PSIT-Pranveer Singh Institute of Technology
Kanpur-Delhi National Highway (NH-2), Bhauti, Kanpur-209305 (U.P.), India

COMPUTER SCIENCE AND ENGINEERING DEPARTMENT

Final Year Project

PROGRESS DIARY

(KCS-851)

Cow Breed Classification

Sana Siddiqui 1901640100233
Ankit Kumar 1901640100054
Atharva Vishwakarma 1901640100082
Avanish Dubey 1901640100083

Project_Id: 23A19

Mr. Atif Mahmood
Assistant Professor

Department Vision Statement

To be a recognized Department of Computer Science & Engineering that produces versatile computer engineers, capable of adapting to the changing needs of computer and related industry.

Department Mission Statements

The mission of the Department of Computer Science and Engineering is:

i. To provide broad-based quality education with knowledge and attitude to succeed in Computer Science & Engineering careers.

ii. To prepare students for emerging trends in computers and related industries.

iii. To develop competence in students by providing them with skills and aptitude to foster a culture of continuous and lifelong learning.

iv. To develop practicing engineers who investigate research, design, and find workable solutions to complex engineering problems with awareness & concern for society as well as the environment.

Program Educational Objectives (PEOs)

i. The graduates will be efficient leading professionals with knowledge of computer science & engineering discipline that enables them to pursue higher education and/or successful careers in various domains.

ii. Graduates will possess the capability of designing successful innovative solutions to real-life problems that are technically sound, economically viable, and socially acceptable.

iii. Graduates will be competent team leaders, effective communicators, and capable of working in multidisciplinary teams following ethical values.

iv. The graduates will be capable of adapting to new technologies/tools and constantly upgrading their knowledge and skills with an attitude for lifelong learning

Department Program Outcomes (POs)

The students of Computer Science and Engineering Department will be able:

1. Engineering knowledge: Apply the knowledge of mathematics, science, Computer Science & Engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identity, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and Computer Science & Engineering sciences.

3. Design/development of solutions: Design solutions for complex Computer Science & Engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Investigation: Use research-based knowledge and research methods including design of experiments, analysis, interpretation of data, and synthesis of the information to provide valid conclusions.

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex Computer Science & Engineering activities with an understanding of the limitations.

6. The Engineering and Society: Apply to reason informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice in the field of Computer Science and Engineering.

7. Environment and sustainability: Understand the impact of professional Computer Science & Engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the Computer Science & Engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex Computer Science & Engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of Computer Science & Engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Department Program Specific Outcomes (PSOs)

The students will be able to:

1. Use algorithms, data structures/management, software design, concepts of programming languages, and computer organization and architecture.
2. Understand the processes that support the delivery and management of information systems within a specific application environment.

Course Outcomes:

On successful completion of this course:

S No	Course Outcome
CO1	Identify and state **[Remember]** the problem statement by surveying a variety of domains.
CO2	Specify **[Understand]** the design methodologies appropriate to solve the problem.
CO3	Apply **[Apply]** appropriate tools and techniques, and resources to implement design exhibiting integrity and ethical behavior of engineering practices.
CO4	Test and Defend **[Analyze]** their work along with their team members through reports and presentations.

CO-PO/PSO Mapping:

CO/PO	STATUS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	A	3	3	3	2	3	3	3	3	3	3	3	3	3	
CO2	A	3	3	3	2	3	3	3	3	3	3	3	3		3
CO3	A	3	3	3	3	3				3		3	3	3	
CO4	A								3	3	3	3	3		
CO5	NA														

PSIT-Pranveer Singh Institute of Technology
Kanpur-Delhi National Highway (NH-2), Bhauti, Kanpur-209305 (U.P.), India

Cow Breed Classification

Report submitted in partial fulfillment of the requirement for the

degree of

B.Tech.

