

TEAM DETAILS

TEAM ID	PNT2022TMID21994
BATCH	B4-4M6E
TEAM MEMBERS	Dhanush A Hariharan N Antony Roshik L Aravindan S
PROJECT TITLE	Digital Naturalist - AI Enabled Tool For Bio Diversity Researchers

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1. INTRODUCTION

1.1 Project Overview

A naturalist is someone who studies the patterns of nature, identifies a different kind of flora and fauna in nature. Being able to identify the flora and fauna around us often leads to an interest in protecting wild spaces, and collecting and sharing information about the species we see on our travels is very useful for conservation groups like NCC.

When venturing into the woods, field naturalists usually rely on common approaches like always carrying a guidebook around everywhere or seeking help from experienced ornithologists. There should be a handy tool for them to capture, identify and share the beauty to the outside world.

Field naturalists can only use this web app from anywhere to identify the birds, flowers, mammals and other species they see on their hikes, canoe trips and other excursions.

In this project, we are creating a web application which uses a deep learning model, trained on different species of birds, flowers and mammals and get the prediction of the bird when an image is been given.

1.2 Purpose

The main purpose of the project is to detect the name of different flora and fauna in different areas around the world. This helps many people to know about different species of flora and fauna which exist in the world and also helps naturalist.

The specific goals of the drowning project:

- 1) To identify the different species in the world
- 2) AI used in this project.
- 3) Increase awareness on distinct species.

2. LITERATURE SURVEY

1.	Paper title	“Automatic Bird-Species Recognition using the Deep Learning and Web Data Mining”.Kang, Min-Seok, and Kwang-Seok Hong. In 2018 International Conference on Information and Communication Technology Convergence(ICTC),pp. 1258-1260. IEEE, 2018.
	Problem definition	<ul style="list-style-type: none"> • First, if you enter the name of the targeted birdbreed, the image will be collectedfrom the Web using the image crawl. • To refine the collected images into the training dataset, the corrupted image is corrected and deleted, the outlier is removed,and finally the image is expanded to obtain the refined training data.
	Methodology/Algorithm	<ul style="list-style-type: none"> • Deep Neural Network (DNN) • Convolutional Neural Network (CNN) • Tensorflow Framework • Back Propagation
	Advantages	<ul style="list-style-type: none"> • It is used in various applications like the image recognition, video analysis,natural language processing, and drug discovery • The performances are improving annually.
	Disadvantages	<ul style="list-style-type: none"> • Birdwatching is a common hobby but to identify their species requires theassistanceof bird books.

2.	Paper title	“Rare Animal Image Recognition Based on Convolutional Neural Networks” .Hao, Xinyu, Guangsong Yang, Qiubo Ye, and Donghai Lin. In 2019 12th International Congress on Image and Signal Processing, BioMedical Engineering and Informatics (CISP-BMEI), pp. 1-5. IEEE, 2019.
	Problem definition	<ul style="list-style-type: none"> • Rare animal image recognition based on thebasic model of CNNs, by which to autonomously extract the image features in the training set • Construct an image recognition system to identify rare animals
	Methodology/Algorithm	<ul style="list-style-type: none"> • Convolutional neural networks(CNN) • Matrix Multiple CNN (MMCNN) • Deep learning Convolutional neural network
	Advantages	<ul style="list-style-type: none"> • Compared with ordinary neural networks, the advantages of simple operation and small computational complexity are very beneficial for the application Compared with ordinary neural networks

		<ul style="list-style-type: none"> the advantages of simple operation and small computational complexity are very beneficial for the application and promotion of many industries. The subsequent work of this research is to improve the network structure to improve the recognition accuracy while reducing the computational complexity.
	Disadvantages	<ul style="list-style-type: none"> The subsequent work of this research is to improve the network structure to improve the recognition accuracy while reducing the computational complexity.

3.	Paper title	“Image Classification Using Deep Neural Network”. Tiwari, Vaibhav, Chandrasen Pandey, Ankita Dwivedi, and Vrinda Yadav. In 2020 2nd International Conference on Advances in Computing Communication Control and Networking (ICACCCN), pp. 730-733. IEEE, 2020.
	Problem definition	<ul style="list-style-type: none"> Image Classification is widely used in various fields such as Plant leaf disease classification, facial expression classification. To make bulky images handy, image classification is done using the concept of a deep neural network.
	Methodology / Algorithm	<ul style="list-style-type: none"> Deep Neural Network VGG , Image Classification Convolutional Neural Network (CNN)
	Advantages	<ul style="list-style-type: none"> An initial interesting point is that the common design principles of the VGG models since it performed best in the competition called ILSVRC 2014[10] It is very simple and easy to comprehend and implement this modular construction of the architecture.
	Disadvantages	<ul style="list-style-type: none"> It is extremely expensive to train due to complex data models. Moreover deep learning requires expensive GPUs and hundreds of machines. This increases cost to the users.

4.	Paper title	“Detection and classification of opened and closed flowers in grape inflorescences using Mask R-CNN”. Pahalawatta, Kapila, Jaco Fourie, Amber Parker, Peter Carey, and Armin Werner. In 2020 35th International Conference on Image and Vision Computing New Zealand (IVCNZ), pp. 1-6. IEEE, 2020.
	Problem definition	<ul style="list-style-type: none"> • This is because it involves the processing of images with varying image qualities, and also because of the close similarity in images between the two classes of interests, opened and closed flowers. • Our aim is to build a system with one of the most promising deep learning object detection networks, Mask R-CNN, to detect the individual instances of the above two classes separately using the images with no prior alterations
	Methodology/Algorithm	<ul style="list-style-type: none"> • R- Convolutional Neural Network (R-CNN) • Convolutional Neural Network (CNN)
	Advantages	<ul style="list-style-type: none"> • The similarity of instance shapes between the two classes, opened and closed flowers, and also the similarity of pixel texture between opened and closed flowers makes the purely image processing based instance segmentation a challenging task.
	Disadvantages	<ul style="list-style-type: none"> • Model accuracy was tested by letting the model extract and segment flower instances from images that were not in the training set.

