Introduction t TensorFlow ™

TensorFlow

A multidimensional array.

TensorFlow

A graph of operations.

3 Years Ago...

TensorFlow ✓
@TensorFlow

팔로우

Happy 3rd birthday TensorFlow! We've come a long way since the first release in 2015 & TensorFlow wouldn't be the framework it is today without you. As we work on #TensorFlow20, look at all the features we've added over the years to make TensorFlow easier to use. #HappyBirthdayTF

What is TensorFlow?

- Open source software library for numerical computation using data flow graphs

- Originally developed by Google Brain Team to conduct machine learning and deep neural networks research

- General enough to be applicable in a wide variety of other domains as well

TensorFlow provides an extensive suite of functions and classes that allow users to build various models from scratch.

Why Tensorflow

- Python API
- Portability: deploy computation to one or more CPUs or GPUs in a desktop, server, or mobile device with a single API
- Flexibility: from Raspberry Pi, Android, Windows, iOS, Linux to server farms
- Visualization (TensorBoard is da bomb)
- Checkpoints (for managing experiments)
- Auto-differentiation autodiff (no more taking derivatives by hand. Yay)
- Large community (> 10,000 commits and > 3000 TF-related repos in one year)
- Awesome projects already using TensorFlow

Search Results on Github

Repositories	47K
Code	7M
Commits	631K
Issues	90K
Marketplace	
Topics	252
Wikis	4K
Users	628

Tensorflow

TensorFlow is an open source software library for numerical computation.

