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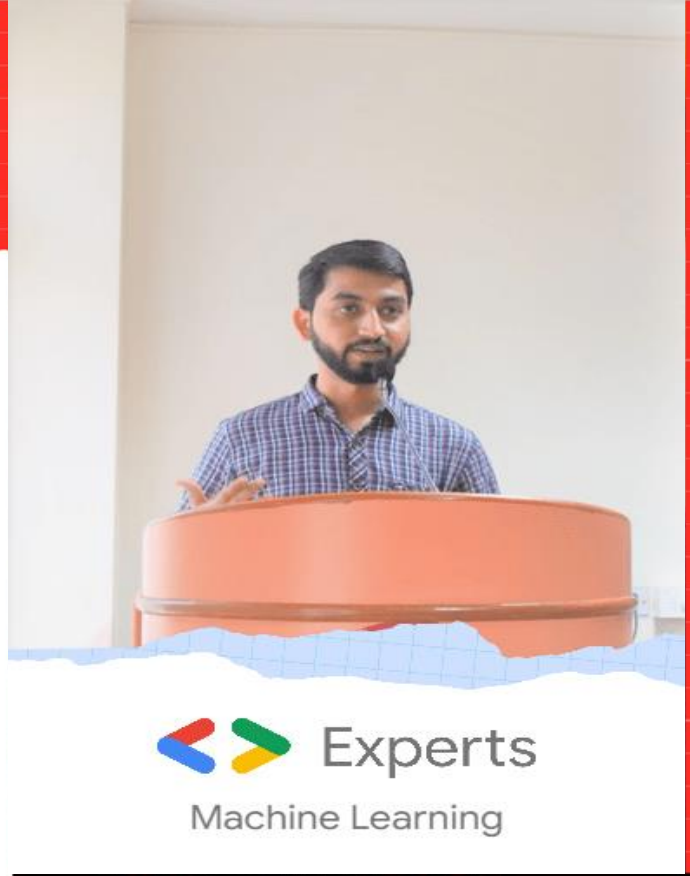

Experts
Machine Learning

MLOps for Computer Vision using TensorFlow

Google Developer Groups
Chandigarh

Nitin Tiwari
Google Developer Expert – Machine Learning
Software Engineer @ LTIMindtree

Content

1. What is MLOps?
2. Building Blocks of an ML application
3. Understanding the MNIST dataset
4. Building your custom character recognizer
5. Some interesting examples built with TensorFlow

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What is MLOps?

MLOps = ML + DevOps

- Practice of applying DevOps practices to automate the building, deployment, and monitoring of ML pipelines.
- MLOps makes it easier to create end-to-end ML applications, and are not just confined to model training.
- Regular ML workflows like data gathering, labeling, transformation, model training, validation, serving, monitoring, and retraining are streamlined.
- TensorFlow Extended (TFX) is an end-to-end platform for deploying production ML pipelines.
- Some companies that are using TFX:

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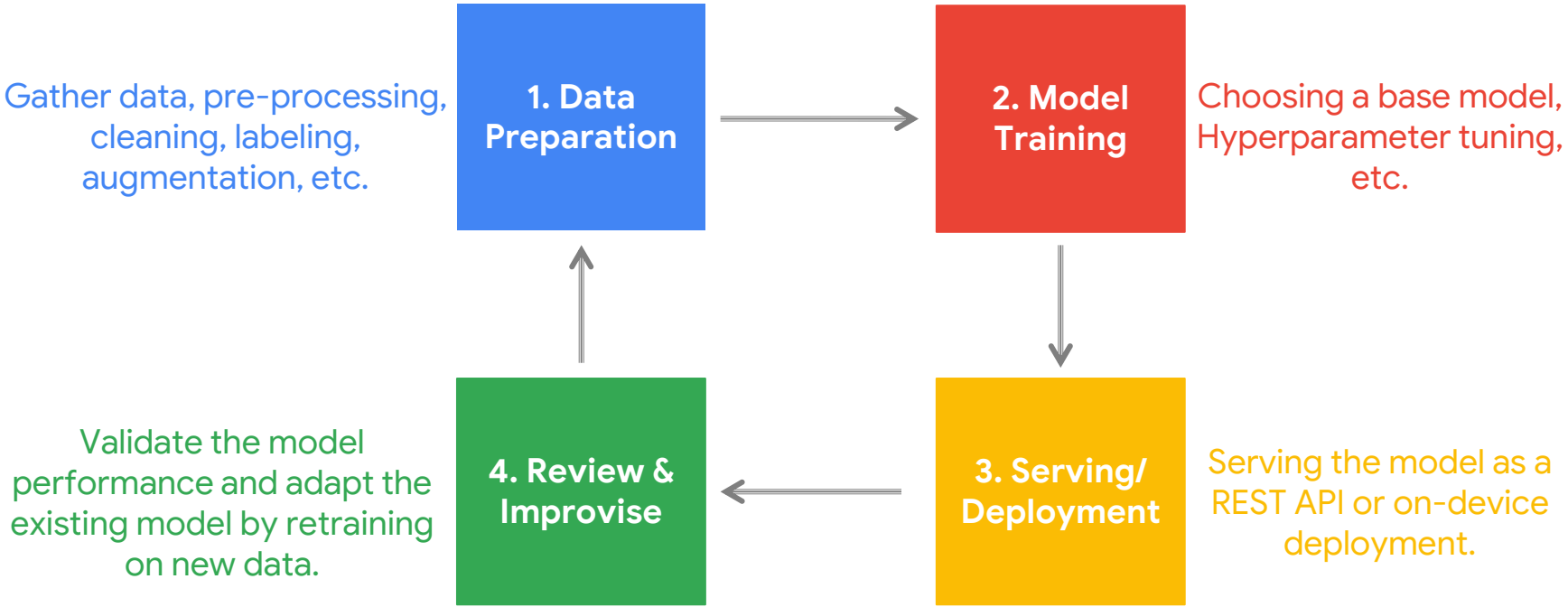
Building Blocks of an ML application

