trained using different CNN layers with activation function mean squared error.	Input a noisy image in the model.	Clean image with high accuracy and low loss.	Noisy image with higher loss than expected.	FAIL

4	Testing noisy images dataset after training it with Residual dense CNN. (DnCNN)	Images trained using Residual dense CNN and activation functions like ReLu and SoftMax.	Input a noisy image in the model	Clean image with high accuracy and low loss.	Clean image with high accuracy for gaussian noise and satisfactory for others.	PASS
5	Deployment of project through Flask.	Front end HTML, CSS and JS documents should be saved in specific folders. “Model.h5” file should be given an appropriate path.	Generate specific Ip by running flask in python.	Website should open and work with the specified ip.	Website works properly with the specified ip.	PASS

Table 7.1 Admin Side

7.1.2 USERSIDE

Id	Test Case Description	Test Step	Expected Output	Actual Output	Result
1	Home Page	User opens the website home page with the given ip.	Home page loaded properly with all the designs, content and animations viewable by the users.	Home page loaded properly with all the designs, content and animations viewable by the users.	PASS
2	Try now	Click on try now on the home page.	Redirected to “Page.html” in which you can select your image to be denoised.	Redirected to “Page.html” in which you can select your image to be denoised	PASS
3	Predict	Click on upload image and submit it to get clean image.	Redirected to the “Test.html” page in which you get your denoised image.	Redirected to the “Test.html” page in which you get your denoised image.	PASS

Table 7.2 User Side

CHAPTER8

SYSTEMDESIGN

- **MODEL DIAGRAM**
- **USE – CASEDIAGRAM**
- **SEQUENCEDIAGRAM**
- **DATA FLOW DIAGRAM**
- **ACTIVITY DIAGRAM**

8.1 MODELDIAGRAM

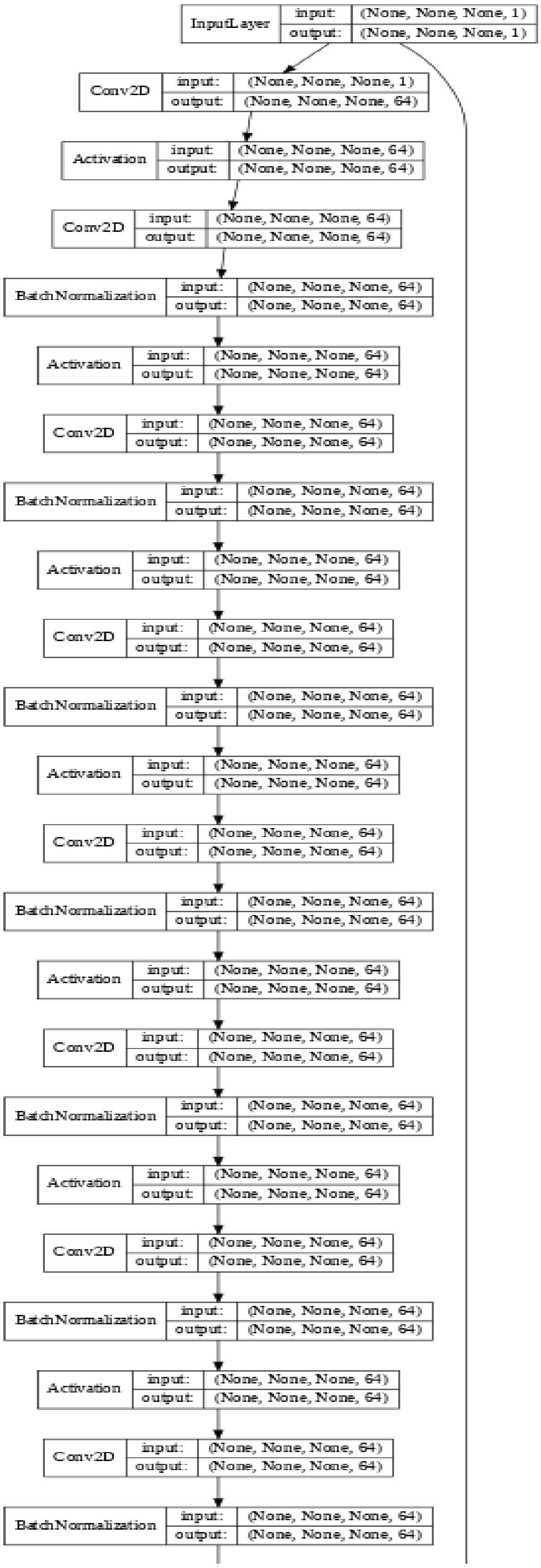
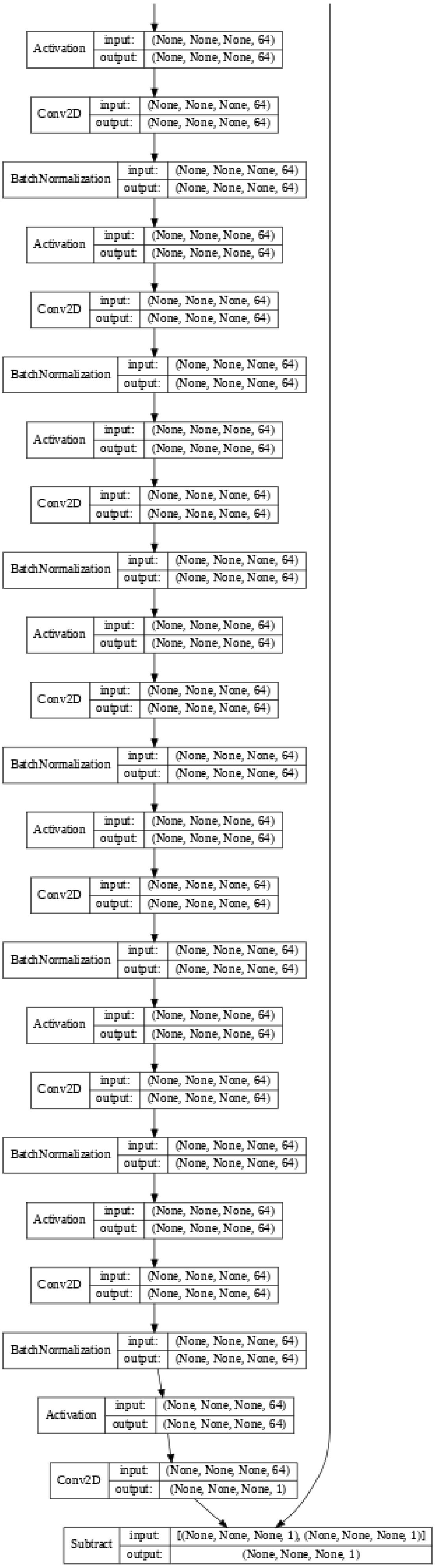


