Finger Number Recognition by TensorFlow on Android

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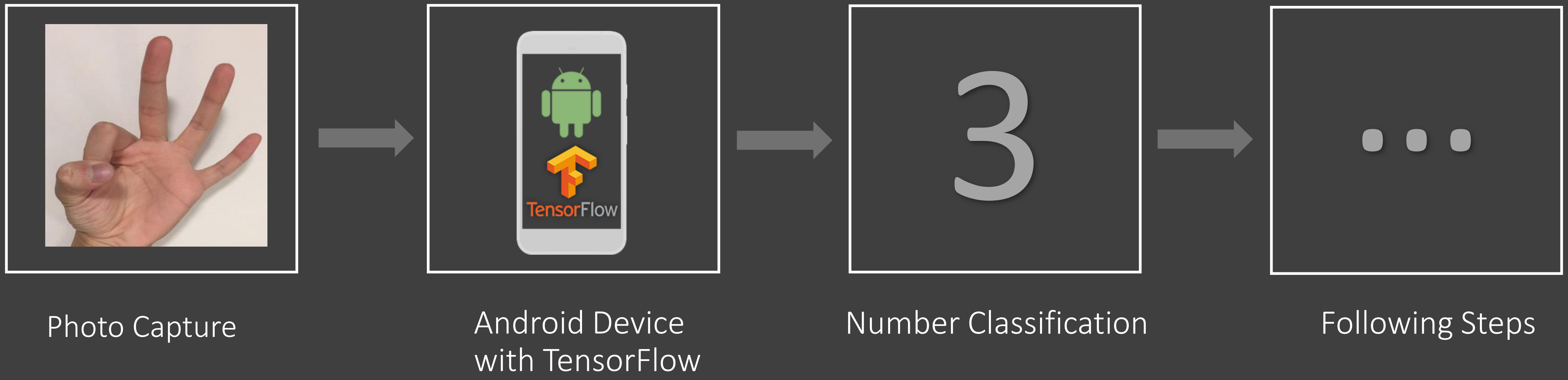
Purpose of the App

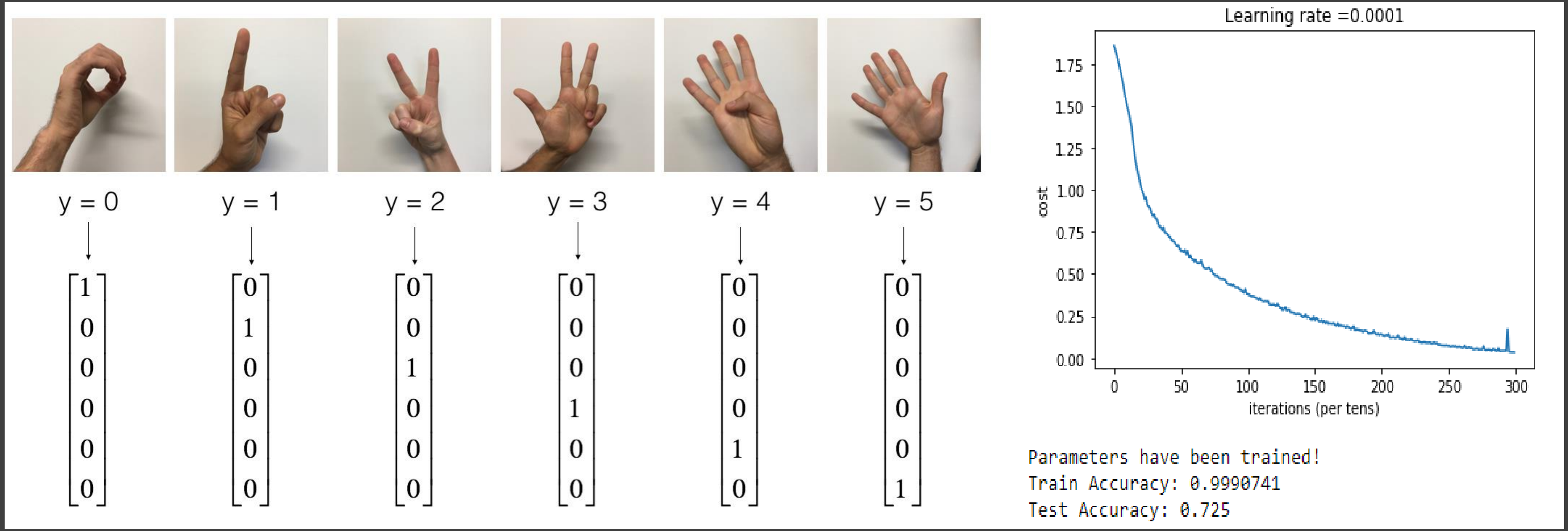
Basic idea: To classify the number representation of a finger in a picture:



