Image Classification with TensorFlow 2

Data Science After Dark

Springfield Missouri

Presented by Jason Klein

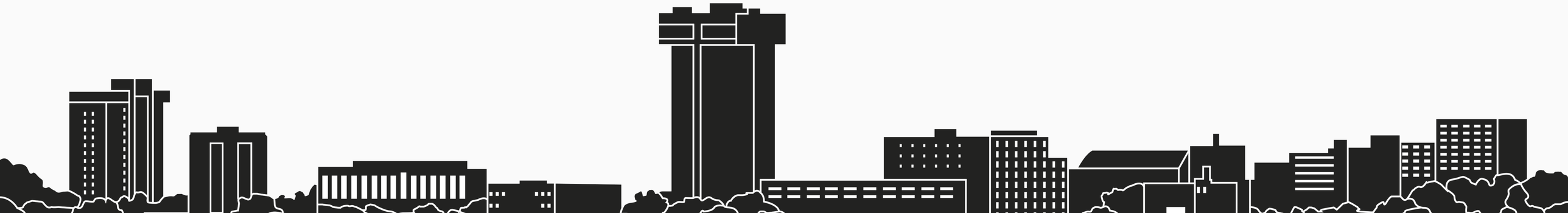
11/19/2019

Welcome

Jason Klein is Chief Innovation Officer at **Logic Forte**, a cloud-based platform that provides managed data services for restaurants. Last year, the platform processed information representing $350MM sales and 50MM customer visits 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.

1946

Digital Computer

The ENIAC was invented by Eckert and Mauchly at the University of Pennsylvania. Construction began in 1943 and ENIAC was completed until 1946.

1962

Checkers

Arthur Samuel started developing his checkers program in the 1950s. In 1962, the program won a publicized match against checkers champion Robert Nealey.

1997

Chess

IBM Deep Blue defeats Kasparov, becoming the first computer system to defeat a reigning world champion in a match.

2017

Go

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

2011

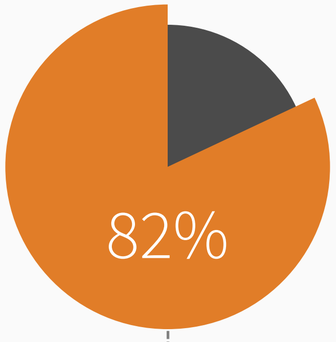
Jeopardy

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)

2018: Google Duplex AI Calls and Makes Appointments

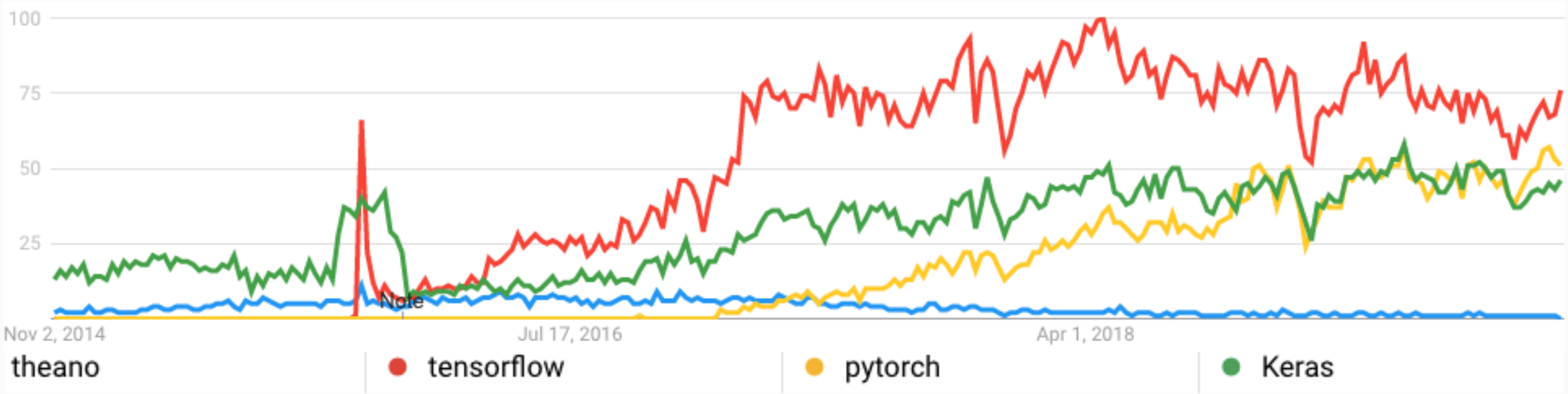
https://www.youtube.com/watch?v=D5VN56jQMWM