Figure 8.1 Model Diagram


Activation input: (None, None, None, 64) output: (None, None, None, 64)
Conv2D input: (None, None, None, 64) output: (None, None, None, 64)
BatchNormalization input: (None, None, None, 64) output: (None, None, None, 64)
Activation input: (None, None, None, 64) output: (None, None, None, 64)
Conv2D input: (None, None, None, 64) output: (None, None, None, 64)
BatchNormalization input: (None, None, None, 64) output: (None, None, None, 64)
Activation input: (None, None, None, 64) output: (None, None, None, 64)
Conv2D input: (None, None, None, 64) output: (None, None, None, 64)
BatchNormalization input: (None, None, None, 64) output: (None, None, None, 64)
Activation input: (None, None, None, 64) output: (None, None, None, 64)
Conv2D input: (None, None, None, 64) output: (None, None, None, 64)
BatchNormalization input: (None, None, None, 64) output: (None, None, None, 64)
Activation input: (None, None, None, 64) output: (None, None, None, 64)
Conv2D input: (None, None, None, 64) output: (None, None, None, 64)
BatchNormalization input: (None, None, None, 64) output: (None, None, None, 64)
Activation input: (None, None, None, 64) output: (None, None, None, 64)
Conv2D input: (None, None, None, 64) output: (None, None, None, 64)
BatchNormalization input: (None, None, None, 64) output: (None, None, None, 64)
Activation input: (None, None, None, 64) output: (None, None, None, 64)
Conv2D input: (None, None, None, 64) output: (None, None, None, 64)
BatchNormalization input: (None, None, None, 64) output: (None, None, None, 64)
Activation input: (None, None, None, 64) output: (None, None, None, 64)
Conv2D input: (None, None, None, 64) output: (None, None, None, 1)
Subtract input: [(None, None, None, 1), (None, None, None, 1)] output: (None, None, None, 1)