ML Lifecycle



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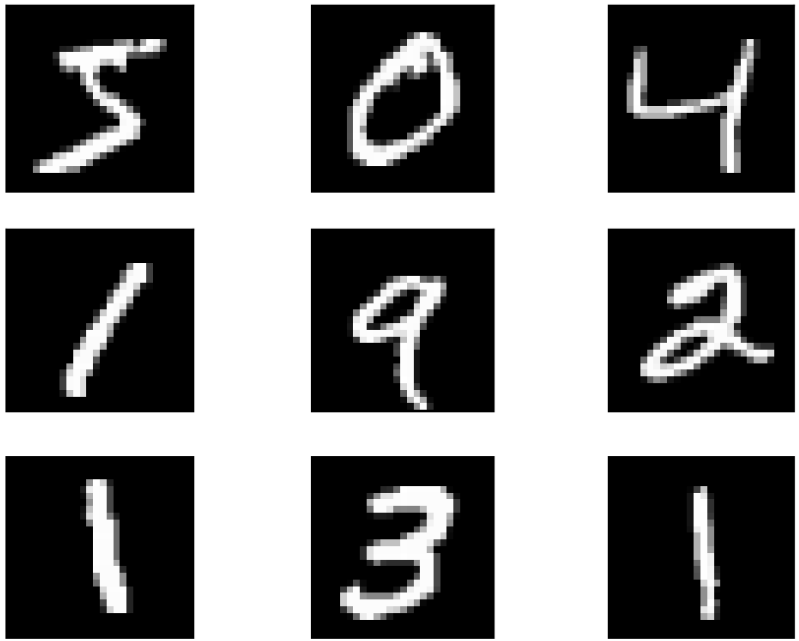
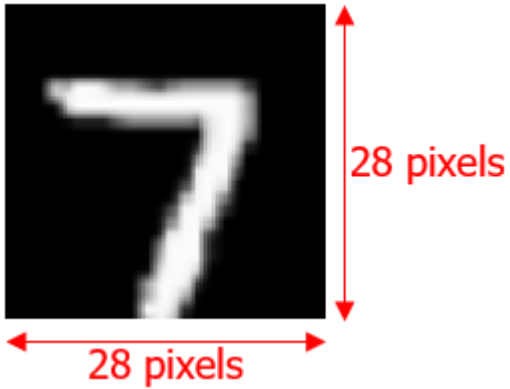
Understanding the MNIST dataset

If you remember this,



Your childhood was awesome.

- Often referred to as the “Hello World” of Computer Vision, the MNIST digit dataset is a classic example of Image Classification.
- MNIST – **Modified National Institute of Standards and Technology** is a database of handwritten digit recognition over 60k images for the digits 0-9.
- Every digit in the MNIST dataset is a 28 x 28 binary or grayscale image with the digits in white color and a black background.



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Building your custom character recognizer

Hindi Character Recognizer

Data Preparation: Synthesize MNIST-like data for your custom dataset

1. Convert images and labels to NumPy arrays.

Images

Labels

[0, अ, २, ध, प, ठ, ६, ७, ए]

```
image_array = np.array(images)
label_array = np.array(labels)
```

2. Normalize the input image array so that each pixel value is between 0 and 1.

```
image_array = image_array/255.0
```

Model Training:

Define the hyperparameters and model architecture.

```
model = keras.Sequential([
keras.layers.InputLayer(input_shape=(28, 28)),
keras.layers.Reshape(target_shape=(28, 28, 1)),
keras.layers.Conv2D(filters=32, kernel_size=(3, 3), activation=tf.nn.relu),
keras.layers.Conv2D(filters=64, kernel_size=(3, 3), activation=tf.nn.relu),
keras.layers.MaxPooling2D(pool_size=(2, 2)), keras.layers.Dropout(0.25),
keras.layers.Flatten(), keras.layers.Dense(NO_OF_CLASSES)
])
```

```
model.compile(optimizer='adam',
loss=tf.keras.losses.SparseCategoricalCrossentropy(from_logits=True),
metrics=['accuracy'])
```

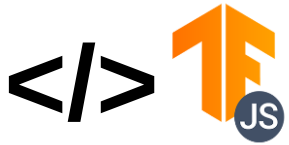
```
model.fit(train_images, train_labels, epochs=50)
```

Complete Colab notebook:
https://github.com/NSTiwari/Hindi-Character-Recognition-on-Android-using-TensorFlow-Lite

Serving/Depoyment:

- Any ML workflow is incomplete without the deployment of the model.
- TensorFlow models can be of the following formats depending upon where they need to be deployed.

Standalone Desktop Application
(TensorFlow)



Browser/Web Application
(TensorFlow.js)

Mobile/IoT Devices
(TensorFlow Lite)

```
converter = tf.lite.TFLiteConverter.from_keras_model(model)
tflite_float_model = converter.convert()

with open('model.tflite', 'wb') as f:
f.write(tflite_float_model)
```

E2E Flow: The final TF Lite model is deployed on an Android application.

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examples

Pose Classifier-based Video Game Controller – Ashes Cricket 2009

Real-time object detection – GTA Vice City

SO YA
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GOT ANY QUESTIONS?

Thank you.

github.com/NSTiwari

medium.com/@tiwarinitin1999

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