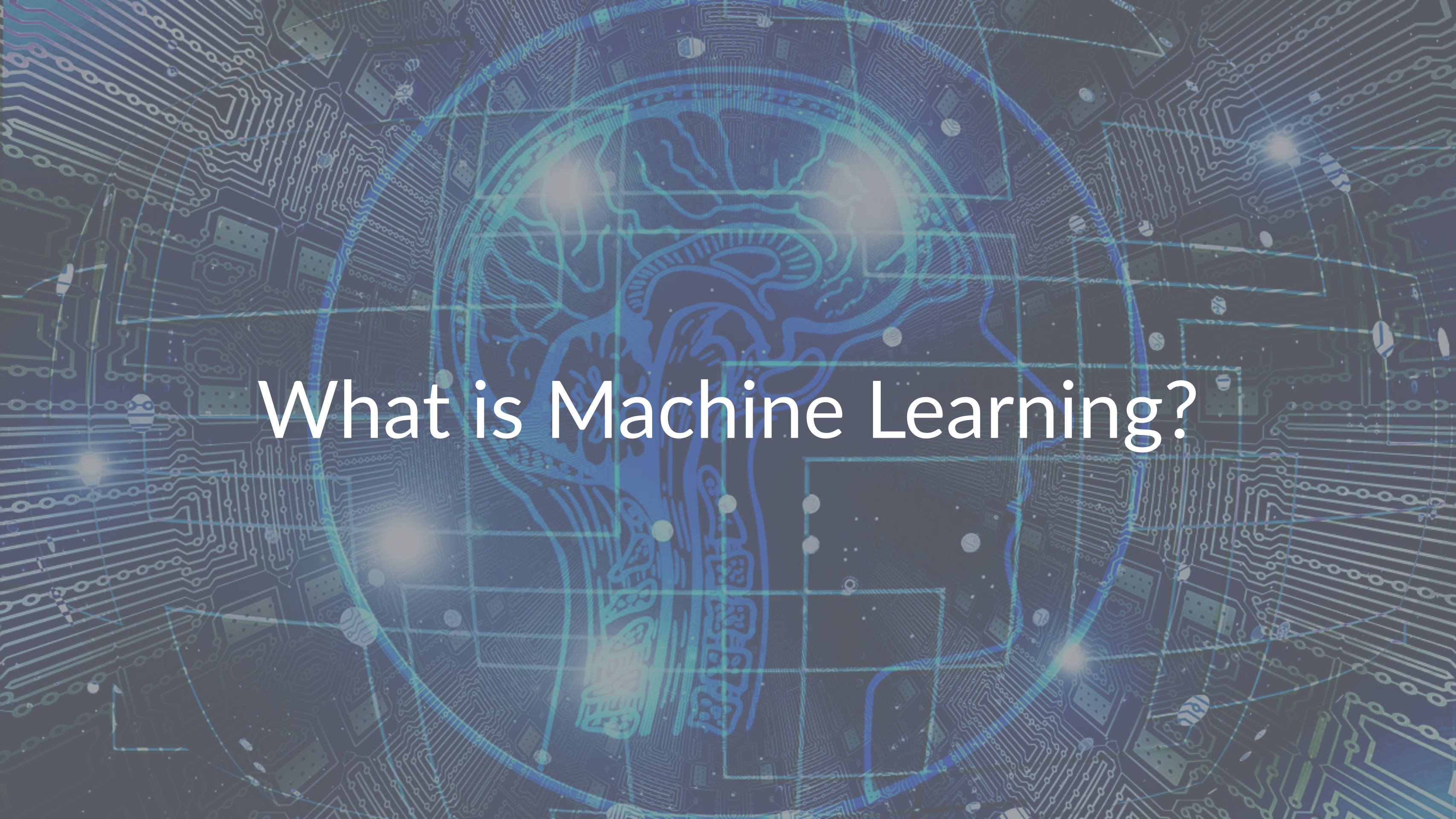
