Introduction to 

Fast Campus
Start Deep Learning with TensorFlow

TensorFlow

A multidimensional array.

A graph of operations.

What is TensorFlow?

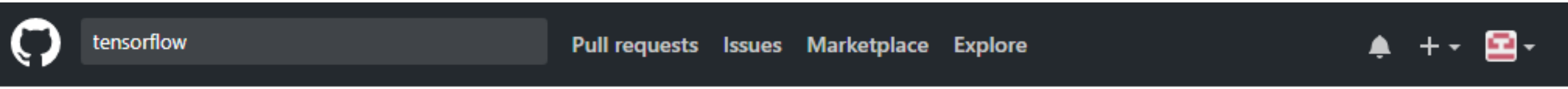
- Open source software library for numerical computation using data flow graphs
- Originally developed by Google Brain Team to conduct machine learning and deep neural networks research
- General enough to be applicable in a wide variety of other domains as well

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 31K
- Code
- Commits 410K
- Issues 56K
- Topics 181
- Wikis 3K
- Users 428

Languages

Python	17,219
Jupyter Notebook	6,476

Tensorflow

TensorFlow is an open source software library for numerical computation.

See topic

31,991 repository results

Sort: Best match

tensorflow/*tensorflow*

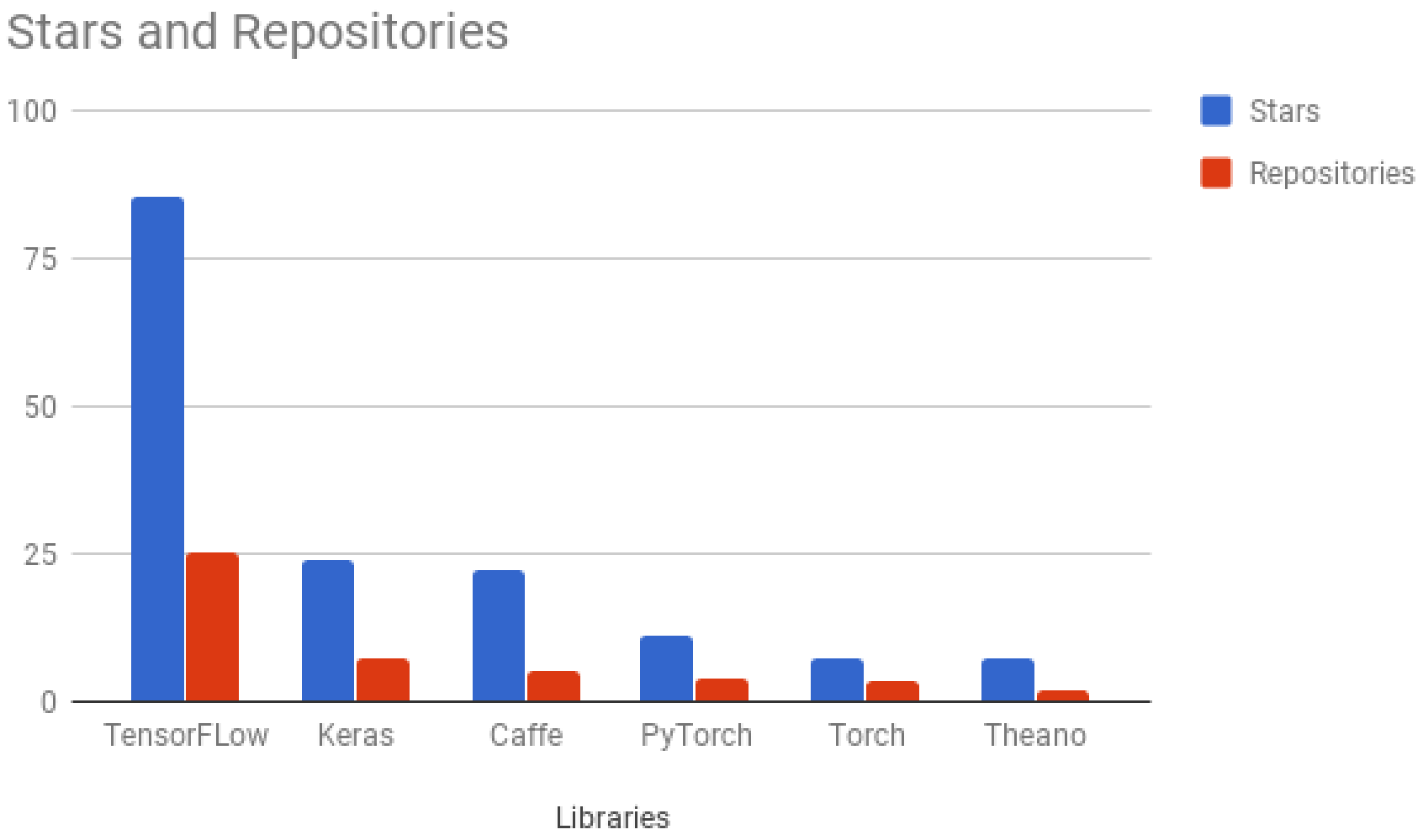
C++ ★ 96.2k

