Mobile Application Development

(Machine Learning)

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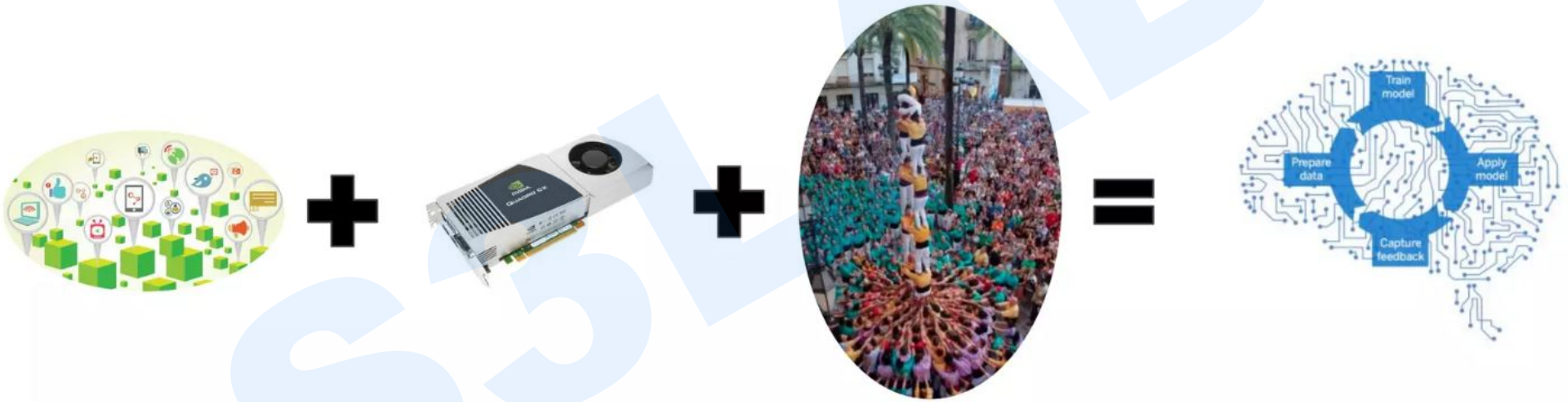
February 1st, 2020

S³Lab
Smart Software System Laboratory

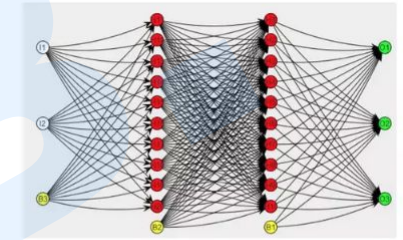

“The future of mobile is the future of online. It is how people access online content now.”
– David Murphy, Founder and Editor of Mobile Marketing Daily

