goto; chicago

Machine Learning

without a PhD

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Machine Learning without a PhD

10:15-11:00
Relating to Machine Learning
Stefan Veis Pennerup

11:15-12:00
Exploring StackOverflow Data
Evelina Gabasova

13:00-13:45
Developing a ML model
Kevin Tsai

14:00-14:45
Life and Death Decisions: Testing Data Science
Phil Winder

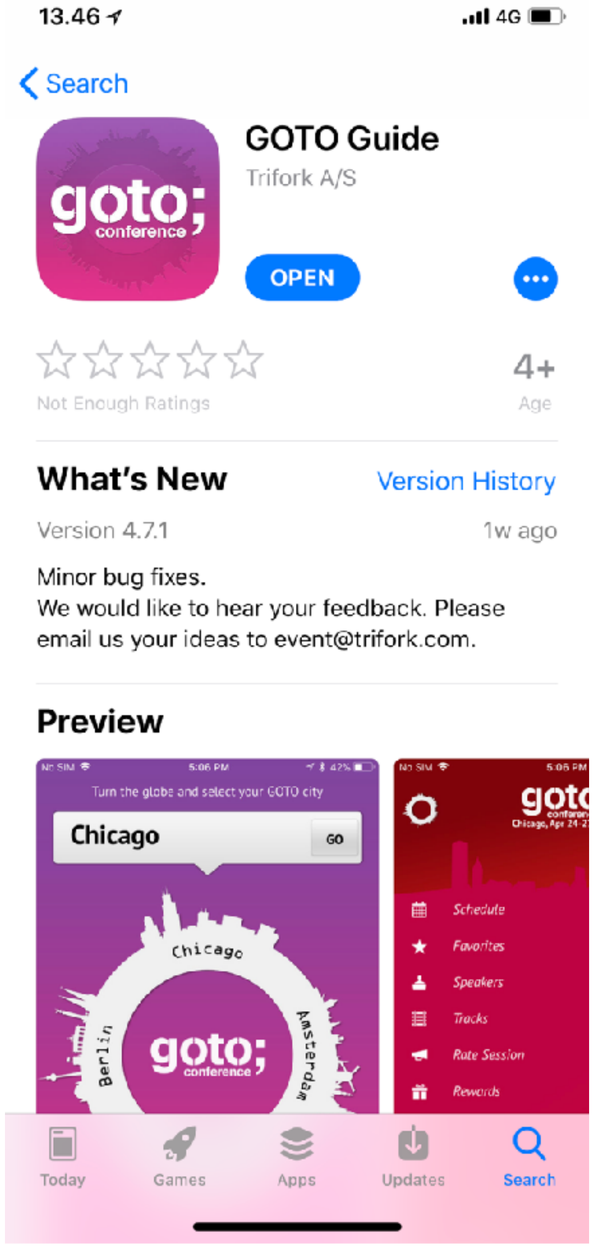
15:15-16:00
Production Model Deployment
Juliet Hougland

16:15-16:45
Delivering AI on Code: Live Demo of source{d}
Francesc Campoy

Housekeeping rules

- Sessions are 45 minutes, including questions
- You can ask questions through the GOTO app
- The track host will read questions at the end of the presentation

GOTO Guide



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bug fixes.

GOTO Guide

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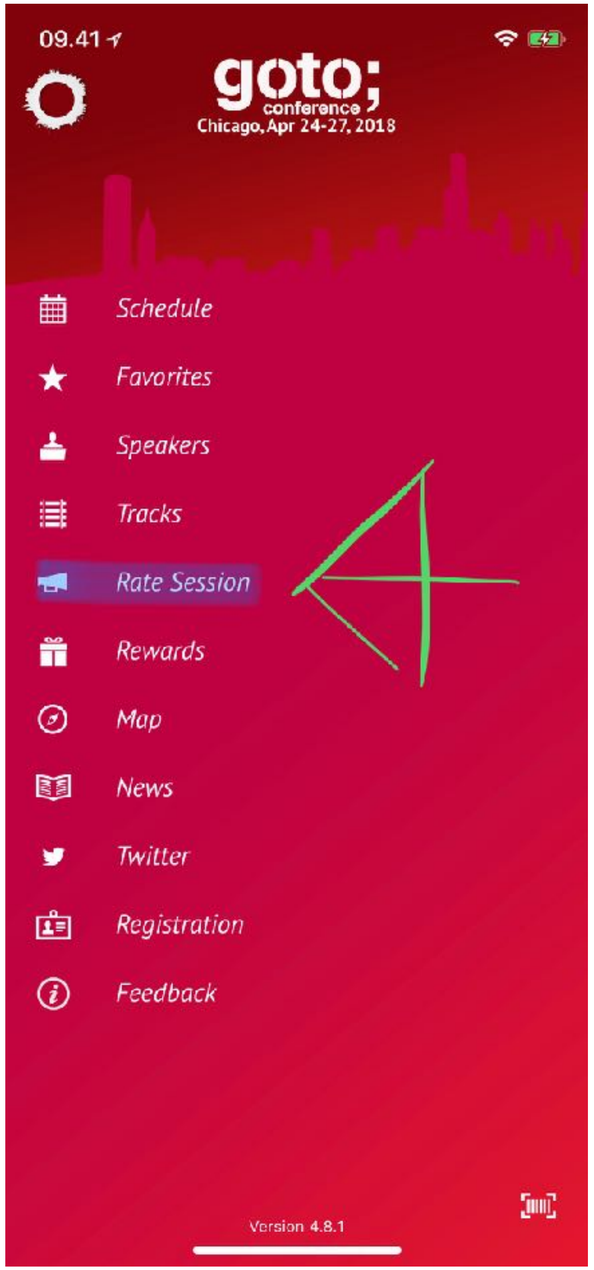

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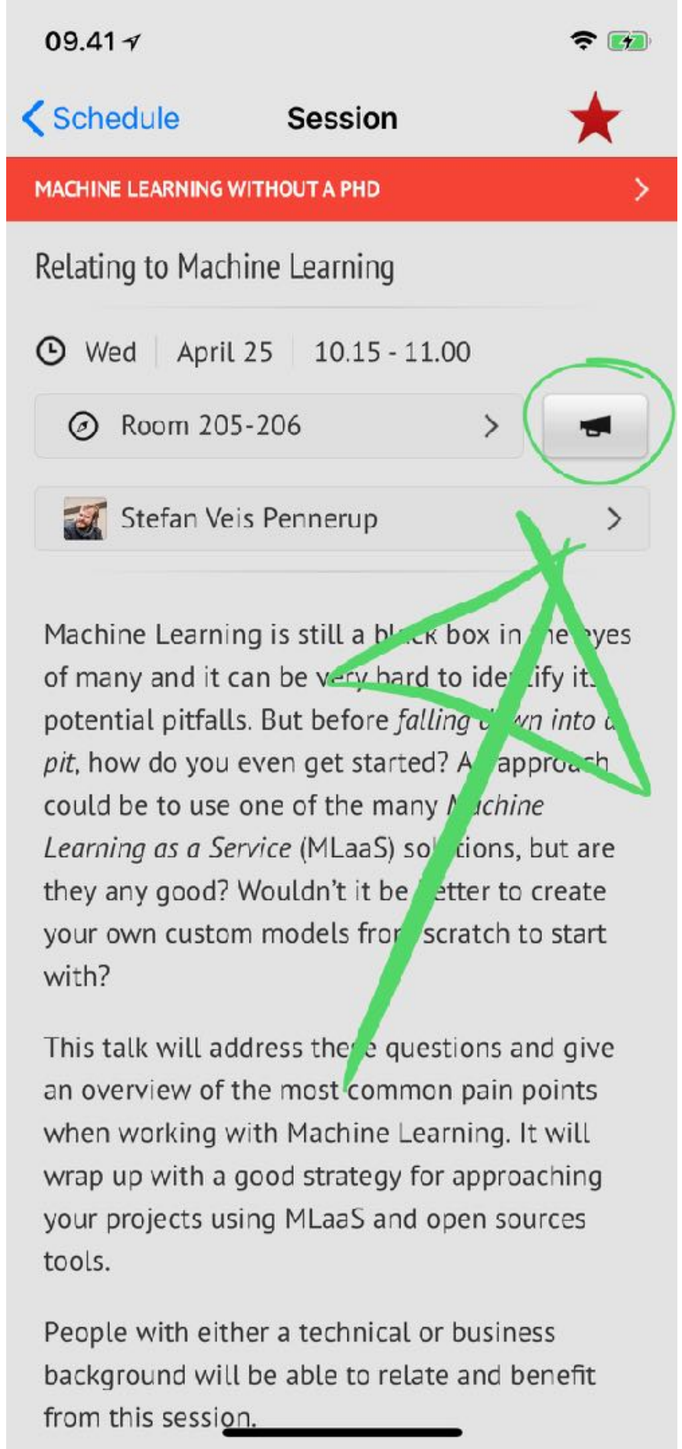

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Relating to Machine Learning

Stefan Veis Pennerup

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Who is this talk for?

TRIFORK.
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What is Machine Learning?

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Rule based

```
if condition then
   if another condition then
      do something
      do something else
   else
      do it
else
   if condition then
      do something
      do another thing
   else
      if condition then
         function
```

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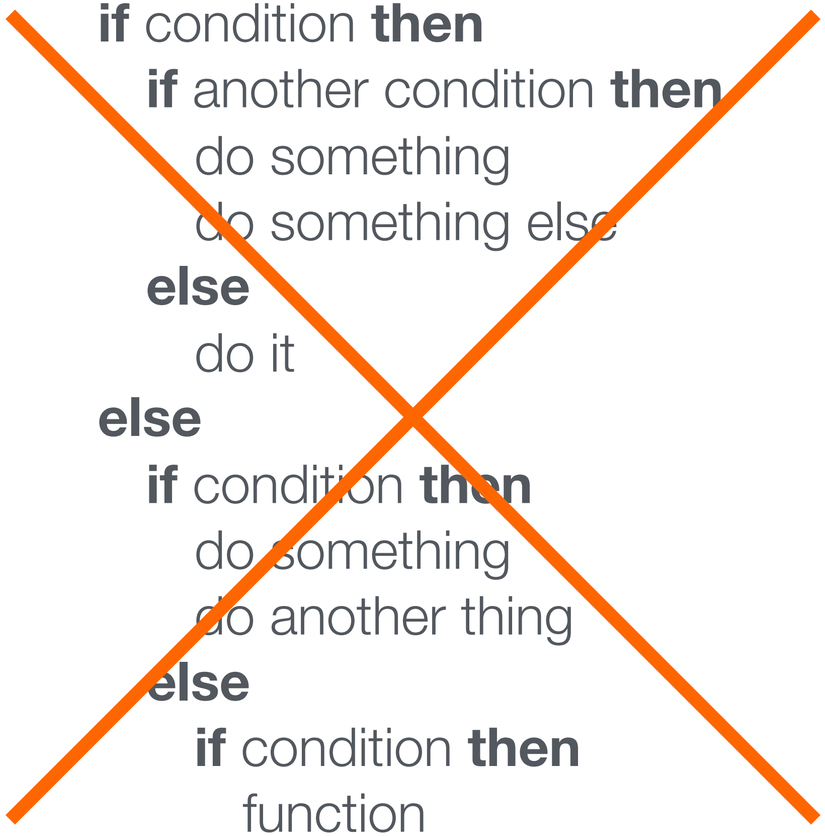
Rule based



