



Android Application on Image Classification using ML kit

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ABSTRACT

Image classification nowadays, is used to narrow the gap between computer vision and human vision so that machine can recognize the image in same way like human recognizes an image. It deals with assigning the appropriate class for the given image. We therefore propose an application named "R5 Image classifier" using Machine learning vision kit that classifies the given images using Tensorflow lite model. Machine learning vision kit has been choosing as the best option for training process as it supports base model that recognize more than 400 entities and custom Tensorflow lite model.

KEYWORDS: Image classification, computer vision, machine learning vision kit, TensorFlow lite model, android studio

1. INTRODUCTION

According to its visual content, Image classification refers to a process in computer vision that can classify an image. With the increasing volatility, necessity and applications of artificial intelligence, fields like machine learning, and its subsets, deep learning and neural networks have gained immense momentum. The training needs software and tools like classifiers, which feed huge amount of data, analyze them and extract useful features. The intent of the classification process is to categorize all pixels in a digital image into one of several classes. Normally, multi-spectral data are used to perform the classification and, indeed, the spectral pattern present within the data for each pixel is used as the numerical basis for categorization. The objective of image

classification is to identify and portray, as a unique gray level (or color), the features occurring in an image in terms of the object these features actually represent on the ground. Image classification is perhaps the most important part of digital image analysis. Classification between objects is a complex task and therefore image classification has been an important task within the field of computer vision. Image classification refers to the labeling of images into one of a number of predefined classes. There are potentially n number of classes in which a given image can be classified. Manually checking and classifying images could be a tedious task especially when they are massive in number and therefore it will be very useful if we could automate this entire process using computer vision. We can classify images using two ways

first by using CNN and another by using google's Machine learning Kit i.e ML-Kit. The advancements in the field of autonomous driving also serve as a great example of the use of image classification in the real-world. The applications include automated image organization, stock photography and video websites, visual search for improved product discoverability, large visual databases, and image and face recognition on social networks, and many more; which is why, we need classifiers to achieve maximum possible accuracy.

2. LITERATURE REVIEW

Many ideas and projects have been created as part of the image classification of a new platform or in an attempt to reproduce many well-known applications, but there is no relevant document to be considered a suitable reference. While researching, we discovered that previous projects related to our theme were built using old technologies like neural network. They were working applications, but the technology has some limitations. Therefore, we introduced Image classification using Machine learning vision kit which provides more accuracy.

[1] Christoph Sager, Christian Janiesch & Patrick Zschech Christoph Sager proposed "A Survey of Image Labeling For Computer Vision Applications". In this paper, they structure the manual labeling task by its organization of work, user interface design options, and user support techniques to derive a systematization schema for this survey. In this survey discuss five dominant use archetypes (complex scene understanding, diagnosis and classification, image retrieval, instance identification, and statistics generation) as well as present the key application areas of autonomous driving, healthcare, mapping & surveillance, research, and television.

[2] K. Lakshmi, Atmakur Vani, Banda Srinivasulu, Kadapa Shaikshavali proposed "ML Kit In Firebase For App Development", A great set of features are provided by Firebase ML Kit. ML Kit or Machine Learning Kit is a mobile Software Development Kit (SDK) that brings Google's machine learning expertise to Android and iOS apps in a powerful yet easy-to-use library. Whether you are new or experienced in machine learning, you can implement the operations

you need in clear and easy manner. In today's rapid, information-rich world, it is becoming more necessary to build applications that are intelligent in the way they process the data they are fed.

[3] XinJia proposed "Image Recognition Method Based on Deep Learning. It first gives an overview of various deep learning approaches and their recent developments, and then briefly describes their applications in diverse vision tasks. Finally, the paper summarizes the future trends and challenges in designing and training deep neural networks.

[4] K. Ganapathi Babu¹, Dakannagari Harith Reddy, P. Divya Teja, C. Yosepu⁴ proposed "An Overview on Image Classification Methods In Image Processing". This paper gives the concise knowledge on some supervised classification methods used in Image Classification. Pixels are the unit represented in an image. Image classification groups the pixels in different classes. The most common approach for image classification is non-parametric. This survey provides some diverse classification method with some limitations.

3. ANALYSIS OF PROBLEM

As technology is changing rapidly we are developing new ways to do work and also we are automating things to do some work on their own. In Order to automate something the system or machine must need to classify the work blueprint. For that purpose we need the image classification to help them understand the environment. E.g. Self Driving System, Robots, Automated Machines, etc.

Image classification can also be used to aid the visually impaired persons to classify the object or images for the purpose to identify surrounding.