In

Computer Science & Engineering

Under the Supervision of

Mr. Atif Mahmood

Assistant Professor

By

Ankit Kumar (1901640100054)

Atharva Vishwakarma (1901640100082)

Avanish Dubey (1901640100083)

Sana Siddiqui (1901640100233)

Pranveer Singh Institute of Technology, Kanpur
Dr. A P J A K Technical University
Lucknow

DECLARATION

This is to certify that Report entitled "Cow Breed Classification" which is submitted by me in partial fulfillment of the requirement for the award of degree B.Tech. in Computer Science & Engineering to Pranveer Singh Institute of Technology, Kanpur Dr. A P J A K Technical University, Lucknow comprises only my own work and due acknowledgment has been made in the text to all other material used.

Date:

Ankit Kumar (1901640100054)
Sana Siddiqui(1901640100233)
Atharva Vishwakarma(1901640100082)
Avanish Dubey (1901640100083)

Approved By:

Prof. (Dr.) Vishal Nagar
Dean Computer Science and Engineering
PSIT, Kanpur

Certificate

This is to certify that Report entitled "Cow Breed Classification" which is submitted by **Sana Siddiqui (1901640100233), Ankit Kumar (1901640100054), Atharva Vishwakarma (1901640100082), Avanish Dubey (1901640100083)**. In partial fulfillment of the requirement for the award of degree B.Tech. in Computer Science & Engineering to Pranveer Singh Institute of Technology, Kanpur Dr. A P J A K Technical University, Lucknow is a record of the candidate's own work carried out by him under my/our supervision. The matter embodied in this thesis is original and has not been submitted for the award of any other degree.

Date:

Signature
(Mr. Atif Mahmood)
(Assistant Professor)

-

PSIT-Pranveer Singh Institute of Technology
Kanpur-Delhi National Highway (NH-2), Bhauti, Kanpur-209305 (U.P.), India

SYNOPSIS

ON

"Cow Breed Classification"

Submitted in

Partial Fulfillment of requirements for the Award of Degree

of

Bachelor of Technology

In

Computer Science and Engineering

By

(Project Id: 23A19)

Sana Siddiqui (1901640100233)
Ankit Kumar (1901640100054)
Atharva Vishwakarma (1901640100082)
Avanish Dubey(1901640100083)

Under the supervision of
Mr. Atif Mahmood
(Assistant Professor)

Pranveer Singh Institute of Technology.
Kanpur - Agra - Delhi National Highway - 19
Bhauti -Kanpur - 209305.
(Dr. A.P.J. Abdul Kalam Technical University)

Table of Contents

1. Introduction

Represented by a worldwide population of about 1.4 billion animals, cattle are our most important livestock species. As the major source of milk, meat, and draught power, cattle may be considered multi-purpose livestock.

Image analysis using computer technology and various predictive applications are commonly used in various fields of human activity and agriculture is one of them. The number of farms is constantly growing and their productivity is increasing, so the importance of computer technology in the automation of agricultural processes is gradually rising. When raising cows, the relationship between the lifetime for which the Cow would produce milk, the meat content that it would yield, the price of purchasing the cow, and fodder consumption can be taken as criteria for organizing the attendance and nutrition of animals in present-day conditions. These parameters are quite important and must be strictly controlled. When they go beyond the permissible limits, the cows' immune system is significantly affected, and, accordingly, the economic efficiency of the farm suffers. It should be noted that the measurement and maintenance of cattle are still manual and rather expensive. Therefore, it seems appropriate to use methods of computational intelligence to solve these problems, in particular, a neural network approach using several neural network models. Convolutional artificial neural networks are used to recognize cows in a photograph and identify their breed followed by determining their body dimensions.

This project is a Deep Learning Model which will perform Breed Classification of cows. The model will classify the cow which is given as input into a particular category i.e. breed. Majorly four types of breeds have been taken as part of the training data for the model.