How did we get here

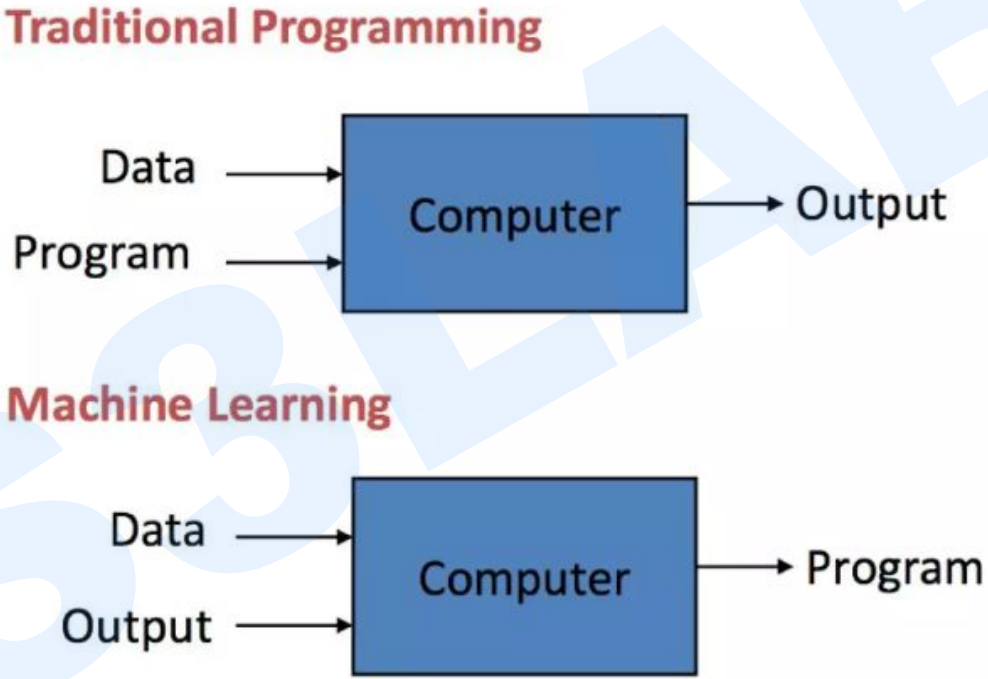


What is Machine Learning?

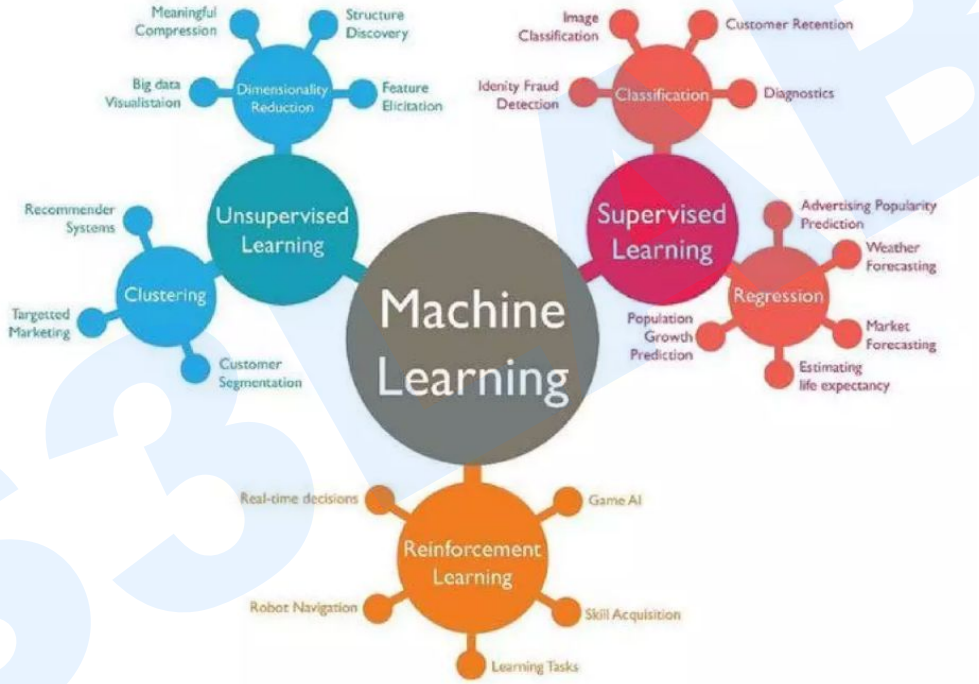
- Subset of AI
- Narrow Intelligence
- Hightly Interdisciplinary
- Let the process find without being explicitly programmed
  - But … find what? **A Model**
- Your model is as good as the data you use



Programming & Learning



What can you do with Machine Learning?

