



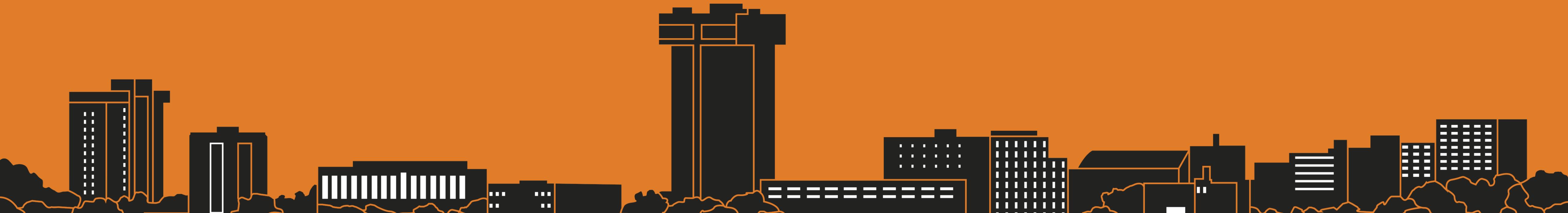
Image Classifier Retraining with TensorFlow

DevFest 2018

Google Developer Group (GDG) and Springfield Web Developers
Springfield Missouri

Presented by Jason Klein

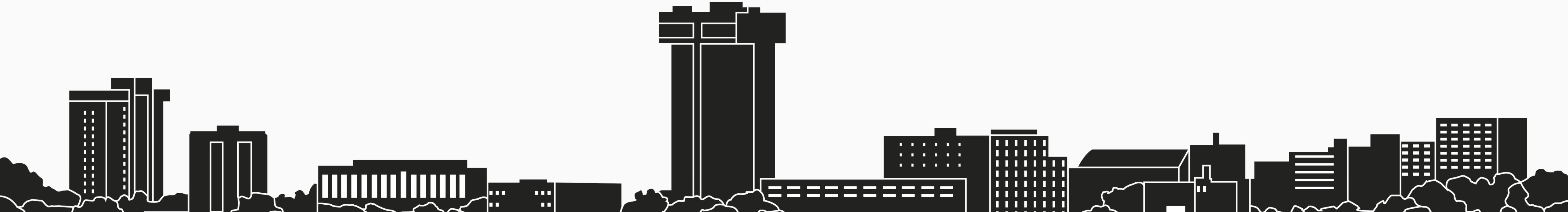
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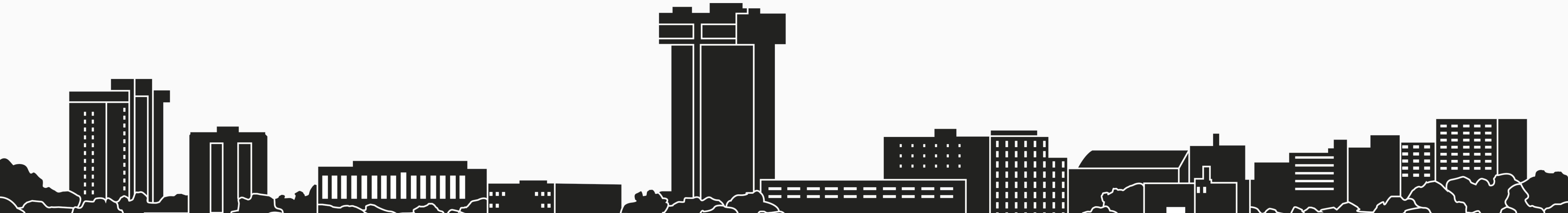
Welcome

Jason Klein is Chief Innovation Officer at **Logic Forte**, a cloud-based platform that provides managed data services for restaurants. The platform began collecting and processing data during the dialup era. In the past year, the platform processed information representing \$350MM sales and 50MM customer visits for restaurants in 19 states. Jason is building Deep Learning models to tap into two decades of historical data.



