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Smart Lens – A Google Firebase ML Kit Application

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Abstract:*Smart Lens is an AI-powered technology application that uses the smartphone camera and deep machine learning concept to offer facilities like Language Translation, Language Identification, Barcode Reader, Object detection, and Text Recognition. All these activities are difficult and time-consuming for the individual human being, so for that purpose, these activities need to be done via Machines only. For real-life entities, new Technology like Artificial Intelligence is best suited for it. In this paper, we have discussed methods for all these activities using Google Firebase Services like Firebase ML kit. It is a complete package of ready-to-use APIs for experienced as well as Naïve developers.*

Keywords: Text Recognition, Language Identification, Language Translation, Barcode Reader, Object Detection, Machine Learning.

I. INTRODUCTION

Nowadays efficiency is the most important factor to be considered while using any application whether it is a web application or an Android application. People only rely on software that is easy to use and yet gives maximum efficiency and accuracy. There are numerous amounts of software present in the market but only those software are chosen that have user-friendly interfaces and ease for giving maximum efficiency. The goal behind this research paper is to develop an android application that will provide very fast and accurate results regarding every machine learning concept like 'Language Identification, Language Translation, Barcode Reader, Object Detection, and Text Recognition'. This application can be installed on smartphones. This application is purely implemented using an ML kit. This ML kit can be used either by a beginner in ML or an experienced developer. No deep knowledge of neural networks is required for its implementation. It provides convenient APIs which help to see the custom TensorFlow Lite models in mobile applications. It brings Google's machine learning expertise into Android and iOS applications in a very powerful yet convenient way. It is a very easy-to-use library.

II. FEATURES

The main features of the ML kit which are used in Smart Lens are:

1. **Text Recognition:**
   This feature of the ML kit is available in the cloud as well as on the device. Using this API, Latin-based language can be recognized in text form. Text Recognition cloud-based API allows the user to extract text from pictures or documents. The extracted text is then used for the document translation.
2. **Object Detection and Tracking:**
   This API is only used on the device and will help the users to localize and detect the objects from an image. The object that is being detected can be classified into the selected general category.
3. **Language Identification:**
   The feature of this API is very clear by its name. Language Identification API helps to identify any language from one text string. The most important use of this feature can be for translators who want to find the language that is written in any image or document.
4. **Language Translation:**

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This feature is also very easy to understand by name only. The API of this feature is used to translate the text for up to 59 languages, and by this feature, the users have the right to switch between the languages. This API uses the same model as used by the Google Translate offline app.

5. **Barcode Reader:**
This API allows the users to scan and read the data from the barcodes using standard formats. In this, there is no need for an Internet connection and the scanning is performed only on the device. Barcodes are the code where the data is hidden in the form of encoding. This API can scan and decode this encoded data in a very convenient way.

Feature	On-device	Cloud
Text Recognition	True	True
Image Labeling	True	True
Landmark Recognition	False	True
Barcode Scanning	True	False
Face Detection	True	False

Table 1

III.PRELIMINARY

1. **Purpose and Objective:**
The purpose of this research paper is to make an all-rounder application that contains all the functions of Machine Learning in a single application so that consumers do need not to search for various applications for their needs.
2. **Scope of the Problem:** In this study, a few of the restrictions that are more focused on the objectives of this application are:
a. The application is public.
b. Entire application is using the ML kit fromGoogle.
c. There may be some inaccuracy with some objects that are not present in the Firebase ML kit dataset.
3. **Research Methodology:**
It is the process that is used for solving a logical problem that requires the data to support the implementation of a study. It is used as a descriptive analysis method which is a method that describes the facts and information of any current state in a factual, accurate, and systematic manner.

Figure 1

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The following research paper has two stages of research methodology ie. Data collection stage and the software development phase.

a. Data Collection Phase:

In this stage the data is to be collected for the given study. In this the data is collected by collecting the literature, research papers, and journals related to the title of the study, or the data is collected by interviewing and asking questions to the informant related to the research.

b. Software Development Phase:

The most used software manufacturing method of paradigm waterfall is used in this. It is a classical model which is systematic and sequential in building software.

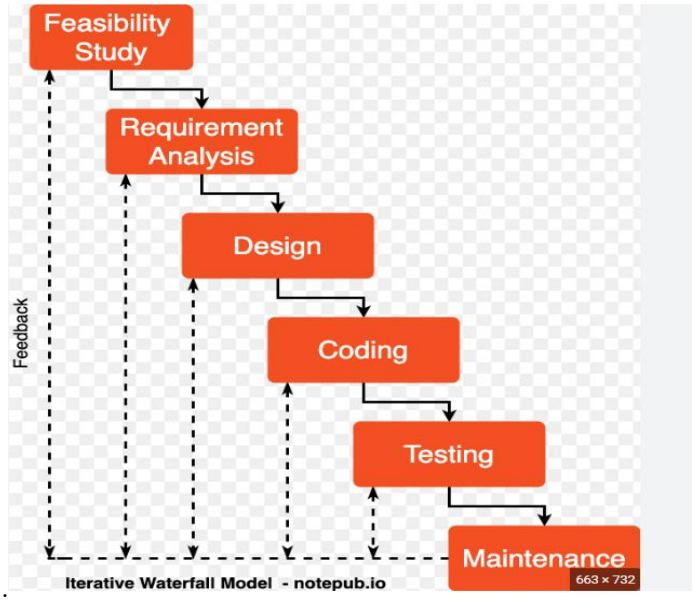

Figure 2

IV. MLKIT FOR FIREBASE

Google introduced the Firebase ML kit which is a part of Firebase and it provides the facility to applications of artificial intelligence in a very easy manner. Its SDK is currently having a variety of predefined capabilities which are required in any application. Any developer can deploy the application in spite the fact whether the developer is familiar with machine learning or not.