Computation using data flow graphs for scalable machine learning

tensorflow python machine-learning

Apache-2.0 license Updated 36 minutes ago

Stars and Repositories

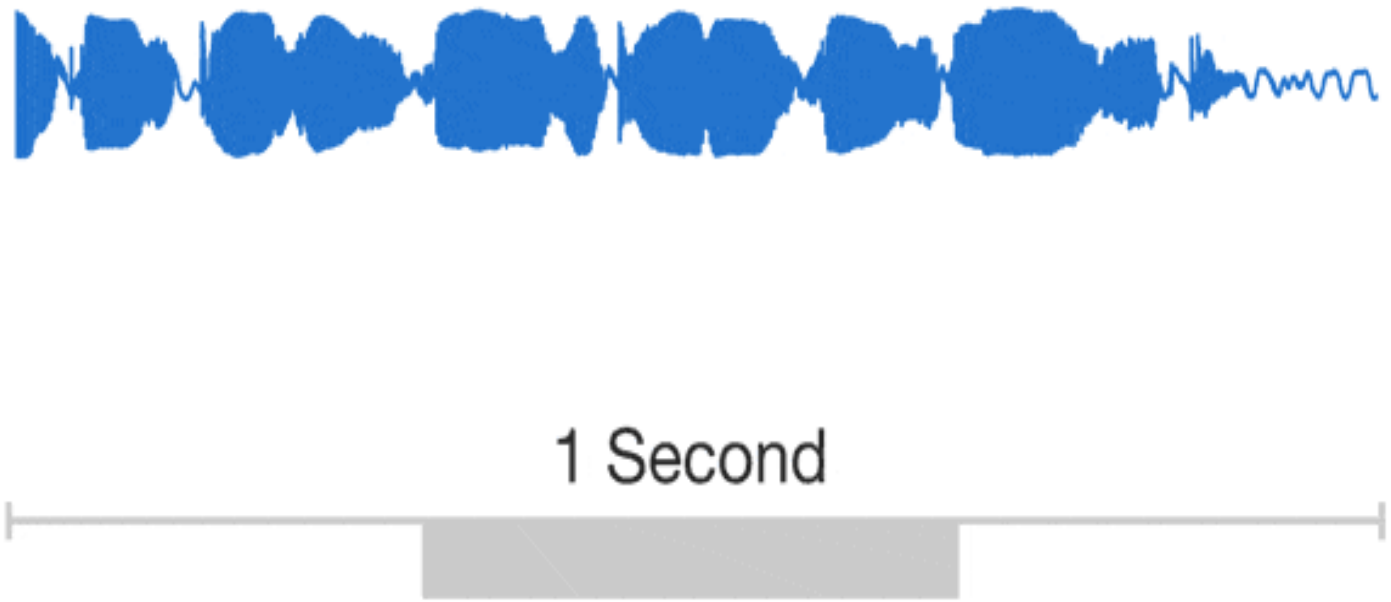


Companies Using Tensorflow

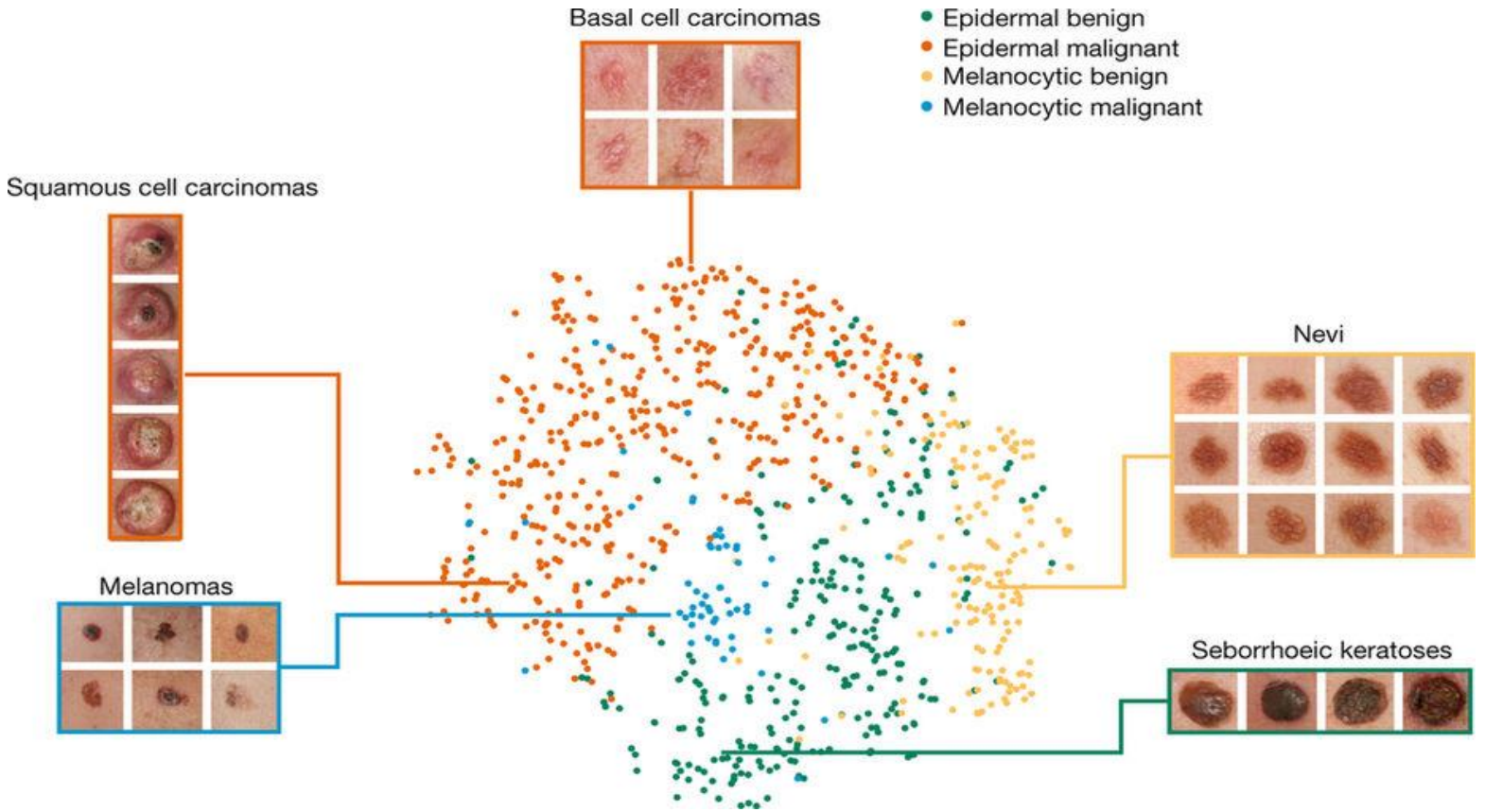
- Google
- OpenAI
- DeepMind
- Snapchat
- Uber
- Airbus
- eBay
- Dropbox
- A bunch of startups

Fancy Projects Using Tensorflow

- WaveNet: A Generative Model for Raw Audio (DeepMind, 2016)