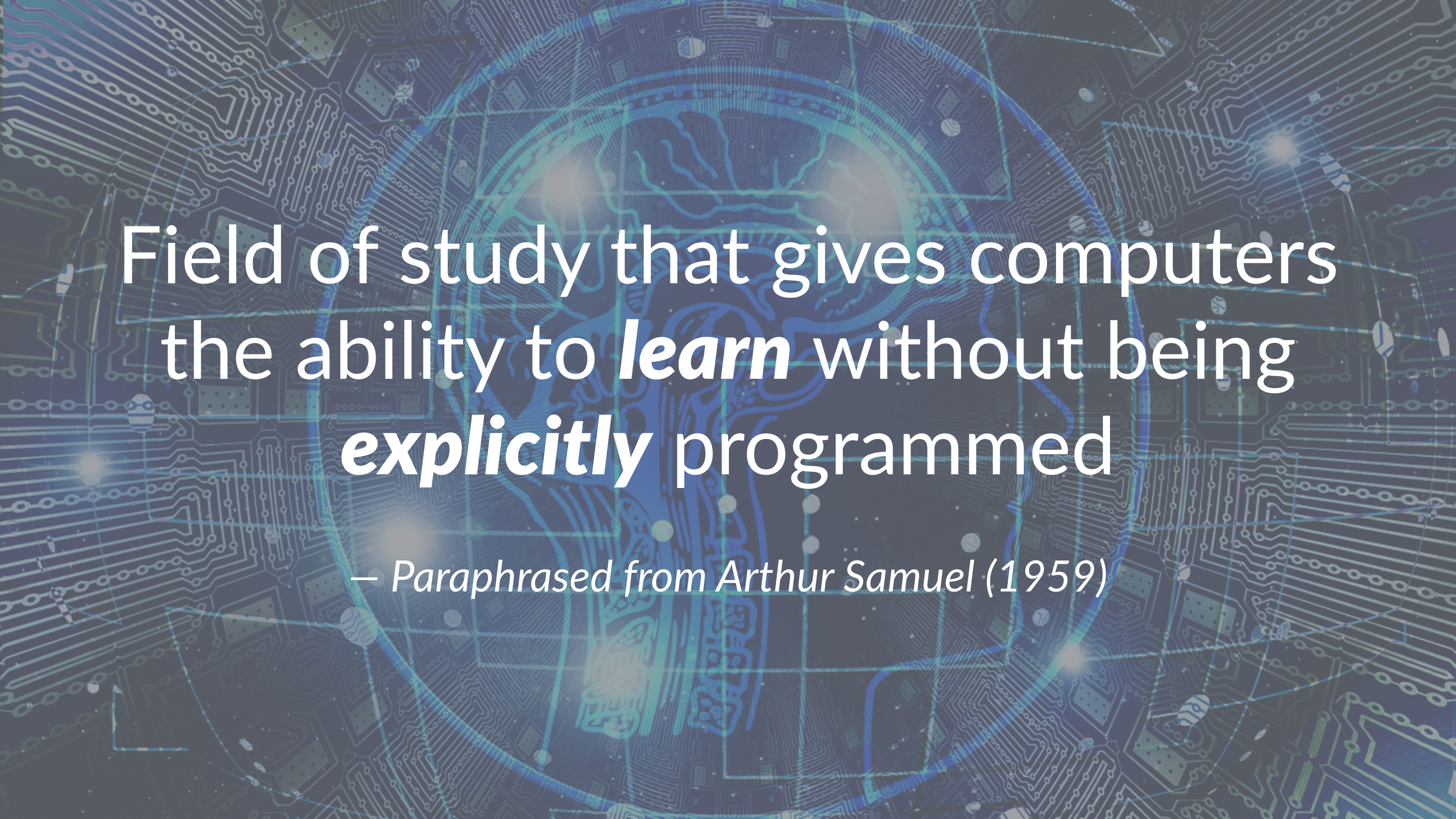