2019: Meet the New Google Assistant on Pixel

https://www.youtube.com/watch?v=i-ZpCCKgkkI

Machine Learning Frameworks

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



Google Search Trends: 11/01/2014-10/31/2019 (5 Years)

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. Google Open Sourced the platform in 2015.

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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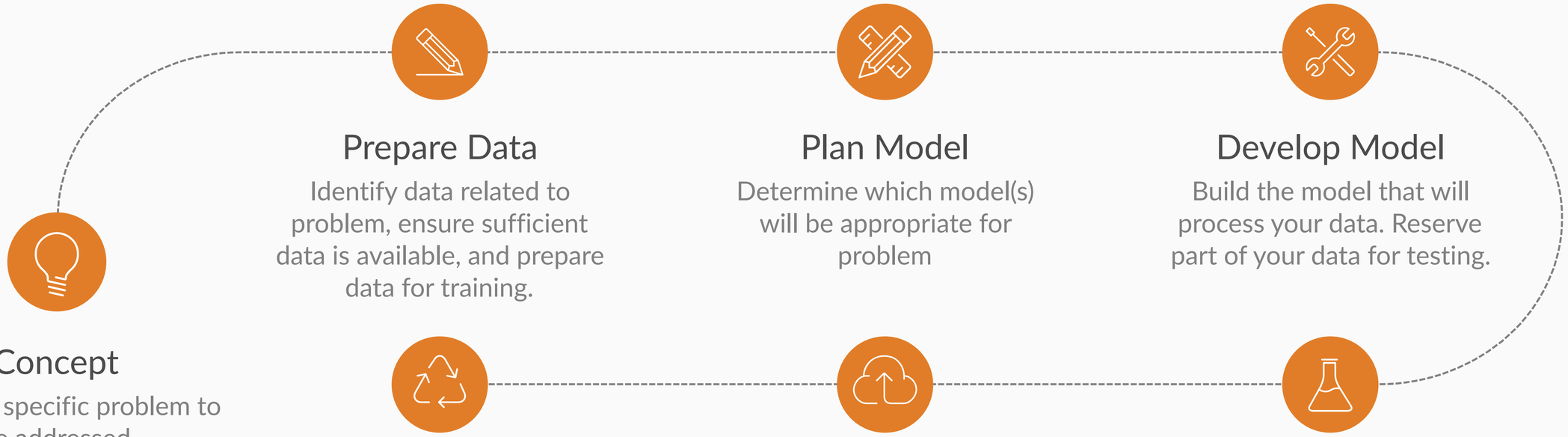
Machine Learning Design Process

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



Concept

Identify a specific problem to be addressed

Prepare Data

Identify data related to problem, ensure sufficient data is available, and prepare data for training.

Plan Model

Determine which model(s) will be appropriate for problem

Develop Model

Build the model that will process your data. Reserve part of your data for testing.

Train and Evaluate

Train and evaluate your model. Refine until desired accuracy.

Deploy

Model can be deployed to large distributed system, or to web and mobile clients.

Ongoing Training

Model should be trained using updated data.

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Changes in TensorFlow 2

TensorFlow 2.0 has been redesigned with a focus on developer productivity, simplicity, and ease of use

1. Ease of Use
2. Eager Execution
3. Easy Model Building and Deploying
4. Simplified Data Pipeline
5. No More Globals
6. Functions, Not Sessions
7. Performance and Portability
8. Keras Models and Layers