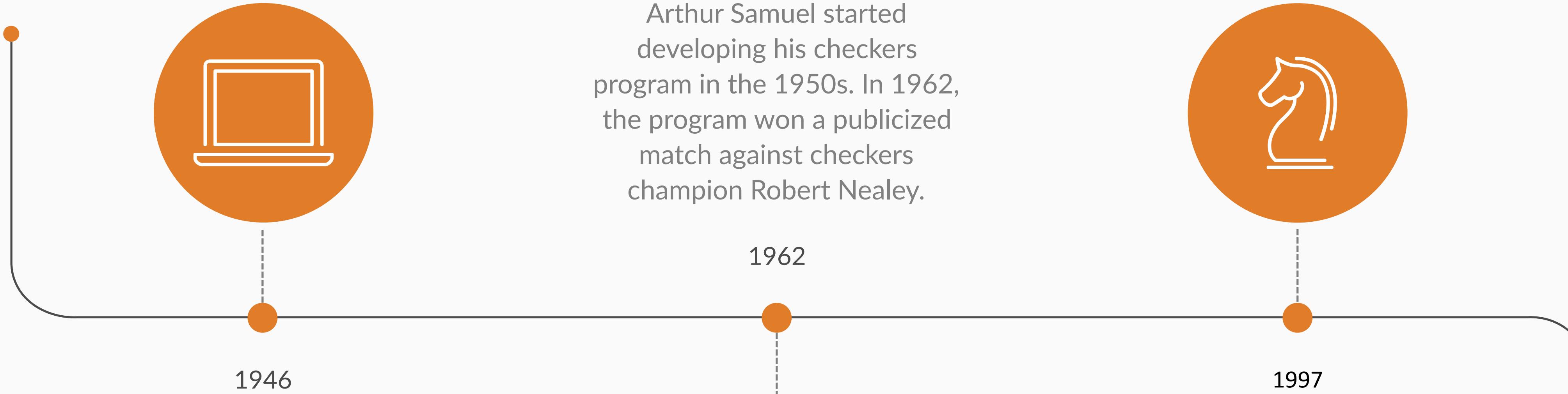
Why Machine Learning?

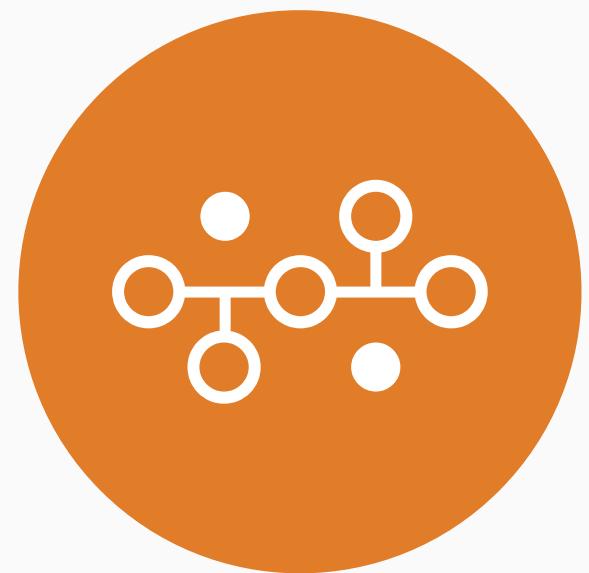
“Artificial intelligence would be the ultimate version of Google. The ultimate search engine that would understand everything on the web. It would understand exactly what you wanted, and it would give you the right thing. We're nowhere near doing that now. However, we can get incrementally closer to that, and that is basically what we work on.” –Larry Page, Co-Founder, Google, October 2000



Artificial Intelligence Timeline

The field of AI research was born shortly after the first Digital Computer was invented. Advances in machine learning and data-hungry deep learning methods can be attributed to faster computers, algorithmic improvements, and access to large amounts of data enabled advances in machine learning and perception.





2017

Go

At the 2017 Future of Go Summit, AlphaGo beat Ke Jie, the world No.1 ranked player at the time, in a three-game match.