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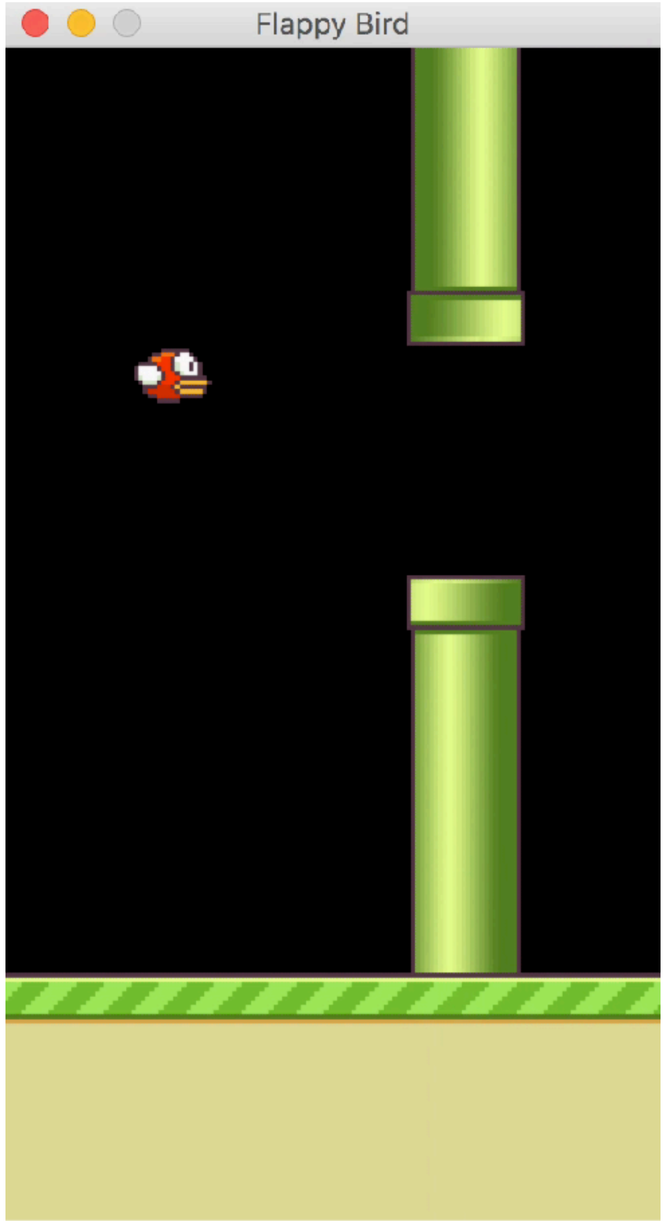
Learn by example



https://github.com/yenchenlin/DeepLearningFlappyBird

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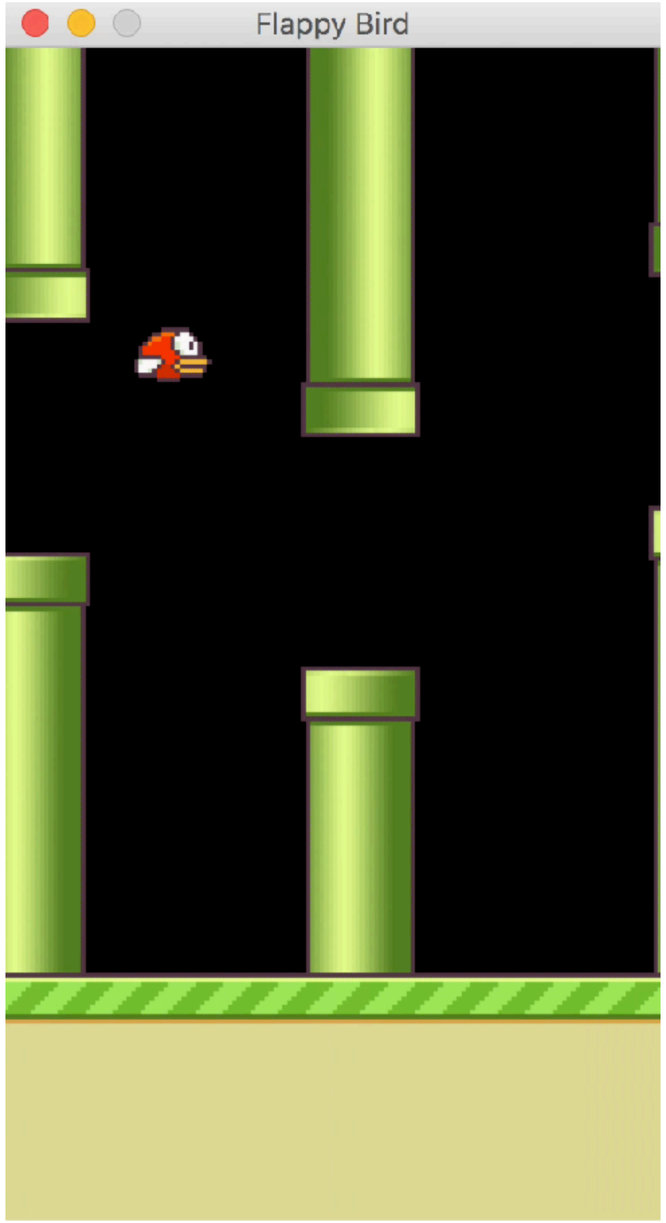
Learn by example



https://github.com/yenchenlin/DeepLearningFlappyBird

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Linear Regression

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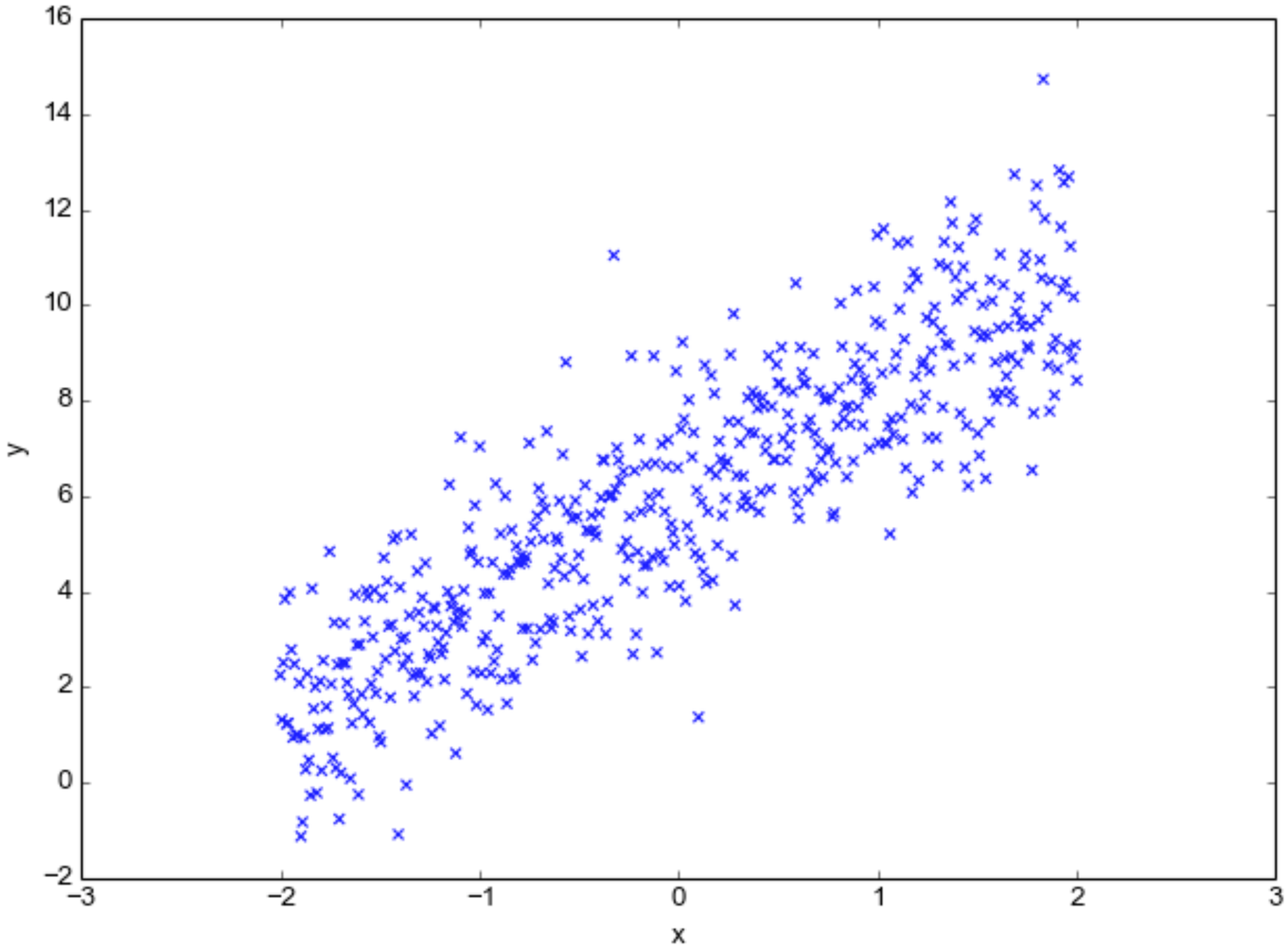
The goal of linear regression



https://eli.thegreenplace.net/2016/linear-regression/

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Linear regression without ML

$$a = \frac{\sum_{i=1}^{n}(x_i - \overline{x}) * (y_i - \overline{y})}{\sum_{i=1}^{n}(x_i - \overline{x})^2}$$

$$b = \overline{y} - a\overline{x}$$

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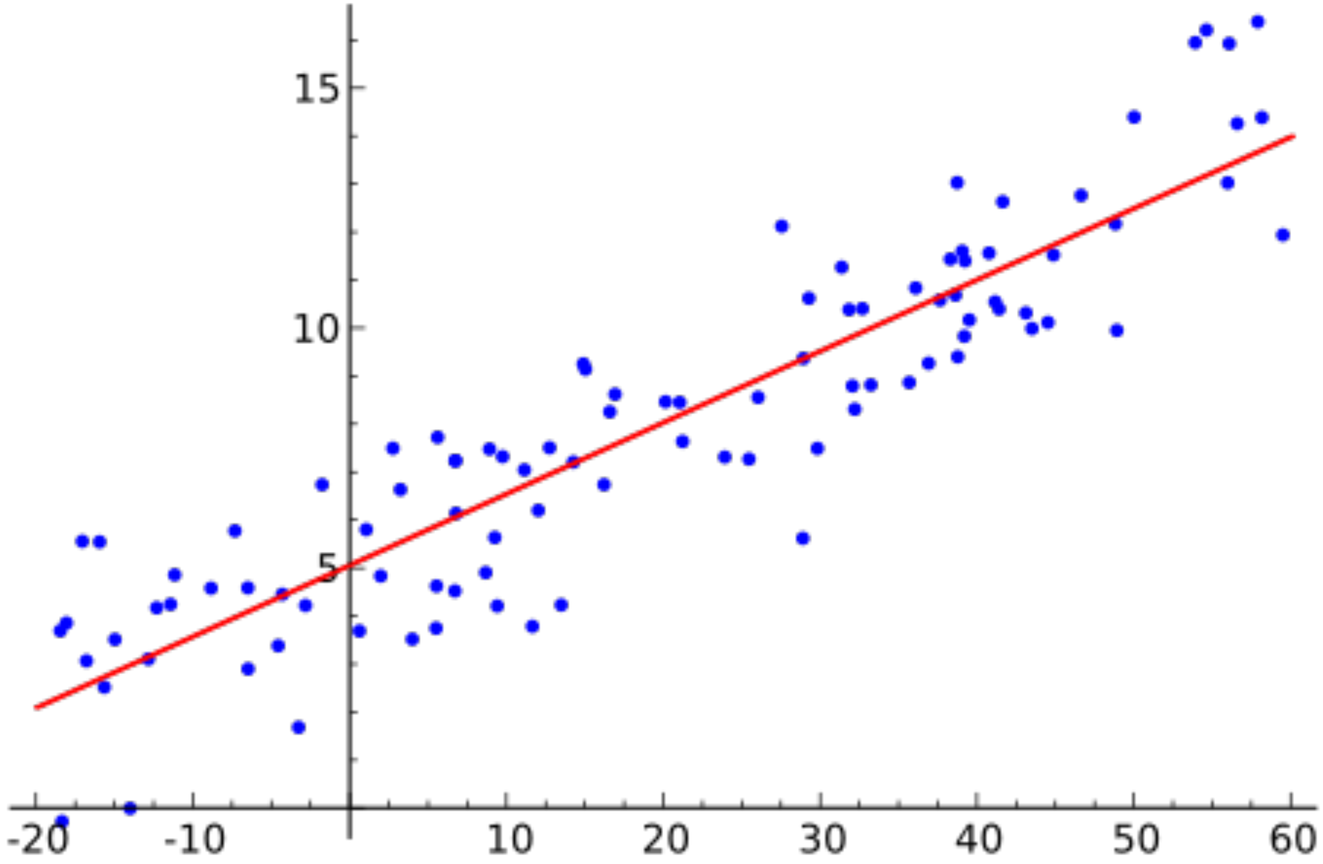
Linear regression without ML

$$a = \frac{\sum_{i=1}^{n}(x_i - \overline{x}) * (y_i - \overline{y})}{\sum_{i=1}^{n}(x_i - \overline{x})^2}$$

$$b = \overline{y} - a\overline{x}$$



https://en.wikipedia.org/wiki/Linear_regression#/media/File:Linear_regression.svg

