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ANIMALS RECOGNIZATION USING DEEP LEARNING FRAMEWORK

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Abstract:

In our day-to-day life's we live in an environment where there are a lot of creatures. In these creatures there are animals, which can harm the human beings, spoil the crops in fields. In agricultural fields animals can spoil the crop and bring a great lose for farmers. While people are travelling forest areas there can be a chance of animal attacks so in these cases our application can be very useful for people. Detecting that there is an animal present or not, even in residential areas also its helpful. For the fast detection of animals, we are using most efficient algorithm. The database of wild animals is created. The overall performances were obtained using different number of training images and test images. Animal Detection using deep learning algorithms, deep learning means a technique that teaches computer what comes naturally to humans. For animal detection we are using deep learning algorithms for the efficient and accurate detection. We are using YOLO (You Only Look Once) algorithm in Convolutional Neural Network. As YOLO is much faster algorithm and also increases its accuracy in prediction with the help of single fully connected layers. Finally detecting the animals with an accuracy of 99% is our best result.

Keywords: YOLO V5, Deep Learning, Animal Recognization, Neural Network

1.Introduction:

Deep learning is a subset of machine learning. A method of teaching a computer to perform tasks that humans accomplish without thinking. As Deep learning framework that offer building blocks for designing, training, and validating. Deep neural networks are the collection of algorithms that have new records in precision for several vital problem. The study of wild animals in their native habitat is crucial to understanding ecosystems. It is capable of training by unsupervised learning from the unstructured data. Here we are using deep learning framework for animal recognition. The study of wild animals in their native habitat is crucial to understanding ecosystems. On Earth, many wild animals have vanished, and many species have spread to new locations where they might damage both natural and societal resources.

Animal detection systems identify large animals before they cross a road and alert drivers when one is present on or nearby. Observing wild animals in their natural environment is an essential task in ecosystem. The goal of animal detection and warning systems is to stop or lessen the frequency of collisions between animals and moving vehicles. These devices are specifically designed to protect people against huge animals that can harm, kill, or destroy property. As preventing the endangered species is a human tendency. In deep learning framework we are

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using YOLO algorithm, You Only Look Once (YOLO)algorithm has eight versions till now. YOLO is an algorithm that uses neural networks to provide real-time object detection. This algorithm is popular because of its speed and accuracy. YOLO is an approach allowing real-time object detection utilizing neural networks.

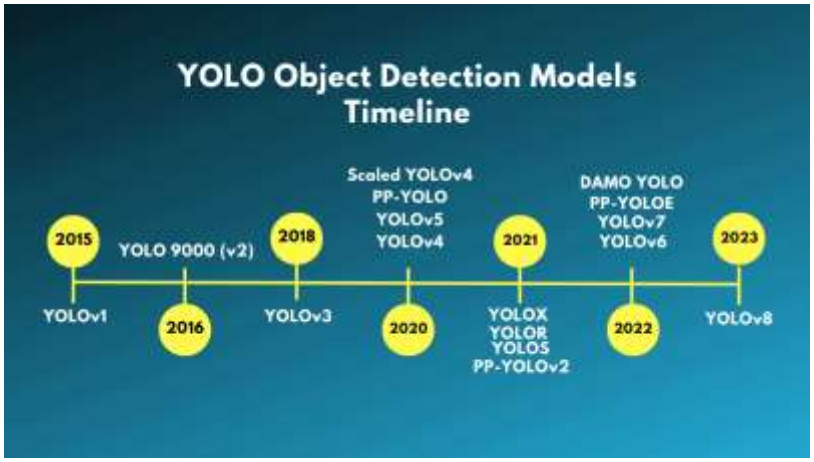

Fig 1: Timeline of YOLO

As the name suggests, the algorithm requires only a single forward propagation through a neural network to detect objects. It has been utilized in plenty of ways to determine people, animals, parking meters, and traffic lights. This algorithm is used for accurate and fast accuracy than other models. This is an algorithm that is used for detection and recognition. Here we are taking the dataset from different websites where it consists of different images of animal in different angles, with that we will be training the dataset and get the accurate
results for it.