8.2 USE – CASEDIAGRAM

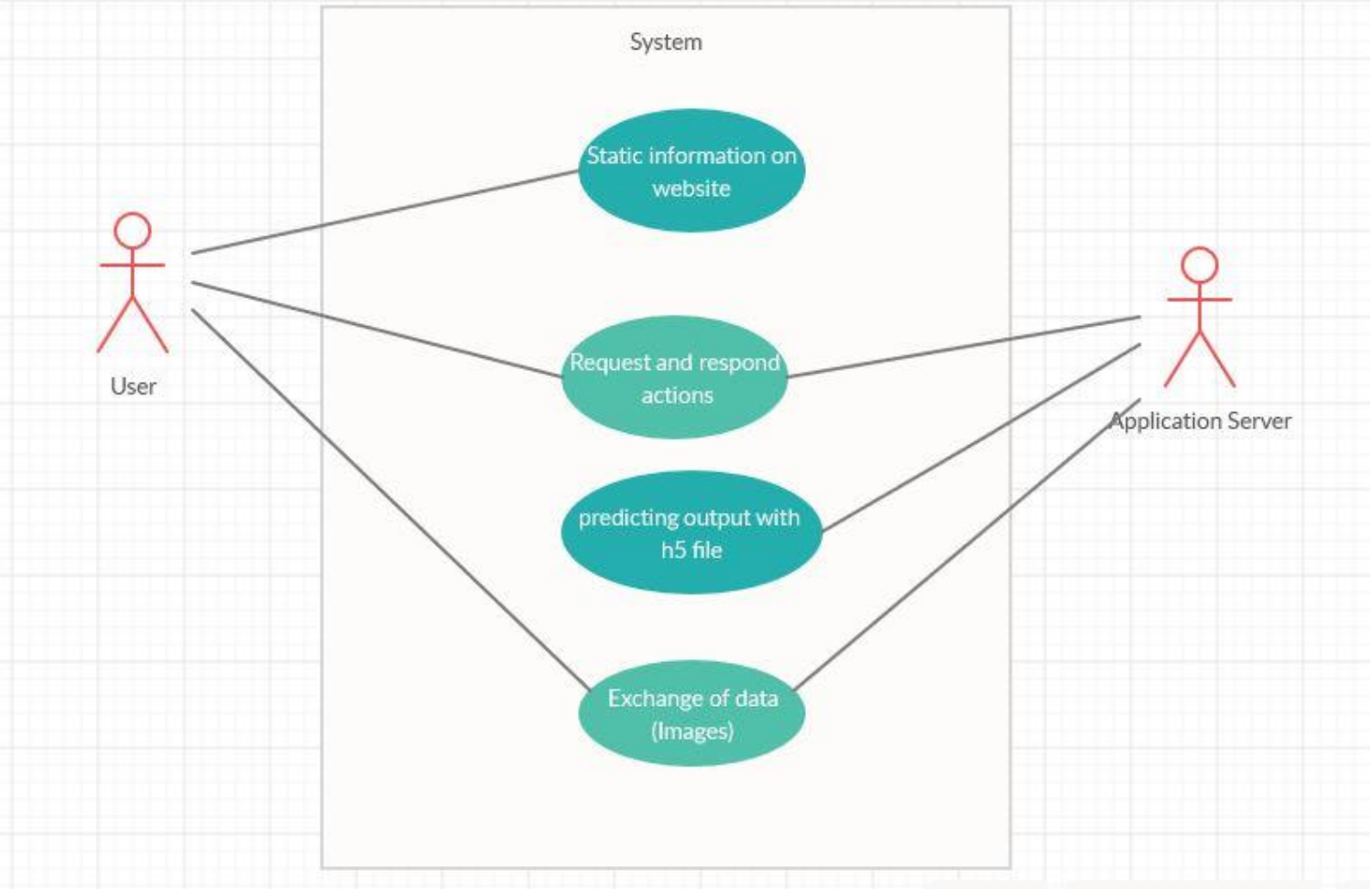


Figure 8.2 Use Case Diagram

8.3 SEQUENCEDIAGRAM

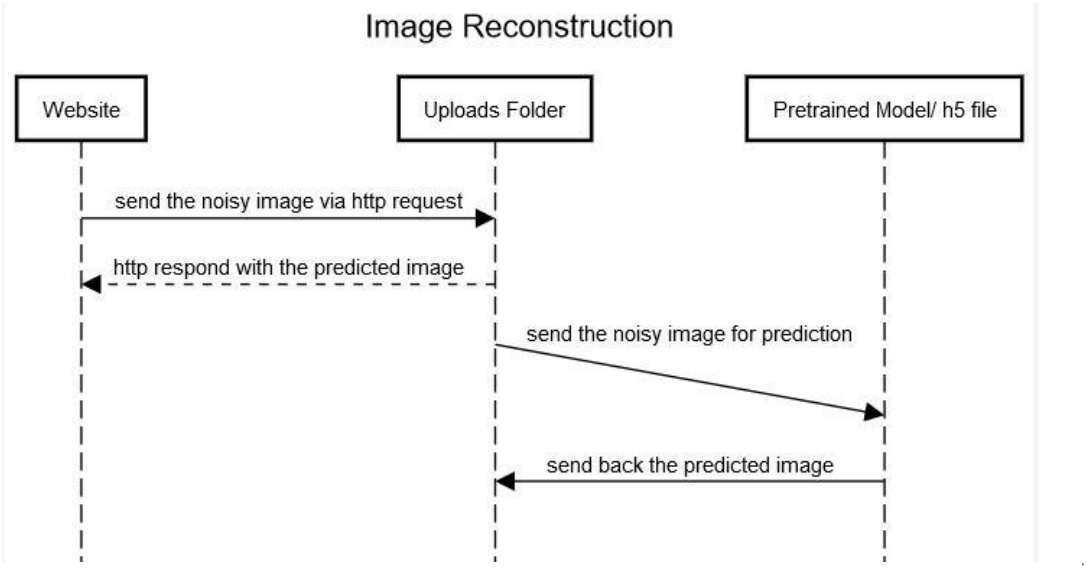


Figure 8.3Sequence Diagram

8.4DATA FLOW DIAGRAM

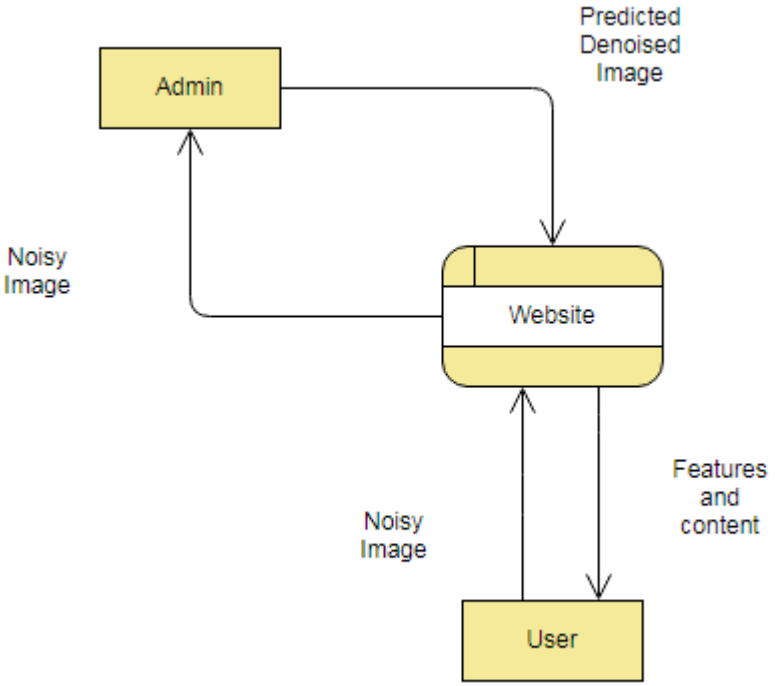


Figure 8.4 Data Flow Diagram

8.5 ACTIVITYDIAGRAM

Figure 8.5 Activity Diagram

CHAPTER9

LIMITATIONSAND FUTURE ENHANCEMENT

- **LIMITATION**
- **FUTUREENHANCEMENT**

9.1 LIMITATION

- It is limited to specific noisesi.e. there might be some noiseswhich cannot be trained with high accuracy.
- We can induce more types of noises such as gaussian, Poisson, filmy grain, Speckle, etc.
- ConvNets only capture local “spatial” patterns in data.
- If the data can’t be made to look like an image, ConvNets are less useful.

9.2 FUTUREENHANCEMENT

- We can induce more types of noises such as Salt, Salt and pepper, filmy grain, etc.
- This will increase the efficiency and accuracy of model in long run
- We can introduce various other functionalities to enhance the working of this project by increasing the resolution of the images, getting an HD image from a low-resolution image, JPEG deblocking, Deblurring, etc.

CHAPTER10

CONCLUSION

- **CONCLUSION**

10.1 CONCLUSION

Image Reconstruction is a web application designed to denoise the noisy images uploaded by the users. The 'Image Reconstruction' website has listed the applications of image denoising in different fields where one can gain knowledge about denoising and its uses. They can denoise their images anywhere, anytime.

Presently, there are only a few websites available which provide denoising of images free of cost to amateurs. So as a solution to this we are going to propose a web-based application through which the people can remove noises like gaussian, speckle and Poisson. All the users who want to denoise their image can directly go to the try now page and upload their image. The admin has all the records of the images uploaded. She also gets the contact inquiries given by the user.

To recapitulate, image reconstruction can be successfully used for research purposes as well as application purposes in field of medical, astronomy, security and surveillance and photography. This domain of Image processing is refined yet active topic in computer vision due to its wide range of applications.

CHAPTER11

APPENDICES

- **BUSINESSMODEL**
- **SCREENSHOTS**

11.1 BUSINESSMODEL

A business model describes the rationale of how an organization creates, delivers, and captures value, in economic, social, cultural or other contexts. The process of business model construction and modification is also called business model innovation and forms a part of business strategy.