2. Project Objective

The main objective is to classify Cow breeds using Deep Learning Models and to get specific information about that breed like the quantity of milk they give, the cost of follow-up, its market price if sold, the amount of meat we can get, and all the general information related to that breed. In our project, we focus on four types of species in which we would be training our deep learning model. Those breeds are below:

- Gir
- Sahiwal
- Rathi
- Red Sindhi

This model will be using three different CNN models in which we can check or classify an image by choosing a respective model and the model would categorize the breed type and will give information like

- Cow's Milk Production
- Time for which Cow would produce milk.
- The expense of maintaining the cow.
- Price of Purchasing the cow
- Meat content that it would yield.

For each model, we will plot a separate Training and Testing Graph, along with showing the confusion matrix of the respective model, which will help us to determine the accuracy of the model.

3. Literature Survey

The conventional constructs of identifying animals can be categorized into :

1. Permanent Recognition Construct(PRC)
2. Semi-Permanent Recognition Construct(SRC)
3. Temporary Recognition Construct(TRC)

According to, the sketching pattern is applied for the recognition of cattle such as Holsteins and Guernsey with broken color. High drawing skills of an individual for sketching is needed which should be comparable to standard image quality and positively affect the cattle identification process. However, this method cannot be used for the identification of solid collared breeds such as Red Poll and Brown Swiss breed as some artificial marking methods such as ear tagging and tattooing that are discrimination based are needed. However, the method of ear tagging damages the cattle's ear in the long run. As iterated in Petersen's work, the muzzle print-based cattle recognition method using blue ink and A-5 paper was the first attempt to get a permanent recognition method for cattle. In the method, skills are required to acquire the muzzle pattern's print image, by holding firm the cattle.

Lately, the research community has shifted attention to advancing cattle recognition using the image of muzzle print as a new paradigm for cattle identification. According to the print image the muzzle pattern is made up of beads and ridges patterns. Muzzle dermatoglyphics such as granola, ridges, and vibrissae from various breeds are not the same . Similarly, proposed in Mishra et al. is method of cattle breeds recognition using the beads and ridges features of muzzle print images. Similar to the work of Mishra et al. is Minagawa et al. they proposed a cattle identification method using muzzle print, the performance evaluation was made using filtering techniques for muzzle image analysis and morphological approaches. Equal Error Rate (EER) of 0.419 was reported by them. Contrary to Minagawa, it is a framework proposed by Barry . The framework is a cattle recognition tool using muzzle print images. They reported the 241 false non match rates (FNMR) over 560

genuine acceptance rate (GAR) and 5197 false matches over 12,160 impostors matching closely with the same value of EER of 0.429, respectively. In their cattle identification effort, Kim et al. proposed a method that could recognize the Japanese black cattle using the cattle face's pixel intensity. The results of the experiment were reported based on the image datasets of 4 cattle breeds used which were captured on A-5 paper with blue ink for the purpose of cattle recognition. Nevertheless, the performance of the matching refinement approach and the original SIFT approach were compared, and the value of EER
equal to 0.0167 was achieved.

An object recognition method that is based on CNN was proposed in. The proposed architecture which combines RGB image and its corresponding depth image for object recognition is made up of two unconnected CNN processing streams, which are sequentially integrated with a late fusion network. ImageNet is employed for the training of the CNNs in which the depth image is encoded as a rendered RGB image, making the information that is contained in the depth data to go round over all the three RGB channels, and subsequently, a standard and pre-trained CNN is employed for the recognition. Due to limited availability of large scale depth datasets that are labeled, CNNs that are pre-trained on ImageNet are employed. Proposed in, is another object recognition method, which employs deep CNN. Jingqui proposed the method of object recognition based on image entropy that was aimed at identifying the behavior of a cow object that is on the motion against a complicated background. Andrew et demonstrated the suitability of computer vision pipelines that utilize deep neural architectures to carry out automated Holstein Friesian cattle detection in addition to individual identification in a farm set up.

In the process of extracting features from an image, Kumar, posited that pre-processing is important for object tracking accuracy but feature extraction and representation algorithms that are based on appearance are unable to perform the recognition of object as a result of image blurriness due to noise.