ML Kit: Hype or Har Gow?

Eric Fung <efung@acm.org>
GDG Toronto Android • 2018-07-16

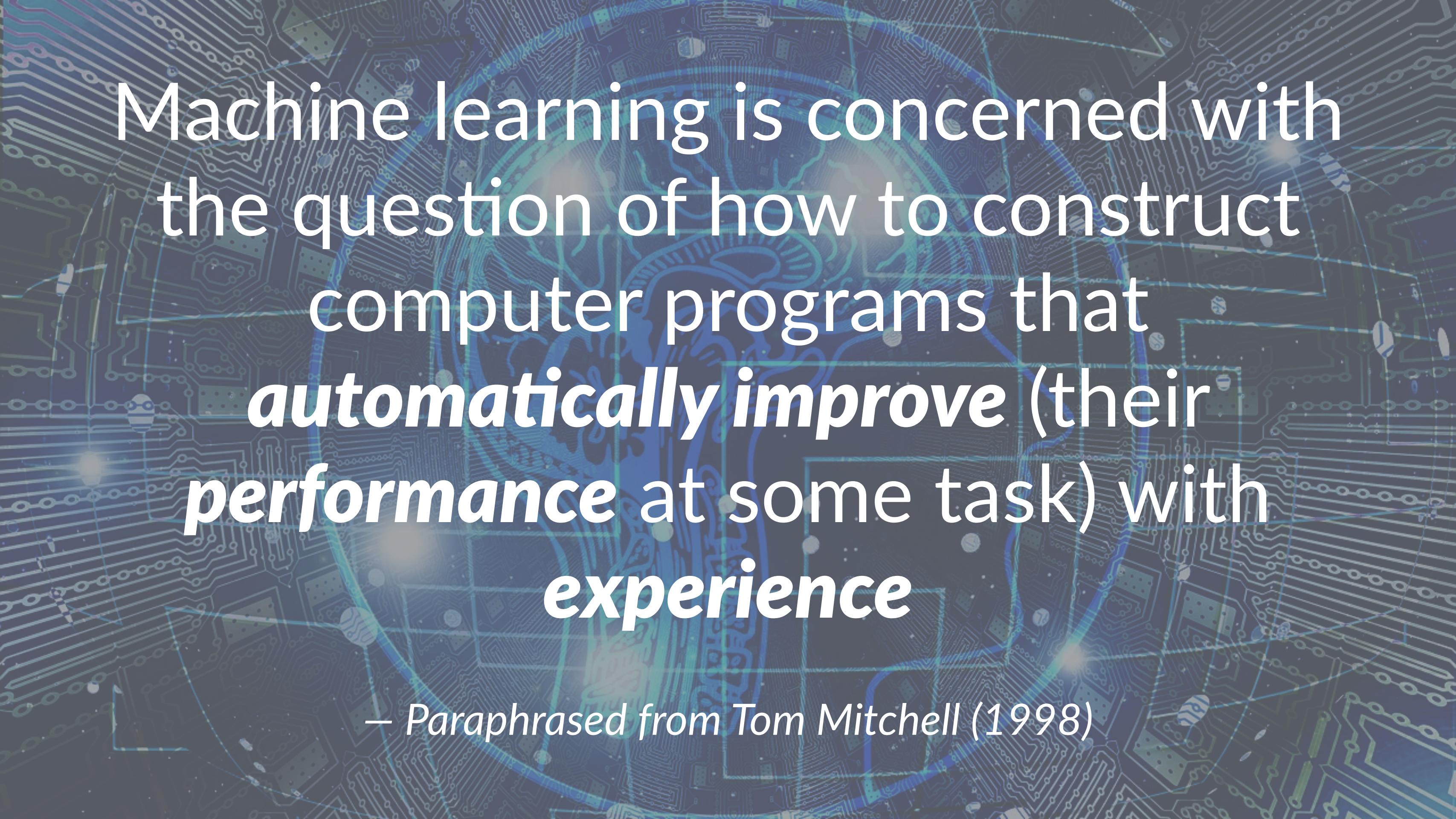


What is Machine Learning?



