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Bird Species Identification Using CNN

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Abstract - Identification of bird species is crucial for ecological study, citizen science initiatives, and conservation efforts. The time-consuming and specialised knowledge needed for traditional identification methods is not beneficial for large-scale applications. In recent years, deep learning has emerged as a promising methodology for automating the identification of bird species using computer vision techniques. In order to identify different species of birds, this study presents a novel deep learning framework that makes use of convolutional neural networks (CNNs) and a large dataset of bird images. A collection of images featuring a range of bird species is used to train the proposed model. This paper provides an accurate and scalable approach for species identification of birds, so advancing the field of ornithology.

Key Words: Bird species identification, Deep learning, Convolutional Neural Network (CNN)

1. INTRODUCTION

Bird species identification is a cornerstone of ornithological research, essential for understanding avian biodiversity, ecology, and behavior. Field guides and reference materials have frequently been used to augment the extensive manual observation that professional ornithologists and bird enthusiasts have historically relied upon for this purpose. Although efficient, manual identification techniques are labor-intensive, time-consuming, and prone to human mistake, which makes them impractical for use in extensive ecological research and conservation initiatives.

Recent developments in machine learning and computer vision have made automated techniques for identifying bird species more popular as practical substitutes for more conventional procedures. Specifically for image classification applications, deep learning has become a potent technique that can learn intricate patterns and representations straight from raw data. Through the use of extensive annotated datasets of bird image training, researchers have shown that it is possible to automate the identification of bird species with a high degree of efficiency and accuracy.

In this paper, we present a novel deep learning framework for bird species identification, leveraging state-of-the-art convolutional neural network (CNN) architectures and a comprehensive dataset of bird images. Our approach aims to address the limitations of existing methods by developing a scalable and accurate solution for automated bird species identification. By harnessing the power of deep learning, we seek to overcome the challenges associated with manual identification methods, enabling more efficient and reliable species identification for ecological studies, conservation monitoring, and citizen science initiatives.

2. Literature Review

The author offers a cutting-edge method for automatically identifying bird species that is made to handle a wide variety of species. The authors discuss the difficulties in accurately and scalable bird species identification, which is important for applications like biodiversity assessment and ecological monitoring. To categorise bird species from audio recordings, their system integrates techniques from machine learning, signal processing, and feature extraction [1].

The authors discuss the increasing demand for reliable and effective techniques for identifying bird species, which are crucial for ecological studies, conservation initiatives, and biodiversity monitoring. It uses convolutional neural networks (CNNs), a deep learning approach, to analyse bird photos and categorise them into several species. The authors show how their method can reliably identify bird species from visual cues by using a sizable collection of annotated bird photos to train the model [2].

The author describes a work that uses deep learning methods on a GPU platform to identify different species of birds. The authors discuss the need for scalable and effective methods for identifying bird species, which is essential for ecological study, biodiversity monitoring, and conservation initiatives. The study uses convolutional neural networks (CNNs), a deep learning technique, to automatically identify different kinds of birds from photos. The scientists hope that by using a GPU platform for accelerated processing, the identification procedure will be more effective and faster [3].

3. METHODOLOGY

3.1 Data Collection:

Data collection involves gathering relevant data from various sources to build a dataset suitable for the intended task.

The dataset consists of bird images collected from various sources, including online repositories. It comprises 882 images categorized into 7 classes of birds: American Robin, Crested Kingfisher, Emperor Penguin, Gila Woodpecker, Golden Eagle, Lucifer Hummingbird, and Peacock.

3.2 Data Preprocessing:

Data preprocessing involves transforming raw data into a format that is suitable for analysis and model training.

3.3 Algorithm:

Convolutional Neural Networks (CNNs) are a class of deep neural networks commonly used for analyzing visual imagery. They have revolutionized various fields such as computer vision, image recognition, and medical image analysis. CNNs are designed to automatically and adaptively learn spatial hierarchies of features from input images. The input image is processed by the Convolutional layer to extract features, the Pooling layer reduces computation by downsampling the image, and the fully connected layer generates the final prediction. The network uses gradient descent and backpropagation to discover the best filters.

1. Convolutional Layers:

The convolutional layers are the building blocks of CNNs. They consist of filters (also called kernels) that slide over the input image, performing element-wise multiplication with a small region of the input and then summing up the results to produce a feature map. This operation captures local patterns such as edges, textures, and shapes.

2. Pooling Layers:

Pooling layers are used to reduce the spatial dimensions of the feature maps produced by convolutional layers while retaining important information. Max pooling is the most commonly used pooling operation, which selects the maximum value from each region of the feature map. Pooling helps in reducing computational complexity and controlling overfitting by providing translation invariance.