2011

Jeopardy

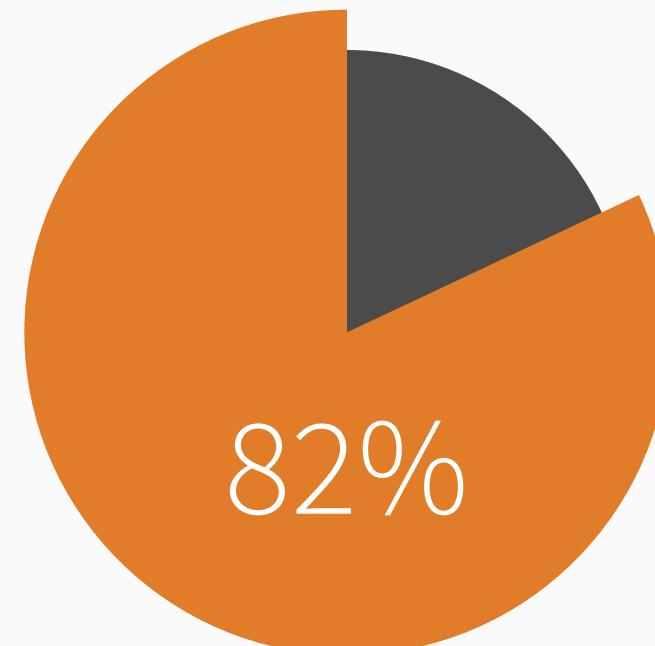
IBM's Watson beats two human champions in a Jeopardy! competition.



2009

Netflix

The Netflix Prize competition is launched. The aim was to beat Netflix's recommendation accuracy in predicting a user's rating for a film. The prize was won in 2009.



2018

Language

Alibaba language processing AI outscores top humans at a Stanford reading and comprehension test, scoring 82.44 against 82.304 on a set of 100,000 questions.

Google Duplex

Announcement of Google Duplex, a service to allow an AI assistant to book appointments over the phone using a "nearly flawless" imitation of human-sounding speech.