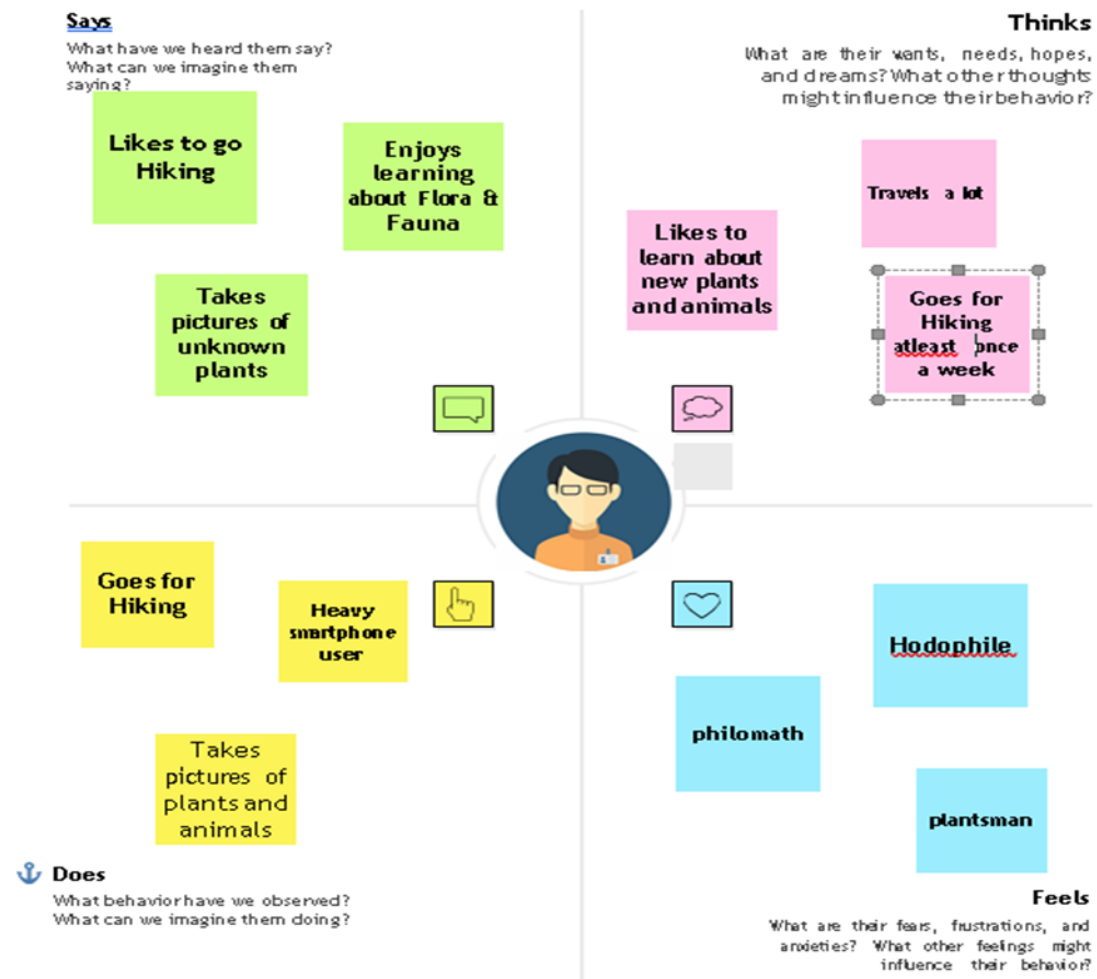
5.	Paper title	“Convolutional Network based Animal Recognition using YOLO and Darknet”. Reddy, B. Karthikeya, Shahana Bano, G. Greeshmanth Reddy, Rakesh Kommineni, and P. Yaswanth Reddy. In 2021 6th International Conference on Inventive Computation Technologies (ICICT), pp. 1198-1203. IEEE, 2021.
	Problem definition	<ul style="list-style-type: none"> • The main goal of this research work to build an animal recognition methodology using YOLOV3 model. • The image of animal will be given as input, then it will display the name of the animal as output by using YOLOV3 model. • The detection is done by using a pre-trained coco dataset from darknet.
	Methodology/Algorithm	<ul style="list-style-type: none"> • YOLO V3 • Darknet • Convolutional network • Detector • Opencv
	Advantages	The image which are predicted correct type of animal name
	Disadvantages	<ul style="list-style-type: none"> • Wrong output means the images which are predicted a different name rather than the correct name of the given input image. • No output means it is not able to predict the given input images.

2.1 Problem Statement Definition:


Problem Statement (PS)	I am (Customer)	I'm trying to	But	Because	Which makes me feel
PS-1	Ornithologist	Conduct are search on different species of birds.	I could not find a proper site for my work.	Most of the sites are not providing proper information.	outraged
PS-2	Marine biologist	Identify unnamed sea species.	no one helped me to figure out them	We don't have a proper database	frustrated
PS-3	Travel freak	Create a vlog on cryptids	I need some resources to publish them in my social media	Even Wikipedia have no facts on cryptids	exhausted
PS-4	Farmer	Eradicate weeds and pest in my farms using technology	I could not find a proper tool to identify The pests	The cost of setup is more and data availability is less	disturbed
PS-5	Biologist	Conduct are search on different species of plants	I am not able to classify the plants based on their nature	They all look similar and there is are dundancy of data	depressed

3. IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas



3.2 Ideation & Brainstorming



Brainstorm & idea prioritization

🕒 10 minutes to prepare
🕒 1 hour to collaborate
👥 2-8 people recommended

Before you collaborate

⌚ 10 minutes

A Team gathering
Define who should participate in the session and send an invite. Share relevant information or pre-work ahead.

B Set the goal
Think about the problem you'll be focusing on solving in the brainstorming session.

C Learn how to use the facilitation tools
Use the Facilitator Superpowers to run a happy and productive session.

1


Digital Naturalist - AI Enabled Tool For Biodiversity Researchers

A naturalist is someone who studies the patterns of nature, identifies a different kind of flora and fauna in nature. Being able to identify the flora and fauna around us often leads to an interest in protecting wild spaces, and collecting and sharing information about the species we see on our travels is very useful for conservation groups like NCC.

When venturing into the woods, field naturalists usually rely on common approaches like always carrying a guidebook around everywhere or seeking help from experienced ornithologists. There should be a handy tool for them to capture, identify and share the beauty to the outside world.

Field naturalists can only use this web app from anywhere to identify the birds, flowers, mammals and other species they see on their hikes, canoe trips and other excursions. In this project, we are creating a web application which uses a deep learning model, trained on different species of birds, flowers and mammals (2 subclasses in each for a quick understanding) and get the prediction of the bird when an image is given.