See topic

47,233 repository results

Sort: Best

Languages

Python	24,729
Jupyter Notebook	9,961
HTML	870

tensorflow/*tensorflow*   ● C++

An Open Source Machine Learning Framework for Everyone

`tensorflow`   `python`   `machine-learning`

Apache-2.0 license   Updated 37 minutes ago
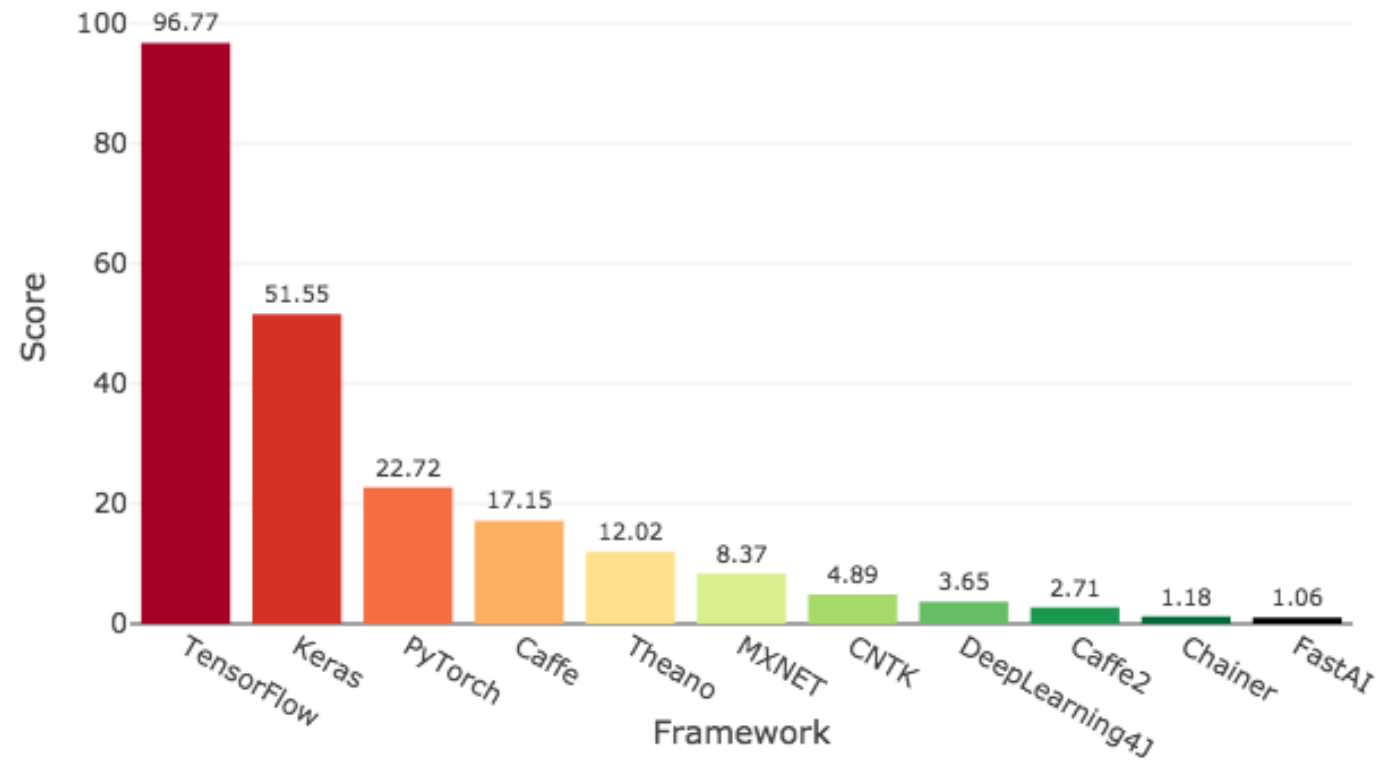
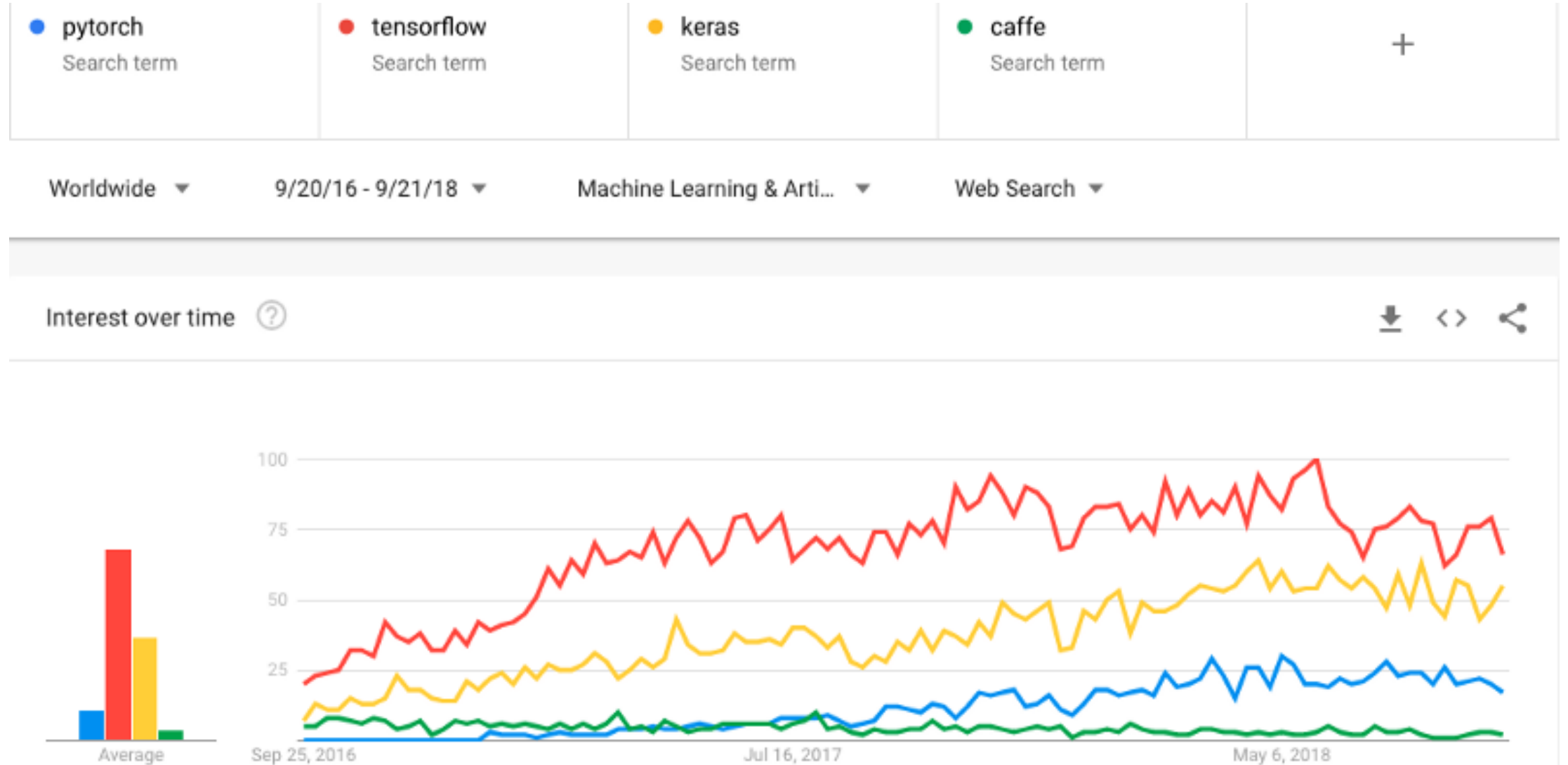### aymericdamien/*TensorFlow*-Examples   ● Jupyter Notebook