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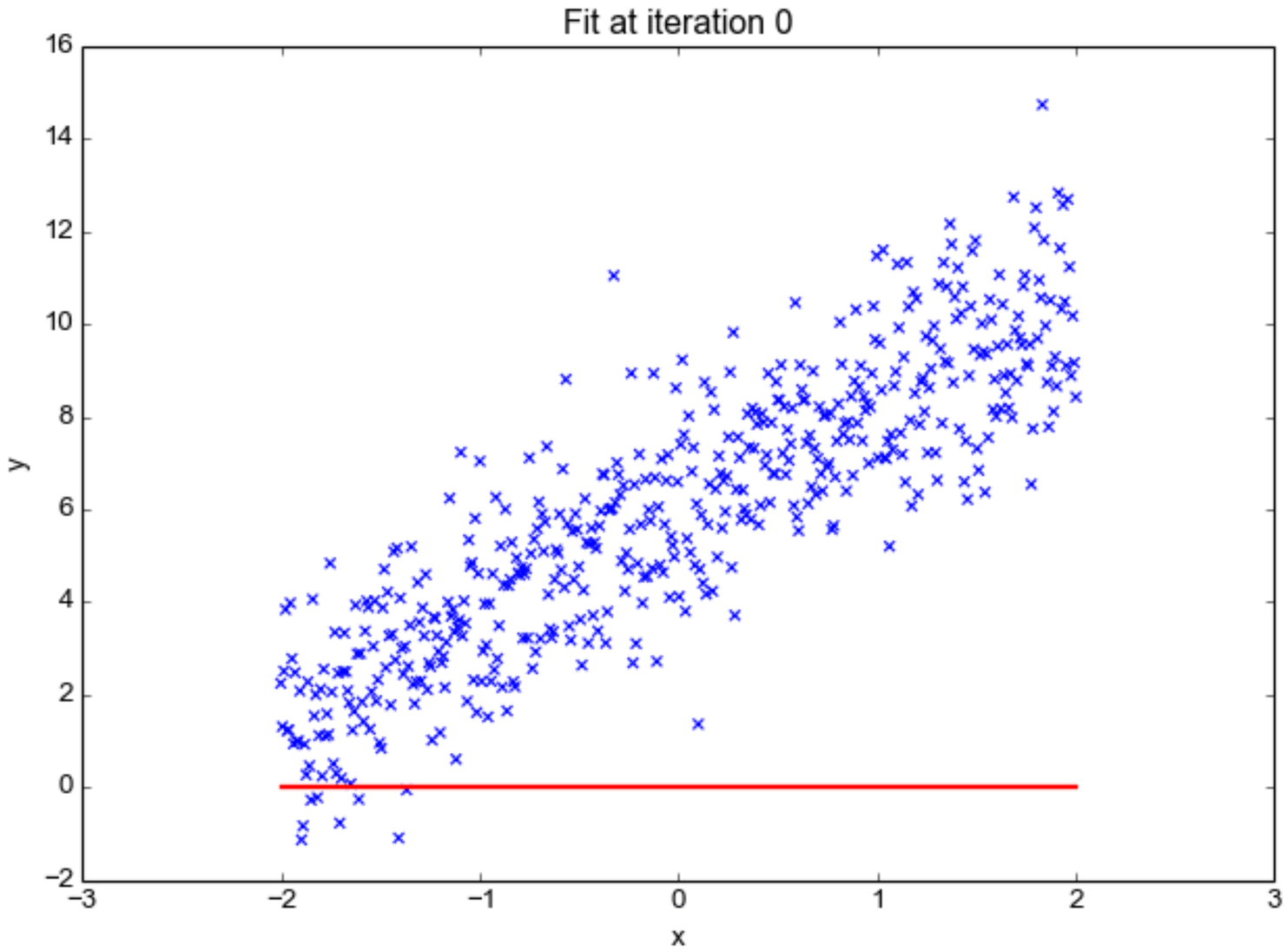
Linear regression with ML



https://eli.thegreenplace.net/2016/linear-regression/

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Machine Learning intuitions

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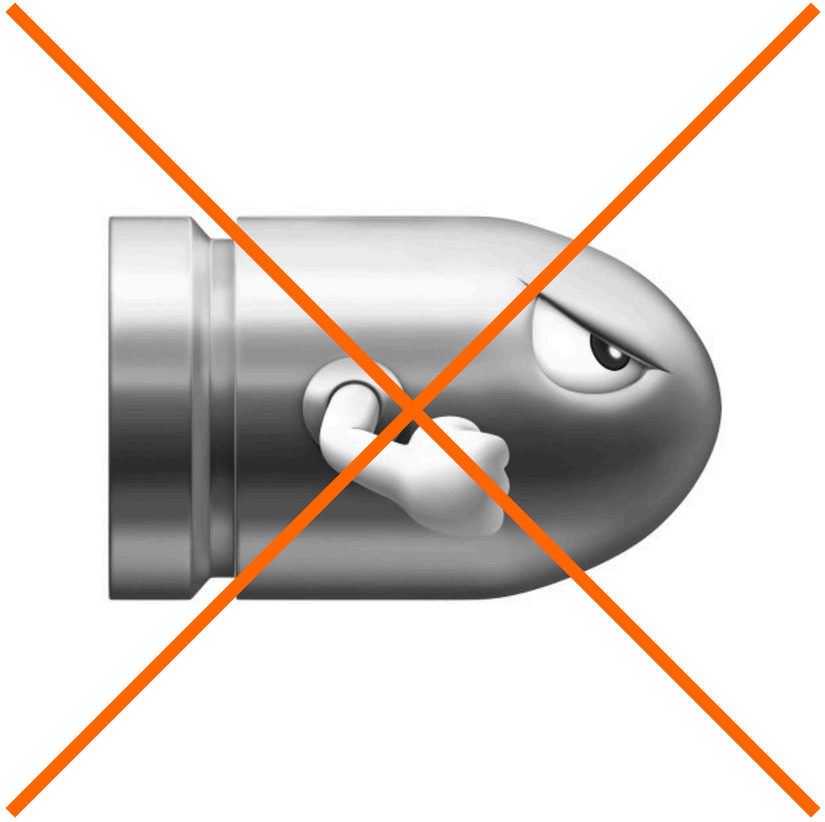
Machine Learning is not a silver bullet 🔫

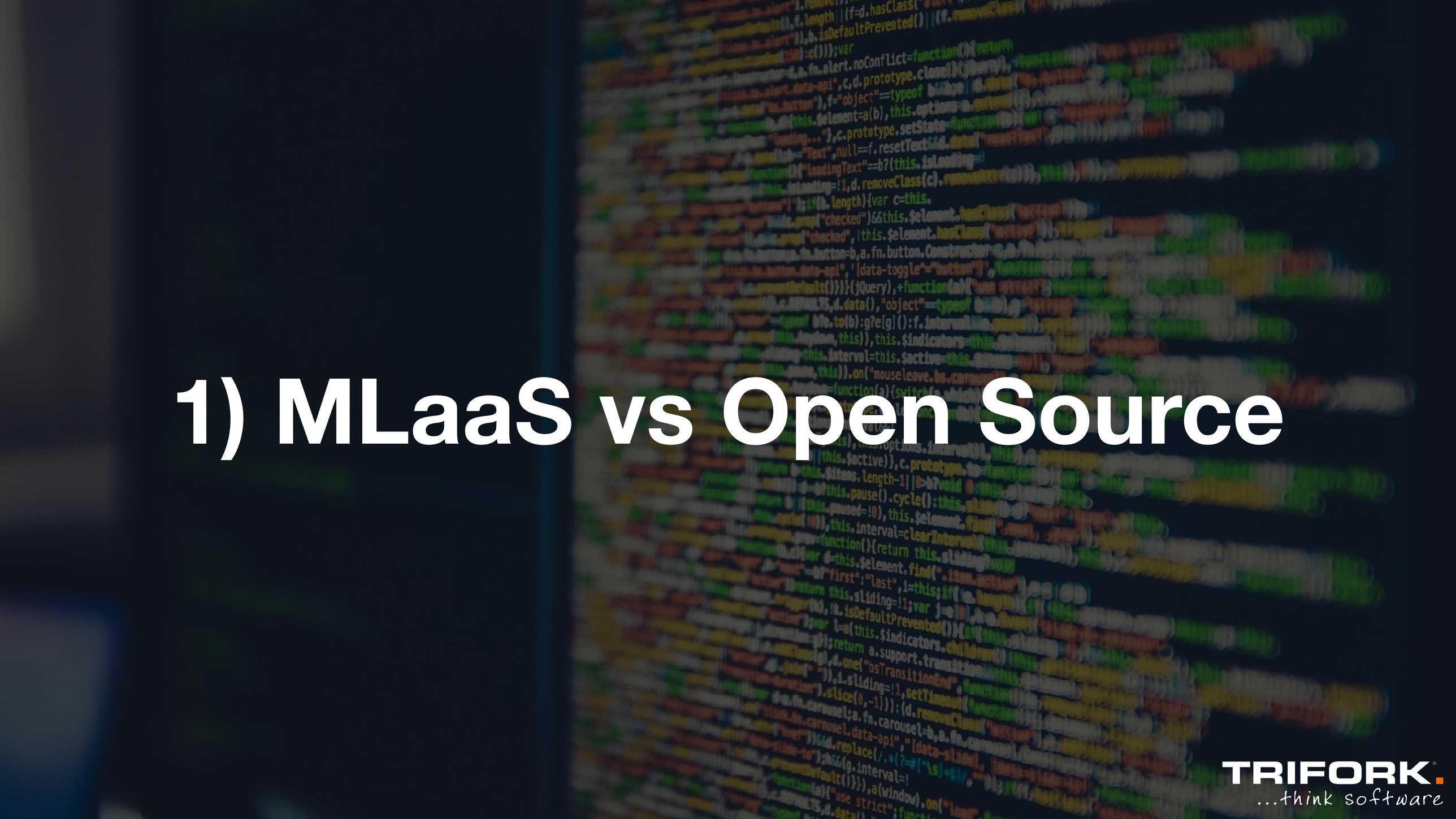


ML is just another tool in the toolbox 🛠

5 intuitions

1. MLaaS vs Open Source
2. Image recognition of complex objects
3. Vulnerabilities
4. Imbalanced datasets
5. Human bias

1) MLaaS vs Open Source



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MLaaS vs Open Source

Machine Learning as a Service (MLaaS)

- Out-of-the-box solutions
- Pay per usage

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MLaaS vs Open Source

Machine Learning as a Service (MLaaS)