2018



2024+

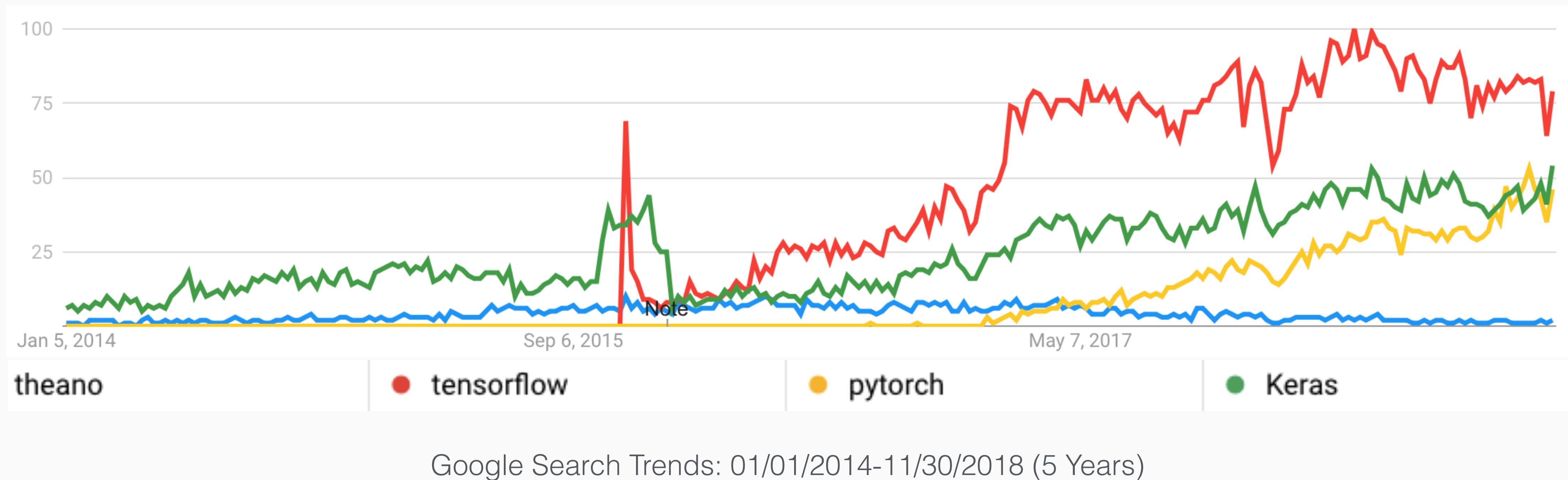
Outperform Humans

Experts believe AI will outperform humans in many activities, such as translating languages (2024), writing a high-school essay (2026), driving a truck (2027), working in retail (2031), writing a bestselling book (2049), and working as a surgeon (2053). [1]

[1] Future milestones in AI predicted by experts (<https://www.futuretimeline.net/blog/2017/06/13.htm>)

Machine Learning Frameworks

TensorFlow is currently the most searched Machine Learning framework on Google Search
Google Open Sourced the platform in 2015



TensorFlow is currently the most searched Machine Learning framework, compared to it's predecessor (Theanos) and it's largest rival (PyTorch). Other frameworks include: Alexnet, Caffe, Caffe 2, Chainer, CNTK (Microsoft), Decaf, DL4J, DSSTNE (Amazon), DyNet (CMU), and MxNet (Amazon).

Deep Learning with TensorFlow

Several current uses of TensorFlow



Deep Speech (Mozilla)

Open Source Speech-To-Text engine, using a model trained by machine learning techniques, based on Baidu's Deep Speech research paper. DeepSpeech uses Google's TensorFlow project to make the implementation easier.



RankBrain (Google)

RankBrain is an algorithm learning artificial intelligence system that helps Google to process search results and provide more relevant search results for users. It is the third most important factor in the ranking algorithm along with links and content.



Inception Image Classification (Google)

Google's deep convolutional neural network architecture named "Inception", which was responsible for setting the new state of the art for classification and detection in the ImageNet Large-Scale Visual Recognition Challenge 2014



SmartReply (Google)

Deep LSTM model to automatically generate email responses. Automatically determine if an email is answerable with a short reply, then compose a few suitable responses that users can edit or send with just a tap.



Networks for Drug Discovery (Google)

These massively multitask networks for Drug Discovery are deep neural network models for identifying promising drug candidates.



On-Device Vision for OCR (Google)

On-device computer vision model to do optical character recognition (OCR) to enable real-time language translation.