TECHNICAL ARCHITECTURE:



Brainstorm

10 minutes

There are 100 countries in the world.	There are 100 countries in the world.	There are 100 countries in the world.
There are 100 countries in the world.	There are 100 countries in the world.	There are 100 countries in the world.
There are 100 countries in the world.	There are 100 countries in the world.	There are 100 countries in the world.

<p> High level of WATER (over 100%) </p>	<p> The water level is high, but the water is not very deep. </p>	<p> The water level is high, but the water is not very deep. </p>

<p>  AMERICAN PSYCHOLOGICAL ASSOCIATION 750 First Street, N.E. Washington, D.C. 20002-4242 Tel: 202/336-6000 Fax: 202/336-6010 E-mail: info@apa.org Web: http://www.apa.org </p>	<p>  AMERICAN PSYCHOLOGICAL ASSOCIATION 750 First Street, N.E. Washington, D.C. 20002-4242 Tel: 202/336-6000 Fax: 202/336-6010 E-mail: info@apa.org Web: http://www.apa.org </p>	<p>  AMERICAN PSYCHOLOGICAL ASSOCIATION 750 First Street, N.E. Washington, D.C. 20002-4242 Tel: 202/336-6000 Fax: 202/336-6010 E-mail: info@apa.org Web: http://www.apa.org </p>
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<p>1. What is the purpose of the study?</p>	<p>2. What is the research question?</p>	<p>3. What is the hypothesis?</p>
<p>4. What is the significance of the study?</p>	<p>5. What is the scope of the study?</p>	<p>6. What is the methodology?</p>
<p>7. What are the results?</p>	<p>8. What are the conclusions?</p>	<p>9. What are the implications?</p>

There is a card for each number 1-10.	Search in this book & ask index.	Search through this index book.
Generate map if needed.		

Group Ideas

© 20 minutes

[illegible]

Economic and financial data

Health, safety and environment data

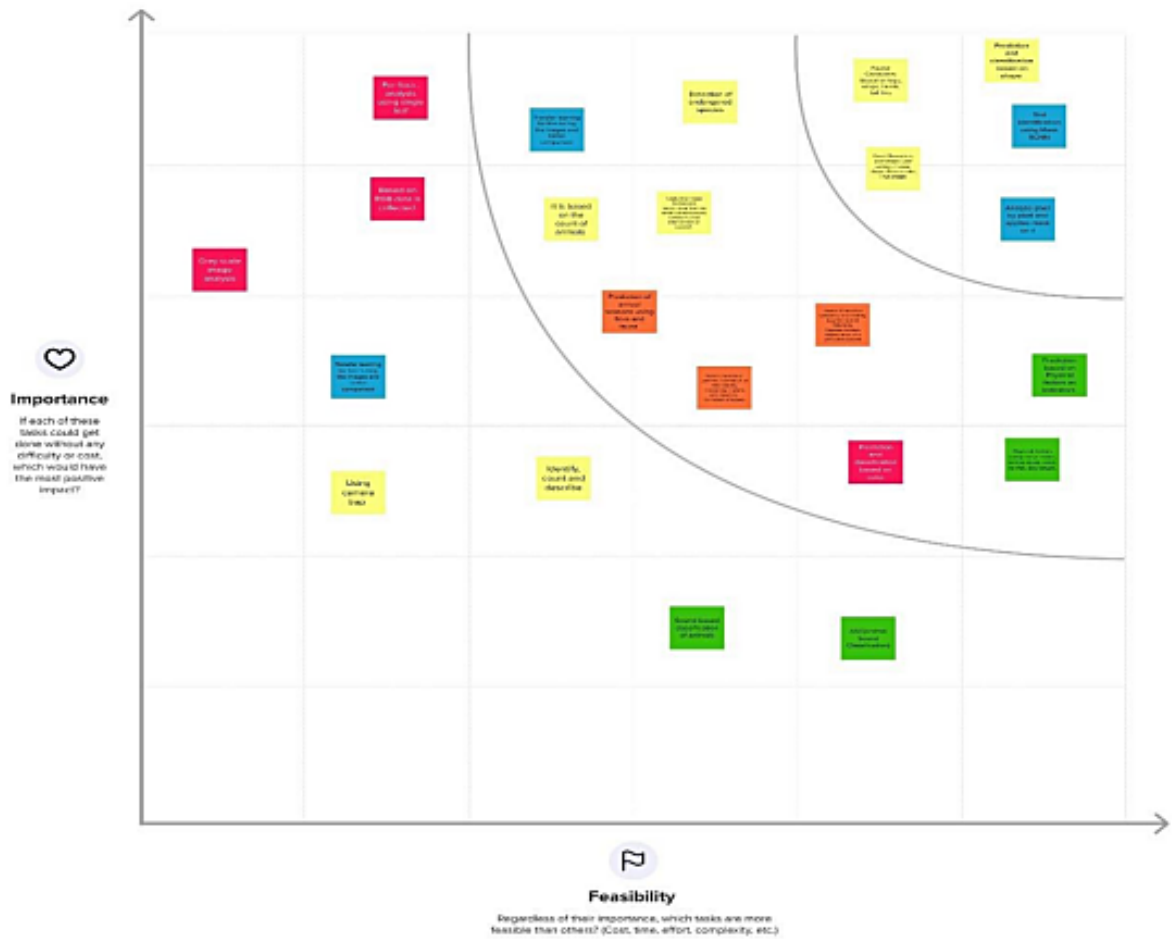
Stakeholder data

Employee data

Other data

The diagram shows five triangles arranged in two rows. The top row contains three triangles: an equilateral triangle (labeled 'Equilateral'), an isosceles triangle (labeled 'Isosceles'), and a scalene triangle (labeled 'Scalene'). The bottom row contains two triangles: an acute triangle (labeled 'Acute') and an obtuse triangle (labeled 'Obtuse'). Each triangle is labeled with its name and a brief description of its properties.