E.g. Live classification of objects or images.

As it works on the manually built dataset so we does not require internet connection thus it can use to solve this problem and we can identify any image or object with reference to their class without internet connectivity.

4. PROPOSED WORK

We have proposed a system that classifies the given input image using Machine learning vision kit. We have designed and developed "R5 Image classifier" android application using android studio which will detect and extract information across a broad group of categories. Machine learning vision kit has been choosing as the best option for training process as it supports base model that recognize more than 400 entities and custom TensorFlow lite model. It produces a high percentage of accuracy.

In our proposed system, the mobile application classifies the image and flower identification acquired from gallery and the device camera in real time. The flower identification mainly focuses in flower category in which there are five types of flowers that have been used. Results are shown in the terms of accuracy of the image classification in percentage.

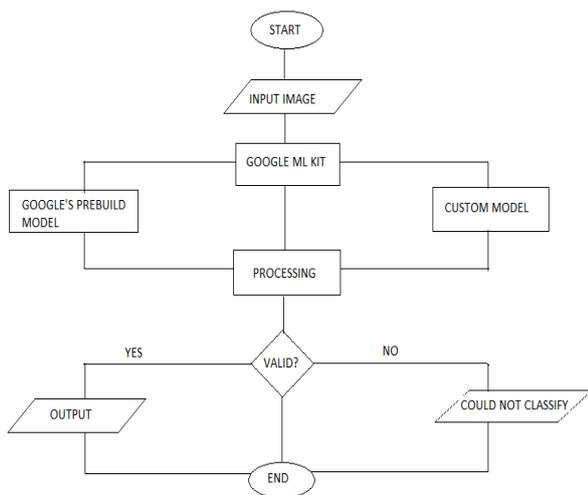


Fig1: Flowchart of System

5. OBJECTIVE

The intent of the classification process is to categorize all pixels in a digital image into one of several land cover classes, or "themes". This categorized data may then be used to produce thematic maps of the land cover present in an image. Normally, multispectral data are used to perform the classification and, indeed, the spectral pattern present within the data for each pixel is used as the numerical basis for categorization. The objective of image classification is to identify and portray, as a unique gray level (or color), the features occurring in an image in

terms of the object or type of land cover these features actually represent on the ground.

6. SYSTEM REQUIREMENT

The system requirement specification of our project will have the entire necessary requirement which will be a baseline of our project.

Machine Learning Vision:

Machine learning (ML) is a type of artificial intelligence (AI) that allows software applications to become more accurate at predicting outcomes without being explicitly programmed to do so. Machine learning algorithms use historical data as input to predict new output values.

Machine learning is important because it gives enterprises a view of trends in customer behavior and business operational patterns, as well as supports the development of new products.

Many of today's leading companies, such as Facebook, Google and Uber, make machine learning a central part of their operations. Machine learning has become a significant competitive differentiator for many companies.

TensorFlow Lite:

TensorFlow Lite is a set of tools that enables on-device machine learning by helping developers run their models on mobile, embedded, and edge devices. TensorFlow Lite is an open-source, product ready, cross-platform deep learning framework that converts a pre-trained model in TensorFlow to a special format that can be optimized for speed or storage.

Java

Java is a programming language and computing platform first released by Sun Microsystems in 1995. It has evolved from humble beginnings to power a large share of today's digital world, by providing the reliable platform upon which many services and applications are built. New, innovative products and digital services designed for the future continue to rely on Java, as well.

XML

XML (Extensible Markup Language) is a markup language similar to HTML, but without predefined tags to use. Instead, you define your own tags designed specifically for your needs. This is a powerful way to

store data in a format that can be stored, searched, and shared. Most importantly, since the fundamental format of XML is standardized, if you share or transmit XML across systems or platforms, either locally or over the internet, the recipient can still parse the data due to the standardized XML syntax.

Android Studio

Android Studio provides a unified environment where you can build apps for Android phones, tablets, Android Wear, Android TV, and Android Auto. Structured code modules allow you to divide your project into units of functionality that you can independently build, test, and debug.

7. IMPLEMENTATION

An Android application framework is a software toolkit that enables app developers to piece together a finished product that meets the requirements of its proprietor. The android framework is the set of API's that allow developers to quickly and easily write apps for android phones. It consists of tools for designing UIs like buttons, text fields, image panes, and system tools like intents (for starting other apps/activities or opening files), phone controls, media players, etc.