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Use Cases of TensorFlow

TensorFlow can train and run deep neural networks for the following uses cases

1

Handwritten digit classification

2

Image recognition

3

Word embeddings

4

Recurrent neural networks

5

Sequence-to-sequence models for
machine translation

6

Natural language processing

7

PDE (partial differential equation)
based simulations

8

Production prediction at scale, with
the same models used for training

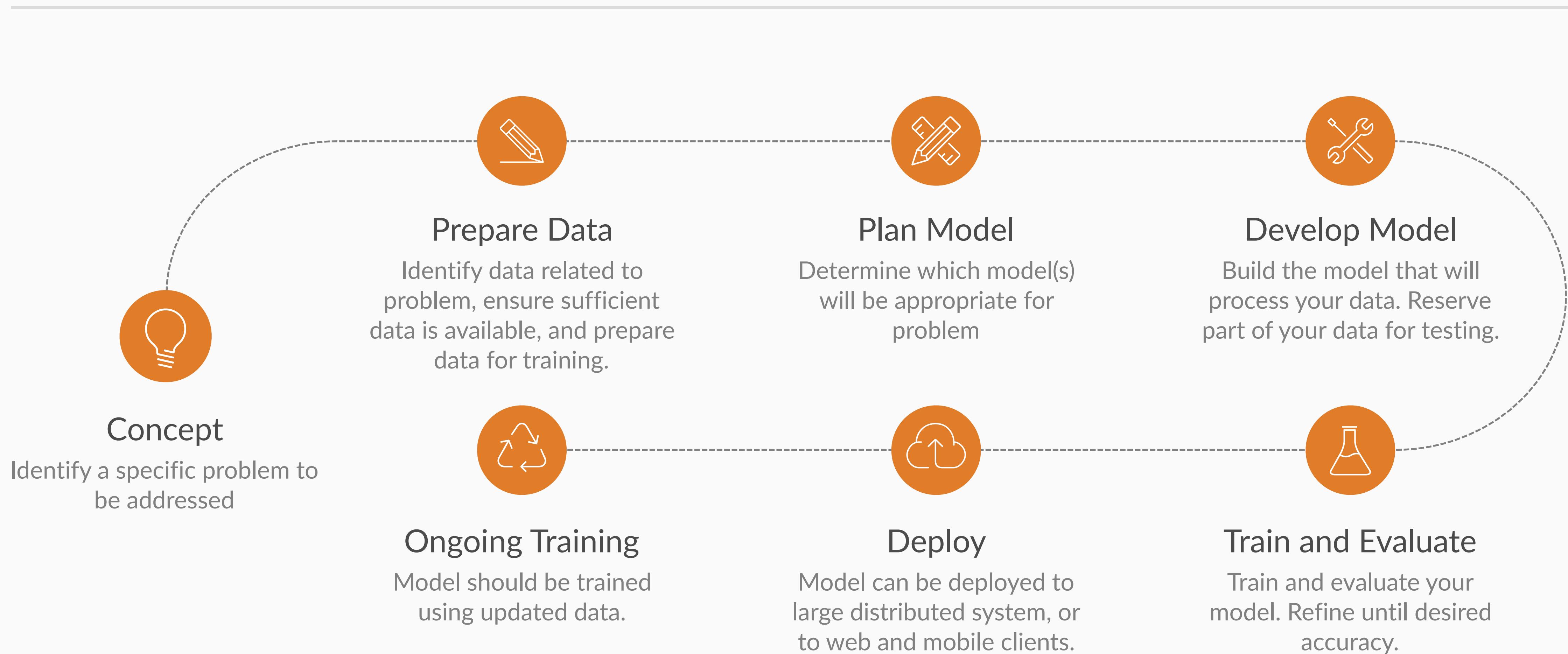
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Machine Learning Design Process

Plan to invest a significant amount of time preparing your data and planning your model