3. Fully Connected Layers:

Fully connected layers are traditional neural network layers where each neuron is connected to every neuron in the preceding layer. These layers are typically placed at the end of the CNN architecture and are responsible for learning high-level features and making predictions. They perform classification based on the features extracted by the convolutional and pooling layers.

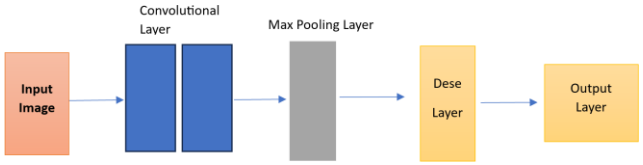

Fig 1:- CNN Architecture

4.RESULT

Through the use of a Convolutional Neural Network (CNN) model trained on a dataset comprising photos of seven distinct bird species, the implemented system correctly recognises bird species from input images. The outcome is summed up by the following main points:

Graphical User Interface (GUI): The Tkinter Python package was used to create an intuitive GUI. The GUI lets users identify the species of bird by letting them choose an image from their local system.

Model Loading: TensorFlow Keras facilitates the smooth loading of the trained CNN model into memory. It is kept in a file called "bird_species_model.h5".

Image Classification: The procedure begins with the system choosing an image, preprocessing it by scaling and normalising it before passing it through to the CNN model.

Prediction representation: The user is presented with the predicted bird species within the GUI interface, coupled with a scaled representation of the input image.

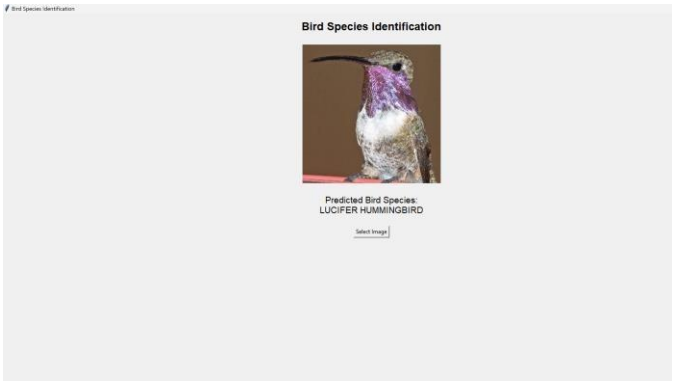

Fig 2:- Output of bird identification

CONCLUSION

Convolutional Neural Networks (CNNs) are used to reliably categorize various bird species by training deep learning models on massive datasets of tagged bird pictures. CNNs are a particular kind of neural network architecture that are used to handle input that resembles a grid, such photographs. They use convolutional layers, which use learnable filters to extract low-level features such as textures and edges. Subsequent layers then integrate these low-level characteristics to create more sophisticated high-level features. Translation invariance is introduced, and feature maps are down sampled using max-pooling layers. Data collection and preprocessing are usually the first steps in the process. Next, a suitable CNN architecture, such as VGGNet, ResNet, or EfficientNet, is chosen. The model is then trained on the image data using methods like transfer learning or training from scratch. Finally, the model is evaluated on a test set before being deployed for actual bird identification tasks. Because CNNs can automatically learn hierarchical visual characteristics and patterns, they have shown to be quite useful for this application. This allows for accurate categorization even among visually identical species. However, the number, diversity, and quality of the training data as well as the surrounding circumstances at the time of picture acquisition, all affect how well they work. By offering automatic and precise identification capabilities, CNN-based bird species identification may substantially support citizen science initiatives, conservation efforts, and bird watching activities when properly applied.

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REFERENCES

1. M. T. Lopes, L. L. Gioppo, T. T. Higushi, C. A. A. Kaestner, C. N. Silla Jr. and A. L. Koerich, "Automatic Bird Species Identification for Large Number of Species," 2011 IEEE International Symposium on Multimedia, Dana Point, CA, USA, 2011, pp. 117-122, doi: 10.1109/ISM.2011.27.
2. K. M. Ragib, R. T. Shithi, S. A. Haq, M. Hasan, K. M. Sakib and T. Farah, "PakhiChini: Automatic Bird Species Identification Using Deep Learning," 2020 Fourth World Conference on Smart Trends in Systems, Security and Sustainability (WorldS4), London, UK, 2020, pp. 1-6, doi: 10.1109/WorldS450073.2020.9210259.
3. P. Gavali and J. S. Banu, "Bird Species Identification using Deep Learning on GPU platform," 2020 International Conference on Emerging Trends in Information Technology and Engineering (ic-ETITE), Vellore, India, 2020, pp. 1-6, doi: 10.1109/ic-ETITE47903.2020.85. create review for this