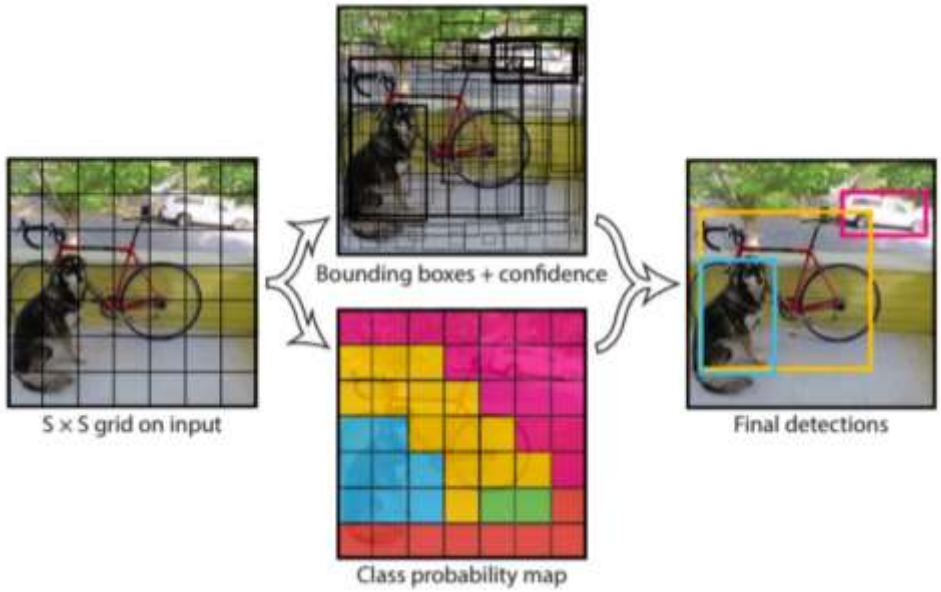

Fig 2: Functioning of YOLO

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2.Literaruture Survey:

Here are the papers that we have researched for the animal detection with author name,title of the project, approach they used and their performances are mentioned.

Ref. N0	AUTHOR NAME	TITLE	METHODOLOGY	DATABASE	ACCURACY
[1]	Bhanupriya prakesh, Saranya srinivasan	Animal Detection Using Deep Learning Algorithm	Convolutional neural network (CNN)	Kaggle	86%
[2]	Tanishka Badhe, Janhavi Borde, Bhagyashree Waghmare	Study of Deep Learning Algorithms to Identify and Detect Endangered Species of Animals	CNN (VGGNET),RCNN, YOLO	Data.gov	96%
[3]	Hemant Shetty, Hemant Singh,Fazal Shaikh	Animal Detection Using Deep Learning	DCNN	Kaggle	91%

[4]	N.Banupriya,s.Saranya, Rashmi Jayakumar	Animal Detection Using Deep Learning	CNN	ImageNet	93%
[5]	Gyanedra K,Verma, Pragya Guptadcnn	Wild Animal Detection Using Deep Convolutional Neural Network	DCNN	Animal Sound Archive	91%
[6]	Vaishali,Jogdande, Ankita Mane	Animal ClassifIcation Using,Deep Leaerning	SVM	Kaggle	94%
[7]	Deepthi,.Vimala,Vinitha Mamatha	animal species recognition system using deep learning	CNN	ImageNet	93%
[8]	R.Kumar, A,krishnan	A Deep learning approach for animal detection in uav images	CNN	Collection of images	96%

[9]	R. Mahesh, M. Manoharan , K. Uma	Animal detection and recognition using deep learning technique	CNN	Collection of images	96%

[10]	G. Sathya, S. Thiruppathi, S. Suresh	Animal detection using deep learning	CNN	ImageNet	85%

S. Saba and S. Sarkar[11], titled "Animal Recognition from Natural Images using Deep Convolutional Neural Networks, used a CNN for animal recognition. The model achieved an accuracy of 94.9% on the test set. S. Das, S. Sengupta, and S. Mukhopadhyay[12], titled "Deep Learning-based Automatic Animal Detection System. They take the dataset from camera trap images They used a Faster R-CNN algorithm for object detection. The model achieved an accuracy of 91.17% on the test set. S. Sengupta and S. Das[13], titled "Deep Learning Based Animal Classification using Transfer Learning and Data Augmentation, a convolutional neural network (CNN) was used for classifying animal images. The model achieved an accuracy of 94.34% on the test set. Shreya Dutta, Anirban Dutta, and Nabanita Chowdhury[14], The survey analysed various deep learning algorithms, including convolutional neural networks. The survey found that CNNs were the most commonly used deep learning algorithm for animal recognition with an average accuracy of 90.9%. A. Singh, A. k and D. Singh[15], They used the deep learning algorithm R-CNN, They use the Camara trap dataset .This model achieved an accuracy of 94%.

3.Methodology:

A system for managing projects is known as a project methodology. It provides a 'roadmap' for the planning & day-to-day management of a project, acting as a reminder of what needs to be considered at the different stages of the project. The four different phases of the methodology are Initiation, Planning, Execution and Closure.