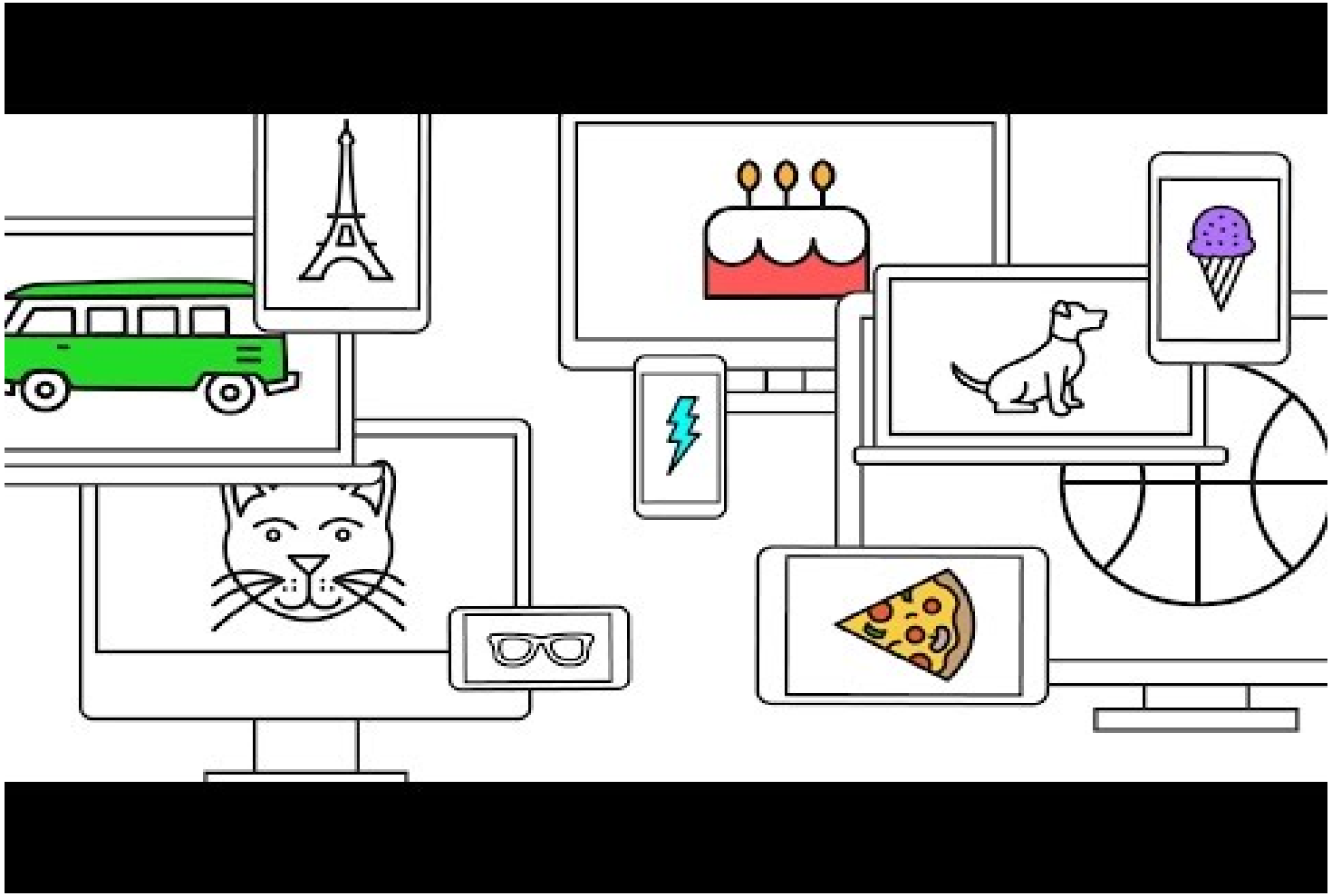


- Dermatologist-level classification of skin cancer with deep neural networks (Esteva, Kuprel, et al., Nature 2017)