In theory and practice, the term business model is used for a broad range of informal and formal descriptions to represent core aspects of a business, including purpose, business process, target customers, offerings, strategies, infrastructure, organizational structures, sourcing, trading practices, and operational processes and policies including culture.Creating a business model of a company involves a combination of the following characteristics:

Distribution Approach: The most important business model characteristic is the distribution approach that a company uses to provide services or create products for customers. We distinguish three main **distribution approaches** that can be used: **on-premise, cloud, and hybrid.**

Source code licensing: Based on licensing of source code the company creates, the software may be **proprietary** or **open-source** code.

Revenue Streams: A software **revenue stream** defines the way company is paid for its products and services. A business model can make use of one or several revenue streams. For instance, software product revenue streams can include ad revenue, sales, subscriptions, and their combinations.

BMI: Software companies inevitably choose between two types of **business model interactions** while forming its business model. It can take a form of **one-to-many** or **many-to-many.**

11.2 SCREENSHOTS

1) HomePage

Figure 11.1 Home Page

2) About

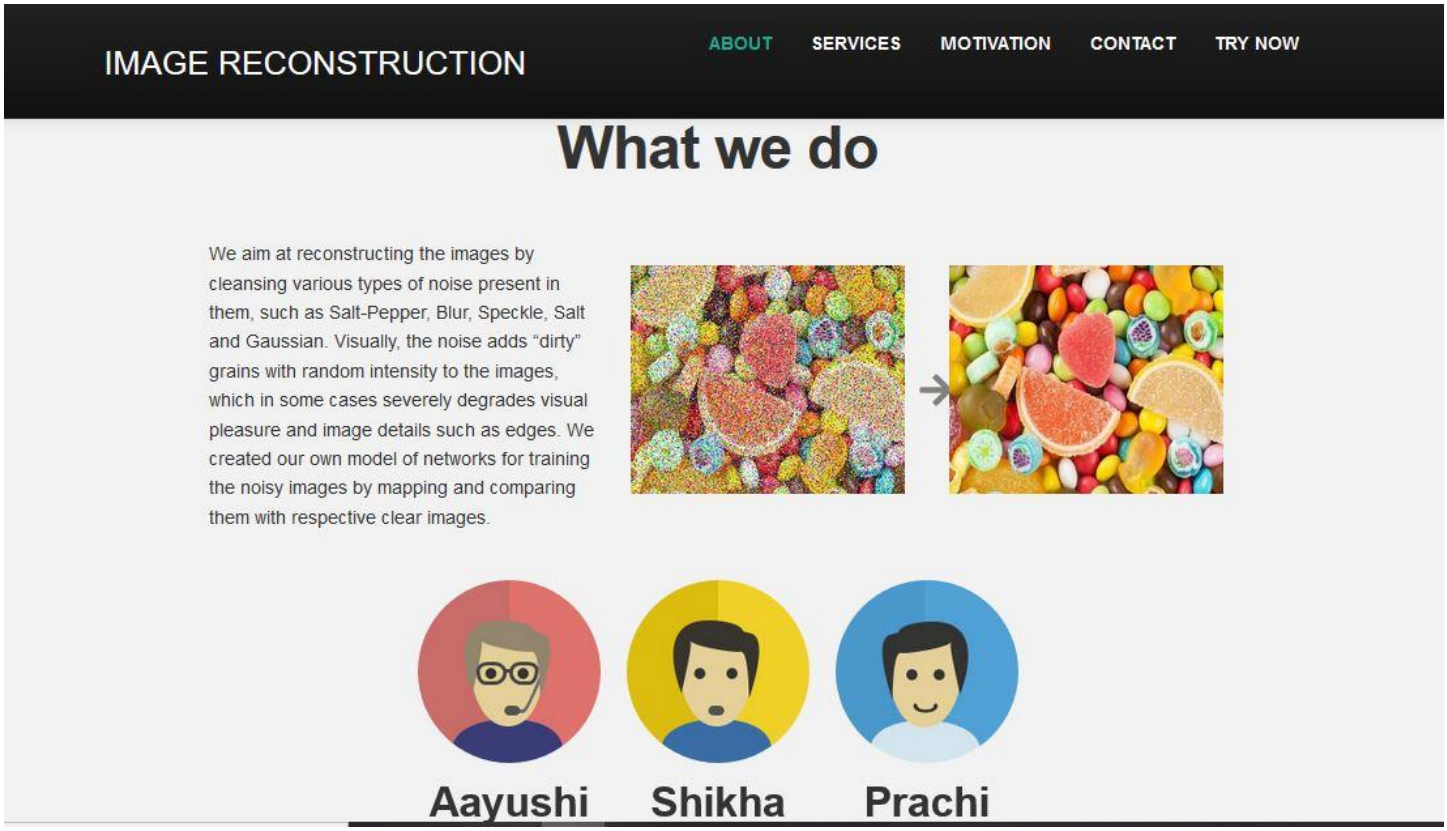