• Principle of the TensorFlow Classifier

Use a simple linear classifier implemented by TensorFlow:

LINEAR -> RELU -> LINEAR -> RELU -> LINEAR -> SOFTMAX



```
Parameters have been trained!
Train Accuracy: 0.9990741
Test Accuracy: 0.725
```

From the Week3 Assignment of course:

Improving Deep Neural Networks: Hyperparameter tuning, Regularization and Optimization

On Coursera, by Andrew Ng

• Android Implementation

Building Blocks:

- button which triggers an action when clicked
- display a pop-up message ("toast")
- display a list of items to choose from
- display an image
- display a web page
- composed of at least 2 linked activities
- pass information from one activity to the next

Activities:

- PhotoActivity.java
- RecognitionActivity.java
- SearchActivity.java

The Flowchart of the entire process is shown on the next page.

Android TensorFlow Interface:

- Use existing interface *TensorFlowInferenceInterface.java*

From GitHub Repo: *tensorflow*

- Use existing module *TensorFlowClassifier.java*

From GitHub Repo: *A_Guide_to_Running_Tensorflow_Models_on_Android*

- The parameters in the linear classifier are trained locally.

Flowchart of Design

PhotoActivity.java

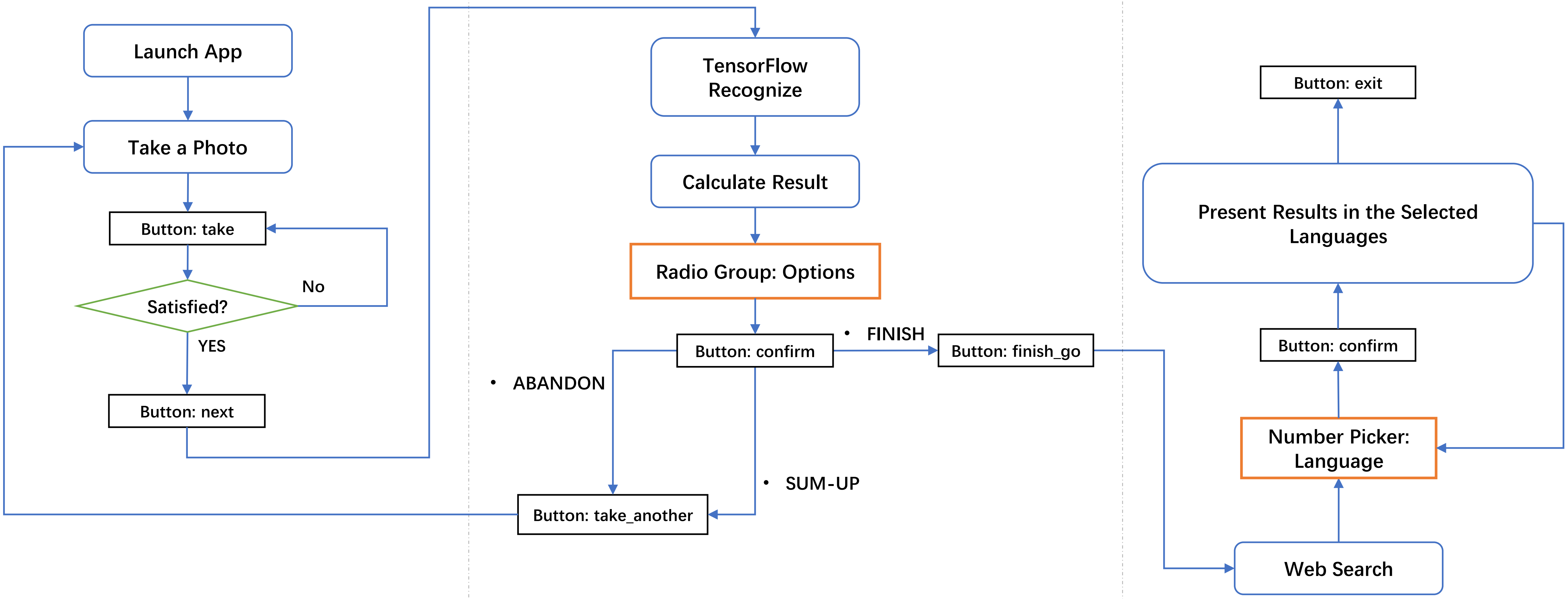
activity_photo.xml

RecognitionActivity.java

activity_recognition.xml

SearchActivity.java

activity_search.xml



Launch App

Take a Photo

Button: take

Satisfied?