TensorFlow Tutorial and Examples for Beginners

Popularity

Deep Learning Framework Power Scores 2018

Google Search Statistics

Companies Using Tensorflow

- Google
- OpenAI
- DeepMind
- Snapchat
- Uber
- Airbus
- eBay
- Dropbox
- A bunch of startups
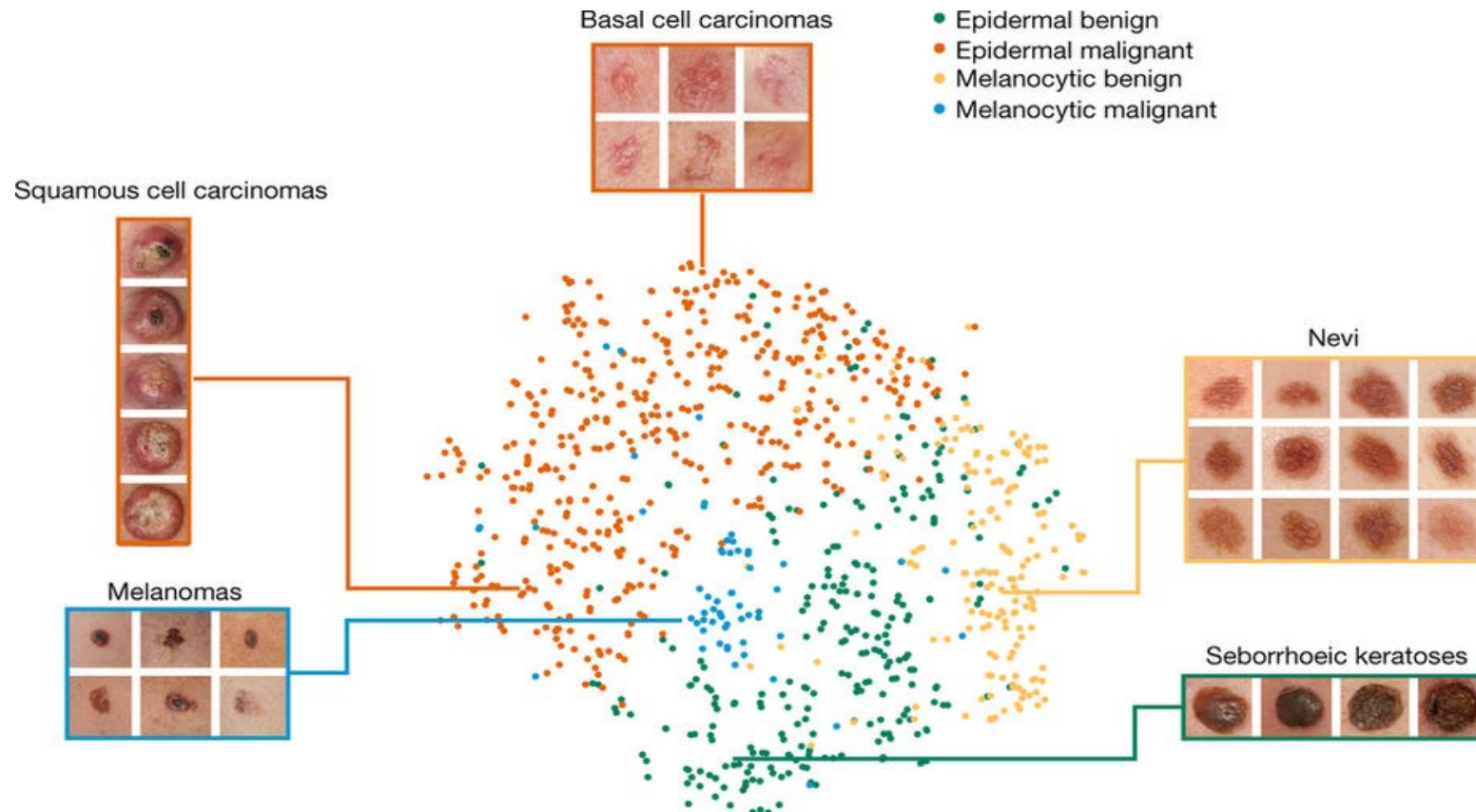
Fancy Projects Using Tensorflow