Field of study that gives computers
the ability to ***learn*** without being
explicitly programmed

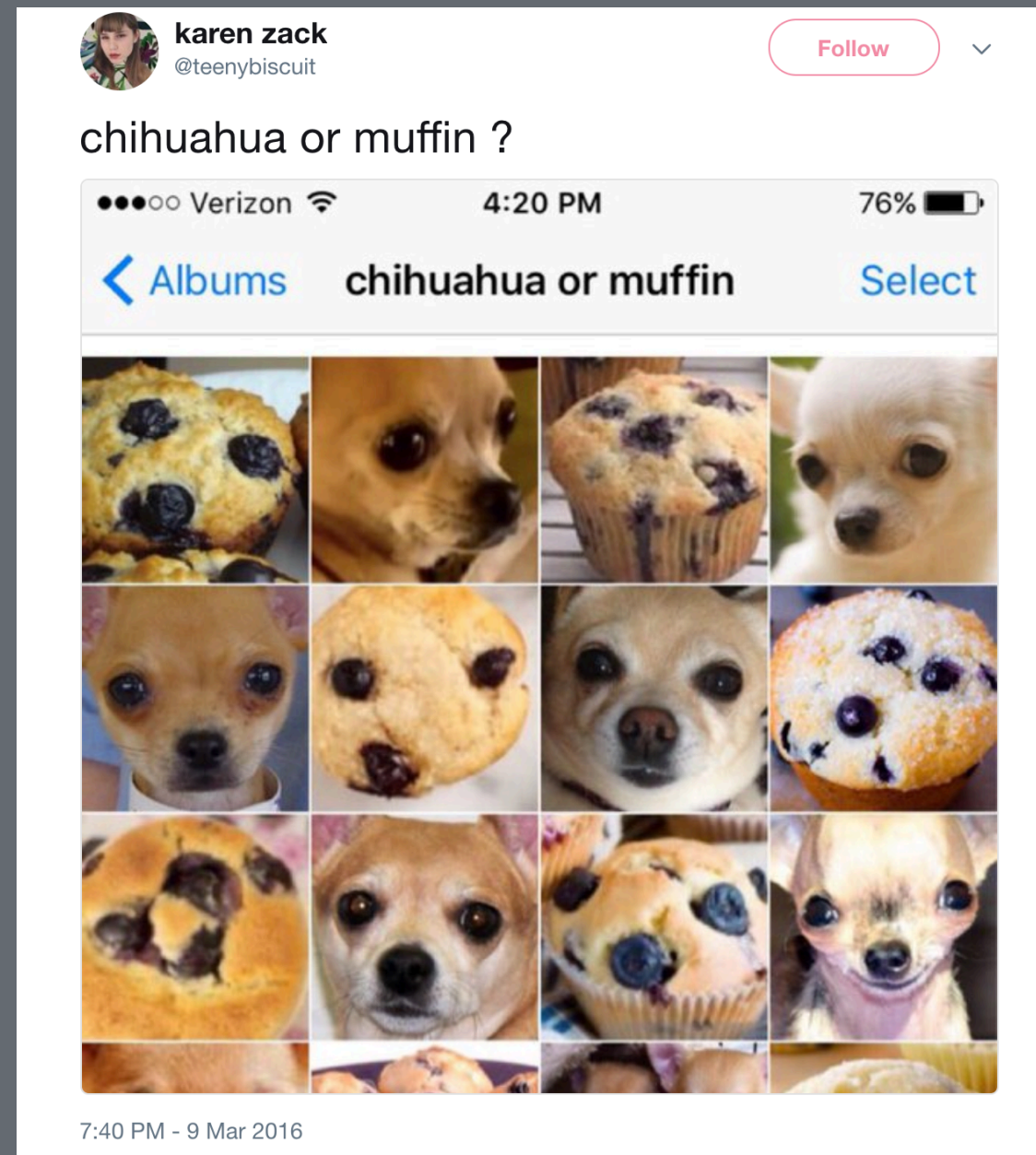
— *Paraphrased from Arthur Samuel (1959)*

The background features a complex, abstract design. It includes a blue-toned circuit board pattern with various traces and components. Overlaid on this is a faint, stylized globe or sphere with grid lines. The overall aesthetic is technological and digital.