4. Feasibility Study:

CNN is needed as it is an important and more accurate way for image classification. With Artificial Neural Networks, a 2D image would first be converted into a 1-dimensional vector before training the model. The human brain processes a huge amount of information the second we see an image. Each neuron works in its own receptive field and is connected to other neurons in a way that they cover the entire visual field. Just as each neuron responds to stimuli only in the restricted region of the visual field called the receptive field in the biological vision system, each neuron in a CNN processes data only in its receptive field as well.

Economical Feasibility:

This is a very important aspect to be considered while developing a project .We decided on the technology based on the minimum possible cost factor.All hardware and software cost has to be borne by the organization. Overall we have estimated that the benefits the organization is going to receive from the proposed system will surely overcome the initial costs and the later running cost of the system.

Technical Feasibility:

This included the study of function, performance, and constraints that may affect the ability to achieve an acceptable system. For this feasibility study, we studied the complete functionality to be provided in the system, as described in the System Requirement Specification (SRS), and checked if everything was possible using different types of frontend and backend platforms.

5. Methodology/ Planning of work

An Artificial Neuron Network (ANN), is highly known as Neural Network. And it is a computational model based on the structure and functions of biological neural networks. For example, it is like an artificial human nervous system for receiving, processing, and transmitting information in the phase of Computer Science.Basically, they're divided into 3 different layers in a neural network: -

1. Input Layer -All the inputs are grazed in the model through this layer.
2. Hidden Layers -There can be more than one hidden layer that is used for processing the inputs received from the input layers.
3. Output Layer -The data after processing is made available at the output layer.

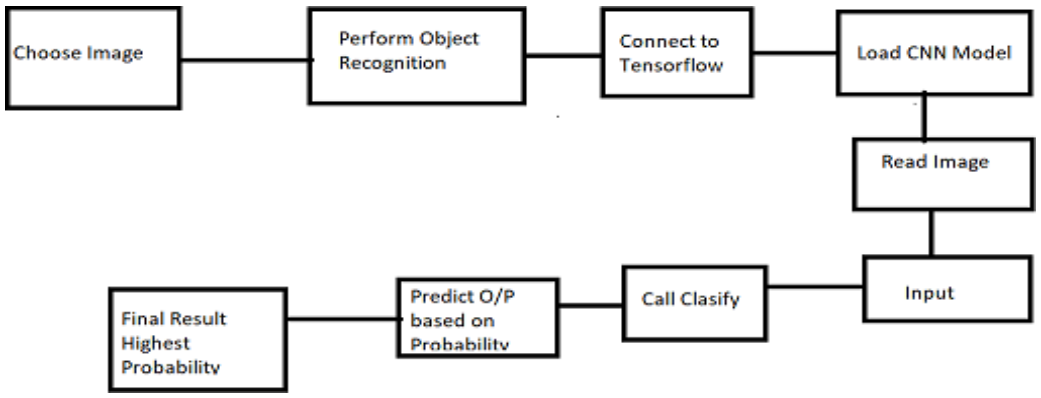
B. Convolutional Neural Network:

Convolutional Neural Network is an exceptional kind of strengthening to advancing artificial neural networks, which is stimulated through the visual cortex. In CNN, the neuron in a layer is solely related to a small area of the layer earlier than it, alternatively of all the neurons in an entirely related manner, so CNN manages fewer quantities of weights and a much smaller number of neurons. A convolutional neural network has an input layer, hidden layers, and an output layer. In any feed-forward neural network, any middle layers are known as hidden because their inputs and outputs both are masked by the activation function and final convolution. In a convolutional neural network, the hidden layers consist of layers that will perform convolutions. Mainly this layer consists of multiplication or other dot products. This is accompanied by layers such as pooling, fully connected, and normalization layers.