- [WaveNet: A Generative Model for Raw Audio](#) (DeepMind, 2016)
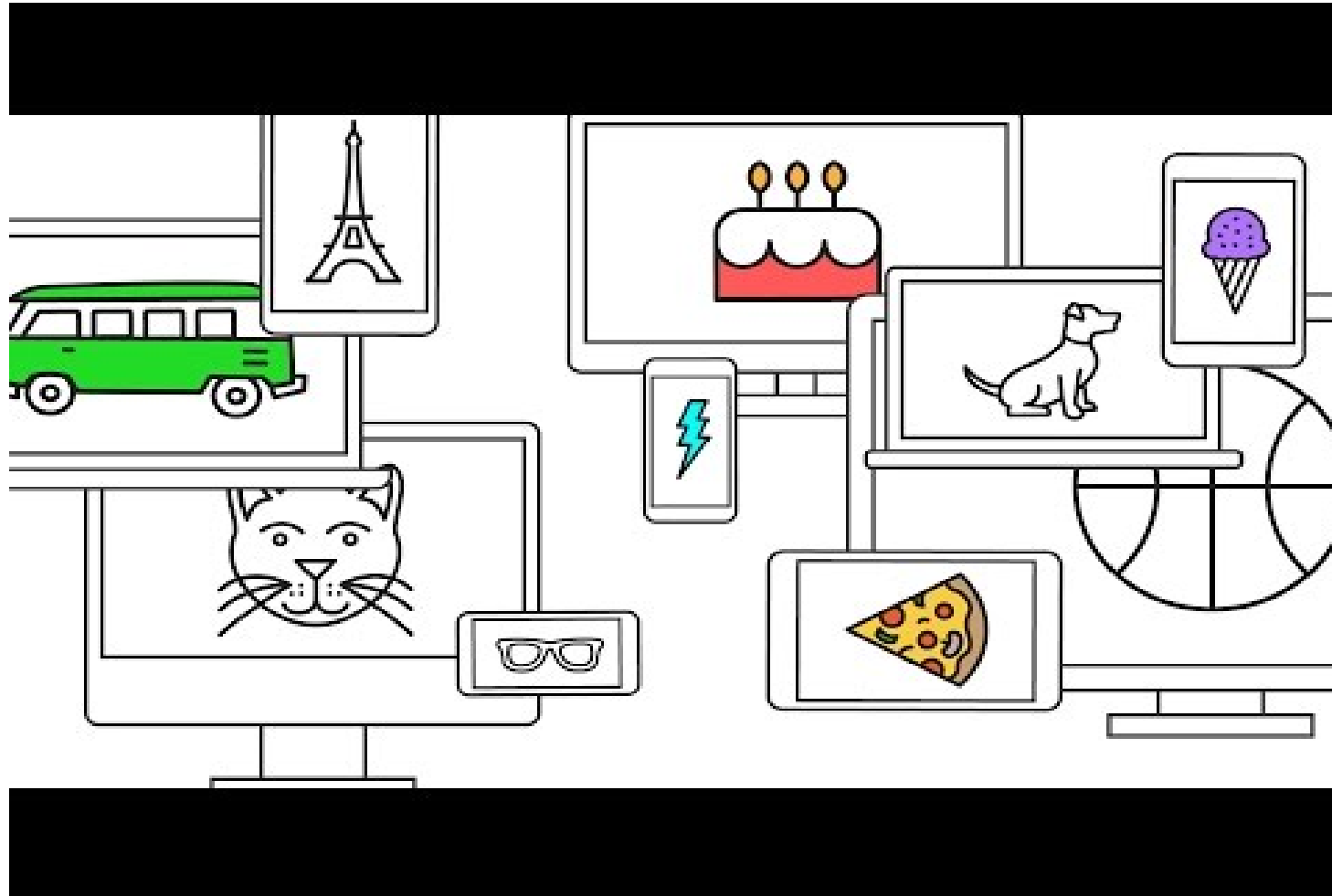
1 Second