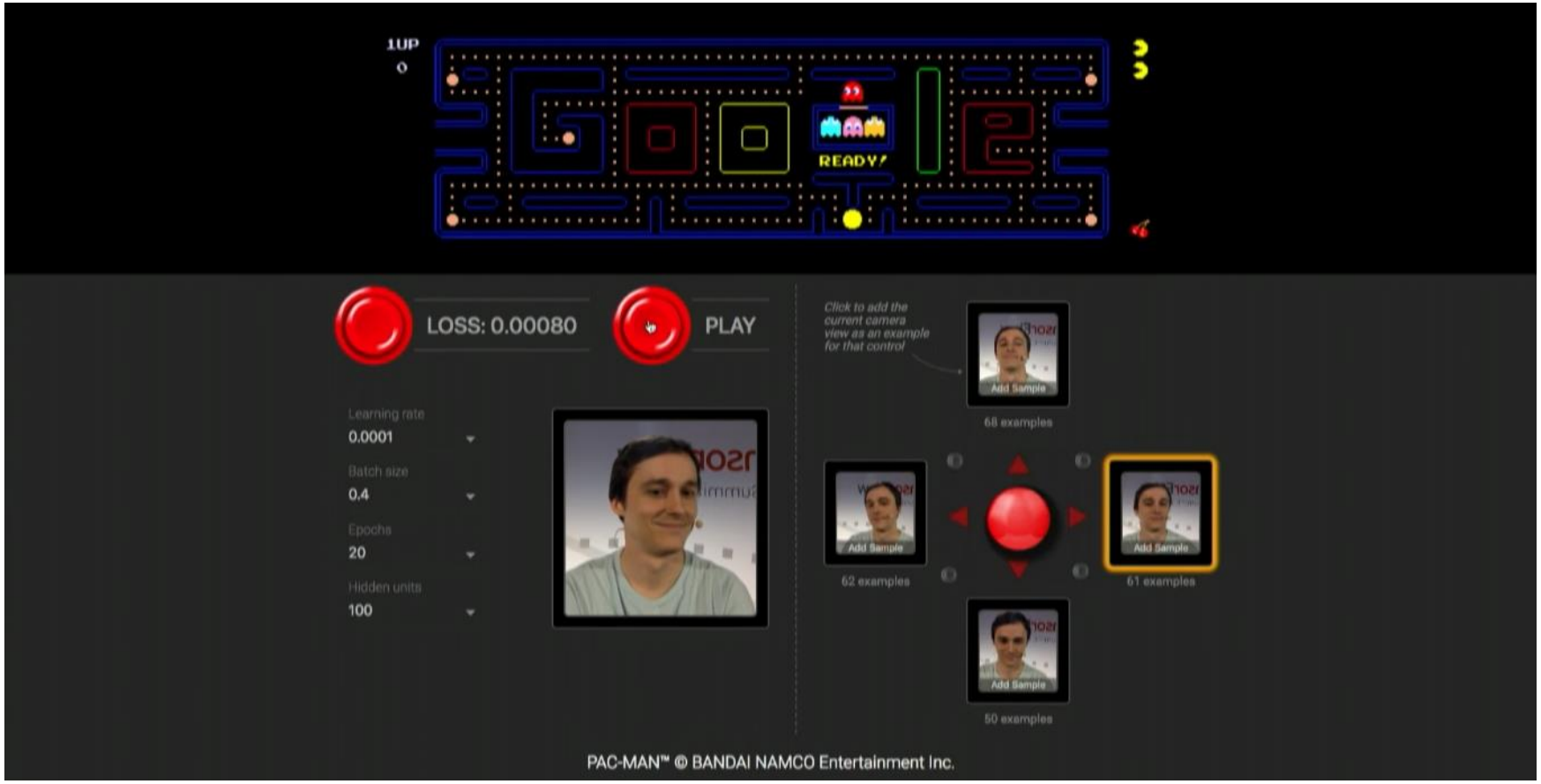


- Magenta (Google)
  - Use machine learning to create compelling art and music. Their projects are really fun! For example, please check out Draw Together with a Neural Network.

- Autodraw



- [Webcam controller PacMan]



- Emoji Scavenger Hunt

- Visual QA


Visual QA Demo
Interact with our state-of-the-art system for visual question answering.
Clear
Is he mad?
no (0.73)
yes (0.26)
maybe (0.01)
possibly (0.00)
don't know (0.00)

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

≈

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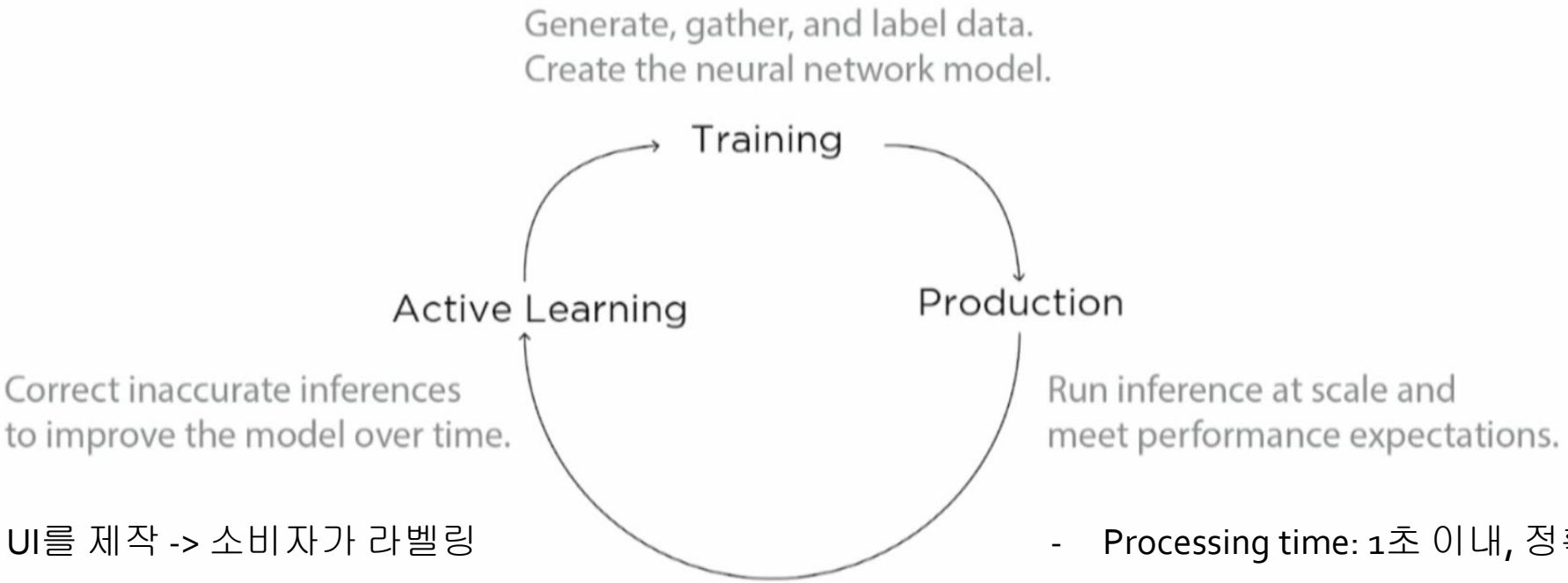
Training 의 과정

- 작은 크기의 모델, update 수행 가능



The three pillars of Applied A.I.