Figure 11.2 About

3) Services

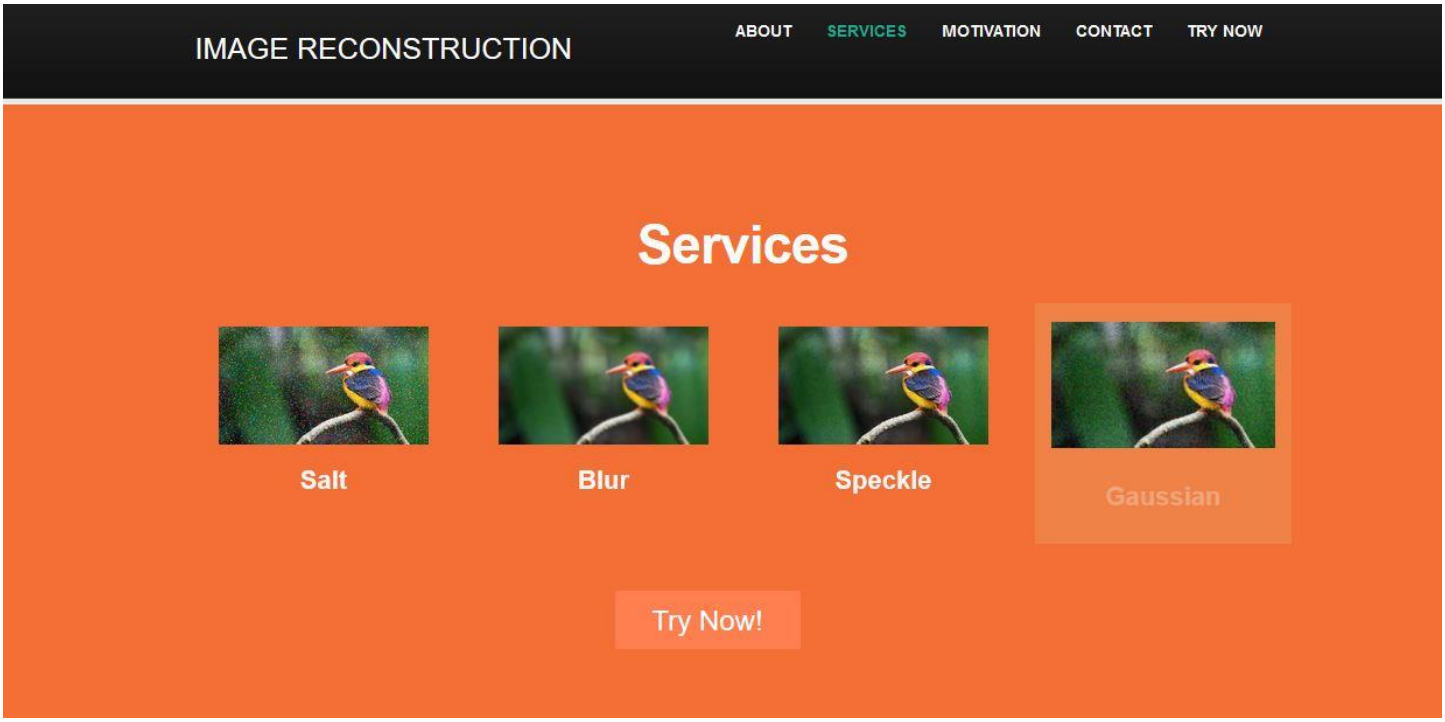


Figure 11.3 Services

4) Motivation

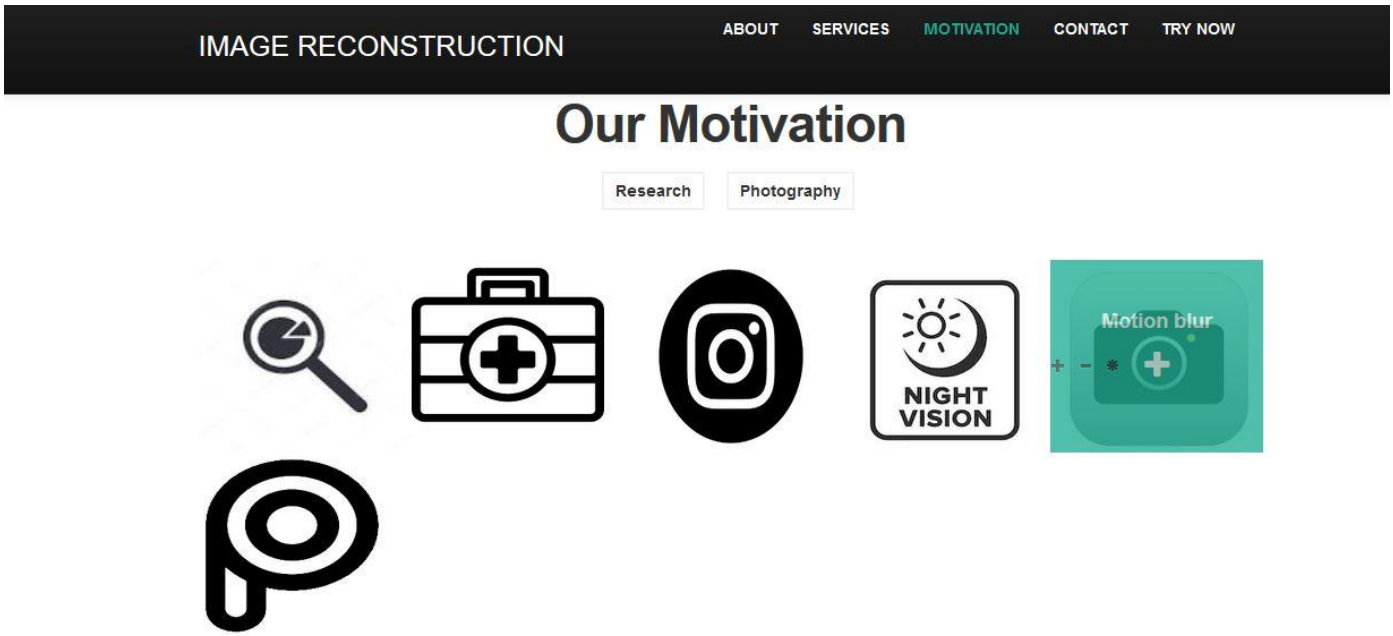


Figure 11.4Motivation

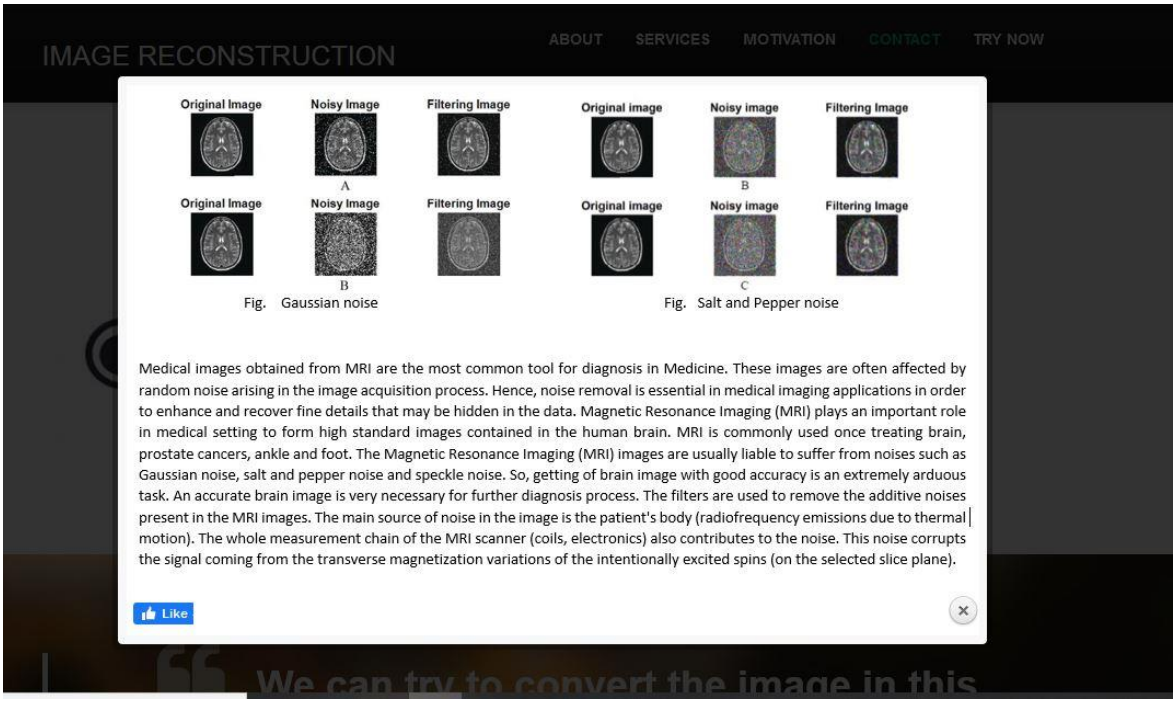


Figure 11.4.1 Healthcare

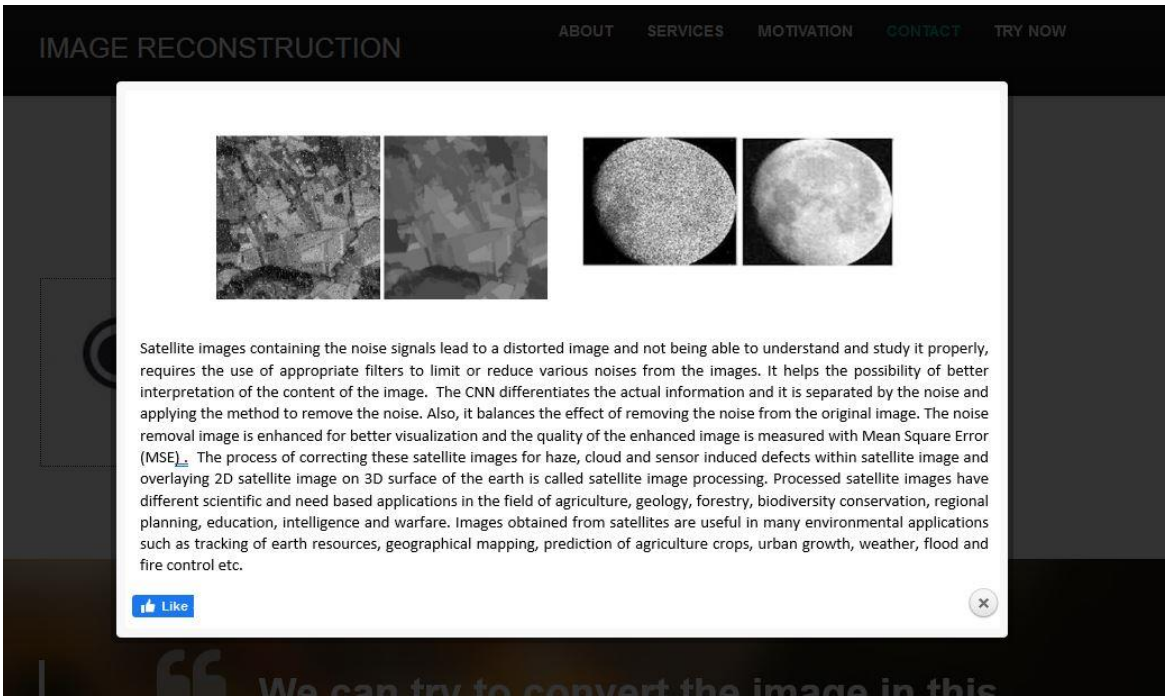


Figure 11.4.2 Space Research

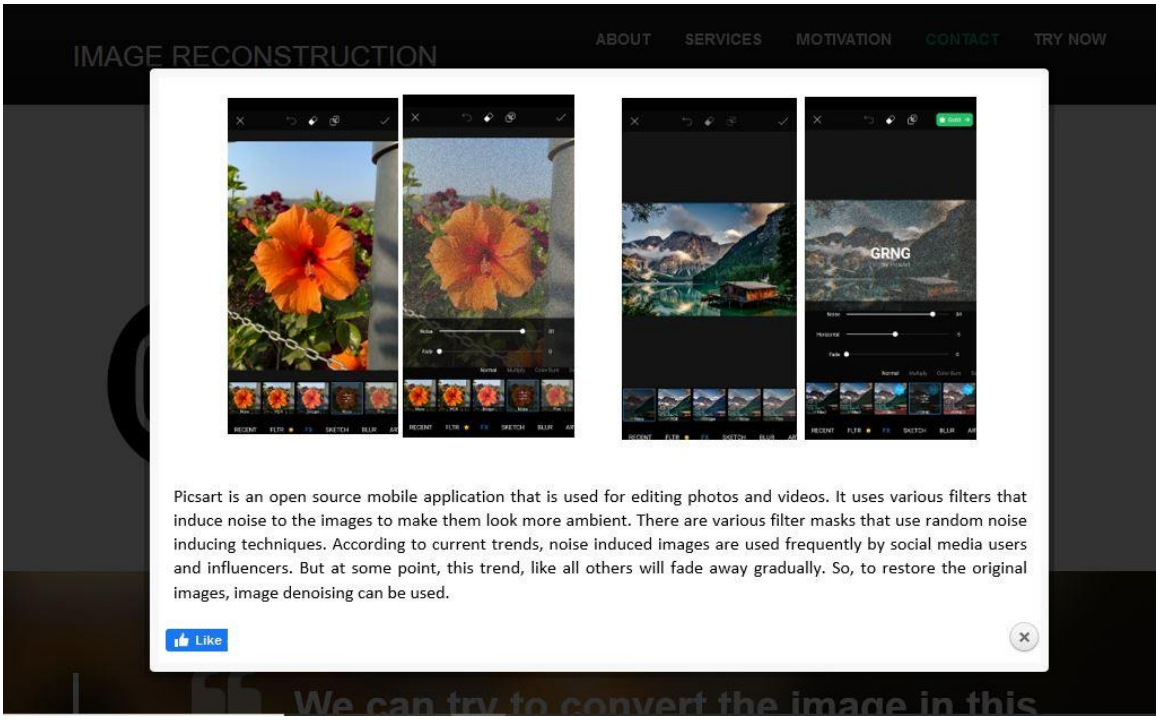


Figure 11.4.3 Picsasrt

5) ContactPage

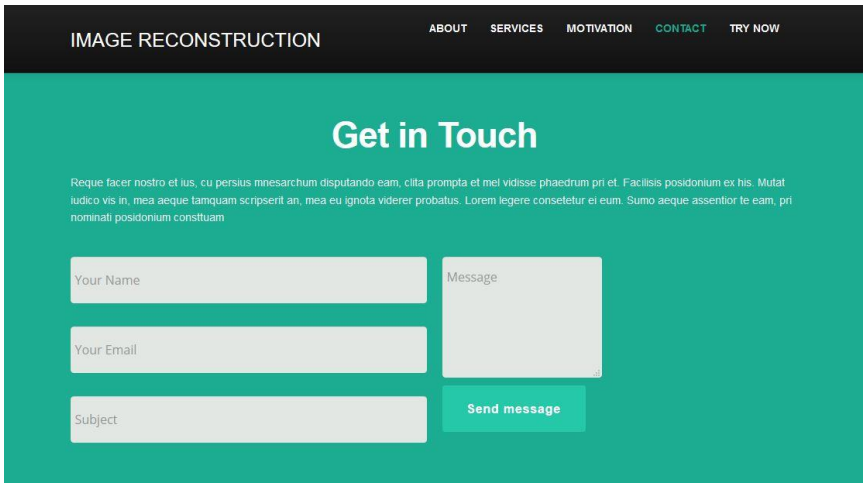


Figure 11.5 Contact Page

6) Page.html

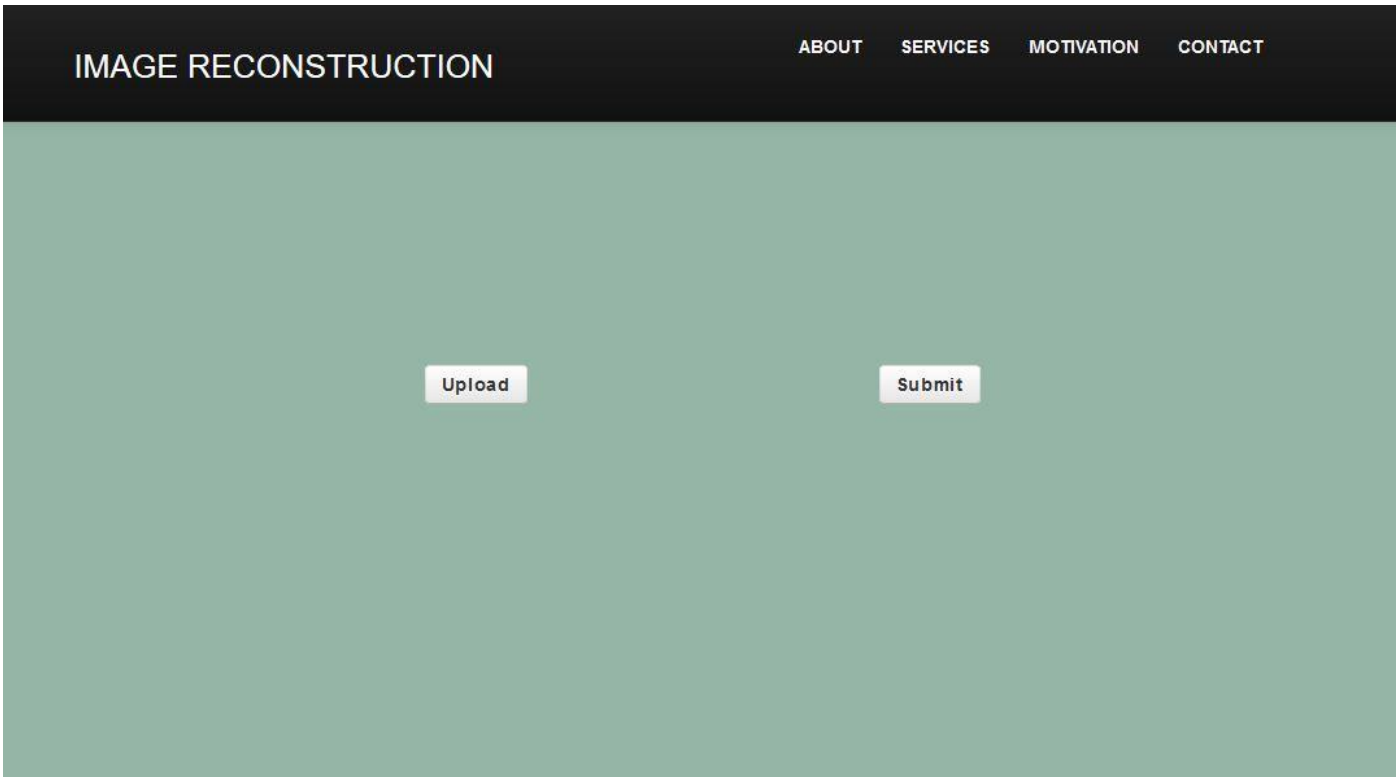


Figure 11.6Page.html

7) Uploading

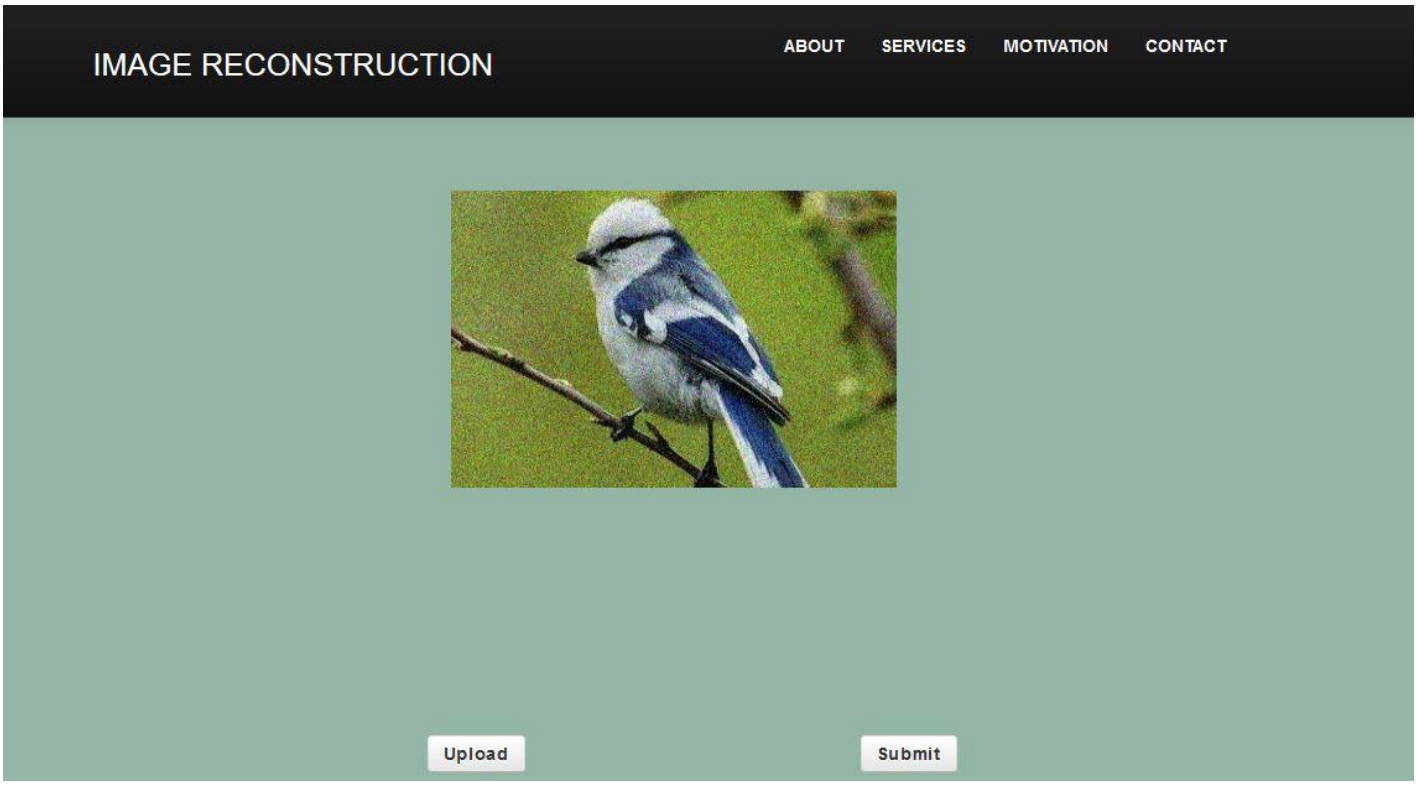


Figure 11.7Uploading

8) Denoised

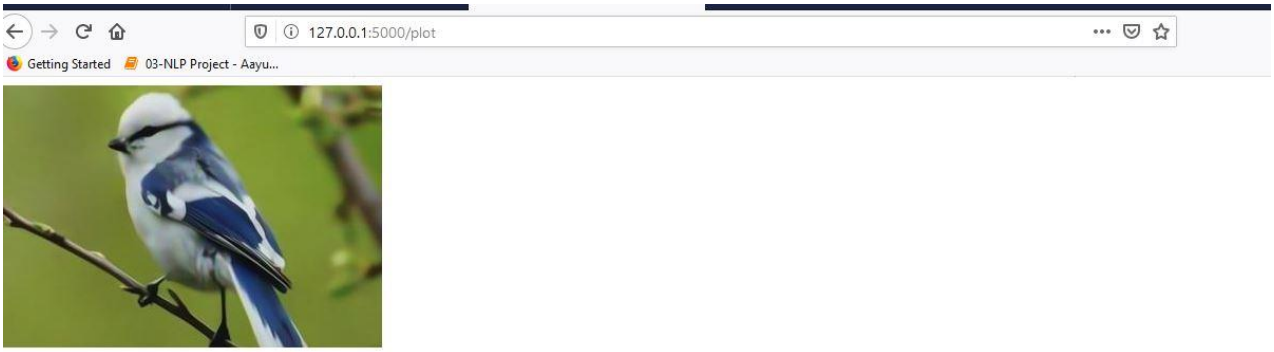


Figure 11.8Denoised