- [Dermatologist-level classification of skin cancer with deep neural networks](#) (Esteva, Kuprel, et al., Nature 2017)
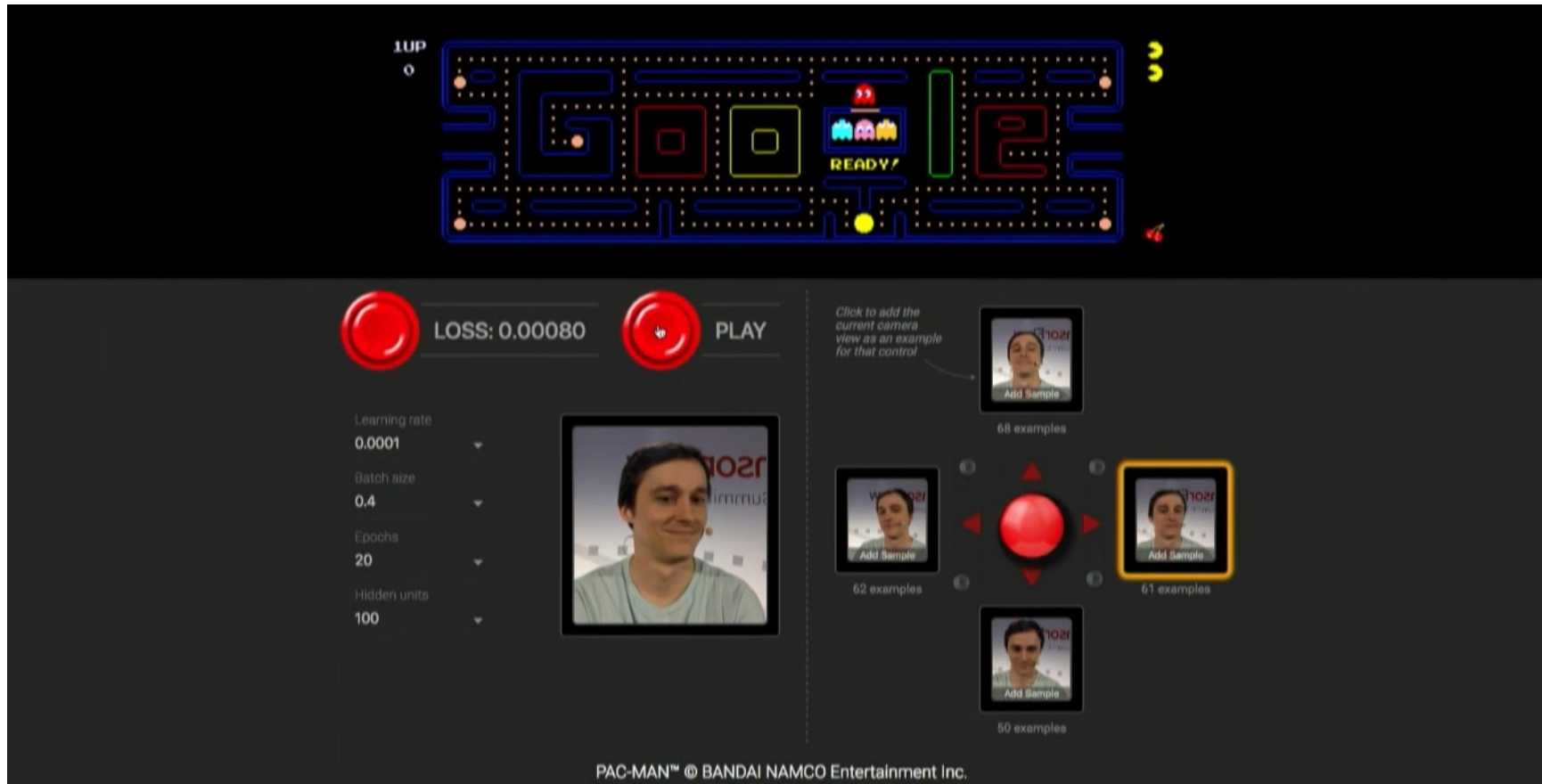
- [Magenta](#) (Google)
  - Use machine learning to create compelling art and music. Their projects are really fun! For example, please check out [Draw Together with a Neural Network](#).