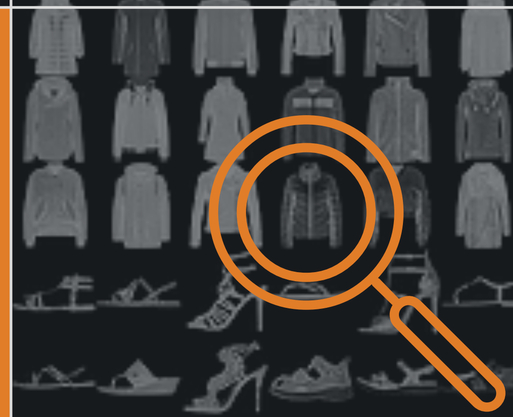
https://medium.com/tensorflow/effective-tensorflow-2-0-best-practices-and-whats-changed-a0ca48767aff

https://www.datasciencecentral.com/profiles/blogs/tensorflow-1-x-vs-2-x-summary-of-changes

Image Classification Training Demo

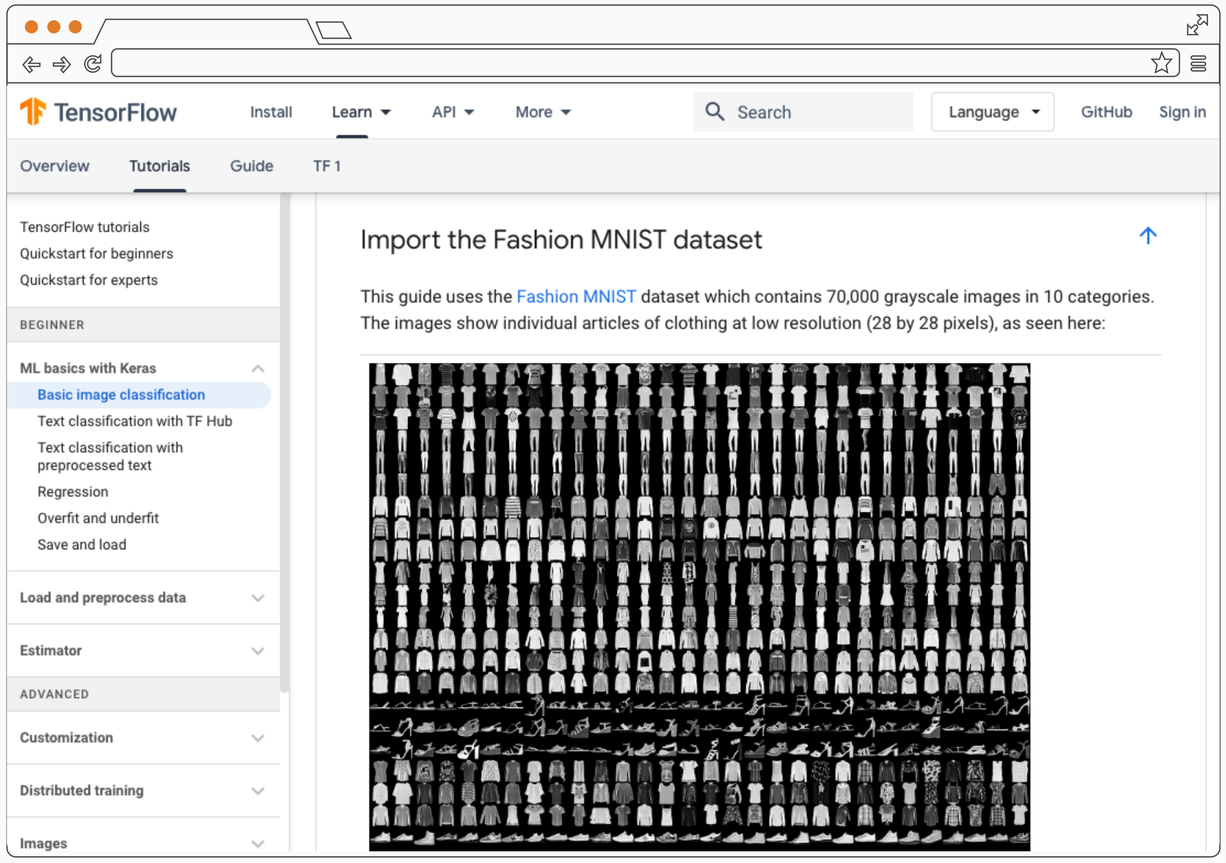
We will use TensorFlow to train a Neural Network Model to classify images of clothing, like sneakers and shirts.