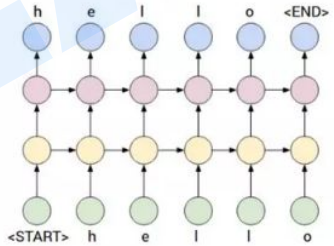


Examples

- Self-driving cars

- Auto color images

- Translation



- Text generation

Examples

- Games

- Recommendation

- Health problems detection

- IoT

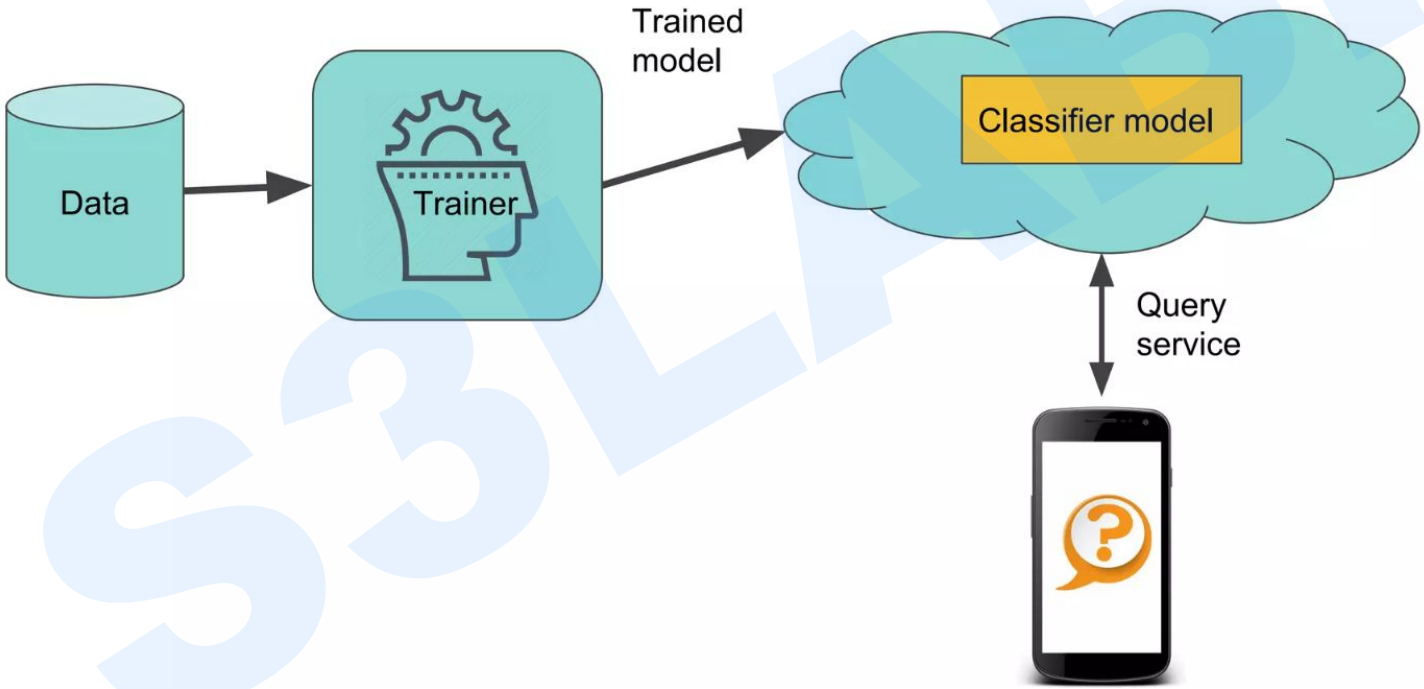
Where are we going?

- Better algorithms with less data
- Auto ML
- Better integration with mobile
- Augmentation of your skills
  - Collaboration
- New Roles: Machine Trainner