- Autodraw

- [Webcam controller PacMan](#)

- [Emoji Scavenger Hunt](#)

- [Visual QA](#)

Coca-Cola

Applied AI at the Coca-Cola Company

Slide credit : 민규식@모두의연구소

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Proof of Purchase

- 소비자는 제품 구매의 증거를 회사측에 전달 (barcode, proof of purchase seal, …) -> 회사는 보상을 지급

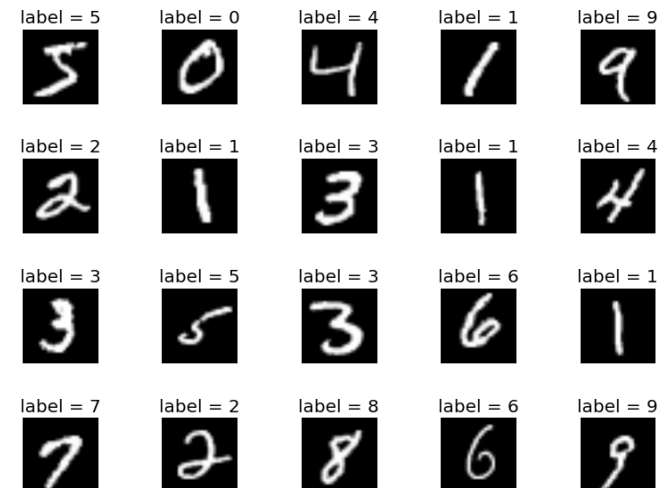- Sales promotion, loyalty marketing, 소비 데이터 수집

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Digital Engagement Marketing

- 기술의 발전으로 인해 web 이나 mobile 플랫폼을 이용한 proof of purchase 가능

- 소비자에게 즉각적인 보상 제공이 가능하며 접근성 향상

- 코카콜라의 경우 병뚜껑에 있는 14 character 로 구성된 pin code 를 이용

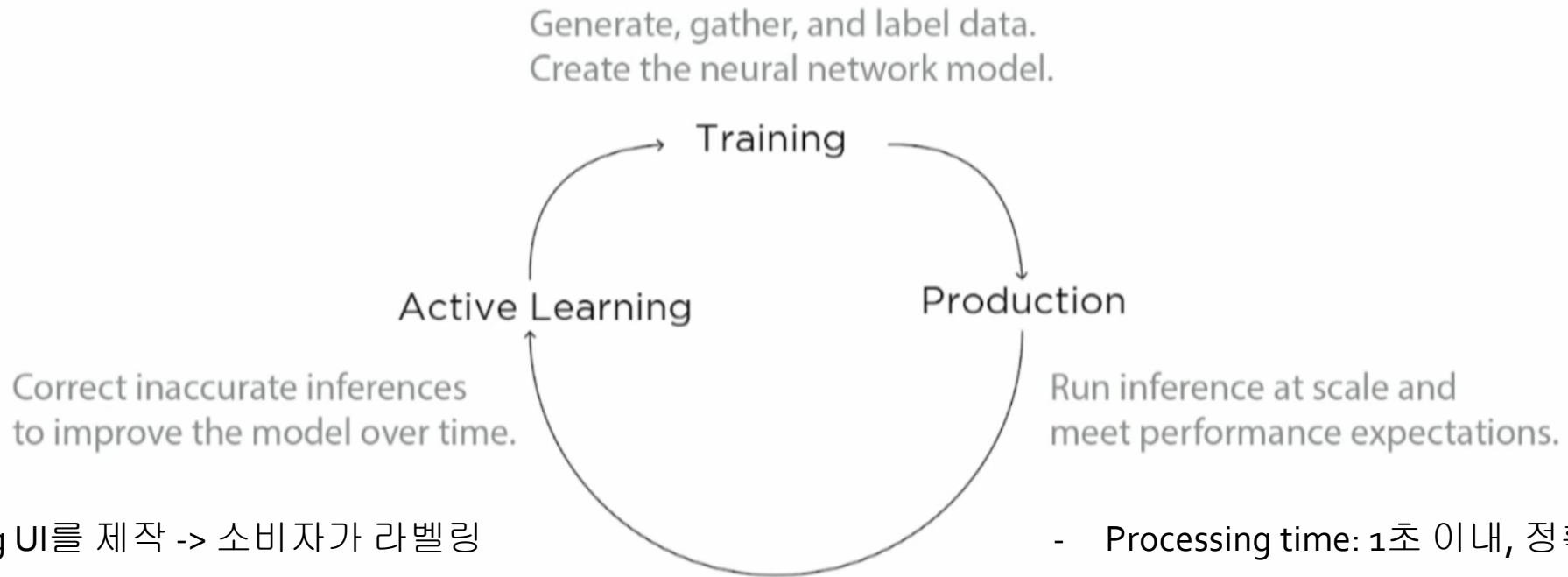 - 모든 제품에 unique 하게 할당된 코드 -> 하지만 이것도 손으로 치기 귀찮지요...