Machine learning is concerned with
the question of how to construct
computer programs that
automatically improve (their
performance at some task) with
experience

— *Paraphrased from Tom Mitchell (1998)*

Example Task: Image Classification



TORONTO
LIFE

TECH

The godfather of artificial intelligence is a Torontonian

Geoffrey Hinton and the Vector Institute are planning to make Toronto the AI capital of the world

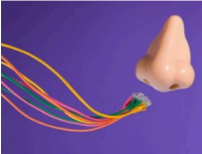
BY LUC RINALDI | SEPTEMBER 18, 2017

THE
NEW YORKER

ELEMENTS

O.K., COMPUTER, TELL ME WHAT THIS SMELLS LIKE

Can machine learning help unravel the bewildering relationship between scent and chemistry?



By **Veronique Greenwood** October 9, 2017

The New York Times

TECHNOLOGY

How an A.I. ‘Cat-and-Mouse Game’ Generates Believable Fake Photos

By CADE METZ and KEITH COLLINS JAN. 2, 2018

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BUSINESS

COMMENTARY

July 12, 2018

Machine learning takes major step in helping predict and treat schizophrenia

Researchers hope to ultimately find reliable biomarkers that can predict the disorder.

The Washington Post

Democracy Dies in Darkness

Health Science

The Training Of Dr. Robot: Data Wave Hits Medical Care

By **John McQuaid** February 14

THE VERGE

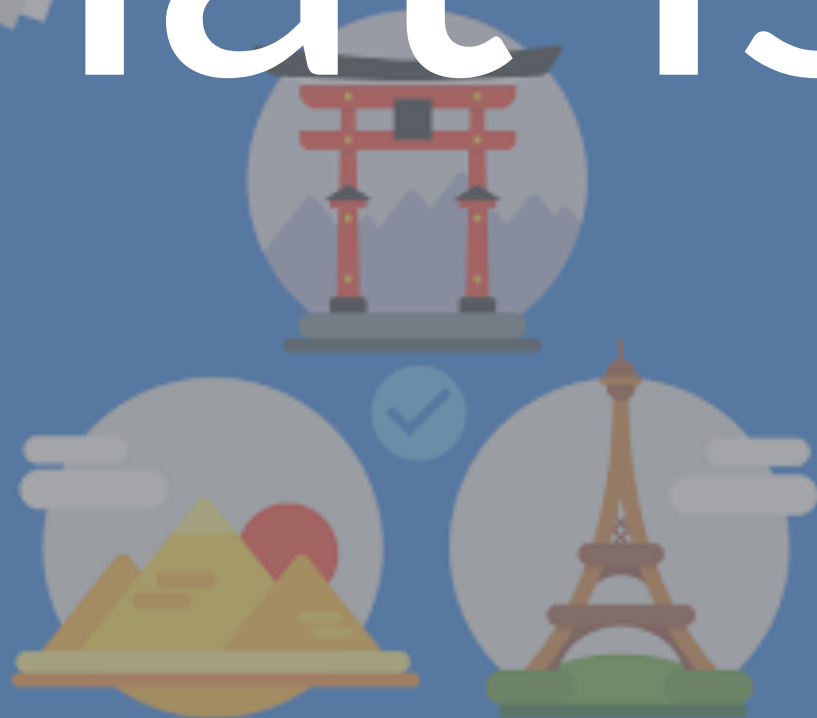
TECHARTIFICIAL INTELLIGENCE

Machine learning is helping computers spot arguments online before they happen

‘Hey there. It looks like you’re trying to rile someone up for no good reason?’

By **James Vincent** | @jvincent | May 23, 2018, 8:27am EDT

What is ML Kit?