No

YES

Button: next

TensorFlow Recognize

Calculate Result

Radio Group: Options

Button: confirm

- FINISH

Button: finish_go

- ABANDON

- SUM-UP

Button: take_another

Button: exit

Present Results in the Selected Languages

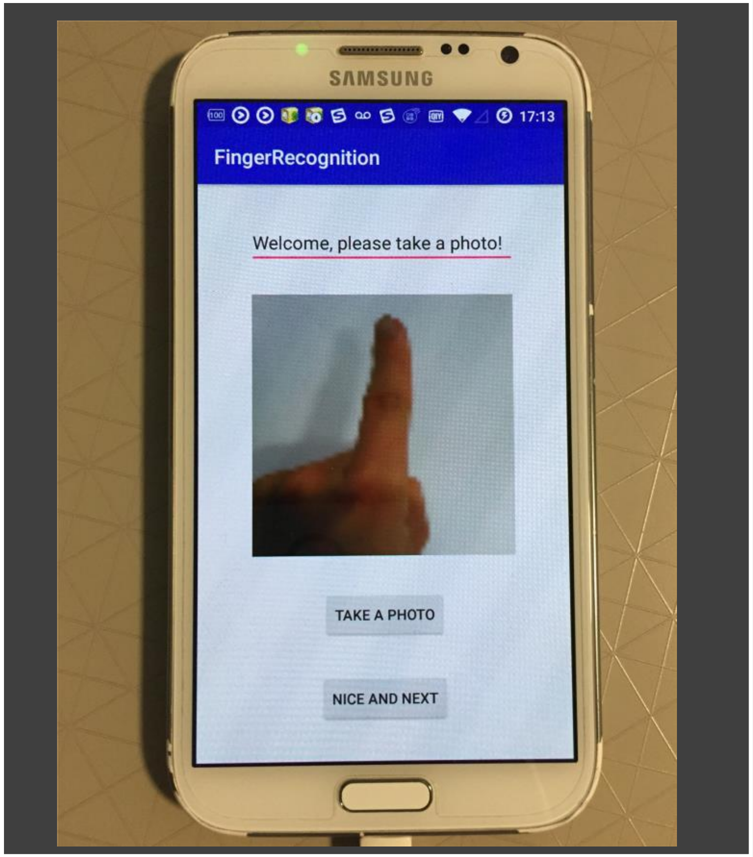
Button: confirm

Number Picker: Language

Web Search

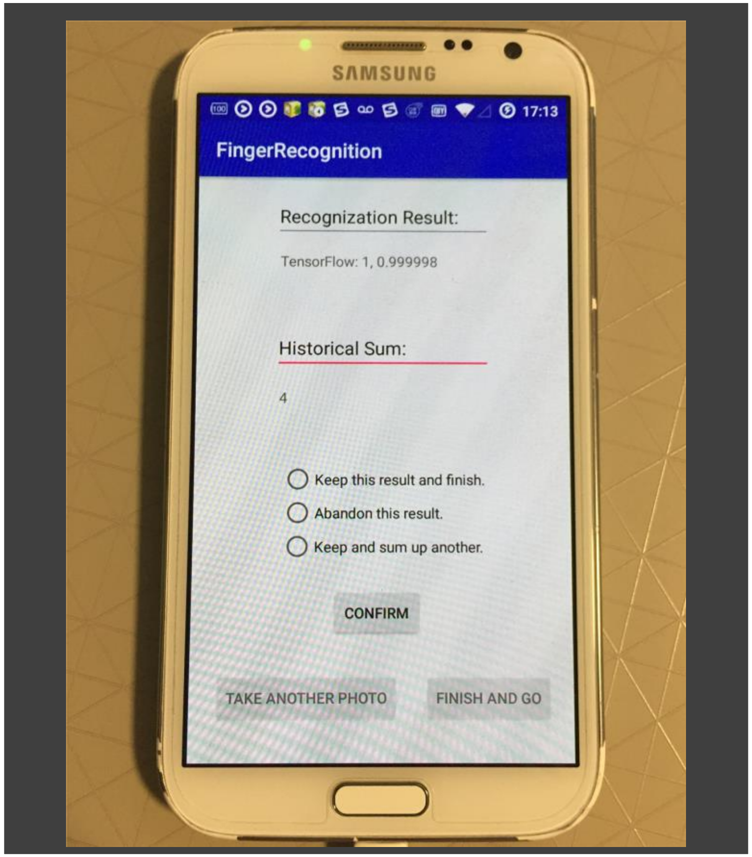
- # Results of the App

PhotoActivity:



Welcome, please take a photo!

RecognitionActivity:



Recognization Result:

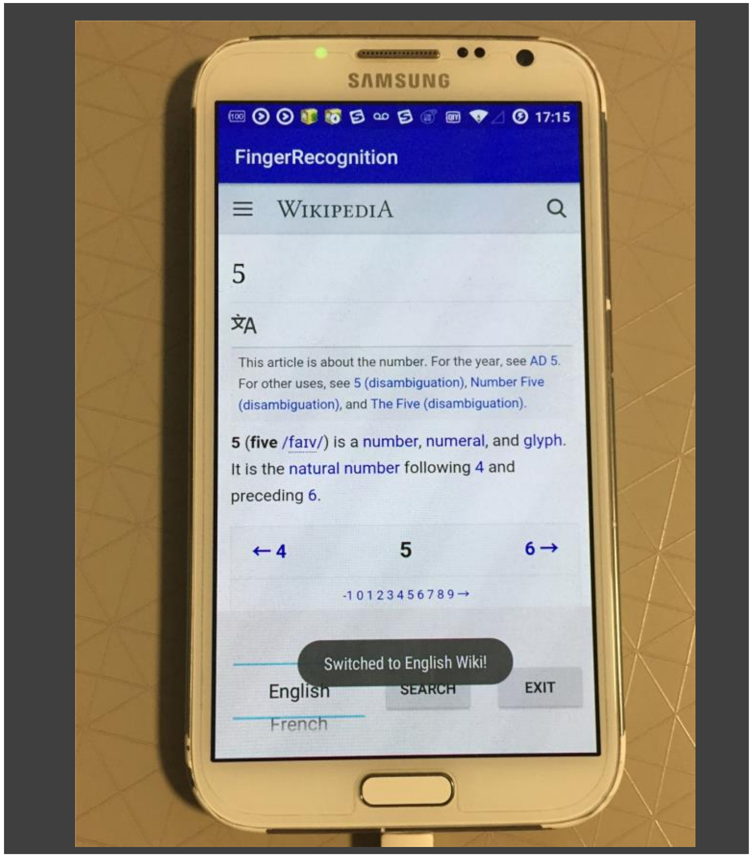
TensorFlow: 1, 0.999998

Historical Sum:

4

○ Keep this result and finish.
○ Abandon this result.
○ Keep and sum up another.

SearchActivity:



5

This article is about the number. For the year, see AD 5. For other uses, see 5 (disambiguation), Number Five (disambiguation), and The Five (disambiguation).

5 (**five** /faɪv/) is a number, numeral, and glyph. It is the natural number following 4 and preceding 6.

Switched to English Wiki!

• Feedbacks of Use

Positive

- Building blocks listed above are applied and utilized.
- Communication between multiple activities work properly.
- Logics and relationships shown in the flowchart are exactly implemented.

Negative

- The testing accuracy of the current model in the device is very very *LOW*, which may be due to the reason that the distributions of data in the training set and testing set differ significantly, such that the trained neural network are overfitted to the online training data source.

To be done:

- May use more complicated convolutional neural network instead of the simple linear classifier to improve accuracy.
- May use the local data gathered by the testing devices to train the network. But this may cause overfitting again when using the app on another device.

Thanks for Watching!

The source code of this project is available on GitHub:

https://github.com/Lunj12/finger-android/

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