Assorted bottle cap and fridge-pack pincodes

≈

Slide credit : 민규식@모두의연구소

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Training 의 과정

- 작은 크기의 모델, update 수행 가능

Generate, gather, and label data.
Create the neural network model.

Training

Active Learning

Production

Correct inaccurate inferences
to improve the model over time.

Run inference at scale and
meet performance expectations.

- Active learning UI를 제작 -> 소비자가 라벨링

- Processing time: 1초 이내, 정확도 95% 이상

The three pillars of Applied A.I.

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Training
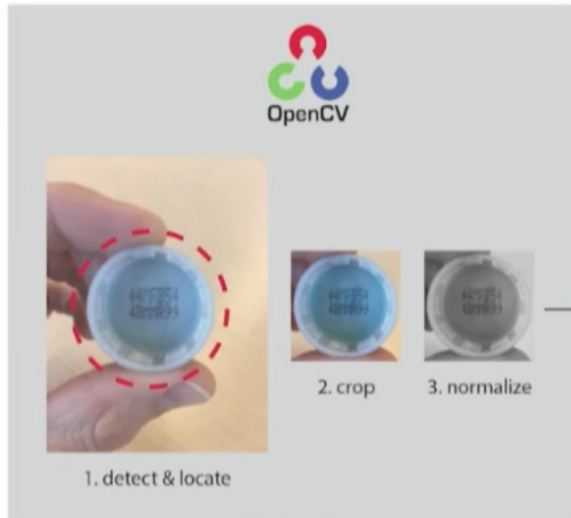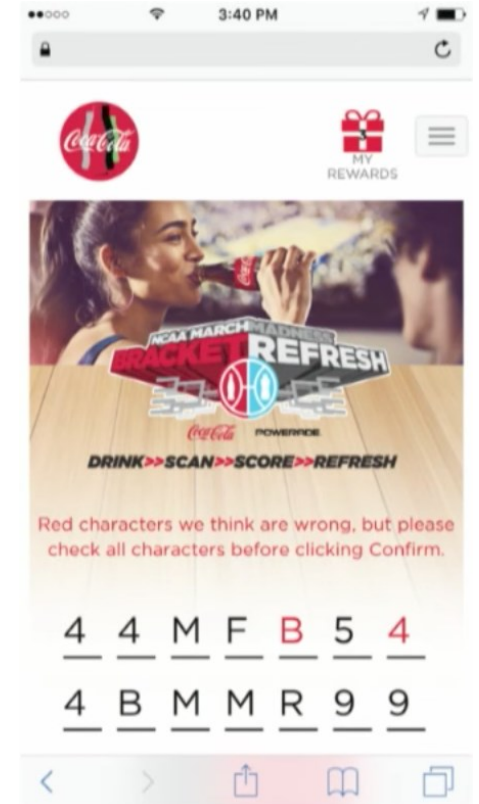
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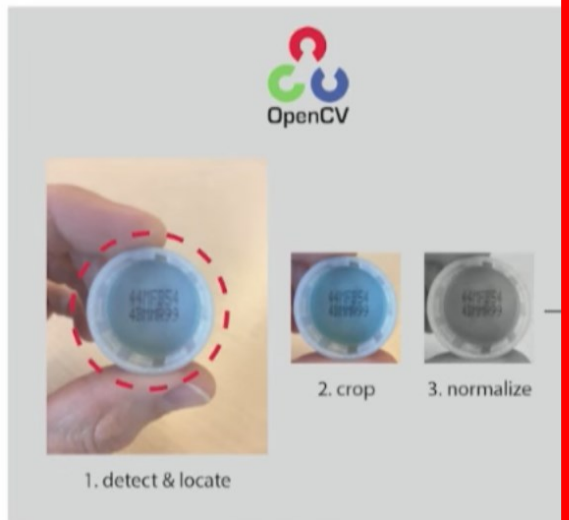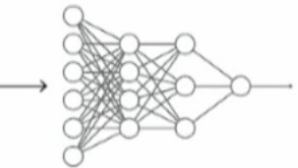
Training