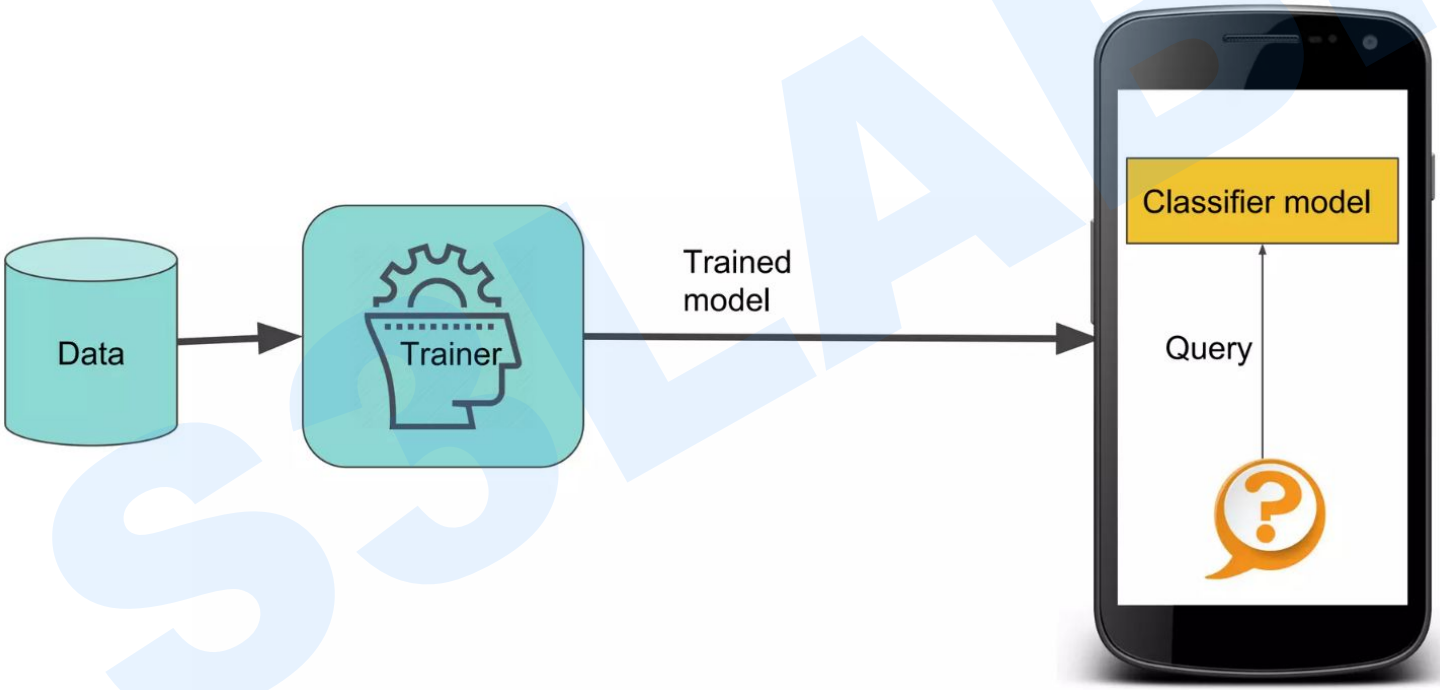
The Mobile Case

- Limited Size and processing power
  - Yet we have GPUs
- Forget about training
  - By now…
- Smaller models yet almost equally capable
- Sacrifice accuracy by speed / size

