

Animal Recognition by an Android App

Prince Gangurde¹, Raj Hatnagar², Kuldeep Kumavat³, Rushikesh Tarle⁴, Prof. Vijay Chaudhari⁵

^{1,2,3,4} Department of Information Technology, Sandip Polytechnic, Nasik, Maharashtra, India.

⁵ HOD, Department of Information Technology, Sandip Polytechnic, Nasik, Maharashtra, India

Abstract –This paper presents an overview of an android app, which is basically an Animal Recognition System in which the person just have to take a picture of the animal and the app will identify the animal using a Convolutional Neural Network hosted on a Server, also this app will provide the name and related information about the animal in more than one language, it also provides some amazing facts about the identified animal.

Key Words: Android, Animal Recognition System, Convolutional Neural Network, Server.

1. INTRODUCTION

People nowadays are very adventurous they are going for wildlife safaris, many of them go hiking in the mountain. Most of the parents go camping with their children. Schools take children to zoos for showing them wildlife which they don't see daily. Many time we see some animal species that we don't have an idea about. Parent can't explain to their children who are curious to know about it.

Here comes the Animal Recognizing app which can identify animal by their photo. It's really helpful for the kids and the adults. It helps them in fulfilling their curiosity to know about the animal they're seeing. This app really helps kids to know a lot more about the animal than just its name. It tells them some interesting facts about the animal. Whenever the user take a picture of the animal using the app it send the picture to the Sever where Convolutional Neural Networks (CNNs) are used to identify the image. CNNs are a category of Neural Networks that have proven effective in areas such as image recognition and classification. CNN have been successful in identifying animals, faces, objects and traffic signs apart from powering vision in robots and self-driving cars ^[1].

When the CNNs identify the image they send the information like about the animal detected to the android app which further can be translated through the app into various languages according to users need. The app also provides various facts about the animal that it has detected.

2. SYSTEM ARCHITECTURE

The software is simply based on a Client-Server Architecture. In today's life client-server phenomena is becoming so popular so that it used in all Fused by the client server system is Hypertext transfer protocol (HTTP), Simple mail transfer protocol (SMTP), and File transfer protocol (FTP). It is a software architecture where client always send request and server is the service provider ^[2]. It provides an inter-process communication between client and server because it involves the exchange of data from both the side that is client and server. Client-Server architecture works when the client computer sends a resource or process request to the server over the network connection, which is then processed and delivered to the client. Here the application simply captures the picture of the animal and then transfer it over to the server. The server with the help of CNN and Dataset classify the image and respond by an analytical report which contain the information about the animal. Fig 1 shows the architecture of the system.

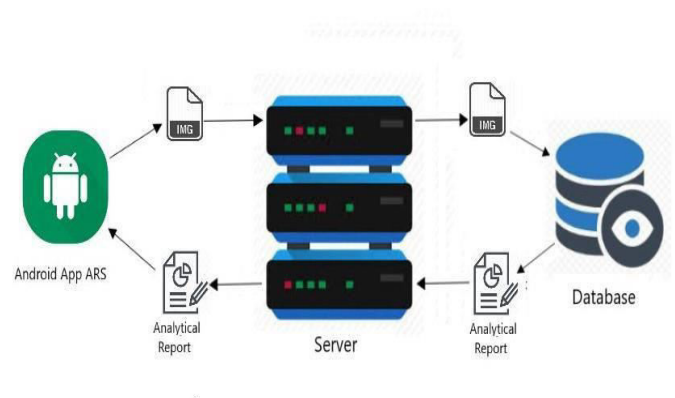


Fig 1: Architecture of the system.

2.1 THE ANDROID APPLICATION

Android is developed by the Open Handset Alliance, which is led by Google, based on a modified version of Linux kernel and other open source software and designed primarily for touchscreen mobile devices such as smartphones and tablets. It is also available for smart watches and personal computers.

The android app here can be used to take the picture of the animal. It is built using Android Studio with XML as front end and Java as a backend programming language. Here the app has a two options whether to take live photo or to select from the gallery of the smartphone.

After capturing the image or selecting the image from the galley the application sends the image to the server which returns information about the animal detected. Fig 2 shows the User Interface of the application.