Front End is everything that user sees on a mobile app including the design of app. simply put, the front end of the mobile app is what the user experiences. You may be familiar with the term "User experience" or "UX"; the front end is where the user experiences and interacts with these things. The front end includes components that make up the user interface, which is what the end user will actually see when opening the app. For example, think about what users see when they open the "YouTube" mobile app.

In our project we have used extensible Markup Language, also known as XML. Much like HTML (or Hyper Text Markup Language), XML is also a markup language. It was created as a standard way to encode data in internet-based applications. However, unlike HTML, XML is case-sensitive, requires each tag is closed properly, and preserves whitespace.

A backend allows you to implement functionality such as backing up user data to the cloud, serving content to

client apps, real-time interactions, sending push notifications through Google Cloud Messaging for Android (GCM), and more. In our project we have used Java as backend. Java has been the language of choice for mobile app development centered on Google's Android platform. Java is a highly popular programming language that allows for cross-platform support and ease of portability when creating apps for multiple OS and hardware types.

In this project we have used the google's ML-Kit for developing the application on image classification. The google's ML kit has its own pre build dataset model which has almost 400 different classes of images. In our project we have made two fragment in which in first fragment we have used pre build model along with ML kit which gives us the output that which classes of images are present in the given input image and in another fragment of our application we have used the custom model which we have created on teachable platform by using tensor flow lite named as "flowers.tflite". This fragment gives us the output as the class of flower to which the given image is belongs.

The working of google's ML kit is that it provides us the different functions such as bitmap and image labeling by using bitmap we are converting and arranging the pixels of our image in order to pass as an argument to the image labeling function after passing to this function it then process our image according to the module provided, after that we get an output i.e the name of the class that image is belongs.

User Interface:

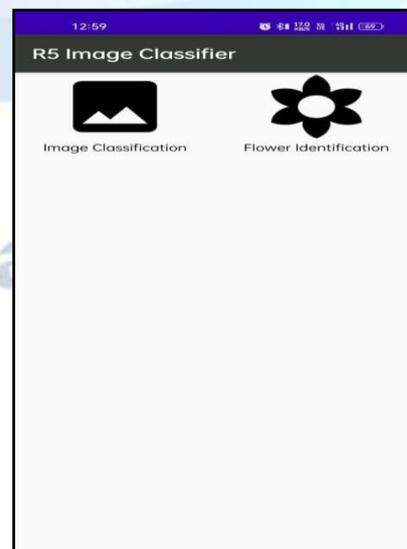


Fig 2: Homepage

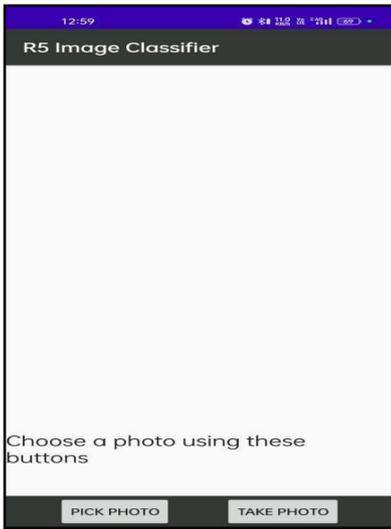


Fig 3: ActivityPage

Output of first fragment i.e Image Classification:



Fig 4: Output 1



Fig 5: Output 2

Output of Second fragment i.e Flower Identification



Fig 7 : Output 4

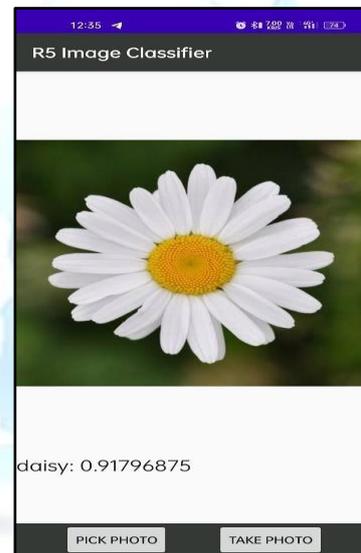


Fig 6: Output 3

7. CONCLUSION

For image classification we need a system that itself can extract features efficiently and classify them. We used Machine learning vision kit for image classification along with two model that is google's pre build model and our tensorflow lite custom model. Through this study, we developed an application R5 image classifier which was tested on android mobile devices and the application ran smoothly and UI components responds as expected. ML kit technique was studied in more details starting from assembling, training model and to simulate the training model and to classify the images into categories or different classes. The computational time for processing

these images is very high as compared to other normal JPEG images.

Conflict of interest statement

Authors declare that they do not have any conflict of interest.

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