Prioritize



3.3 PROPOSED SOLUTION

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	<ul style="list-style-type: none">a. Need for a way to analyze and identify the type of living beings in a particular environment,so that they can gain knowledge about different species.b. There should be a recognition software that is able to recognize a species in any given angle.
2.	Idea / Solution description	<ul style="list-style-type: none">a. The aim is to develop a recognition software using the concept of supervised learning that takes in a image of various species as the input and provide the name of the species as the output.
3.	Novelty / Uniqueness	<ul style="list-style-type: none">a. Unlike the other open source solution available, this application not only classifies an image as either plant or animal but also tells about the individual species name.b. There are also some solutions available which either work only for one class of species, I.e either plants or animals.
4.	Social Impact / Customer Satisfaction	<ul style="list-style-type: none">a. Create a set of model citizens who are aware of the various species in their surroundings prompting them to be more environmentally conscious.b. Create a way to identify the indigenous and endangered species so that people can spread awareness about them and protect those species.

5.	Business Model (Revenue Model)	<ul style="list-style-type: none"> a. The solution is a reliable recognition software planned to be created as an application with which the consumers can identify the type of living beings in a particular environment. b. It follows a non-monetary revenue model where the consumers aren't asked to pay any fee but when they use the software for recognition purposes the image they provide is stored in the database and used for future training
6.	Scalability of the Solution	<ul style="list-style-type: none"> a. This project is focused on recognizing a limited number of species of each category. b. In future, this project can be extended to recognise many other species with the help of a carefully crafted dataset. c. This project can be extended to provide more detailed information about each instance of a living being like places where they are commonly found, eating habits, etc.

3.4 PROBLEM SOLUTION FIT

Define CS, fit into CC	1. CUSTOMER SEGMENT(S) CS <ul style="list-style-type: none"> - Botanists - Wildlife-photographers - Trekkers - Ornithologists - Hikers - Naturalists - Mountaineer - Backpackers 	6. CUSTOMER CONSTRAINTS CC <ul style="list-style-type: none"> - Inability to store massive amounts of jargons and information about flora & fauna in mind - Unavailability of an one-stop solution for different species of both flora and fauna 	5. AVAILABLE SOLUTIONS AS <ul style="list-style-type: none"> - Accessing state government tourism portal to know about native species - Asking native people - Travel archives and Encyclopedia - Flora-fauna information crash course 	Explore AS, differential
	2. JOBS-TO-BE-DONE / PROBLEMS J&P <ul style="list-style-type: none"> - There is a need for a way to analyze and identify the type of living beings in a particular environment a person finds themselves in, so that they can gain knowledge about different species. - There should be a recognition software that is able to recognize the species in any given angle. 	9. PROBLEM ROOT CAUSE RC <ul style="list-style-type: none"> - Unavailability of information regarding the local flora and fauna - There is very less knowledge about the animals and plants living in the locality 	7. BEHAVIOUR BE <ul style="list-style-type: none"> - In their free time they browse through various sources to gain knowledge about the local flora and fauna - Whenever they need help onsite, access the online resources to clarify their doubts regarding the encountered species 	

Identify strong TR & EM	3. TRIGGERS TR <ul style="list-style-type: none"> - Unable to determine whether a particular species of plant is poisonous or not while camping - Having trouble specifying the class of animals such as herbivore, carnivore, omnivore 	10. YOUR SOLUTION SL <p>The aim is to develop a recognition software using the concept of supervised learning that takes in the image of various species as the input and provides the species name as output.</p>	8. CHANNELS of BEHAVIOUR CH	Identify strong TR & EM
	4. EMOTIONS: BEFORE / AFTER EM <ul style="list-style-type: none"> - Before: <ul style="list-style-type: none"> - lost, - Frustrated, - & confused - After: <ul style="list-style-type: none"> - enlightened, - Relieved, - & confident 		8.1 ONLINE <ul style="list-style-type: none"> - Whenever they need help <u>onsite</u>, access the online resources to clarify their doubts regarding the encountered species 8.2 OFFLINE <ul style="list-style-type: none"> - In their free time they browse through various sources to gain knowledge about the local <u>flora</u> and fauna 	

4. REQUIREMENT ANALYSIS

4.1 Functional Requirement

Product Requirements :

- Python (libraries, packages, open CV and Flask, etc..,)
- Web Languages
- IBM Cloud

4.2 Non Functional Requirement

Hardware Requirements :

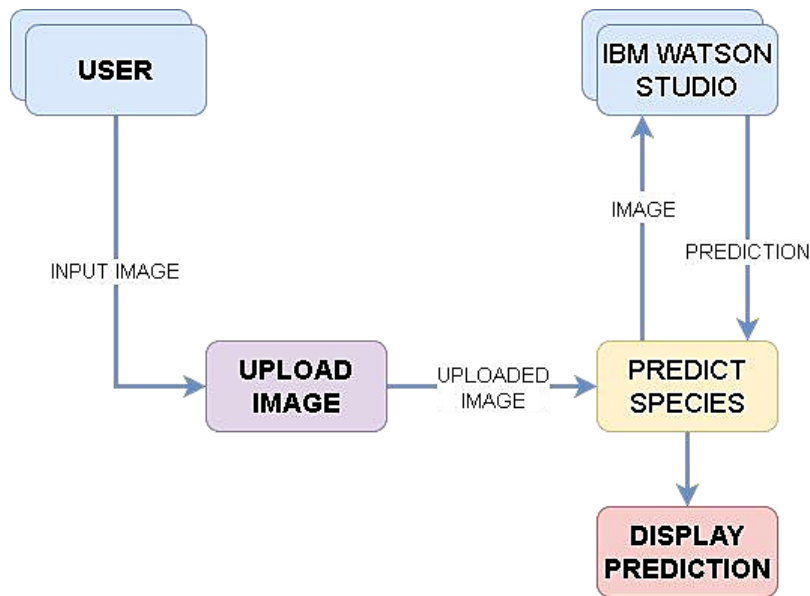
- CPU Type : Intel i3 Core or above
- Clock Speed : 3.0 GHz
- RAM Size : 4GB or above
- Hard Disk Capacity : 1TB
- Camera : 1920 x 1080 px

Software Requirements :