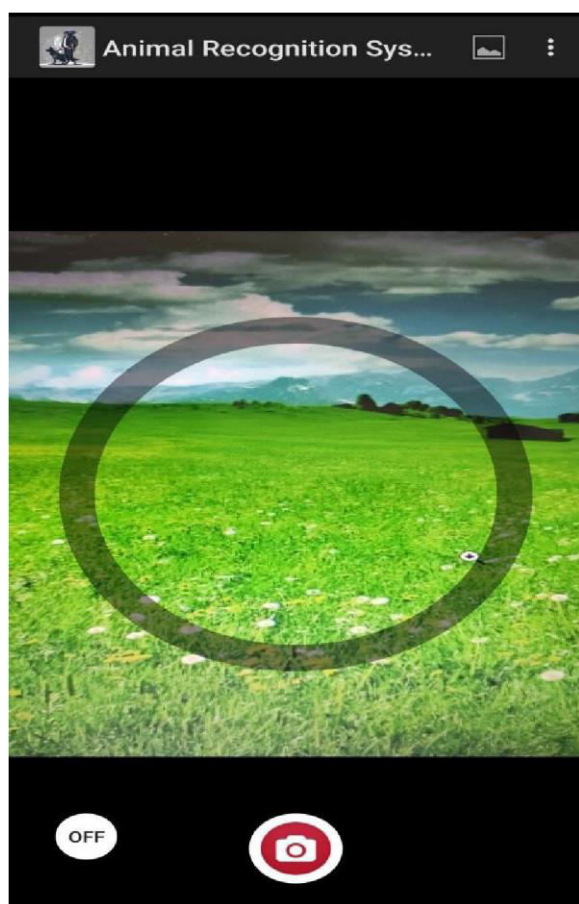


Fig 2: User Interface

2.2 THE SERVER (REST API)

The word REST stands for Representational State Transfer, and it is a software architectural style that defines a set of rules to be used when creating APIs. The APIs that conform to the REST style is called RESTful APIs. Flask-RESTful is an extension for Flask that adds support for quickly building REST APIs. It is a lightweight abstraction that works with the existing ORM/libraries. The REST architecture was originally designed to fit the HTTP protocol that the World Wide Web uses. First, we created one endpoint and exposed them to the clients (android application). Then, the clients are able to access them via HTTP using the correct HTTP methods. The clients send requests to these URIs using the methods defined by the HTTP protocol^[3]

2.4 MIDDLEWARE

Middleware is computer software that provides services to software applications. Middleware is an object that wraps the original application, hence the name. A middle is called between the application and the server. It can modify the response or the environment or route requests to different application objects Fig 3 shows how a middleware works^[4] Client → Server → Middleware → Server-side Application

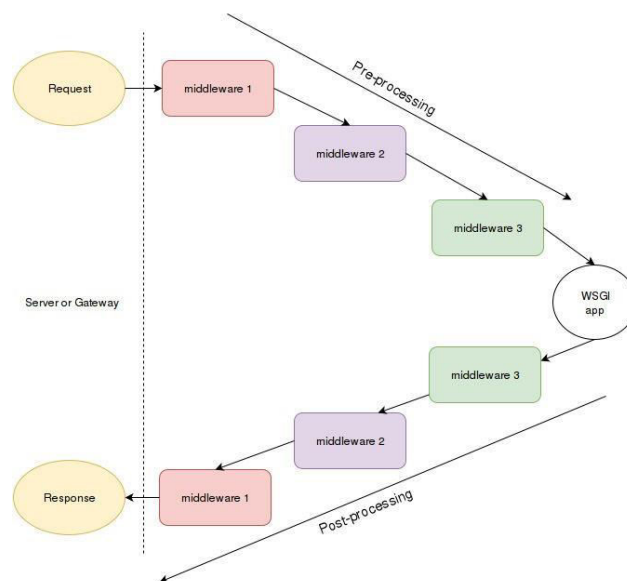


Fig 3: How a middleware works

2.5 ANIMAL RECOGNITION SYSTEM

The image recognition algorithm (image classifier) takes the image as input and outputs what the image contains. In other words, the output is a class label (dog, cat, horse etc.)^[5].

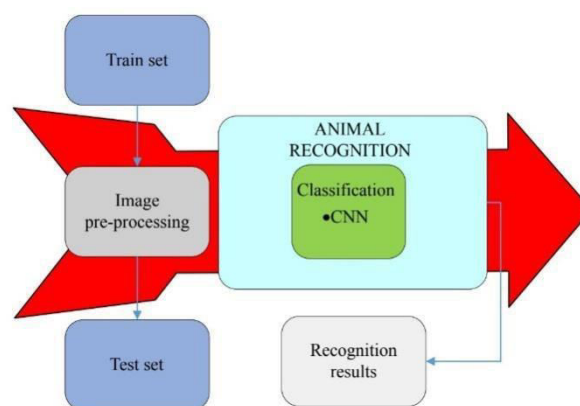


Fig 4: Animal Recognition System

The animal recognition system (see Fig. 4) is divided into following steps:

- The pre-processing block - the input image can be treated with a series of pre-processing techniques to minimize the effect of factors that can adversely influence the animal recognition algorithm.
- Neural Networks (classification) –Here the Convolutional Neural Networks builds predictive model from training data that have features and class labels. The predictive model use the features learnt from the training data on the new (previously unseen) data to estimate their class labels. The output classes are discrete.