- Active learning UI를 제작 -> 소비자가 라벨링
- Processing time: 1초 이내, 정확도 95% 이상

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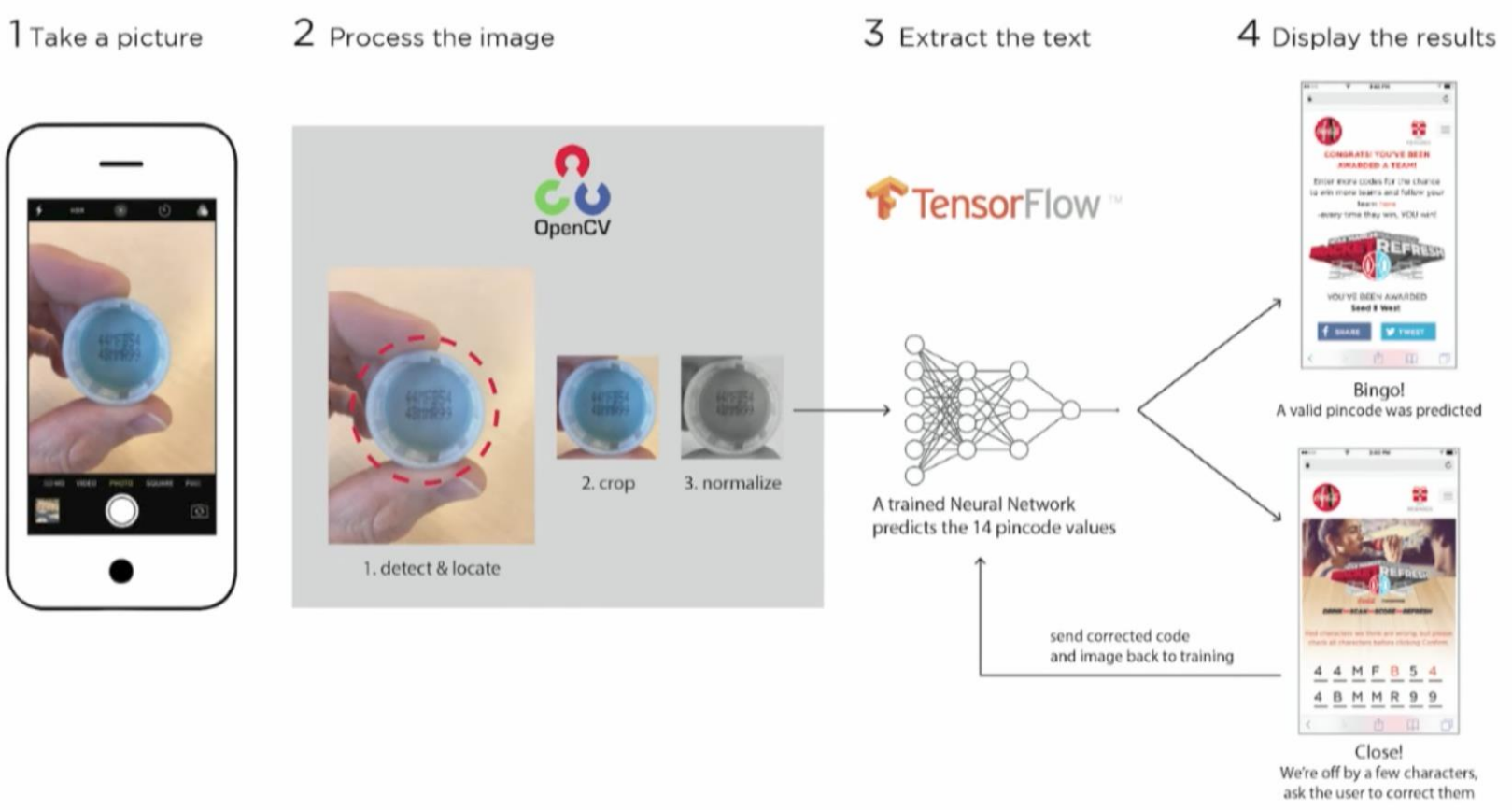
Training