3.1 Data set

A dataset is a grouping of different kinds of data that has been digitally preserved. We gathered a collection of images of diverse animals in various stances from the Kaggle platform. Datasets

are largely composed of photos, texts, sounds, videos, numerical data points are used to address a variety of images or videos. The dataset used in this contains different animal images which is divided into two categories. The two categories are train and val folders. In this project, the prediction of the provided animal is tested using a collection of animal photos found in this data set. The images are must be divided into 80 and 20 percentage train and test images respectively. The dataset contains 5 different categories of animal were taken in five different folders. And each folder contains of 60 images in train and 15 images in val. We have images folder and labels folder (as shown in the Table.2: Train and Val images in Dataset), Where in images all images are stored and in label folder, we have values of every image. The images stored in a folder will be given to the different phases of the project to processing. For example, in this project first we have to do the operation label encoding to the images for the purpose of image pre-processing, which is helps in the gives effective results efficiently which helps for the future execution of animal detection in the Deep learning framework for the animal detection.

DATASET DESCRIPTION			
S.NO	**ANIMAL**	**NO OF IMAGES**	
		Train	**Test**
01.	Cat	160	30
02.	Deer	160	30
03.	Dog	160	30
04.	Horse	160	30
05.	Yak	160	30

Table.2: Train and Test images in Dataset

The input data we have given to this framework is in the form of images as shown in the Fig-2: Horse Image Data) which is used to recognize the animal in the given particular area. We given the images in the two folders test and Val for the train the data for the process and test the data respectively. The input images will change into the numerical format after pre-processing using label encoding for the better understanding image digital data to the machine.



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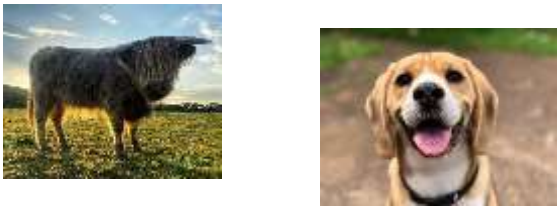

Fig-3: Images in Dataset

3.1.1 Pre-Processing

Pre-processing is a term used to describe editing on images at their most basic level, both the input and output are intensity images. These famous photos are of the same type as the original data recorded by the sensor, where an intensity photo is usually represented by a matrix of image function (brightness) values. Although geometric transformations of images such as rotation, scaling, and translation are categorized here as pre-processing methods because similar techniques are used, the purpose of pre-processing is an enhancement of the image data that suppresses unintentional distortions or enhances some images. We are using label encoding pre-processing technique for enhancing the image input data to use furtherly in the project.

3.1.1.1 Label Encoding

Popular encoding methods for categorical variables include label encoding. According to this method, an individual number is given to each label based on its alphabetical order. In the procedure of pre-processing, we have done label encoding using makesense online tool. Using the label encoding tool we completed the labelling of the input images which are used in the animal recognization using deep learning framework to detect the animal in the specific given area.

3.2 Algorithm

The concept of You Only Look Once is commonly referred to as YOLO. This algorithm recognises and locates several elements in a picture. (In real-time). The class probabilities of the detected image are provided as part of the object detection process in YOLO.

Convolutional neural networks (CNN) are used by the YOLO method to recognise objects in real-time. YOLO refers to “You Only Look Once” is one of the most versatile and famous object detection models. One of the most flexible and well-known object detection models is referred to as "You Only Look Once" (YOLO). Data scientists and machine learning engineers always use YOLO as their first choice for real-time object detection tasks. All of the input photographs are divided by YOLO algorithms into a SxS grid. Object detection is the responsibility of each grid. Now, the boundary boxes for the observed object are predicted by those grid cells. We have five major attributes for each box: the x and y coordinates, the width

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and height of the object, and a confidence score indicating how likely it is that the box contains the object.

The YOLO algorithm employs the following three methods:

- Remaining blocks
-Regression with bounding boxes
-Crossroads Over Union (IOU)

We are using YOLOv5 version in our project which is a revised version of YOLOV4.YOLOv5 is twice as fast as Efficient (competitive recognition model) with comparable performance.