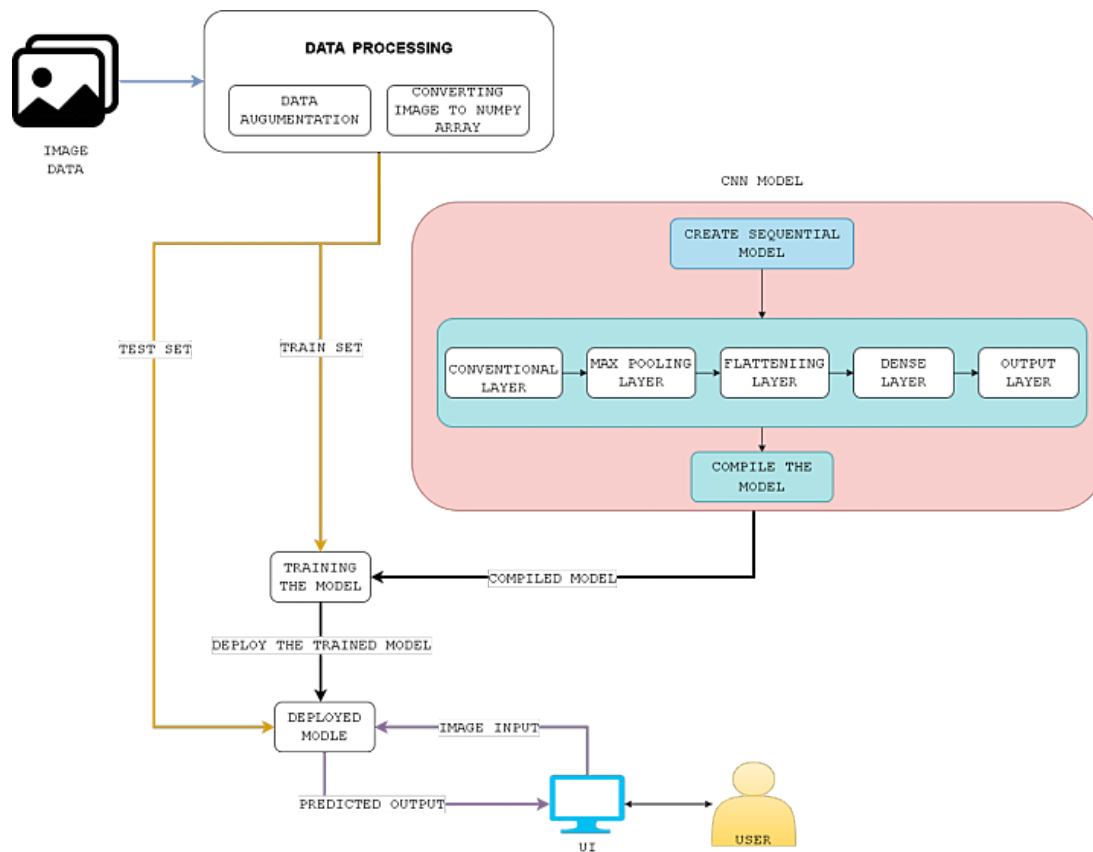
- Operating System : Windows 10/11
- Language : Python
- IDE : Pycharm

5. PROJECT DESIGN

5.1 Data Flow Diagrams



5.2 Solution & Technical Architecture



5.3 USER STORIES

User Type	Functional Requirement(Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Web user)	Dashboard	USN-1	As a user I can access the website to use this feature.	Displaying the dashboard	High	Sprint-3
Customer (Web user)	Upload Image	USN-2	As a user, I can upload image of an plant or animal species to identify it.	A dialog box stating a successful upload.	High	Sprint-1
Customer (Web user)	Predict Image	USN-3	As a user I can use this feature to predict a species.	The name of the species is displayed	High	Sprint-2

6. PROJECT PLANNING & SCHEDULING

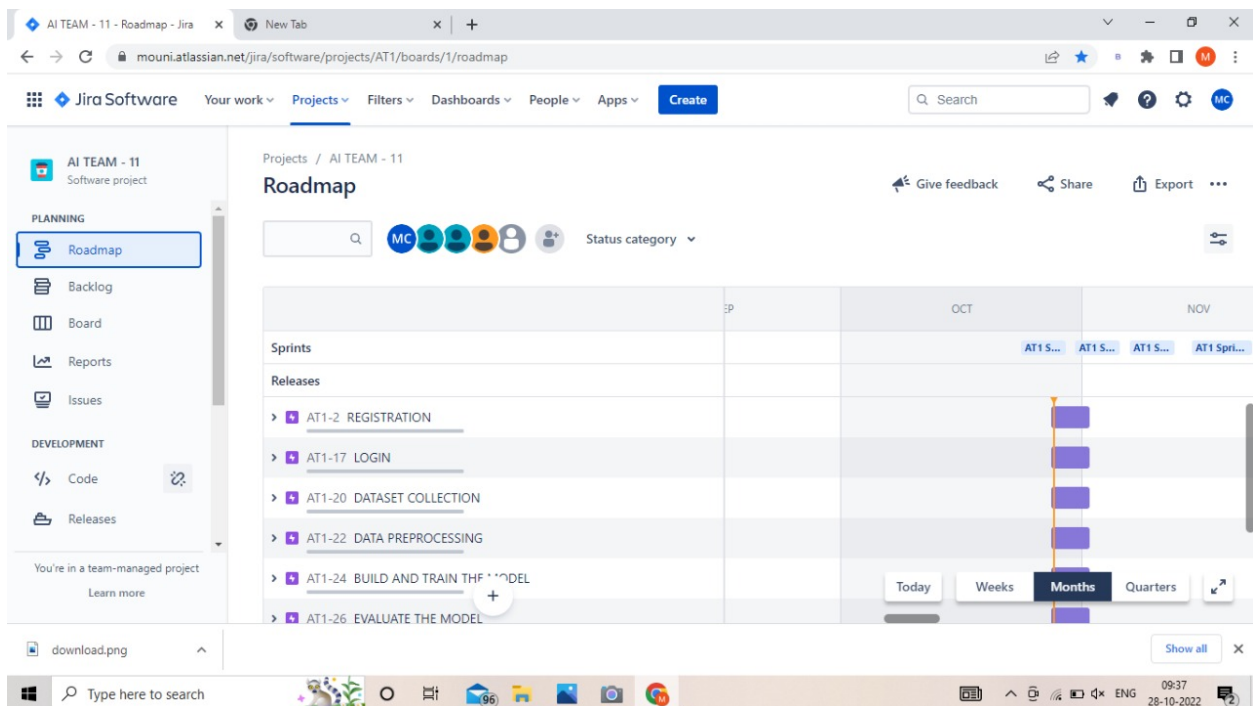
6.1 Sprint Planning & Estimation

Sprint	Functional Requirement (Epic)	User Story Number	User Story/Task
Sprint-1	Registration	USN-1	As a user, I can install the application and register it by entering my email, password, and confirming my password.
Sprint-1		USN-2	As a user, I will receive confirmation email once I have registered for the application
Sprint-1		USN-4	As a user, I can register for the application through Gmail
Sprint-1		USN-3	As a user, I can register for the application through Facebook
Sprint-2	Login	USN-5	As a user, I can login to the application by entering email & password
Sprint-3	Dashboard	USN-6	As a user, I will analyze the functions of a software
Sprint-4	Input/output	USN-7	As a user, I will give required information to the software to get output
Sprint-4		USN-8	As a user I can get the name and description of species which I captured