Cow breed prediction using CNN

In the first step, we choose an image as an input in which we want to predict the object. In the second step, we perform object recognition which will connect to the Pytorch which contains 1000 images of different objects used for training as mentioned in the third step. In the fourth step, the CNN Model is loaded which is CNN (convolution Neural Network) model. CNN with two convolutional layers, pic

out a special combination of activation features and classifiers for comparison purposes. Test the system with training datasets respectively. Then in the fifth step, the input image is given as an input parameter to ReadImage()which converts the image into pixels. In the sixth step, input() is executed which converts the pixel image into a tensor, and in final the step this tensor image is given as an input parameter to classify the function which predicts the output based on the probability from which we consider the highest probability value as a best predicted object.



Conclusion:

The main aim of this model is to learn how to use a machine learning classification tool to classify images, namely cow breeds. The application is properly proved with all sorts of cow images which gives faithful and precise results. A convolution neural network is a learning method for data analysis and predictions. Nowadays it has become a very popular image classification problem.

6. Tools/Technology Used:

Hardware Requirements

A custom PC or Laptop with the following minimum requirements:

RAM: A minimum of 8 GB is required, as training any algorithm will require some heavy Lifting. Less than 8 GB can cause problems while multitasking.

CPU: Processors above Intel Core i7 7th Generation are advised as it is more powerful and delivers High Performance.

Storage: A minimum of 1TB HDD is required as the datasets tend to get larger and larger by the day. If you have a system with SSD a minimum of 256 GB is advised. Then again if you have less storage you can opt for Cloud Storage Options. There you can even get machines with high GPUs even.

6.1 Software Requirements

Browser: Chrome, IE 6.0 Mozilla Firefox

Database: Sqlite3 Database (Django Administration)

Operating System: Windows 7 and above

Documentation Tool: Ms. Word, MS PowerPoint

Scripting Language: Javascript

Front-End Language: HTML, CSS, ReactJS

Back-End Language: Python3

Framework: Tensorflow

Other Softwares: VS Code, Jupyter Notebook, Pycharm

7. References :

Here specifies the description of the study material(Research Papers/other references) referred for the development project.

1. P. Ajeet Ram, P. Manjusha and R. Siddharth, "Application of Deep Learning for Object Detection", *International Conference on Computational Intelligence and Data Science (ICCIDS 2018) Procedia Computer Science*, vol. 132, pp. 1706-1717, 2018.

2. V.A.M. Weber, F.L. Weber, R.C. Gomes, A.S. Oliveira Junior, G.V. Menezes, N.A.S. Belete, et al., "Prediction of Girolando cattle live weight by means of body measurements extracted from images", *Revista Brasileira de Zootecnia*, vol. 49, 2020.

3. E.C. Too, L.Y. Sam, S. Njuki and L. Yingchun, "A comparative study of fine-tuning deep learning models for plant disease identification", *Computers and Electronics in Agriculture*, vol. 161, pp. 272-279, 2019.

4. B. Alexey, C. Y. Wang and H.Y. Mark Liao, "Yolov4: Optimal speed and accuracy of object detection", 2020.

5. S. Albahli, N. Nida, A. Irtaza, M. H. Yousaf and M. T. Mahmood, "Melanoma Lesion Detection and Segmentation Using YOLOv4-DarkNet and Active Contour", *IEEE Access*, vol. 8, pp. 198403-198414, 2020.

(To be filled by Students for every week to show the Weekly Progress of Project)

Subject Code: KCS 851 **Group Id:**

Meeting Date

Session 2022 – 2023 (Odd Semester)

S No	Roll Number	Student Name	Status on Meeting Date (Present /Absent)	Student Signature
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Project Title :_____

Name of Project Supervisor: _____

Work done in current Week:

Work to be done in next Week :

Supervisor Comments:

Supervisor Signature/Date**.....**

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Work done in current Week:

Work to be done in next Week :

Supervisor Comments:

Supervisor Signature/Date**.....**

(To be filled by Students for every week to show the Weekly Progress of Project)

(To be filled by Project Supervisor)

Project Title:_____
Project_Id.:_____

Roll No	Name of the student	Total Marks

Type of the project (Software/ Software and Hardware/ Simulation or Modeling):

Any other Remark:

Supervisor Name and Signature: