

# ML KIT IN FIREBASE FOR APP DEVELOPMENT

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**ABSTRACT:-** 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. No deep knowledge of neural networks or model optimization to get started. On the other hand, if you are an experienced Machine Learning developer, ML Kit provides convenient API's that help you use your custom TensorFlow Lite models in your mobile applications.

**Key words:** App development; platform; API; Frameworks;TensorFlow;Neural Networks;

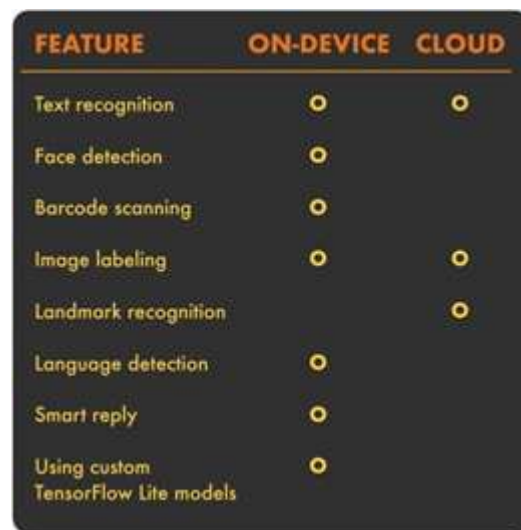
## 1. INTRODUCTION

Machine Learning for a beginner can be very tricky to understand the concepts and then implement them at the same time and it's also very time consuming so Google has come with an interesting,exciting and ready to go solution for Machine Learning which is ML Kit.It is a mobile 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 way. No deep knowledge of neural networks or model optimization to get started.Where as if you are an experienced ML and AI developer, ML Kit provides convenient APIs that help you use your custom TensorFlow Lite models in your mobile applications.

## 2. FEATURES

- [1] **TEXT RECOGNITION:-**Text recognition can automate tedious data entry for credit cards, receipts, and business cards of various organizations. With the Google Cloud-based API, you can extract text from pictures of documents of various formats, which you can use to increase accessibility or translate documents.
- [2] **FACE DETECTION:-** The Machine Learning Kit's face detection API, you can detect faces in an image, identify key facial features of a human in a more interactive way and get the contours of detected faces.
- [3] **SMART REPLY:-** The Machine Learning Kit's Smart Reply API, you can automatically generate relevant replies to messages. Smart Reply helps the broad range of users respond to messages quickly, and makes it easier to reply to messages on devices with limited input capabilities.

Some of the features of ML Kit are shown in Figure 1.



FEATURE	ON-DEVICE	CLOUD
Text recognition	<input type="radio"/>	<input type="radio"/>
Face detection	<input type="radio"/>	<input type="radio"/>
Barcode scanning	<input type="radio"/>	<input type="radio"/>
Image labeling	<input type="radio"/>	<input type="radio"/>
Landmark recognition	<input type="radio"/>	<input type="radio"/>
Language detection	<input type="radio"/>	<input type="radio"/>
Smart reply	<input type="radio"/>	<input type="radio"/>
Using custom TensorFlow Lite models	<input type="radio"/>	<input type="radio"/>

Fig-1:ML Kit Features

### 3. LIMITATIONS

1. The disadvantage with ML Kit is that you might need to upgrade your Firebase plan to a paid one depending on your use.
2. If you want a Machine Learning model of your own then a separate custom model should be trained and built with the help of TensorFlow Lite and then should be deployed with the help of ML Kit.
3. The ML Kit models are run on device or cloud, if run on device then there's a slight chance of slowing down the phone if the model is too large

### 4. AutoML

Here we can Create custom image classification models from your own training data with AutoML Vision Edge. If you need a more specialized image labeling model, covering a narrower domain of concepts in more detail—for example, a model to distinguish between species of flowers or types of food—you can use AutoML Vision Edge to train a model with your own images and use the model you trained instead.

#### **Key Capabilities :**

- a. *Train models based on your data : Automatically train custom image labeling models to recognize the labels you care about, using your training data.*
- b. *Built-in model hosting : Host your models with Firebase, and load them at run time with the iOS and Android SDKs. By hosting the model on Firebase, you can make sure users have the latest model without releasing a new application version, and of course, you can also bundle the model with your app, so it's immediately available on install.*

#### **Running AutoML models in the cloud :**

- i. *ML Kit currently generates only mobile-optimized models intended to run on the device. However, for models with many thousands of labels or when significantly higher accuracy is required, you might want to run a server-optimized model in the cloud instead, which you can do by calling the Cloud AutoML Vision APIs directly.*
- ii. *Note that unlike running AutoML Vision Edge models on device, running a cloud-based AutoML model is billed per invocation.*

#### **Steps for Implementation :**

- [1] *Assemble training data : Put together a dataset of examples of each label you want your model to recognize.*
- [2] *Train a new model : In the Firebase console, import your training data and use it to train a new model.*
- [3] *Use the model in your app : Bundle the model with your app or let the ML Kit SDK download it from Firebase. Then, use the model to label images on the device.*

**5. Text Recognition Prerequisites :** Add the dependencies for the ML Kit Android libraries to your module (app-level) Gradle file (usually app/build.gradle)

```
implementation 'com.google.firebase:firebase-ml-vision:24.0.1'
```

- a. *In Android Manifest File : If you use the on-device API, configure your app to automatically download the ML model to the device after your application is installed from the Play Store. To do so, add the following declaration to your application's AndroidManifest.xml file:*

```
<application ...>
```

```
...
```

```
<meta-data
```

```
    android:name="com.google.firebase.ml.vision.DEPENDENCIES" android:value="ocr" />
```

```
<!-- To use multiple models: android:value="ocr,model2,model3" -->
```

```
</application>
```

## 6. CONCLUSION

*A great set of features are provided by Firebase ML Kit. The Firebase's ML Kit is a blessing for application developers. 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. Artificial Intelligence and Machine Learning is quickly becoming an essential tool in software development. It is exceptionally helpful for entry level and intermediate mobile developers who thrive for Machine Learning and other stuff.*

## 7. References

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