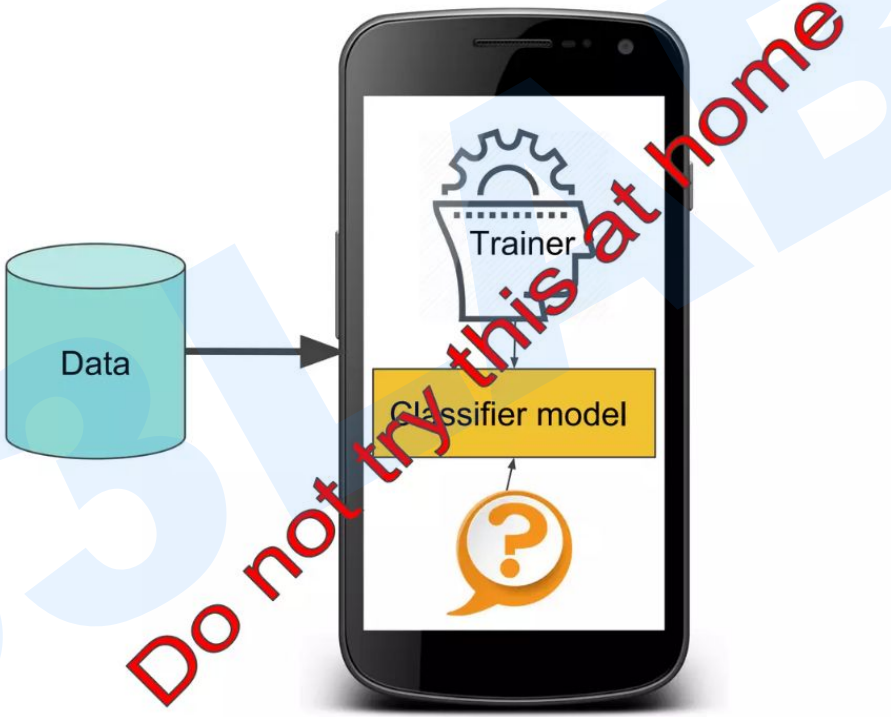
Architectures - Cloud-Base



Architectures - Model Baked-In



Architectures - All in the phone



Step by Step

Base on Tensorflow-lite

1. Explore the Dataset
2. Curate the Dataset (if required)
3. Preprocessing the Input
4. Determine the Train/Test Datasets
5. Choose your Architecture
6. Define the hyper-parameters
7. Train the model
8. Evaluate the model
9. Export the model
10. Use the exported model in the Android Application with Tensorflow

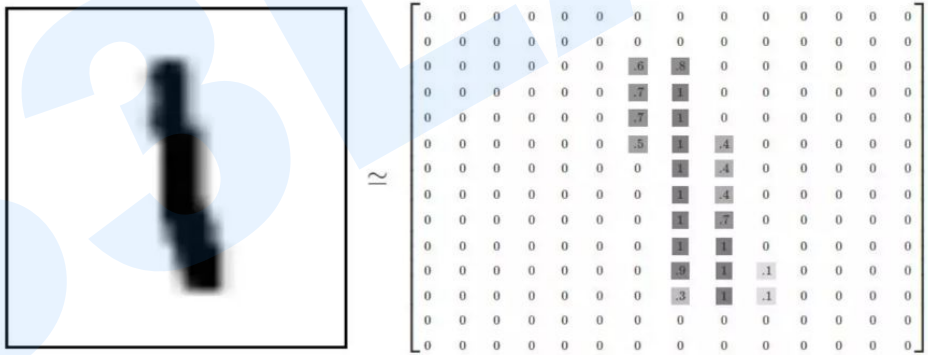
Step by Step

Explore the Dataset

Step by Step

Preprocessing the Input

- Image can be flattened from matrix to a vector
  - Tensorflow is already doing this for us in the sample dataset
- But important remember as we will have to replicate the preprocessing in the client