- Out-of-the-box solutions
- Pay per usage

Open Source

- Custom models for your use case
- Requires the necessary skills

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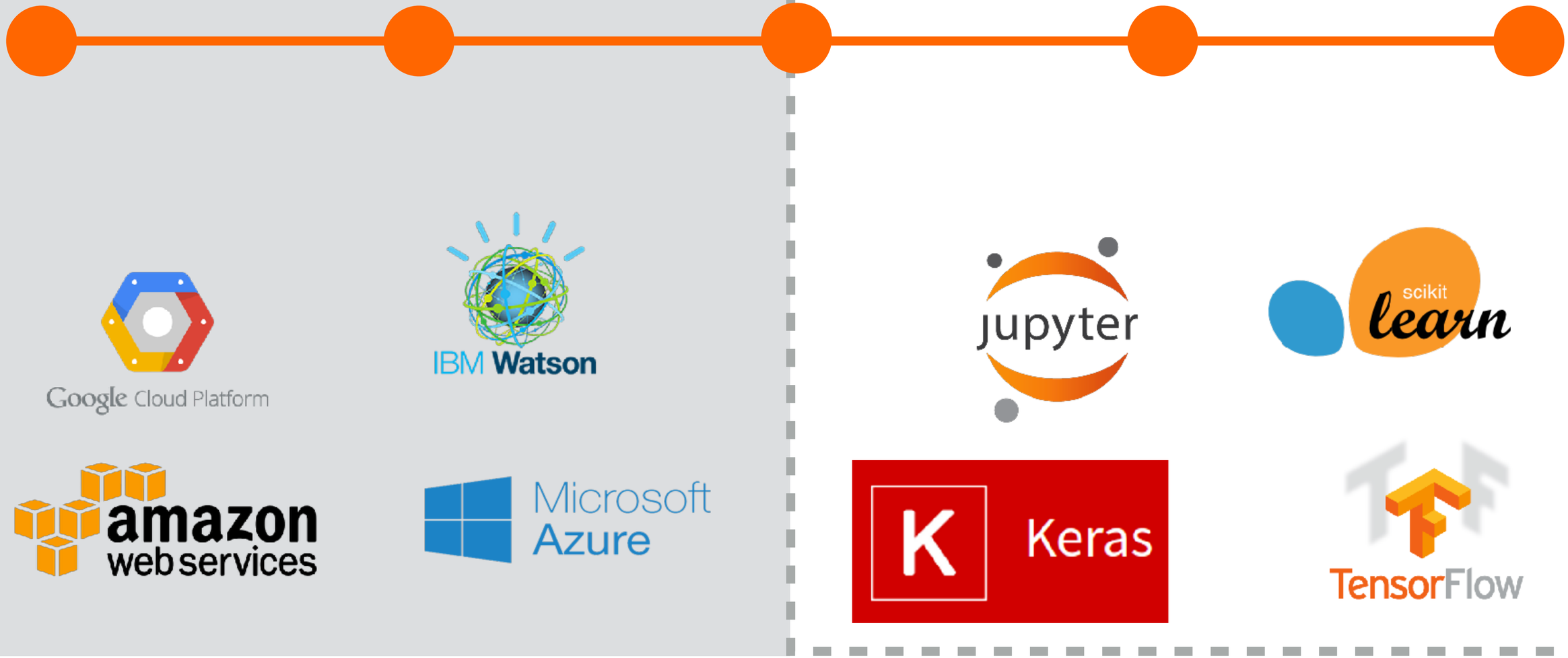
Experiment with the whole scale

Machine Learning as a Service (MLaaS)

Open Source



Experiment with the whole scale

Machine Learning as a Service (MLaaS)

Open Source

Ready to use APIs

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Experiment with the whole scale

Machine Learning as a Service (MLaaS)

Open Source

Ready to use APIs

Custom training with MLaaS

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Experiment with the whole scale

Machine Learning as a Service (MLaaS)

Open Source

Ready to use APIs

Custom training with MLaaS

Pre-trained models

Google Cloud Platform

IBM Watson

jupyter

scikit learn

amazon web services

Microsoft Azure

Keras

TensorFlow

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Experiment with the whole scale

Machine Learning as a Service (MLaaS)

Open Source

Ready to use APIs

Custom training with MLaaS

Pre-trained models

Transfer Learning

Google Cloud Platform

IBM Watson

jupyter

scikit learn

amazon web services

Microsoft Azure

Keras

TensorFlow

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Experiment with the whole scale

Machine Learning as a Service (MLaaS)

Open Source

Ready to use APIs

Custom training with MLaaS

Pre-trained models

Transfer Learning

Custom model

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What’s feasible with MLaaS?

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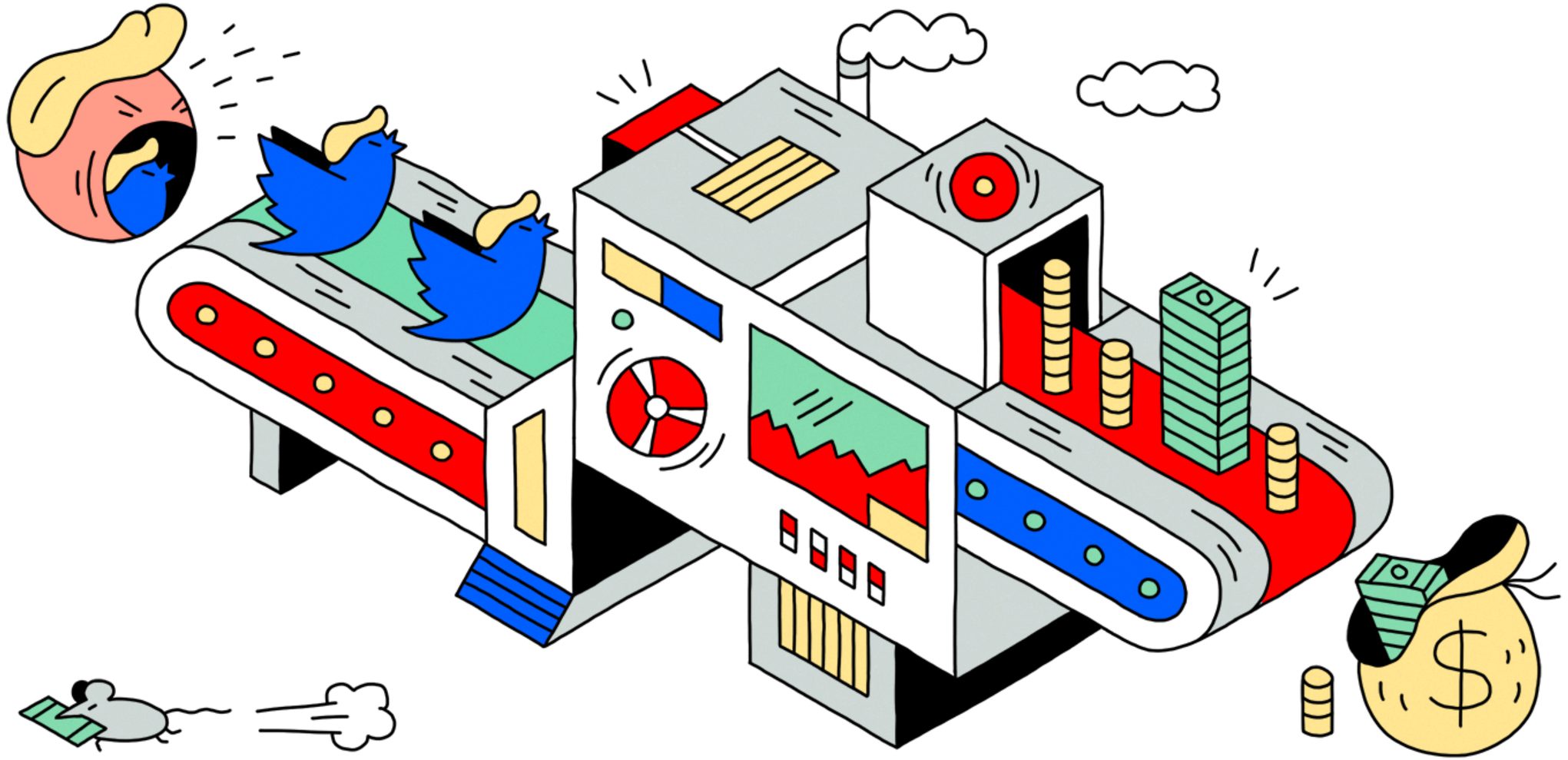
Trump2Cash



https://github.com/maxbbraun/trump2cash

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2) Recognising complex objects

Banana

Apple

Banana

https://gist.github.com/yrevar/942d3a0ac09ec9e5eb3a

```
947: 'mushroom',
948: 'Granny Smith',
949: 'strawberry',
950: 'orange',
951: 'lemon',
952: 'fig',
953: 'pineapple, ananas',
954: 'banana',
955: 'jackfruit, jak, jack',
956: 'custard apple',
957: 'pomegranate',
958: 'hay',
959: 'carbonara',
960: 'chocolate sauce, chocolate
961: 'dough',
962: 'meat loaf, meatloaf',
```

Apple - Granny Smith

Norfolk terrier

https://www.akc.org/dog-breeds/norfolk-terrier/

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Norwich Terrier

http://www.akc.org/dog-breeds/norwich-terrier/

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3) Vulnerabilities

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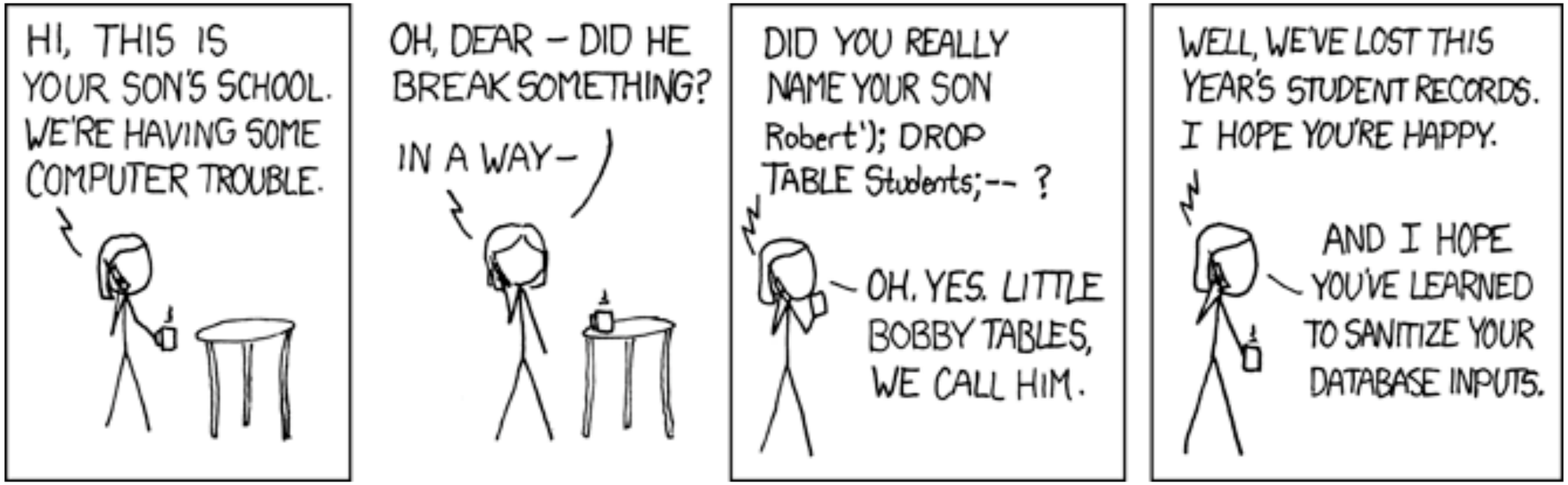
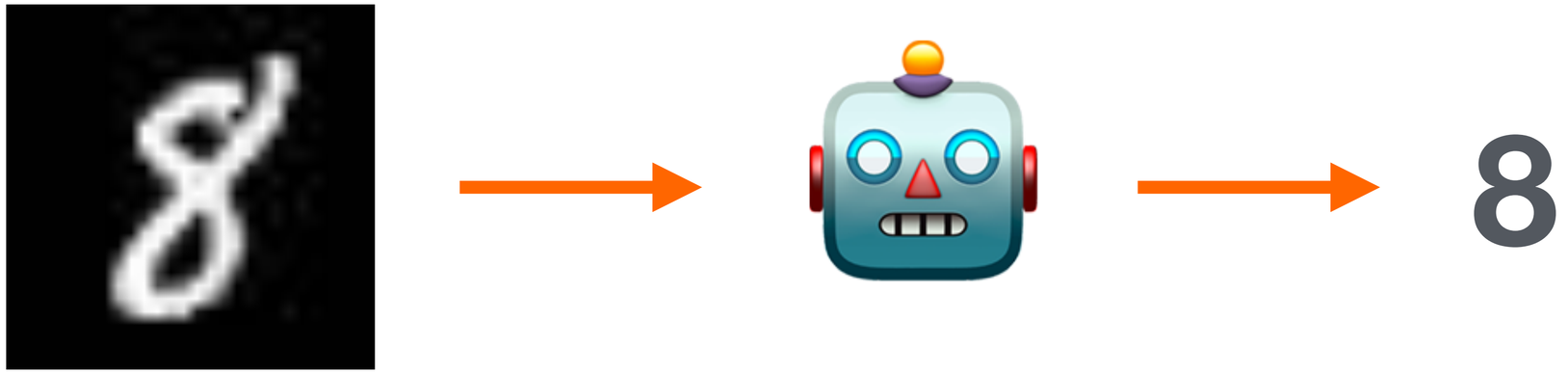
Previous IT vulnerabilities



https://xkcd.com/327/

Neural Networks can easily be fooled



A. Nguyen, J. Yosinski, J. Clune. Deep Neural Networks are Easily Fooled: High Confidence Predictions for Unrecognizable Images. 2015.