2.6 CONVOLUTIONAL NEURAL NETWORKS

The name “convolutional neural network” indicates that the network employs a mathematical operation called convolution. Convolution is a specialized kind of linear operation. Convolutional networks are simply neural networks that use convolution in place of general matrix multiplication in at least one of their layers.^[6]

A convolutional neural network consists of an input and an output layer, as well as multiple hidden layers. The hidden layers of a CNN typically consist of a series of convolutional layers that *convolve* with a multiplication or other dot product. The activation function is commonly a RELU layer, and is subsequently followed by additional convolutions such as pooling layers, fully connected layers and normalization layers, referred to as hidden layers because their inputs and outputs are masked by the activation function and final convolution. The final convolution, in turn, often involves backpropagation in order to more accurately weight the end product.^[7]

The convolutional neural networks are mostly used in image classification, natural language processing, recommender systems, etc.

3. RESULTS

The proposed application basically servers an educational app for children and adults to help them in identifying the animals in the wildlife or domestic animal such as cats and dogs. It also provides them with useful information about the animal in many languages with voice enabled system for their ease. This proves to be a helping hand to Children, Hikers, Travelers and Wildlife enthusiasts. Fig 5 shows the successful prediction of the dog as boxer.

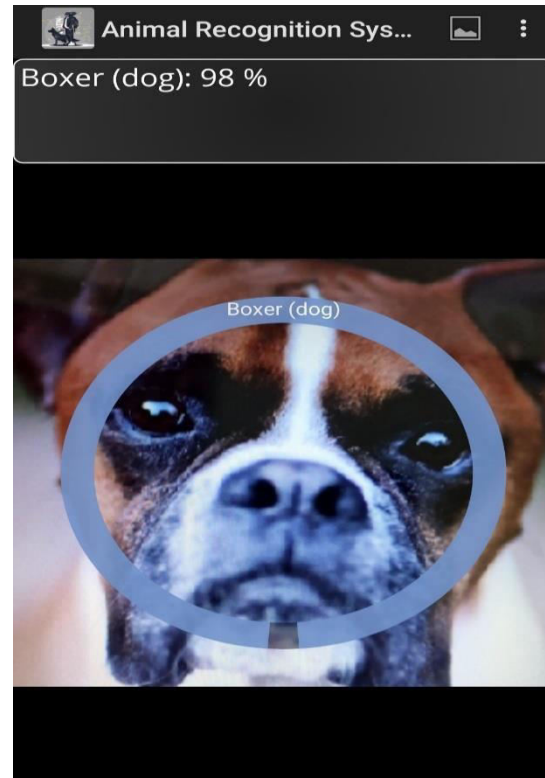


Fig5: Animal successfully classified as Boxer (Dog).

4. CONCLUSIONS

The paper presents a proposed application for educational purpose for children and adults to identify animals around them. The app is built using Android Studio connected to Server with RESTful services. A convolutional neural network is used to identify classify the animal and the information is provided in many languages with voice assistance.

ACKNOWLEDGEMENT

I would like to express my gratitude to my primary supervisor, Prof. V.J Chaudhari, who guided me throughout this project. I would also like to thank my friends and family who supported me and offered deep insight into the study.

REFERENCES

- [1]. WU, J. L. and W. Y. MA. A Deep Learning Framework for Coreference Resolution Based on Convolutional Neural Network. In: 2017 IEEE 11th International Conference on Semantic Computing (ICSC). San Diego: IEEE, 2017, pp. 61–64. ISBN 978-1-5090-4284-5. DOI: 10.1109/ICSC.2017.57.
- [2] “Client-Server Model” by Saifulazmi Tayib.
- [3] “Image classification API” by Kunal Bhanskar
- [4] <https://scotch.io/tutorials/build-a-restful-api-with-flask-the-tdd-way-part-2>

[5] Tibor TRNOVSZKY, Patrik KAMENCAY, Richard ORJESEK, Miroslav BENCO, Peter SYKORA. Department of multimedia and information-communication technologies, Faculty of Electrical Engineering, University of Zilina, Univerzitna 8215/1, 010 26 Zilina, Slovakia. DOI: 10.15598/aece.v15i3.2202.

[6] Ian Goodfellow and Yoshua Bengio and Aaron Courville (2016). Deep Learning. MIT Press. p. 326.

[7] "CS231n Convolutional Neural Networks for Visual Recognition". cs231n.github.io. Retrieved 2018-12-13.