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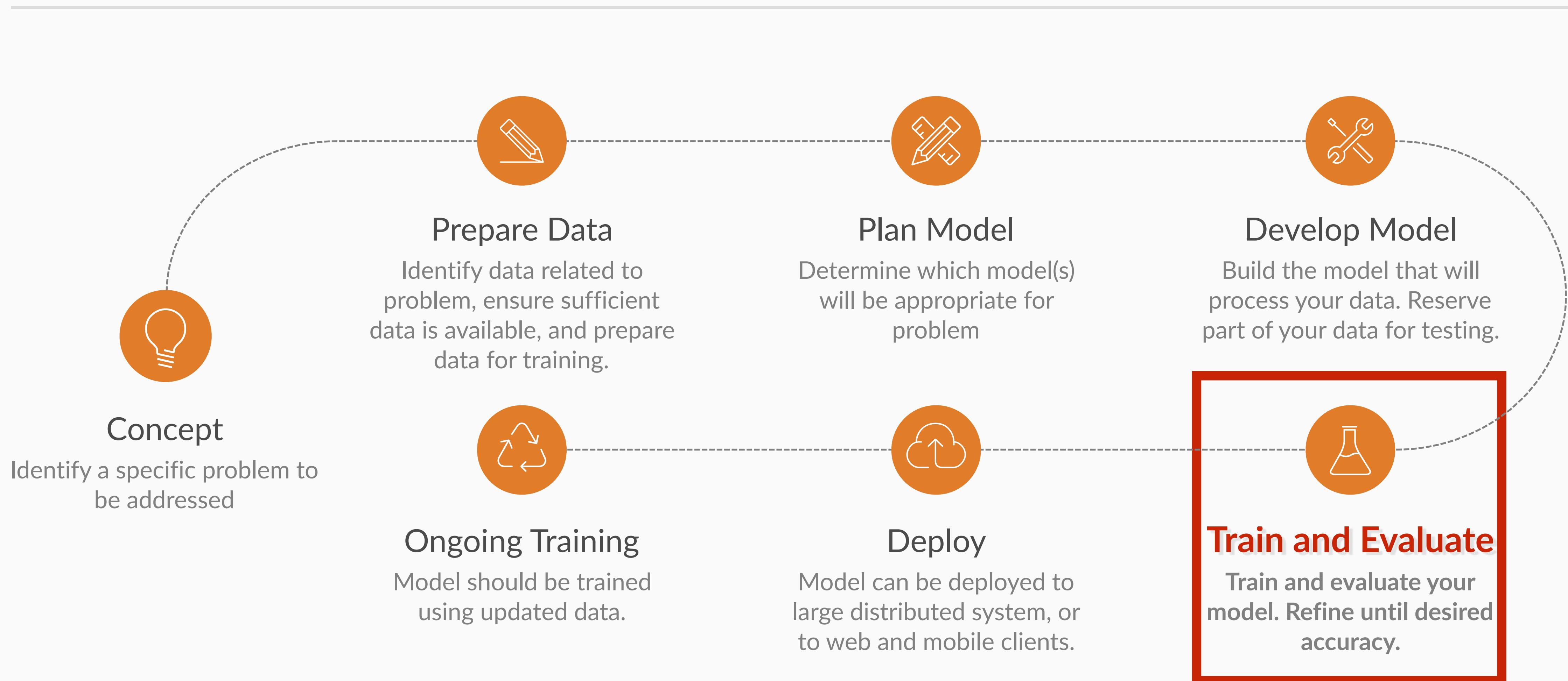


Image Classifier Retraining

We will use TensorFlow retrain a MobileNet open-source model, used for efficient on-device vision.

Our retrained model will recognize two categories:
“Hotdog” and “Not Hotdog”



Image Classifier Retraining with TensorFlow

Transfer Learning for Deep Learning - Retrain an Existing Neural Network

The screenshot shows a web-based codelab titled "TensorFlow For Poets". The title bar indicates "21 min remaining". On the left, a sidebar lists steps from 1 to 9: 1. Introduction (selected), 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), and 9. Next steps. The main content area displays the first step, "1. Introduction". It explains that TensorFlow is an open source library for numerical computation, specializing in machine learning applications. It also states that 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. A large image of a white daisy flower is shown. Below the image, it says "Image CC-BY by Retinafunk". At the bottom, a dark box contains the output of a command: "daisy (score = 0.99071), sunflowers (score = 0.00595), dandelion (score = 0.00252), roses (score = 0.00049), tulips (score = 0.00032)". A blue "Next Step" button is visible at the bottom right.

TensorFlow For Poets

In this code lab, you will learn how to run TensorFlow on a single machine, and will train a simple classifier to classify images we provide.



Transfer Learning

We will be using transfer learning, which means we are starting with a model that has been already trained on another problem. We will then retrain it on a similar problem.



ImageNet Visual Recognition Challenge

We are going to use a model trained on the ImageNet Visual Recognition Challenge dataset. These models can differentiate between 1,000 different classes, like Dalmatian or dishwasher.

Follow along @

codelabs.developers.google.com/codelabs/tensorflow-for-poets/

Wrap-up and Questions!

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Thank you for Attending

DevFest 2018

Google Developer Group and Springfield Web Devs
Springfield Missouri

12/05/2018

Questions about TensorFlow or Image Classifier Retraining? Contact Jason Klein



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[LinkedIn.com/JasnK](https://www.linkedin.com/JasnK)