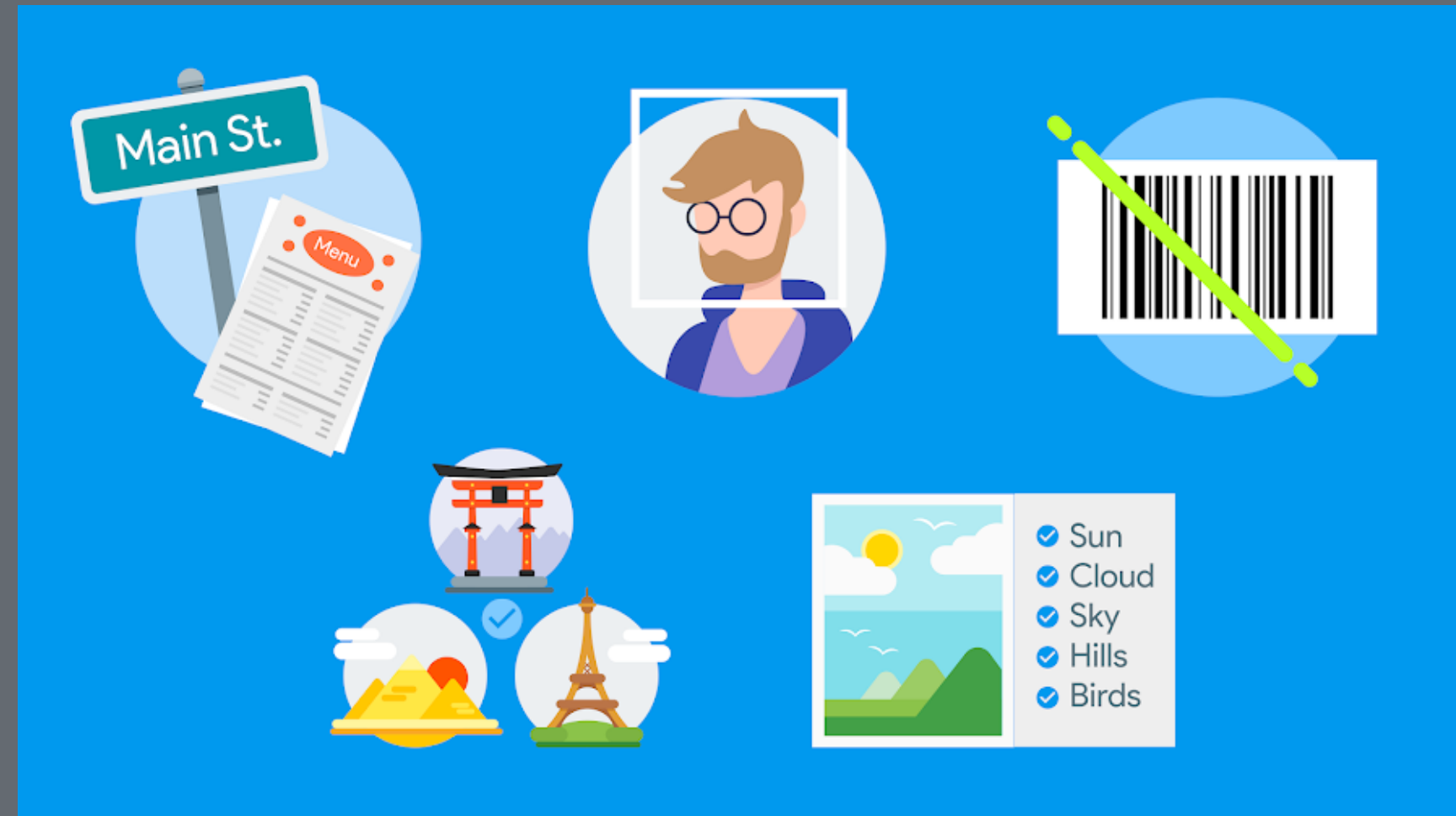


What is ML Kit?

- Set of machine learning SDKs for mobile
- Application layer of Google's mobile ML stack
 - ML Kit
 - TensorFlow Lite
 - Android Neural Networks API / iOS Metal
- Solves hard challenges in deploying ML on mobile

ML Kit Base APIs

- Recognizing text
- Labeling images
- Detecting faces
- Scanning barcodes
- Identifying landmarks
- More to come: Smart Reply, face contours