Neural Networks can easily be fooled

A. Nguyen, J. Yosinski, J. Clune. Deep Neural Networks are Easily Fooled: High Confidence Predictions for Unrecognizable Images. 2015.

Neural Networks can easily be fooled

Gibberish

A. Nguyen, J. Yosinski, J. Clune. Deep Neural Networks are Easily Fooled: High Confidence Predictions for Unrecognizable Images. 2015.

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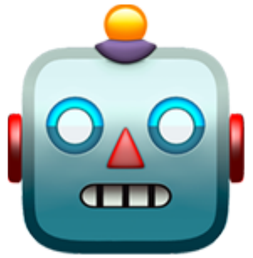
Neural Networks can easily be fooled

Gibberish

8

A. Nguyen, J. Yosinski, J. Clune. Deep Neural Networks are Easily Fooled: High Confidence Predictions for Unrecognizable Images. 2015.

Neural Networks can easily be fooled



Gibberish

8

99.99% confidence

A. Nguyen, J. Yosinski, J. Clune. Deep Neural Networks are Easily Fooled: High Confidence Predictions for Unrecognizable Images. 2015.

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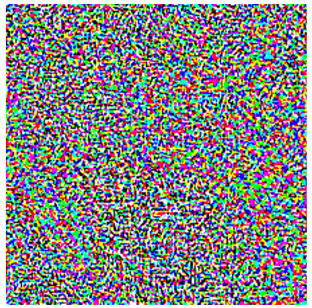
Adversarial attack

+



Panda
57.7% confidence

I. J. Goodfellow, J. Shlens, C. Szegedy. Explaining and Harnessing Adversarial Examples. 2015.

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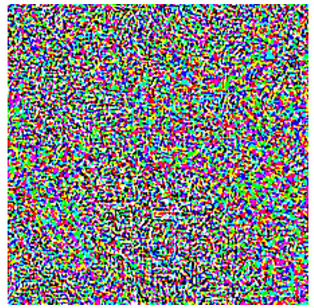
Adversarial attack

Panda
57.7% confidence

\+ 0.7% of



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I. J. Goodfellow, J. Shlens, C. Szegedy. Explaining and Harnessing Adversarial Examples. 2015.

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Adversarial attack

Panda
57.7% confidence

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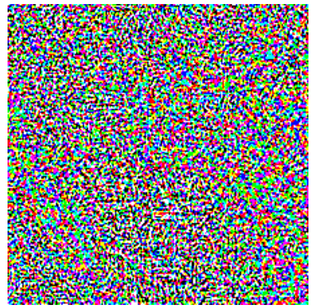

=

Gibbon
99.3% confidence

I. J. Goodfellow, J. Shlens, C. Szegedy. Explaining and Harnessing Adversarial Examples. 2015.

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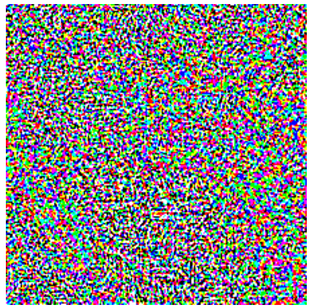
Adversarial attack

Panda
57.7% confidence

\+ 0.7% of



=

Gibbon
99.3% confidence

https://en.wikipedia.org/wiki/Gibbon

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Potential impact of adversarial attack

K. Eykholt, I. Evtimov, E. Fernandes, B. Li, A. Rahmati, C. Xiao, A. Prakash, T. Kohno, D. Song. Robust Physical-World Attacks on Deep Learning Models. 2018.

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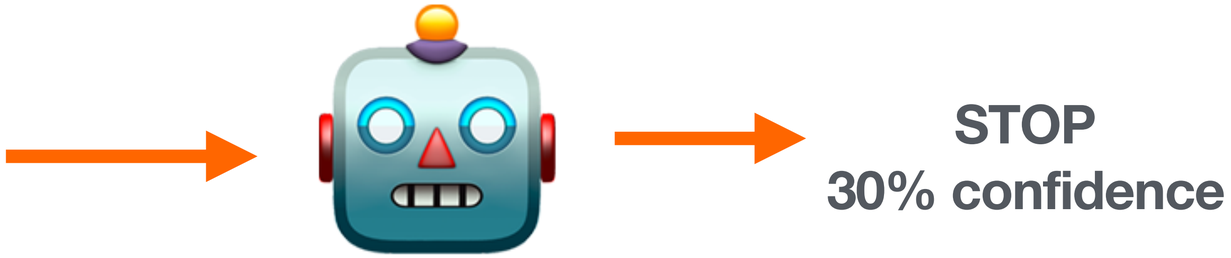
Potential impact of adversarial attack



STOP
30% confidence

K. Eykholt, I. Evtimov, E. Fernandes, B. Li, A. Rahmati, C. Xiao, A. Prakash, T. Kohno, D. Song. Robust Physical-World Attacks on Deep Learning Models. 2018.

Potential impact of adversarial attack

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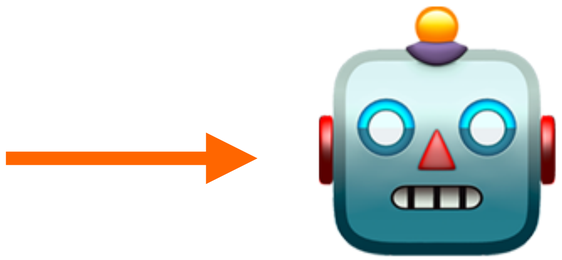
Potential impact of adversarial attack



STOP
30% confidence

Speed Limit 45 mph

K. Eykholt, I. Evtimov, E. Fernandes, B. Li, A. Rahmati, C. Xiao, A. Prakash, T. Kohno, D. Song. Robust Physical-World Attacks on Deep Learning Models. 2018.

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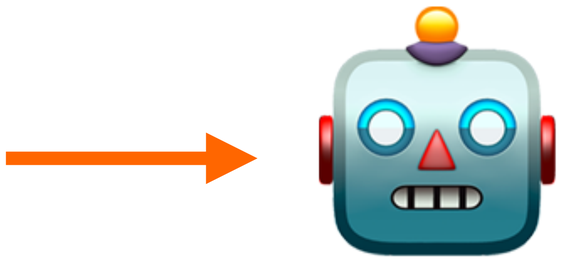
Potential impact of adversarial attack



STOP
30% confidence

Speed Limit 45 mph
39% confidence

K. Eykholt, I. Evtimov, E. Fernandes, B. Li, A. Rahmati, C. Xiao, A. Prakash, T. Kohno, D. Song. Robust Physical-World Attacks on Deep Learning Models. 2018.

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4) Imbalanced datasets

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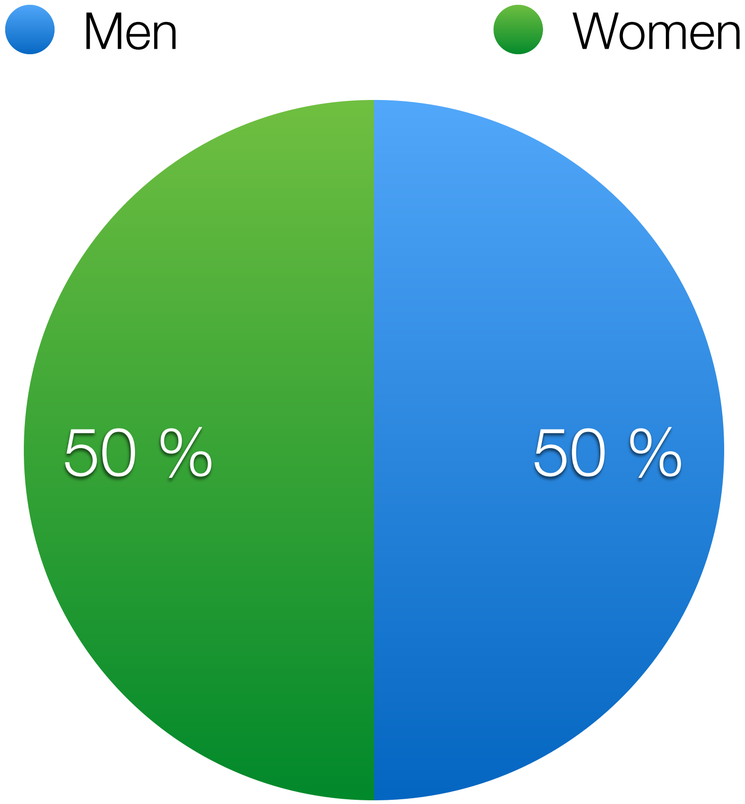
Imbalanced dataset



