Digital Naturalist - AI Enabled tool for Biodiversity Researchers

TEAM MEMBERS :

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PREREQUISITE :

Anaconda Navigator

Anaconda Navigator is a free and open-source distribution of the Python and R programming languages for data science and machine learning related applications. It can be installed on Windows, Linux, and macOS. Conda is an open-source, cross-platform, package management system. Anaconda comes with so very nice tools like JupyterLab, Jupyter Notebook, QtConsole, Spyder, Glueviz, Orange, Rstudio, Visual Studio Code. For this project, we will be using Jupiter notebook and spyder ….

To build Deep learning models you must require the following packages

Tensor flow:

TensorFlow is an end-to-end open-source platform for machine learning. It has a comprehensive, flexible ecosystem of tools, libraries, and community resources that lets researchers push the state-of-the-art in ML and developers can easily build and deploy ML-powered applications.

Keras:

Keras leverages various optimization techniques to make high-level neural network API easier and more performant. It supports the following features:

Consistent, simple, and extensible API.
Minimal structure – easy to achieve the result without any frills.
It supports multiple platforms and backends.
It is a user-friendly framework that runs on both CPU and GPU.
Highly scalability of computation.

Flask:

Web framework used for building Web applications

GITHUB ACCOUNT:

I have created my github account with the email id 950619104029@einsteincollege.ac.in in the https://github.com website. Github team ID is **IBM-Project-45818-166073564**

Abstract:

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 been given.

LITERATURE SURVEY

- **REVIEW-1:**

✧ Title of the Paper:
Digital Naturalist Using Deep Learning

✧ Name of the Author:
Aparna , Saloni M , Chandana M , Neha U , Banushree D J , Prof. Naresh Patel K M
Department of Computer Science and Engineering, BIET Davanagere

✧ Problem Description:

A naturalist is someone who studies the patterns of nature identify different kingdom of flora and fauna in the nature. Being able to identify the flora and fauna around us often leads to an interest in protecting wild species, collecting and sharing information about the species we see on our travels is very useful for conserving groups like NCC. Deep-learning based techniques and methods are becoming popular in digital naturalist studies, as their performance is superior in image analysis
fields, such as object detection, image classification, and semantic segmentation. Deep-learning techniques have achieved state
of-the -art performance for automatic segmentation of digital naturalist through multi-model image sensing. Our task as naturalist has grown widely in the field of natural-historians. It has increased from identification to saviours as well. Not only identifying flora and fauna but also to know about their habits, habitats, living and grouping lead to fetching services for protection as well.

➢ REVIEW-2:

✧ Title of the Paper:

AI Naturalists Might Hold the Key to Unlocking Biodiversity Data in Social Media Imagery

✧ Name of the Author:

Tom A. August, Oliver L. Pescott,

Alexis Joly, Pierre Bonnet

✧ Problem Description:

The increasing availability of digital images, coupled with sophisticated artificial intelligence (AI) techniques for image classification, presents an exciting opportunity for biodiversity researchers to create new datasets of species observations. We investigated whether an AI plant species classifier could extract previously unexploited biodiversity data from social media photos (Flickr). We found over 60,000 geolocated images tagged with the keyword ‘‘flower’’ across an urban and rural location in the UK and classified these using AI, reviewing these identifications and assessing the representation of images. Images were predominantly biodiversity focused, showing single species. Non-native garden plants dominated, particularly in the urban setting. The AI classifier performed best when photos were focused on single native species in wild situations but also performed well at higher taxonomic levels (genus and family), even when images substantially deviated from this. We present a checklist of questions that should be considered when undertaking a similar analysis

➢ **REVIEW-3:**

✧ Title of the Paper:

Digital Naturalist Design Guidelines: Theory, Investigation, Development, and Evaluation of a Computational Media Framework to Support Ethological Exploration

✧ Name of the Author:

Andrew Quitmeyer

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✧ Problem Description:

This research aims to develop and evaluate a design framework for creating digital devices that support the exploration of animal behaviors in the wild. This paper quickly shares the main concepts and theories from the fields forming Digital Naturalism's foundation while presenting the key challenges emerging from these critical intersections between field biology and computational media. It then reviews the development of this research's hybrid methodology designed specifically for its multi-year series of "Qualitative Action Research" fieldwork carried out at a rainforest field station. This paper analyzes the resulting on-site ethnographies, workshops, design projects, and interactive performances, whose take-aways are synthesized into design guidelines for digital-natural media. This framework, itself, is then evaluated via an extra iteration of fieldwork and the results discussed. Finally, the paper identifies targets for

continued research development. Further areas of interest are presented which will promote Digital Naturalism's progression into its own topic of study

➢ **REVIEW-4:**

✧ Title of the Paper:

From Digital Nature Hybrids to Digital Naturalists: Reviving Nature Connections Through Arts, Technology and Outdoor Activities

✧ Name of the Author:

L. Edwards, A. Darby, and C. Dean

✧ Problem Description:

This work considers how the arts and technology in combination can stimulate connections in heritage gardens, and also nurture care for non-human nature.The chapter divides into two overlapping parts. The first part describes and critiques the design of Digital Nature Hybrid artifacts for interpreting gardens and exploring nature. The second part builds on the first by showing how the challenges presented by the Digital Nature Hybrids stimulated the design of Digital Naturalist workshops. It shows the value of combining arts, digital technologies and outdoor activities to support active engagements with non-human nature and to inspire the development of knowledge and

skills needed to attend to natural environments. Research through design underpins the way of working and the project uses a critical approach toward technology, to guide the design decisions. One of the insights is the value that adopting this critical approach has in shaping both processes and designs.

➢ **REVIEW-5:**

✧ Title of the Paper:

Digital Naturalism: Interspecies Performative Tool Making for Embodied Science

✧ Name of the Author:

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Digital Media PhD Student

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✧ Problem Description:

Digital Naturalism investigates the role that digital media can play in field Ethology. While digital technology plays an increasingly larger role in the Ethologist's process, its use tends to be limited to the experimentation and analysis stages. My

goal is to work with scientists to develop context-dependent, behavioral tools promoting novel interactions between animal, man, and environment. The aim is to empower the early exploratory phases of their research as well as the later representation of their work. I will test a methodology combining analytical tool making and interaction studies with modern ethology.