6.2 Sprint Delivery Schedule

Sprint	Total StoryPoints	Duration	Sprint Start Date	Sprint End Date(Planned)	StoryPoints Completed (as onPlannedEndDate)	Sprint Release Date(Actual)
Sprint -1	20	3Days	5Nov 2022	7Nov2022	10	7Nov2022
Sprint-2	20	4Days	8Nov 2022	11Nov2022	15	11 Nov 2022
Sprint-3	20	4Days	12Nov 2022	15Nov2022	18	15 Nov 2022
Sprint-4	20	4Days	16Nov 2022	19Nov2022	20	19 Nov 2022

6.3 Reports from JIRA



AT1 board - Agile board - Jira x New Tab x +

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Jira Software Your work Projects Filters Dashboards People Apps Create

AI TEAM - 11 Software project

PLANNING Roadmap Backlog Board Reports Issues

DEVELOPMENT Code Releases

OPERATIONS Deployments On-call

Project pages

Projects / AI TEAM - 11

All sprints

Complete sprint

GROUP BY None Insights

TO DO 12 ISSUES

IN PROGRESS

DONE ✓

As a user, I can register for the application by entering my email, password and confirming my password.

AT1-1 2

As a user, I will receive confirmation email once I have registered for the application.

AT1-4 2

As a user, I can log into the application by entering email & password.

AT1-5 1

As a user, I can upload the image to identify the species.

AT1-6 3

download.png

Show all

Type here to search

95

ENG 09:38 28-10-2022

AI TEAM - 11 - Agile board - Jira x New Tab x +

mouni.atlassian.net/jira/software/projects/AT1/boards/1/backlog

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Backlog

Insights

AT1 Sprint 1 24 Oct – 29 Oct (5 issues) 10 Complete sprint

AT1 Sprint 2 31 Oct – 5 Nov (3 issues) 18 Complete sprint

AT1 Sprint 3 7 Nov – 12 Nov (2 issues) 14 Complete sprint

AT1 Sprint 4 15 Nov – 22 Nov (2 issues) 8 Complete sprint

Backlog (12 issues) 50 Create sprint

https://mouni.atlassian.net/jira/software/projects/AT1/boards/1/backlog

download.png

Show all

Type here to search

95

ENG 09:37 28-10-2022

7. CODING & SOLUTIONING

7.1 Feature 1 – WEB UI

The below code is used to go into web user interface so the user uses the application in very friendly.

```
global graph
graph=tf.get_default_graph()

app = Flask(__name__)

json_file = open('final_model.json','r')
loaded_model_json = json_file.read()
json_file.close()

loaded_model = model_from_json(loaded_model_json)
loaded_model.load_weights('final_model.h5')

print('Model loaded. Chesk http://127.0.0.1:5000/')

@app.route('/',methods=['GET'])
def index():
    return render_template('digital.html')

@app.route('/', methods=['POST'])
```

```
def predict():
    if request.method == 'POST':

        f = request.files['image']
        print(type(f))
        basepath = os.path.dirname(__file__)
        file_path = os.path.join(basepath,'static','uploads', f.filename)
        f.save(file_path)
        print(file_path)
        img = image.load_img(file_path, target_size=(224,224))
        x = image.img_to_array(img)
        x = np.expand_dims(x, axis=0)
```

```
with graph.as_default():
    preds = loaded_model.predict_classes(x)
```

```
print(preds)
```

found = ["The great Indian bustard (*Ardeotis nigriceps*) or Indian bustard, is a bustard found on the Indian subcontinent. A large bird with a horizontal body and long bare legs, giving it an ostrich like appearance, this bird is among the heaviest of the flying birds.",

"The spoon-billed sandpiper (*Calidris pygmaea*) is a small wader which breeds on the coasts of the Bering Sea and winters in Southeast Asia.",

"*Amorphophallus titanum*, the titan arum, is a flowering plant in the family Araceae. It has the largest unbranched inflorescence in the world. The inflorescence of the talipot palm, *Corypha umbraculifera*, is larger, but it is branched rather than unbranched. *A. titanum* is endemic to rainforests on the Indonesian island of Sumatra.",

"lady's slipper, (subfamily Cypripedioideae), also called lady slipper or slipper orchid, subfamily of five genera of orchids (family Orchidaceae), in which the lip of the flower is slipper-shaped. Lady's slippers are found throughout Eurasia and the Americas, and

some species are cultivated.",

"Pangolins, sometimes known as scaly anteaters,[5] are mammals of the order Pholidota, Pangolins have large, protective keratin scales, similar in material to fingernails and toenails, covering their skin; they are the only known mammals with this feature. They live in hollow trees or burrows, depending on the species. Pangolins are nocturnal, and their diet consists of mainly ants and termites, which they capture using their long tongues. ",

"The Seneca white deer are a rare herd of deer living within the confines of the former Seneca Army Depot in Seneca County, New York. These deer are not albino, but instead have leucism, which is an abnormal genetic condition that carries a set of recessive genes for all-white coats."]

```
print('uploads/'+f.filename)
```

```
text=found[preds[0]]
```

```
return render_template('digital.html', msg=text,img=f.filename)
```

```
@app.route('/uploads/<filename>')
```

```
def display_image(filename):
```

```
    return redirect(url_for('static', filename='uploads/' + filename), code=301)
```

```
if __name__=='__main__':
```

```
    app.run(threaded = False)
```