Our trained model will be able to recognize 9 different articles of clothing.



Basic Image Classification with TensorFlow 2

Train a Neural Network Model to Classify Images of Clothing, like Sneakers and Shirts.



Classify the Fashion MNIST dataset

This guide uses the Fashion MNIST dataset which contains 70,000 grayscale images in 10 categories.

Train the Model

Training the neural network model requires feeding training data to the model, learning the images and labels, and verifying predictions.

Make Predictions

With the trained model, you can make predictions about images.

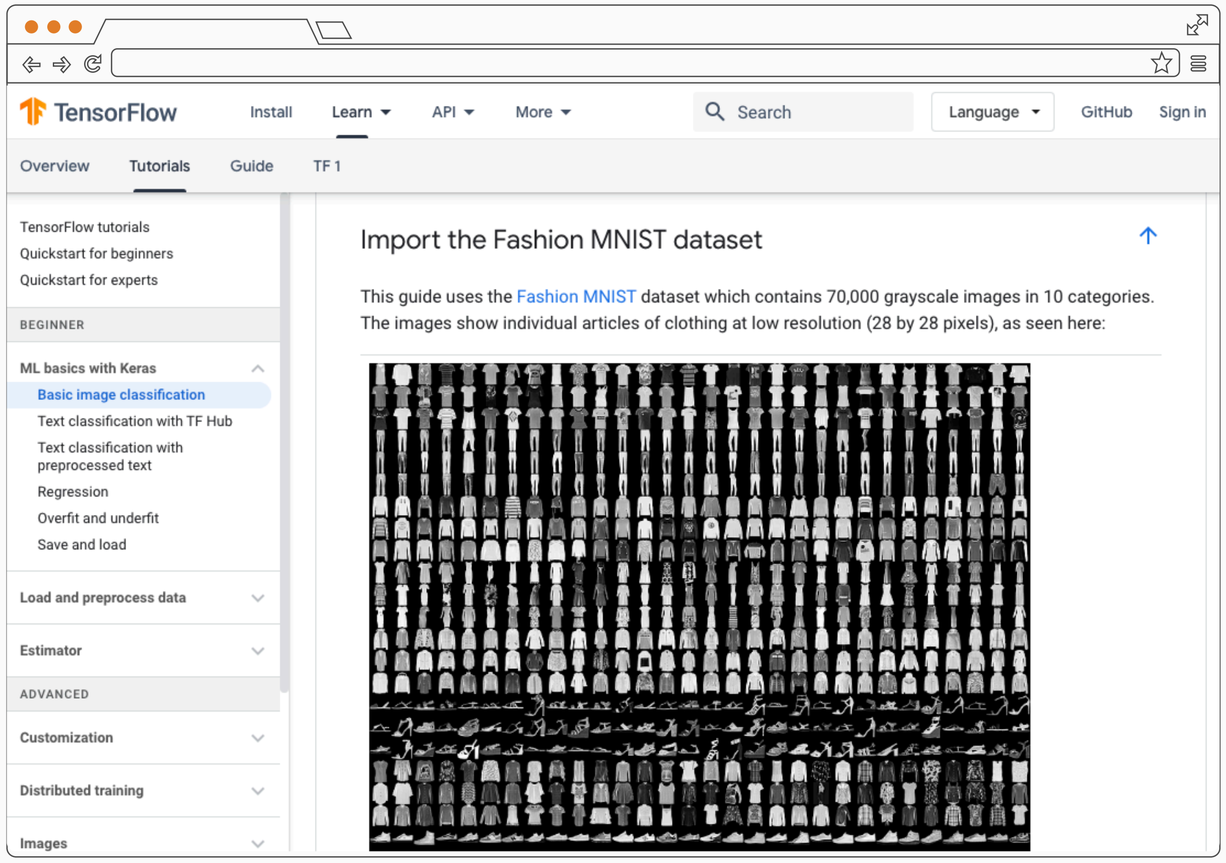
Follow along @

tensorflow.org/tutorials/keras/classification

Demo

Wrap-up and Questions

Basic Image Classification with TensorFlow 2



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Thank you for Attending

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