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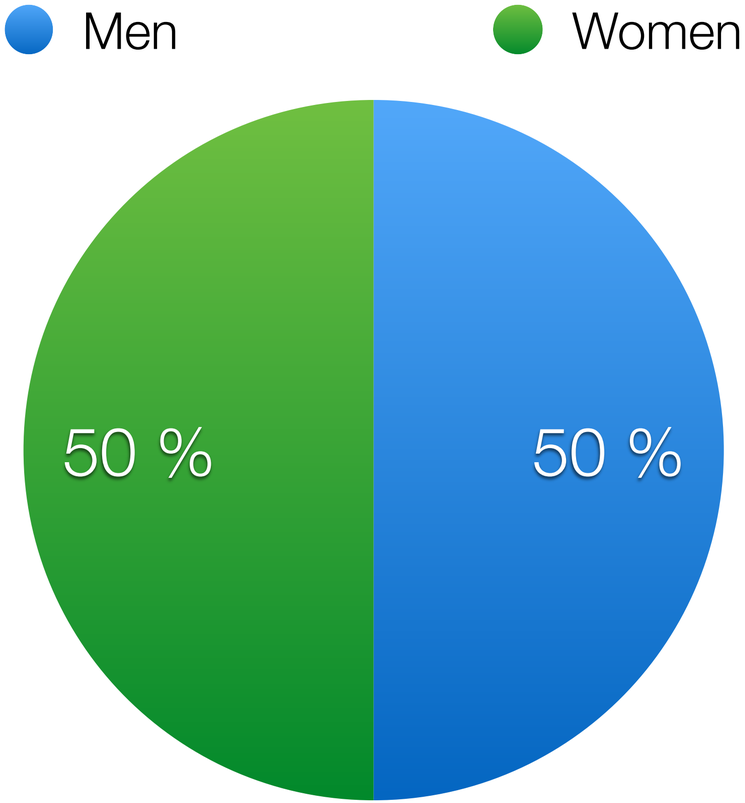
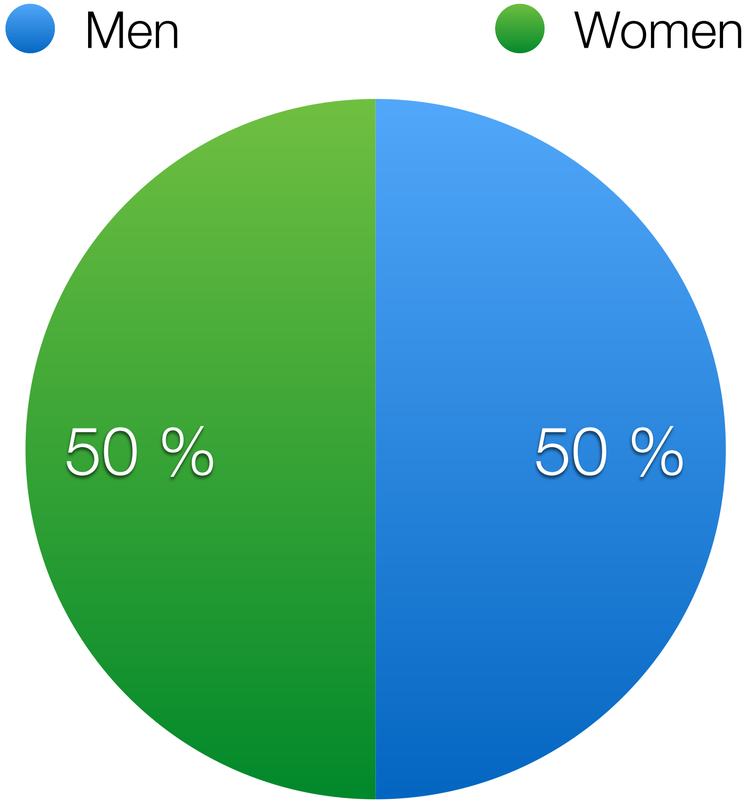
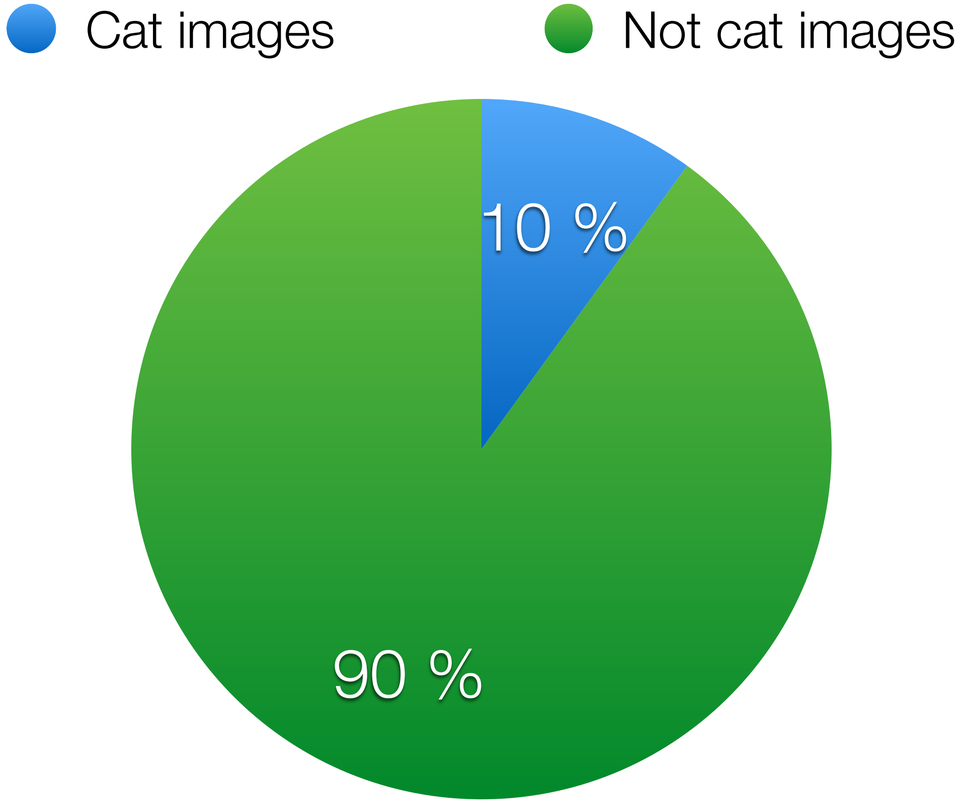
Imbalanced dataset



Imbalanced dataset





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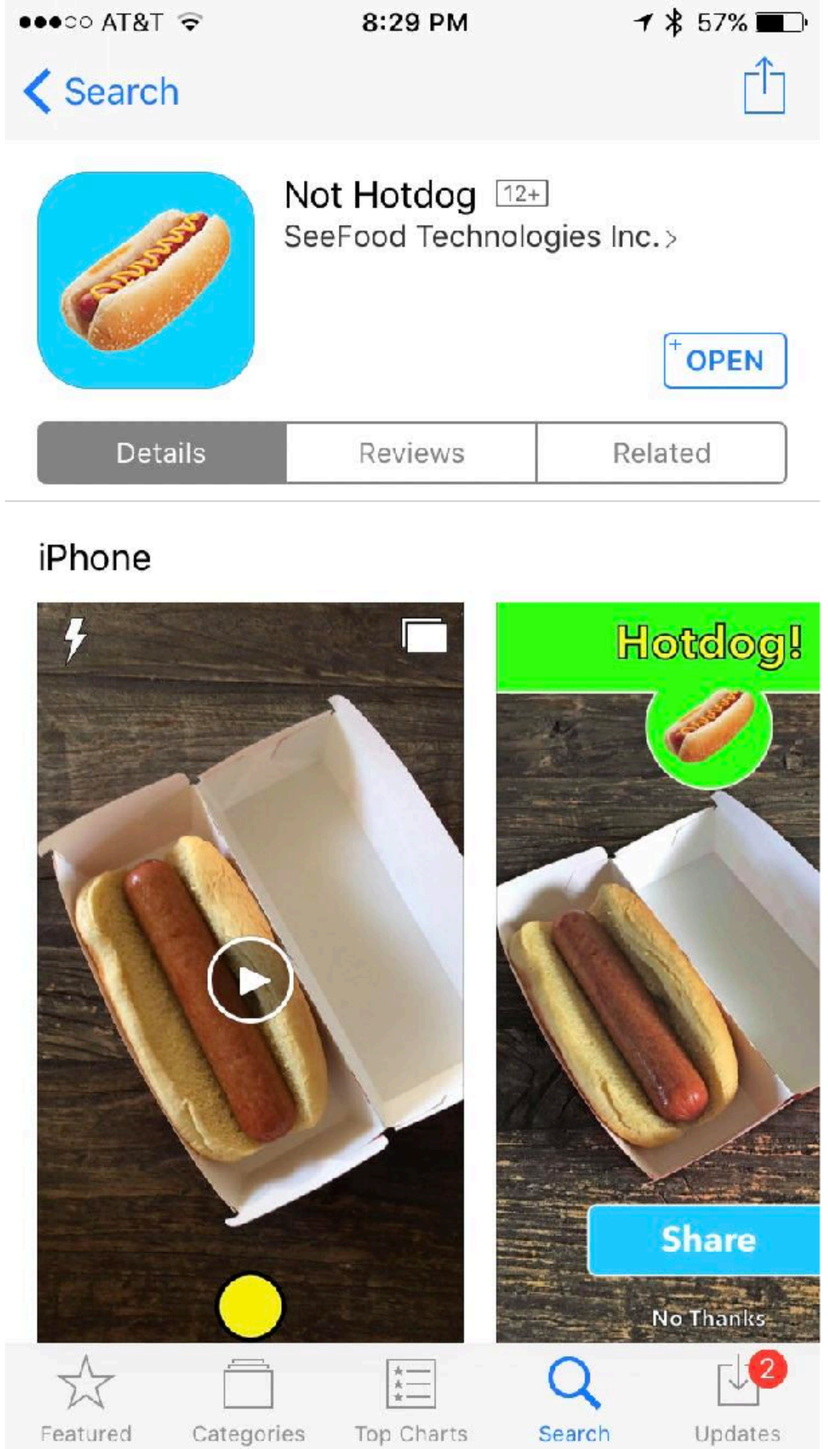

https://itunes.apple.com/app/not-hotdog/id1212457521

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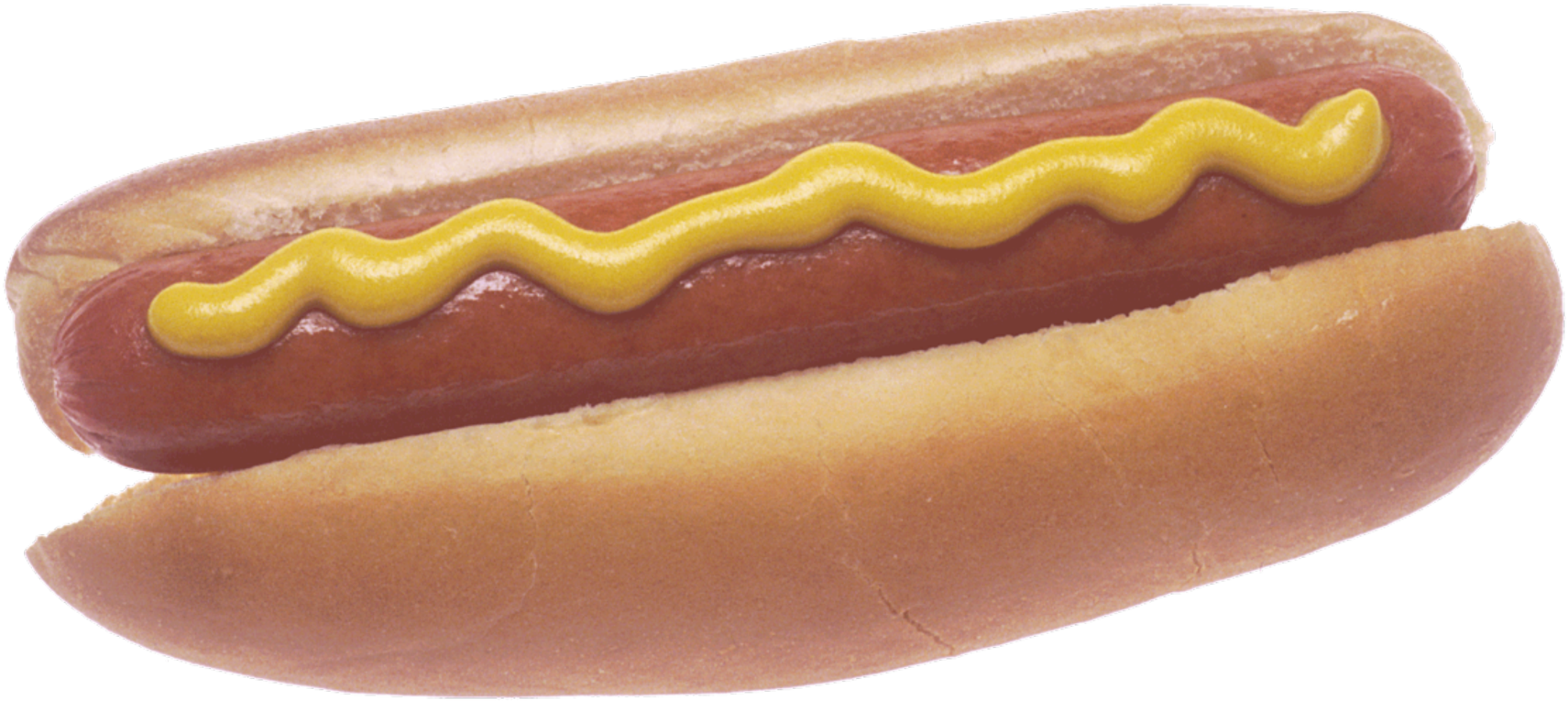