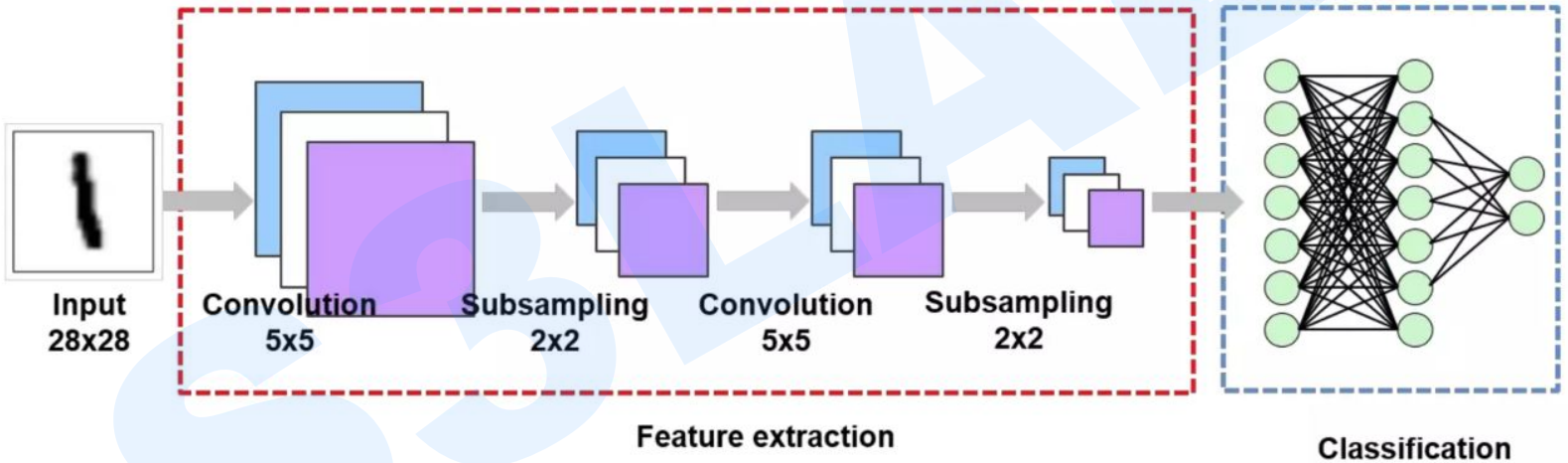
Step by Step

Choose you architecture

- We will go with a Convolution Neural Network
  - Very good at finding patterns in images
- We could have used a neuron network with one hidden layer
- Lost with the terms?
  - This is expected
  - So many new terms and definitions and vocabulary

Step by Step

Choose you architecture



Step by Step

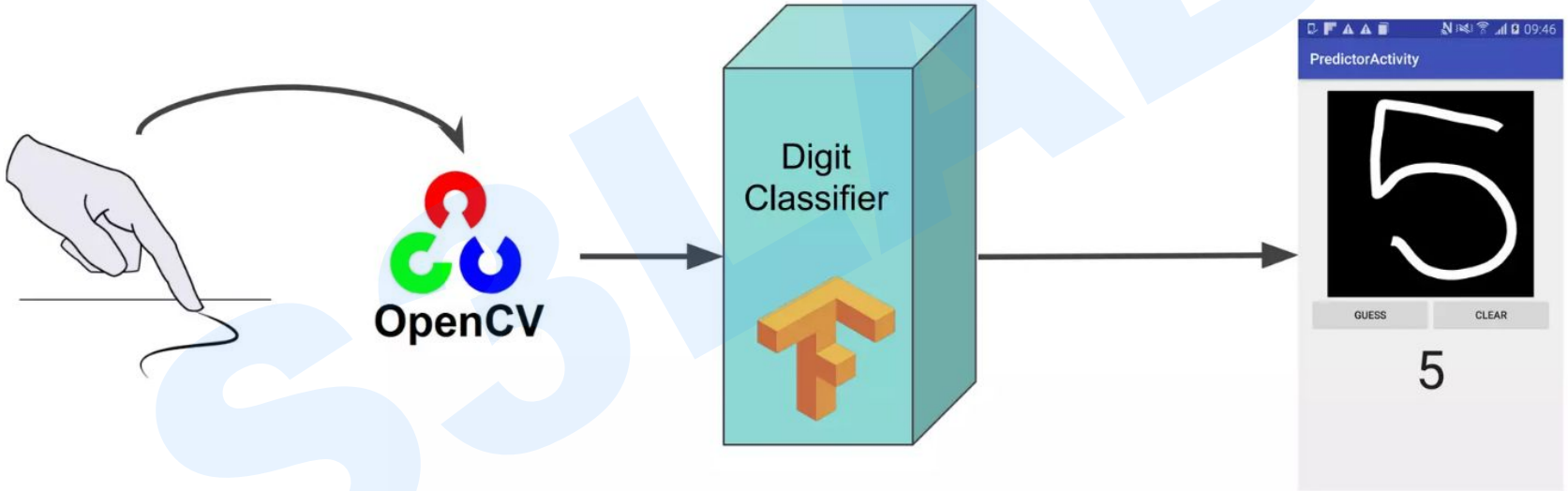
Evaluate the model

step 0, training accuracy 0.18
step 100, training accuracy 0.76
step 200, training accuracy 0.94
step 300, training accuracy 0.92
step 400, training accuracy 0.86
step 500, training accuracy 0.94
step 600, training accuracy 0.96
step 700, training accuracy 0.9
…
step 9800, training accuracy 0.96
step 9900, training accuracy 1

test accuracy 0.9919

Step by Step

Use the exported model



Step by Step

Full source code on Google Colab and Mobile

- https://developer.android.com/codelabs/digit-classifier-tflite#0

Q & A

Thank you for listening

“Coming together is a beginning;
Keeping together is progress;
Working together is success.”
- HENRY FORD