7.2 Feature 2 – Prediction

The below code segment has the feature to predict the species.

```
def predict():
```

```
    if request.method == 'POST':
```

```
        f = request.files['image']
```

```
        print(type(f))
```

```
        basepath = os.path.dirname(__file__)
```

```
        file_path = os.path.join(basepath,'static','uploads', f.filename)
```

```
        f.save(file_path)
```

```
        print(file_path)
```

```
        img = image.load_img(file_path, target_size=(224,224))
```

```
        x = image.img_to_array(img)
```

```
        x = np.expand_dims(x, axis=0)
```

```
    with graph.as_default():
```

```
        preds = loaded_model.predict_classes(x)
```

```
    print(preds)
```

found = ["The great Indian bustard (*Ardeotis nigriceps*) or Indian bustard, is a bustard found on the Indian subcontinent. A large bird with a horizontal body and long bare legs, giving it an ostrich like appearance, this bird is among the heaviest of the flying birds.",

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"*Amorphophallus titanum*, the titan arum, is a flowering plant in the family Araceae. It

has the largest unbranched inflorescence in the world. The inflorescence of the talipot palm, *Corypha umbraculifera*, is larger, but it is branched rather than unbranched. *A. titanum* is endemic to rainforests on the Indonesian island of Sumatra.",

"lady's slipper, (subfamily Cypripedioideae), also called lady slipper or slipper orchid, subfamily of five genera of orchids (family Orchidaceae), in which the lip of the flower is slipper-shaped. Lady's slippers are found throughout Eurasia and the Americas, and some species are cultivated.",

"Pangolins, sometimes known as scaly anteaters,[5] are mammals of the order Pholidota, Pangolins have large, protective keratin scales, similar in material to fingernails and toenails, covering their skin; they are the only known mammals with this feature. They live in hollow trees or burrows, depending on the species. Pangolins are nocturnal, and their diet consists of mainly ants and termites, which they capture using their long tongues. ",

"The Seneca white deer are a rare herd of deer living within the confines of the former Seneca Army Depot in Seneca County, New York. These deer are not albino, but instead have leucism, which is an abnormal genetic condition that carries a set of recessive genes for all-white coats."]

```
print('uploads/'+f.filename)
```

```
text=found[preds[0]]
```

```
return render_template('digital.html', msg=text,img=f.filename)
```

8.TESTING

8.1 Test Cases

Testing is one of the most crucial stages in the software development process. The main goal of the testing phase in the software development life cycle (SDLC) is to ensure that the developed software meets the necessary functionality and performance. There are several test cases related to the project.

Libraries and packages	Console working
Code Segments Execution	Detection
Running the application	Prediction
Navigating the web pages	Displaying Results

8.2 User Acceptance Testing

Test Case No	Test Case	Testing Status (Yes / No)	Result (Pass / Fail)
01	Libraries and packages	Yes	Pass
02	Code Segments Execution	Yes	Pass
03	Running the application	Yes	Pass
04	Navigating the web pages	Yes	Pass
05	Console working	Yes	Pass
06	Detection	Yes	Pass
07	Prediction	Yes	Pass
08	Displaying Results	Yes	Pass

1. Defect Analysis

This report shows the number of resolved or closed bugs at each severity level, and how they were resolved

Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Subtotal
By Design	2	0	0	0	2
Duplicate	1	0	0	0	1
External	0	1	0	0	1
Fixed	8	0	4	1	13
Not Reproduced	0	0	1	0	1
Skipped	1	0	0	0	1
Won't Fix	0	0	1	0	1
Totals	12	1	6	1	20

2. Test Case Analysis

Section	Total Cases	Not Tested	Fail	Pass
Print Engine	2	0	0	2
Client Application	1	0	0	1
Security	3	0	0	3
Final Report Output	4	0	0	4
Version Control	2	0	0	2

This report shows the number of test cases that have passed, failed, and untested

9. RESULTS

9.1 Performance Metrics

S.N	Parameter	Values
1.	Accuracy	Training Accuracy – 89.9% Validation Accuracy - 90%

10. ADVANTAGES & DISADVANTAGES

ADVANTAGES :

- Makes it easy for naturalists to know about different species
- Implementation of AI for detecting.
- Predicts the name of the species.
- Helps to learn about new species

DISADVANTAGES :

- Using a camera to capture images
- can't work without internet

11 . CONCLUSION

This system is mainly used for people and naturalists to identify different flora and fauna around the world. Also it is a easy way as everyone who goes for outing to mountains and forests always carries a camera so it makes them easy to capture a picture of the and upload to identify what species is it.

12. FUTURE SCOPE

In future works maybe we are going to extend some more species in this project. We will try to help the naturalists who wants to know about different species of flora and fauna around the world. We will use another AI model or new model to be used in this project and improve the accuracy, speed, and efficiency of the project. And we will be published the journal of this project in international journals or conferences.