https://en.wikipedia.org/wiki/Hot_dog

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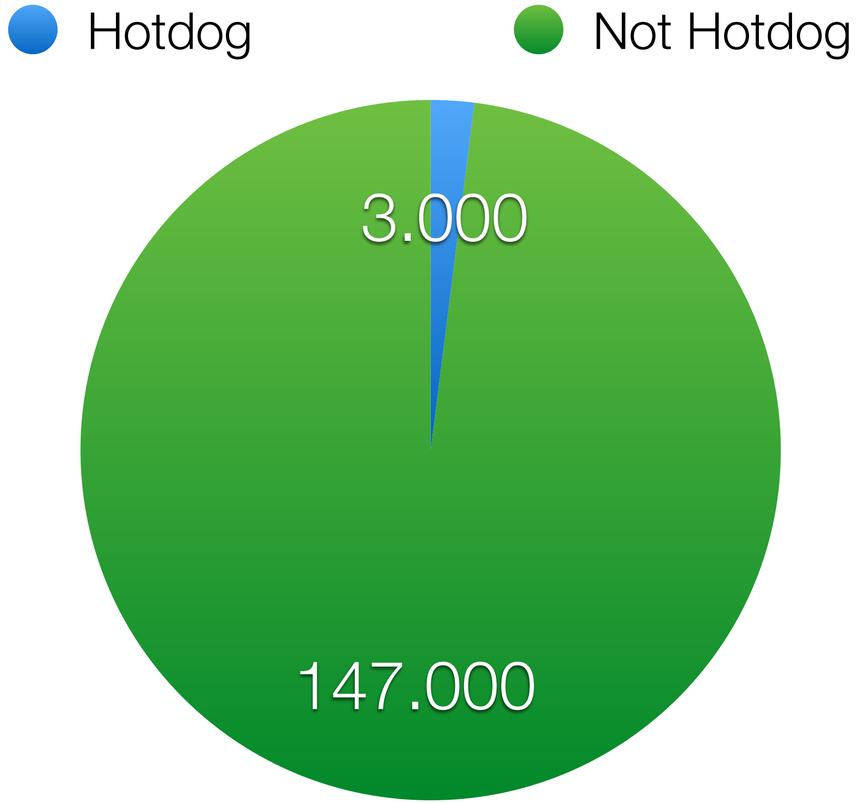
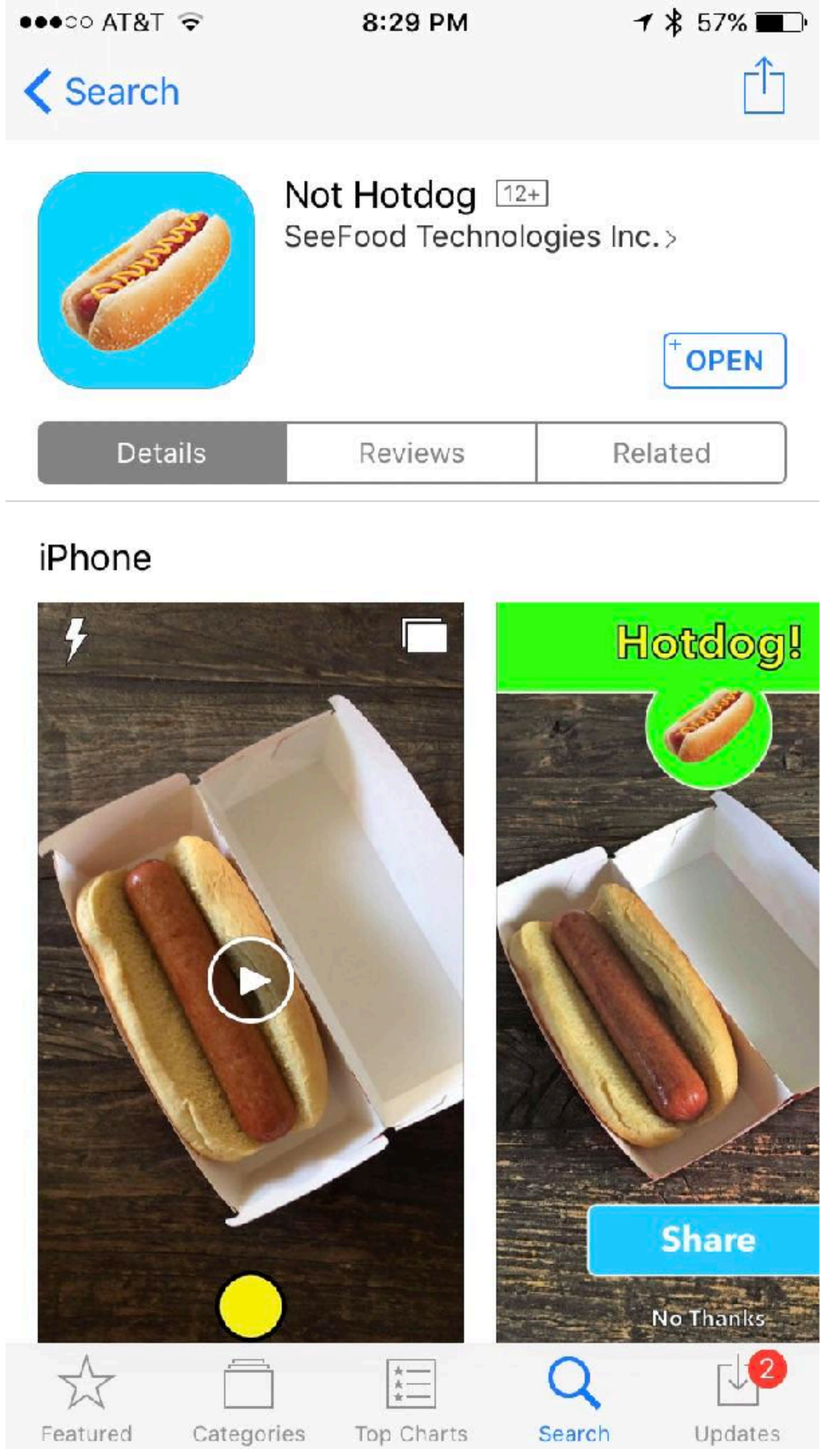
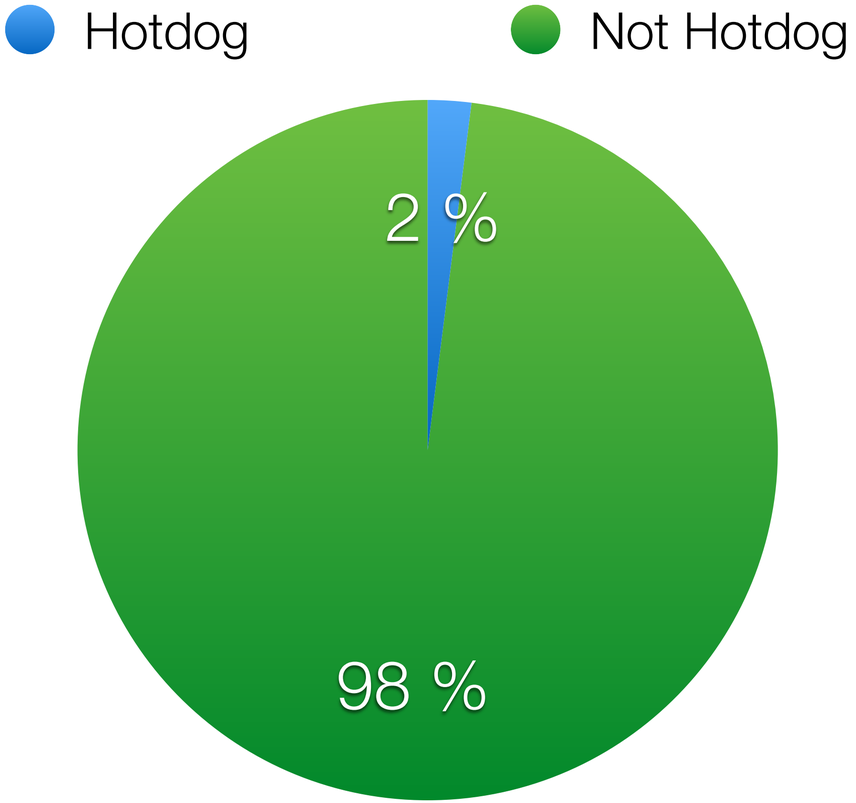
Not Hotdog

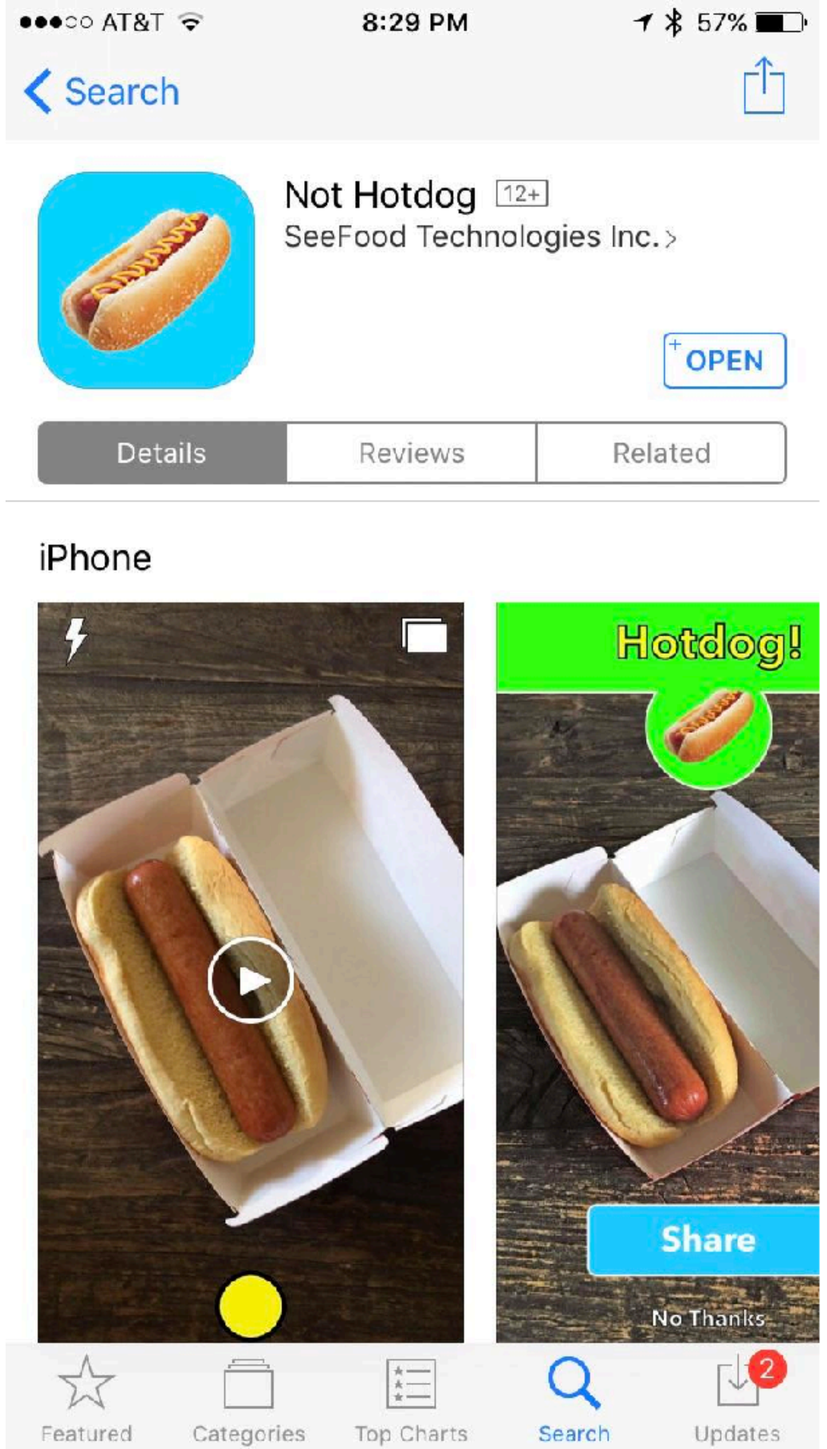




https://medium.com/@timanglade/how-hbos-silicon-valley-built-not-hotdog-with-mobile-tensorflow-keras-react-native-ef03260747f3