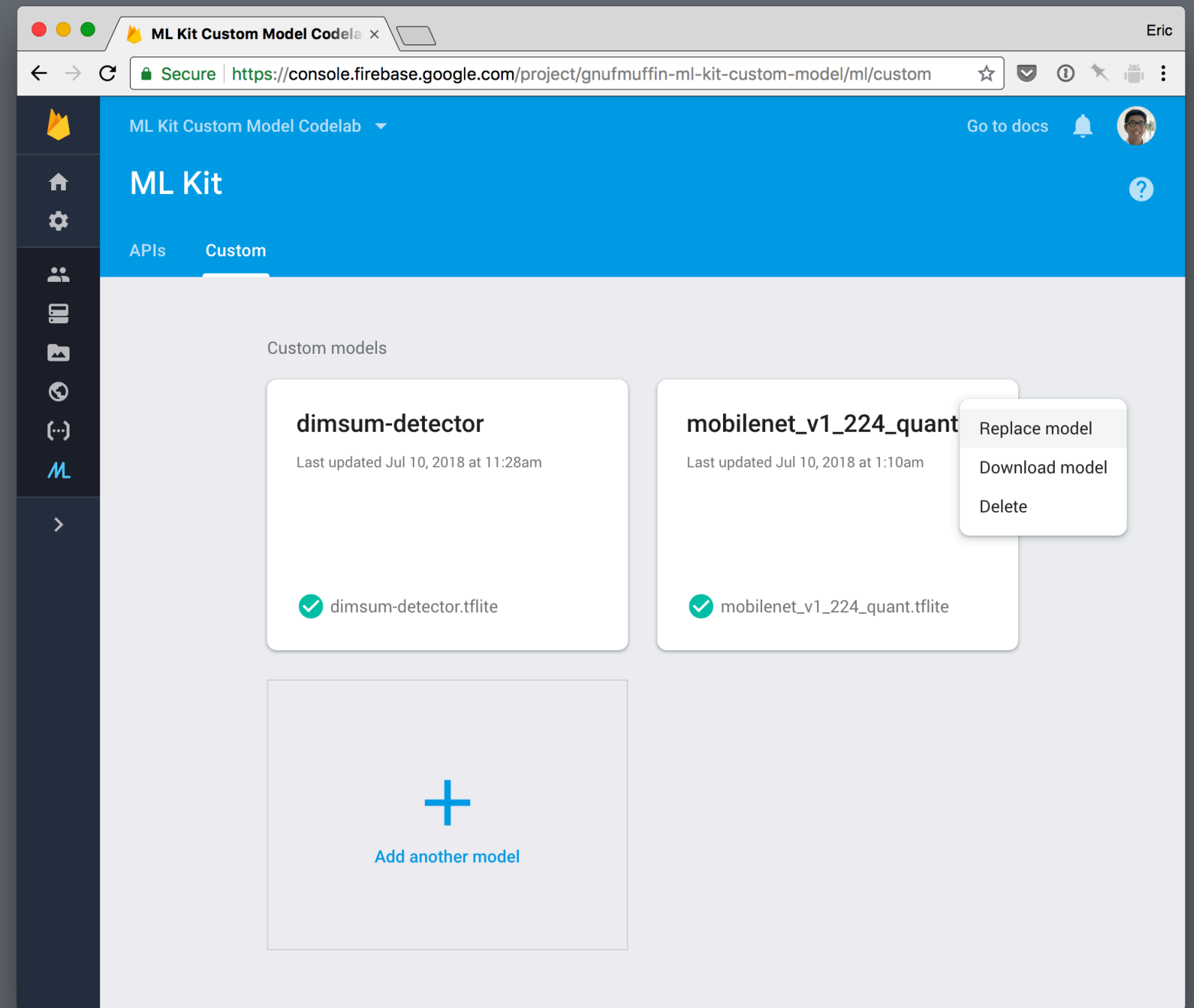
Other ML Kit Features

- Runs on-device (faster, no network) or via cloud (greater accuracy, more functionality)
- Models can be downloaded at app install time, or on first-use
- Supports custom ML models

Let's Play with Custom Models

Custom Models

- Upload your own TensorFlow Lite models
- A/B test different models
- Decouple model updates from app updates



Codelabs

- TensorFlow For Poets
 - Use Python to retrain an existing network
 - Classify images on command-line
 - Output is a TF model

TensorFlow For Poets

Secure | <https://codelabs.developers.google.com/codelabs/tensorflow-for...>

Eric

← TensorFlow For Poets

🕒 21 min remaining

1 Introduction

2 Setup

3 Download the training images

4 (Re)training the network

5 Training And TensorBoard (Optional)

6 Using the Retrained Model

7 Trying Other Hyperparameters (Optional)

8 Training on Your Own Categories (Optional)

9 Next steps

1. Introduction

[TensorFlow](#) is an open source library for numerical computation, specializing in machine learning applications.