13. APPENDIX

Source Code

Digital.html

```
<html>
<style>
body{
    background: linear-gradient(45deg, #677be6, transparent);
    <!-- background-image: url("C:/Users/Hariharan/Downloads/wallpaperflare.com_wallpaper
(1).jpg");
    background-position: center;
    background-repeat: no-repeat;
    background-size: cover;-->
```

```
}

.heading{
display:flex;
flex-direction:column;
align-item:center;
justify-content:center;
background:linear-gradient(45deg, #2e45d2, transparent);
border-radius:20px;
}

.teamid{
display:flex;
align-items:center;
justify-content:center;
}

.container{
margin-top:40px;
height:700px;
display:flex;
flex-direction:row;
gap:50px;
justify-content:stretch;

}

.uploader{
```

```
background: linear-gradient(45deg,#31a84d63, transparent);
padding: 10px;
/* margin-top: 30px
px
; */
margin-right: 160px;
margin-left:115px;
height: 550;
width: 550;
border-radius: 50px;
}
.image{
float:left;
margin-top:30px;
margin-left:180px;
border-radius:100px;
border:1px inset black;
}
.displayimg{
border-radius:100px;
opacity: 0.5;
}
.displayimg:hover{
opacity:1.0;
}
```



```
.label{
    border: #070a07;
    background: black;
    color: #e8dcdc;
    display: inline-block;
    text-align: center;
    margin-left: 100px;
    margin-top: 72px;
    padding: 2px;
    width: 200px;
    border-radius: 10px
}

.label:hover{
    background: linear-gradient(45deg, #677be6, transparent);
    transition: margin-right 2s;
}

.uploadbutton{
    color: #fdeaea;
    background: black;
    border-radius: 10px;
}

.uploadbutton:hover{
    background: linear-gradient(45deg, #677be6, transparent);
}

/* .uploadbuttondiv{
```

```
margin-top:30px;
margin-left:60px;

}*/

.result{
background: linear-gradient(45deg,#31a84d63, transparent);
border-radius: 40px;
height: 570;
width: 570;

}

.preview{
margin-left:100px
}

.prediction{

margin:20px;

}

.spanupload{font-size: 20;
font-weight: bold;
}

.resultimage{
display:block;
height:300px;
```

```
width:300px;

border:1px solid;

margin-top:10px;

margin-left:110px;

}

</style>

<script>

function showPreview(event){

if(event.target.files.length > 0){

    var src = URL.createObjectURL(event.target.files[0]);

    var preview = document.getElementById("previewimg");

    preview.src = src;

    preview.style.display = "block";

}

}


function validateImage(event){

    event.preventDefault();

    const element = document.querySelector('#getimage');

    if( element.files.length==0){

        alert('Please select an image to upload');

    }

    else{

        const form = document.querySelector('form');

        form.submit();

    }

}
```

```
}  
}
```

```
</script>
```

```
<body >
```

```
<div class='heading'><div style='margin-left: 600px;'><h2 style='color:white;font-family:cursive;font-weight:700;'>DIGITAL NATURALIST</h2></div>
```

```
<div class='teamid'><h4 style='color:white;display:inline-block;'>TEAM  
ID:PNT2022TMID21994</h4></div>
```

```
</div>
```

```
<div class='container'>
```

```
<div class='uploader'>
```

```
<div style='display:flex;justify-content:center;'><span  
class='spanupload'>UPLOAD:</span></div>
```

```
<form action="/" method='post' enctype='multipart/form-data'>
```

```
<label for='getimage' class='label'>Select an image</label>
```

```
<input type='file' id='getimage' name='image' style='display:none;color:red;'>  
onchange='showPreview(event);' >
```

```
<input type='submit' value=Upload class='uploadbutton'  
onclick='validateImage(event);'>
```

```
        <div class='preview'><img id='previewimg' style='display:none;margin-
top:30px;width:300px;height:300;'/></div>
```

```
    </form>
```

```
</div>
```

```
<div class='result'>
```

```
    <div class='prediction'>
```

```
        <div style='text-align:center;font-weight:800;'> PREDICTION:</div>
```

```
        <br>
```

```
        {% if img %}
```

```
        
```

```
        {% endif %}
```

```
        <br>
```

```
    <div class='resulttext'> <p style='text-indent:40px;word-spacing:5px'> {{msg}}</p></div>
```

```
    </div>
```

```
</div>
```

```
</div>
```

```
</body>
```

```
</html>
```

App.py

// Packages and Libraries

```
from __future__ import division, print_function

import os

import numpy as np

import tensorflow as tf

from tensorflow import keras

from keras.preprocessing import image

from keras.models import load_model

from flask import Flask, request, render_template, url_for, redirect

from werkzeug.utils import secure_filename

from keras.models import model_from_json
```

// Flask

```
global graph

graph=tf.get_default_graph()


app = Flask(__name__)


json_file = open('final_model.json','r')

loaded_model_json = json_file.read()

json_file.close()


loaded_model = model_from_json(loaded_model_json)

loaded_model.load_weights('final_model.h5')
```

```
print('Model loaded. Chesk http://127.0.0.1:5000/')
```

```
@app.route('/',methods=['GET'])
```

```
def index():
```

```
    return render_template('digital.html')
```

```
@app.route('/', methods=['POST'])
```

```
def predict():
```

```
    if request.method == 'POST':
```

```
        f = request.files['image']
```

```
        print(type(f))
```

```
        basepath = os.path.dirname(__file__)
```

```
        file_path = os.path.join(basepath,'static','uploads', f.filename)
```

```
        f.save(file_path)
```

```
        print(file_path)
```

```
        img = image.load_img(file_path, target_size=(224,224))
```

```
        x = image.img_to_array(img)
```

```
        x = np.expand_dims(x, axis=0)
```

```
        with graph.as_default():
```

```
            preds = loaded_model.predict_classes(x)
```

```
        print(preds)
```

found = ["The great Indian bustard (*Ardeotis nigriceps*) or Indian bustard, is a bustard found on the Indian subcontinent. A large bird with a horizontal body and long bare legs, giving it an ostrich like appearance, this bird is among the heaviest of the flying birds.",

"The spoon-billed sandpiper (*Calidris pygmaea*) is a small wader which breeds on the coasts of the Bering Sea and winters in Southeast Asia.",

"*Amorphophallus titanum*, the titan arum, is a flowering plant in the family Araceae. It has the largest unbranched inflorescence in the world. The inflorescence of the talipot palm, *Corypha umbraculifera*, is larger, but it is branched rather than unbranched. *A. titanum* is endemic to rainforests on the Indonesian island of Sumatra.",

"lady's slipper, (subfamily Cypripedioideae), also called lady slipper or slipper orchid, subfamily of five genera of orchids (family Orchidaceae), in which the lip of the flower is slipper-shaped. Lady's slippers are found throughout Eurasia and the Americas, and some species are cultivated.",

"Pangolins, sometimes known as scaly anteaters,[5] are mammals of the order Pholidota, Pangolins have large, protective keratin scales, similar in material to fingernails and toenails, covering their skin; they are the only known mammals with this feature. They live in hollow trees or burrows, depending on the species. Pangolins are nocturnal, and their diet consists of mainly ants and termites, which they capture using their long tongues. ",

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```
print('uploads/'+f.filename)
```

```
text=found[preds[0]]
```

```
return render_template('digital.html', msg=text,img=f.filename)
```

```
@app.route('/uploads/<filename>')
```

```
def display_image(filename):
```

```
    return redirect(url_for('static', filename='uploads/' + filename), code=301)
```



```
if __name__=='__main__':  
    app.run(threaded = False)
```

GitHub Link : <https://github.com/IBM-EPBL/IBM-Project-17897-1659677008>

Demo Link :

https://drive.google.com/file/d/1D8ff4QDvgxGHgdWUtYJFNpK_ozcswQlE/view?usp=sharing

Youtube Link :



Digital Naturalist - AI Enabled
tool for Biodiversity Researchers