- Character probability matrix 계산
  - Every character in every position
  - Matrix size: 글자 수 x 라벨 수

Top 10 prediction 선택

Valid: Pincode 제출

Invalid: Active learning

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Training

Improving the Model in 3 Phases

Improving image normalization...

Started with Binarization

Now using Best Channel Conversion

Reduce model size →

Implementing SqueezeNet...

*Iandola et al., 2016

Improve training efficiency →

Using Batch Normalization...

$$\mu_{\mathcal{B}} \leftarrow \frac{1}{m} \sum_{i=1}^{m} x_i$$

$$\sigma_{\mathcal{B}}^2 \leftarrow \frac{1}{m} \sum_{i=1}^{m} (x_i - \mu_{\mathcal{B}})^2$$

$$\widehat{x}_i \leftarrow \frac{x_i - \mu_{\mathcal{B}}}{\sqrt{\sigma_{\mathcal{B}}^2 + \epsilon}}$$

$$y_i \leftarrow \gamma \widehat{x}_i + \beta \equiv \mathrm{BN}_{\gamma,\beta}(x_i)$$

*Ioffe & Szegedy, 2015

Made the model too large

Prevented the model from converging

Gets the model to converge
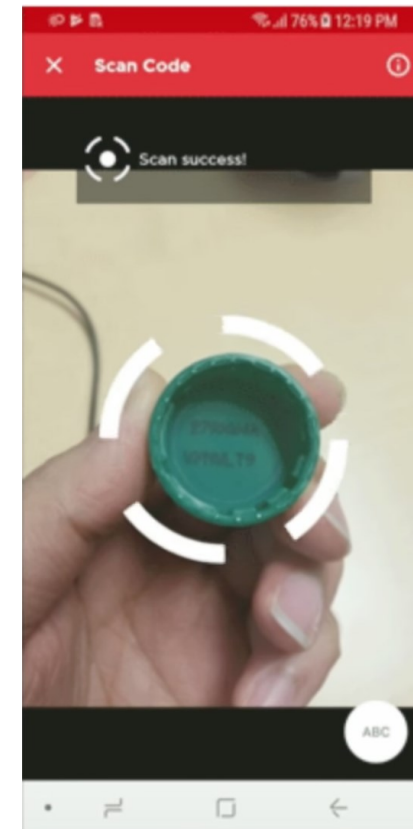
(5mb model with acc > 95%)

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22

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Result

Valid pincode recognition examples with different types of occlusion, translation, rotation, and camera focus issues.

TensorFlow Basics

- Import tensorflow as tf

- The first thing we need to understand about TensorFlowTensorFlow is its computation graph approach . Any TensorFlowTensorFlow program consists of two phases phases :
  - Phase1: assemble a graph
  - Phase2: use a session to execute operations in the graph.

- Note that this might change in the future with TensorFlow's eager mode, currently experimental.