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- Referring fromhttps://keras.io/
- Referring fromhttps://www.tensorflow.org/
- Referring fromhttps://pythonhow.com/

Reference Research Papers:

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  DenoisingZhang, WangmengZuo, Senior Member, IEEE, Yunjin Chen,

  Deyu Meng, Member, IEEE,and Lei Zhang Senior Member, IEE
- Trainable Nonlinear Reaction Diffusion: A Flexible Frameworkfor

  Fast and Effective Image Restoration, IEEE Yunjin Chen and Thomas Pock

EXPERIENCE

EXPERIENCE

My experience at 'Digimation Technologies Pvt Ltd' was delightful and pleasing. The work environment at Digimation always helped me focus on learning new things and constantly implementing the things I learned on our live project.
We were mainly trained in the domain of deep learning. Following are the topics we learned at Digimation:

I. Python
II. Machine Learning Basics
III. Deep Learning – CNN, Image Processing Basics
IV. C++ Basics

I got to learn a lot about Image Processing throughout the Image Denoising Project. We learned about filtering in special domain, the effect of Convolutional Neural Networks on image training, Web scrapping and a much more. The work culture at Digimation was very friendly and kind. Our project guide has always been helpful in every way possible. My overall experience at Digimation helped me nurture my inner strength and work hard to achieve accomplishment.