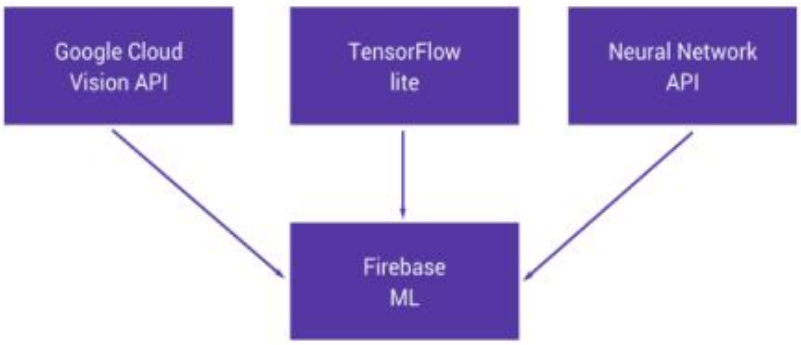

Figure 3

There are many other ways to implement the machine learning facilities without using the Firebase ML kit, but there are several reasons why one cannot able to do it.

a. Cloud storage is required for Hosting the ML applications, which can be a difficult task but by using an ML kit the developer does not require it additionally.

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b. Datasets for machine learning models are super difficult to find as they require accuracy and properly trained, and at the same time it is very difficult to choose which dataset is to be chosen and which platform is required for it.
c. Lack of knowledge about machine learning is the most important drawback o why not chose the other algorithms for implementing the machine learning functionalities?

V. IMPLEMENTATION

The implementation of the Smart Lens is done with the help of android studio and Firebase services.

Frontend Development:

To develop the frontend of the application is developed using android studio because it has a lot of advantages like gradle-based support and it has built-in emulators that work like a virtual mobile phone to get the execution done in a very convenient way. It has layout files called XML files which are used to make Android designs and their components. Android Studio has a feature called editorial manager which enables the developer to drag and drop the UI components. It has support for building applications on both mobiles and other portable devices.

Backend Development:

To develop the backend Java Language is used which can also be used as a android development language in android studio. There were several Java files which have backend code for several components. Android Studio provides the developer to work with backend files also so no other software is used for the backend coding.
After the Android Studio, we used the services of google firebase APIs to implement the functionality of machine learning in smart lenses.
We have just added the dependencies of the ML kit Android libraries of the gradle module file of the Android studio.

VI. LIMITATIONS

1. There is no 100 percent accuracy guarantee that is maybe the application will not give accurate results for some inputs
2. Not all the inputs can be detected by the application. As there is a dataset present that contains a limited amount of input in it so it may be possible that the input feed by the user is not recognized by the user at any level.
3. The modules of the Firebase ML kit can be used both by the cloud and the device but if the model is very large then there may be a slight chance of slowing down of the user's phone.

VII. CONCLUSION

There are a lot of impressive functions that are present in the application which will give the user the best experience while using the application. The user can access all the functionalities of the application like text recognition, language identification, language translation, barcode reader, and object detection with other supportive features.This is the main page of the application from where the user selects their preferred category.
Google Firebase ML kit has proved its services and tools are very efficient as it uses the latest and advanced technology which can help beginners to develop projects in machine learning.

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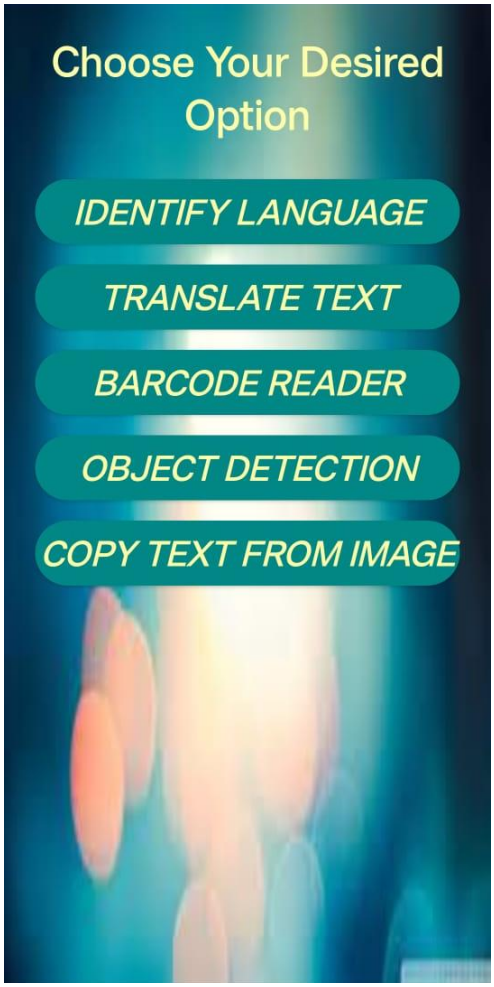

Figure 4

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