What you will build

In this codelab, you will learn how to run TensorFlow on a single machine, and will train a simple classifier to classify images of flowers.



Image CC-BY by Retinafunk

```
daisy (score = 0.99071)
sunflowers (score = 0.00595)
dandelion (score = 0.00252)
roses (score = 0.00049)
tulips (score = 0.00032)
```

Next

Did you find a mistake? [Please file a bug.](#)

Codelabs

- TensorFlow For Poets 2: TFLite Android
 - Convert TF model to TensorFlow Lite model
 - Include model with Android app
 - Run inference using embedded TFLite interpreter

TensorFlow for Poets 2: TFLite An...

Secure | https://codelabs.developers.google.com/codelabs/tensorflow-for-... 20 min remaining

1 Introduction

2 Setup

3 Convert the model to TFLite format

4 Setup the Android app

5 Test run the app

6 Run the customized app

7 How does it work?

8 What Next?

What you will build

A simple camera app that runs a TensorFlow image recognition program to identify flowers.



164ms
daisy:0.9889642
sunflowers:0.0038049358
dandelion:0.0037251285

Next

Did you find a mistake? [Please file a bug.](#)

Codelabs

- Identify objects in images using custom machine learning models with ML Kit for Firebase
- Upload a TF Lite model into Firebase
- Use ML Kit SDK in Android app to download model
- Run inference using SDK

Identify objects in images using ... 19 min remaining

1 Introduction

2 Getting set up

3 Create Firebase console Project

4 Set up the Firebase console Project

5 Run the starter app

6 Host a Tensor Flow Lite custom model with Firebase

7 Configure our app to automatically download the hosted model

8 Use the downloaded/local model to label images

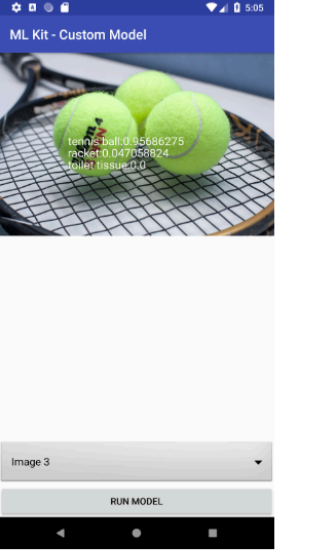
9 Congratulations!

Did you find a mistake? [Please file a bug.](#)

What you will build

In this codelab, you're going to build an Android app with Firebase ML Kit. You will:

- Learn how to host your custom pre-trained TensorFlow Lite model using Firebase
- Use the ML Kit Custom Model API to download the pre-trained TensorFlow Lite model to your app
- Use the downloaded model to run inference and label images



ML Kit - Custom Model

tennis ball: 0.95586275
racket: 0.047058824
golfer: 0.00000000

Image 3

RUN MODEL

What you'll learn

- ✓ How to use Firebase to store custom pre-trained TensorFlow Lite models to use in any Android app.
- ✓ How to use the Firebase ML Kit SDK to easily download the custom models and run on-device inference in your Android app.

What you'll need

- A recent version of Android Studio (v3.0+)
- Android Studio Emulator or a physical Android device
- [The sample code](#)
- Basic knowledge of Android development in Java

Next

💡 Idea

- What's in that steamer basket?
- Train an existing vision model to classify dim sum
- Deploy model using Firebase ML Kit
- Build an app to capture images and identify them via model



Womp womp

- Unfortunately, it didn't work out
- TFLite model incompatibility with ML Kit Android sample
 - `float32` vs `int`?
- Live camera feed
 - ML Kit sample uses bundled static images
- Need more investigation



However...

Demo

(Non ML Kit) Demo

End

- **Email** efung@acm.org
- **Blog** code.gnufmuffin.com
- **Code** github.com/efung
- **Social** [@gnufmuffin](https://twitter.com/gnufmuffin)
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