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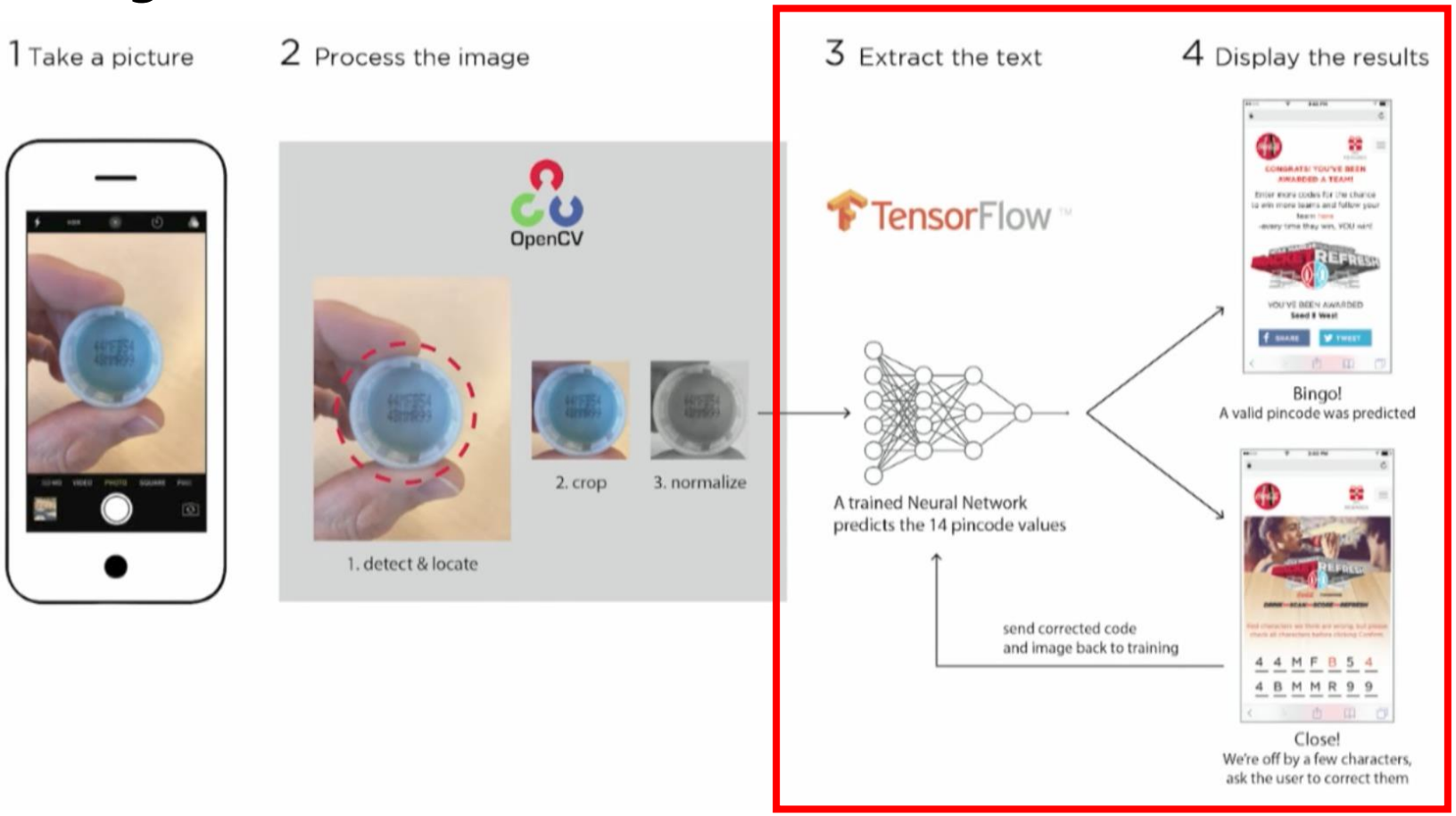
Training



- 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...

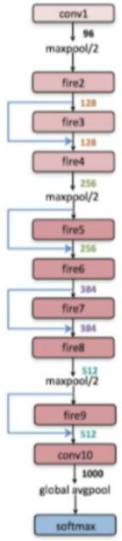
Started with Binarization

Now using Best Channel Conversion

Made the model too large

Reduce model size

Implementing SqueezeNet...



*Iandola et al., 2016

Prevented the model from converging

Improve training efficiency

Using Batch Normalization...