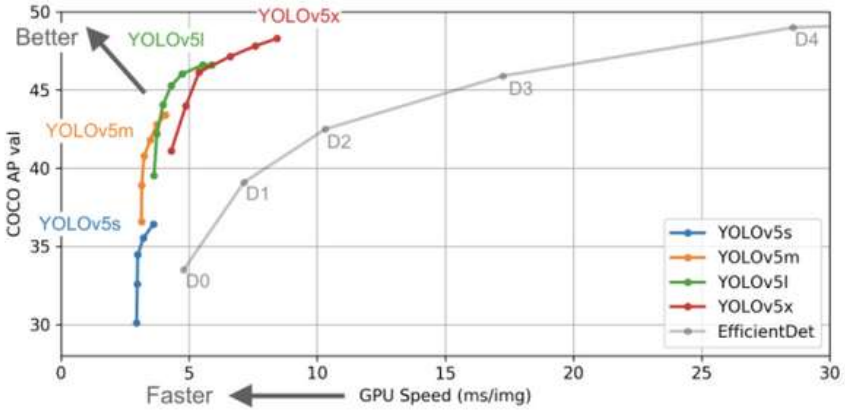

Fig-4: YOLOv5 Graph

3.3 Proposed System

The methodology of the recognization of animals using deep learning framework consists of different phases as shown in the Fig-5: Methodology which includes:

- Input image
-Image Pre-Processing
-YOLO Model and Configuration
-Object Detection
-Animal Detected

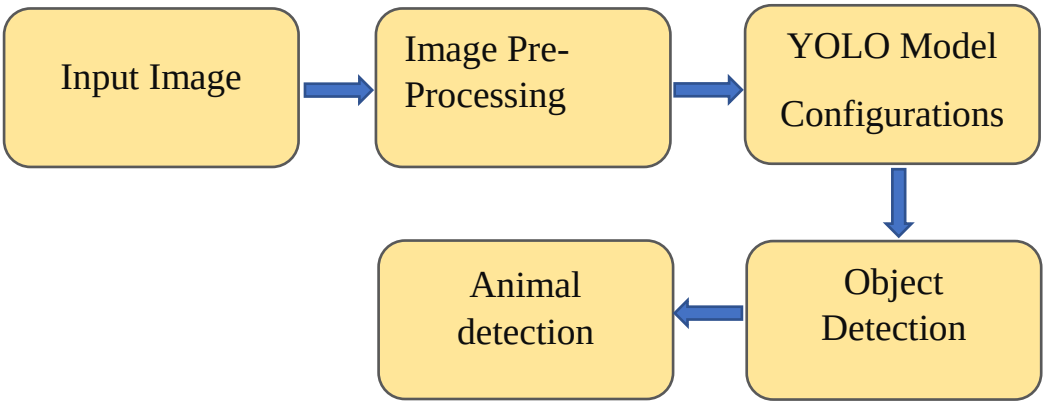

Fig-6: Methodology

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The first step in the methodology input image gives the required images to the framework to ease the further process. In the next step image pre-processing the images are labeled using the label-encoding tool to convert digital image data to text labels to uncomplicated the farther operation after that YOLO model and configuration used to batch into the different blocks. The YOLO main aim is object detection in single iteration, it does not take more steps and more time to detect the object. Finally, it detects the specified image in the given region with the name and accuracy.

4.Results & Discussions

Our project Recognization of animals using Deep Learning detects the animal given as input by mentioning the particular animal's name with the accuracy. The accuracy tells that how many times the model was correct overall.

Fig-7: Batch wise animal detection

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Table.3: Results of given input images

Comparison of our work and previous work:

Proposed Model Performance		**Previous Performance**	
Algorithm name	Accuracy	Algorithm name	Accuracy
YOLOv5	99%	CNN	85%
		SVM	94%
		DCNN	91%
		RCNN	90%

Table.4: Differentiation of existing and proposed

5.Conclusion:

Observing wild animals in their natural environment is an essential task in ecosystem. As preventing the endangered species is a human tendency. Many wild animals on the Earth have disappeared due to the deforestation And there are some other reasons also, in the rapid increase in construction of the road in between forest and wild animal dense areas, it became very difficult for the driver to ride. Sometimes the driver may not be able to spot the animal, which sometimes leads to a dangerous accident. By doing this project we can prevent the animal

RESULTS FOR DISTINCT FOLDERS				
S.NO	**FOLDER NAME**	**RESULT VALUES**		
		Accuracy	**Precision**	**Recall**
01.	Cat	92	92.7	99.8
02.	Deer	91	99.8	91.8
03.	Dog	86	98.9	97.2
04.	Horse	99	90.7	83.3
05.	Yak	90	91.8	98.9

attacks from human and also to human beings. We want to detect the animal in a certain region. For getting an accurate and fast accuracy we are using deep learning algorithms. We are using You Only Look Once (YOLO) algorithm, which is very fast in giving the better accuracy than another algorithms in deep learning. This is an algorithm that is used for detection and recognition. Here we are taking the dataset from Kaggle where it consists of different images

of animal in different angles, with that we will be training the dataset and get the accurate results for it.

Furtherly we can add different features to this project. As while driving the vehicles we can add if any animal appears like crossing the road, then a little vibration or alarm notification to the driver. Secondly, in the case of fields or human areas if any dangerous animals appears then a notification to the forest officers.

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