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

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

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

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

*Ioffe & Szegedy, 2015

Gets the model to converge

(5mb model with acc > 95%)

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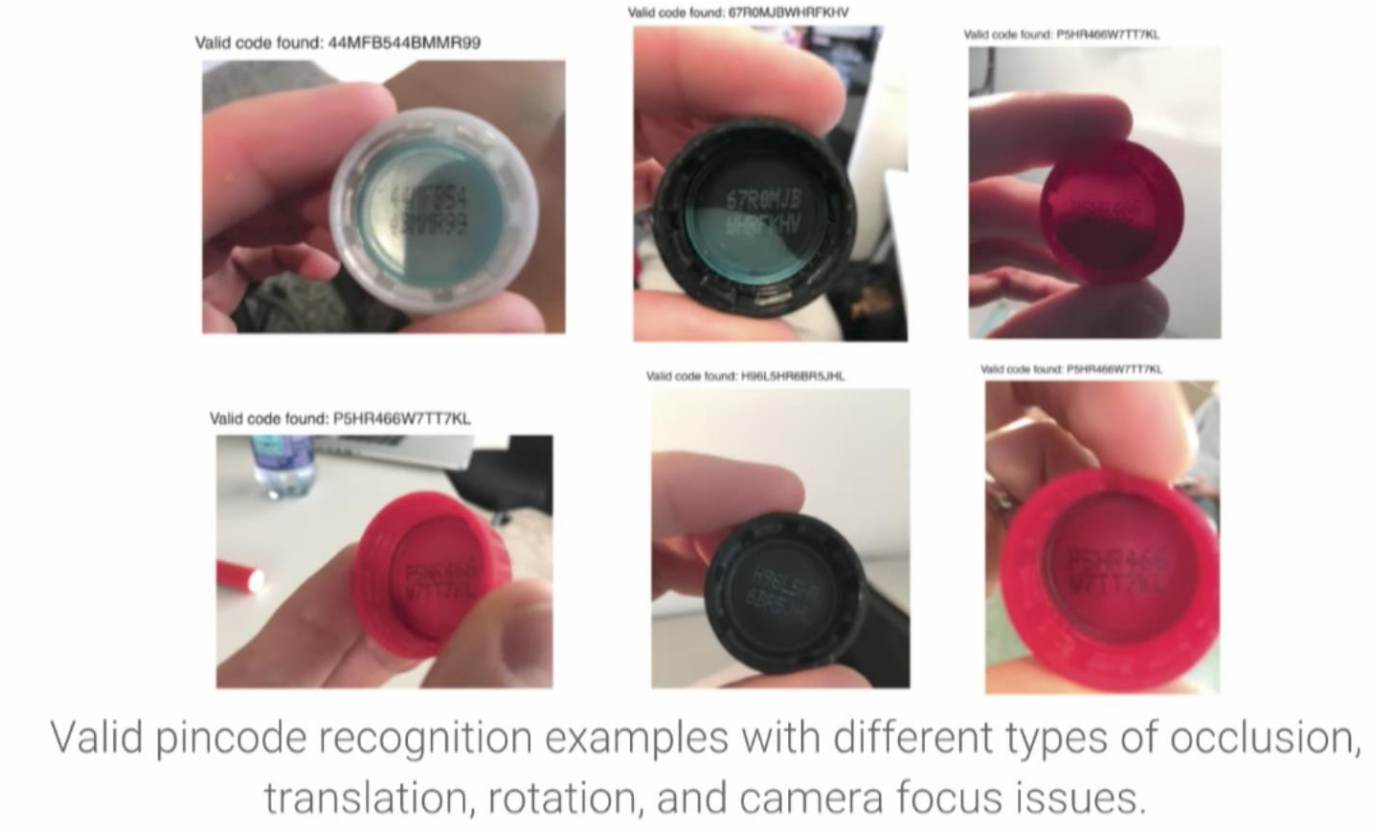
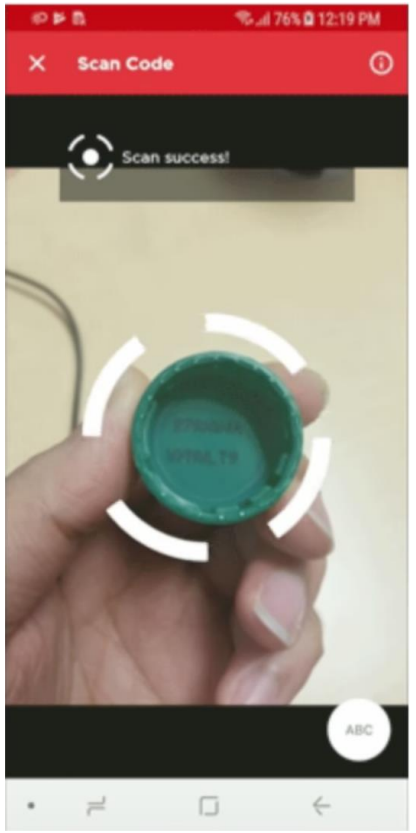
Result



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



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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.