Not Hotdog





https://medium.com/@timanglade/how-hbos-silicon-valley-built-not-hotdog-with-mobile-tensorflow-keras-react-native-ef03260747f3

5) Human bias

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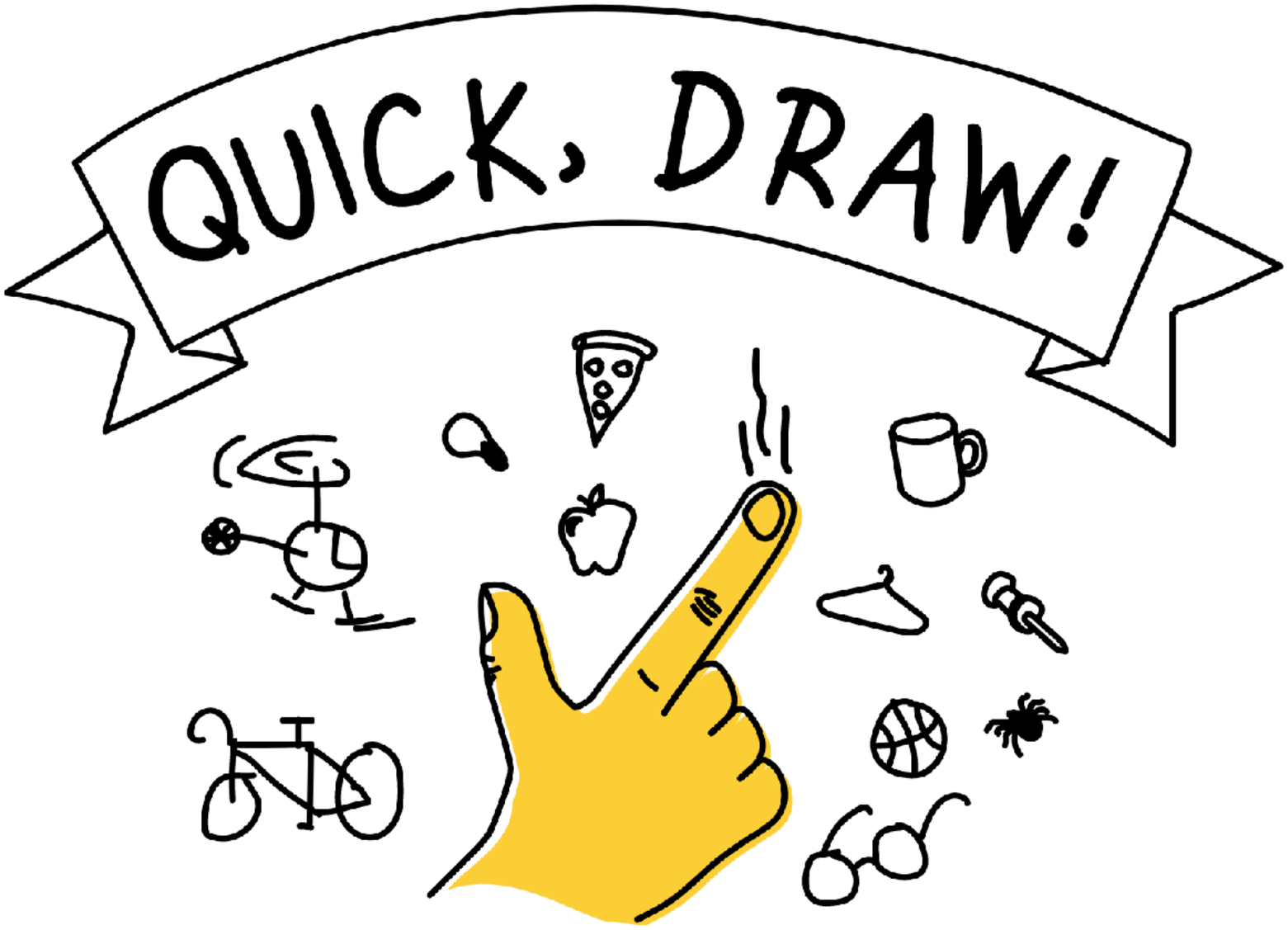
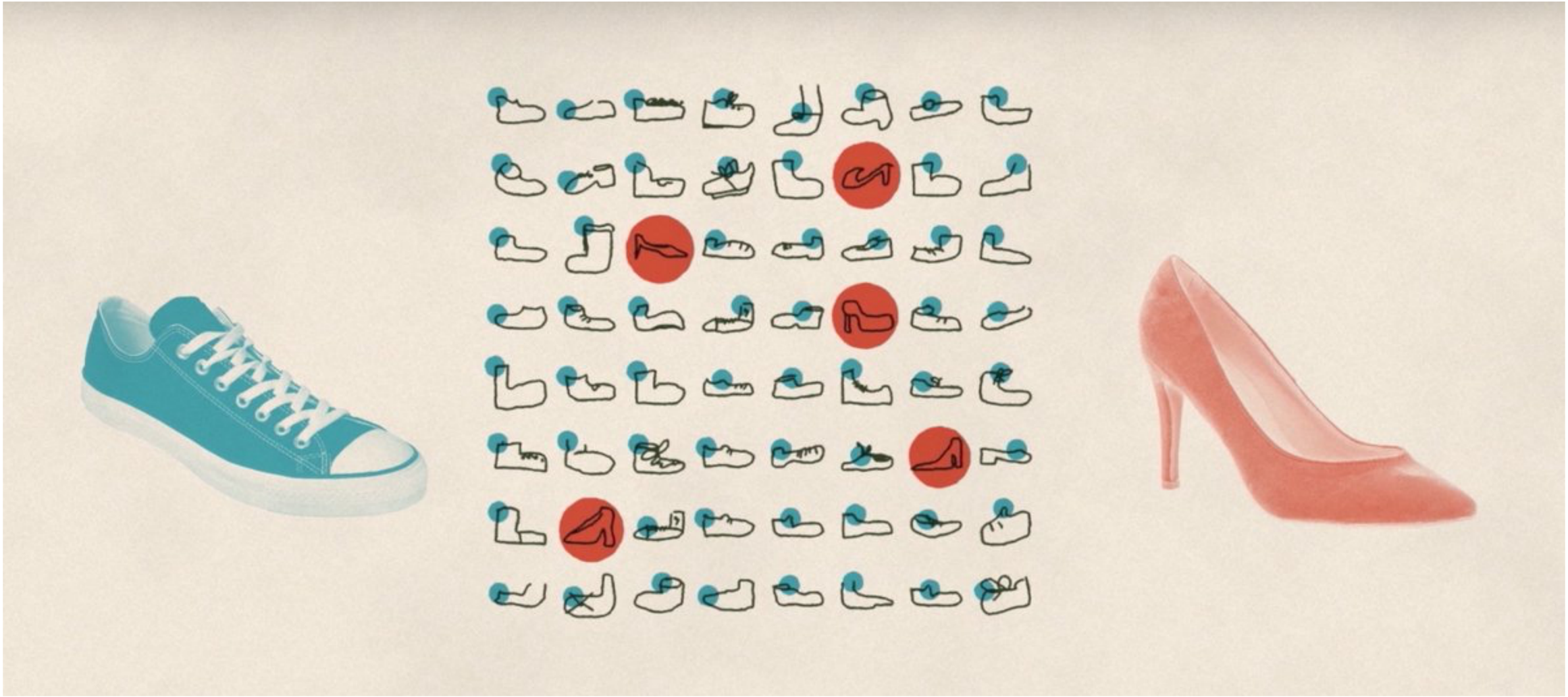


https://quickdraw.withgoogle.com/



https://www.youtube.com/watch?v=59bMh59JQDo

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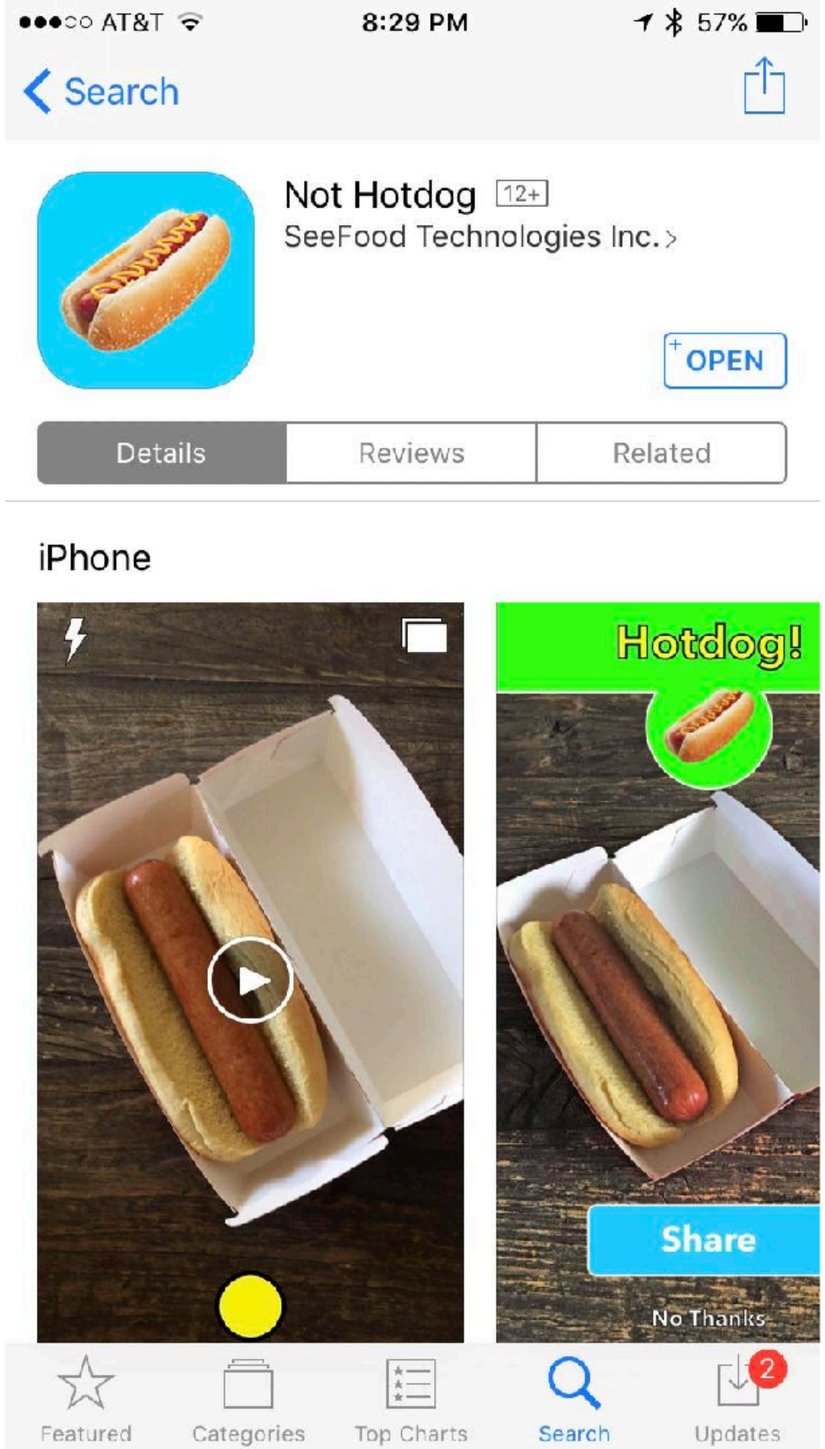

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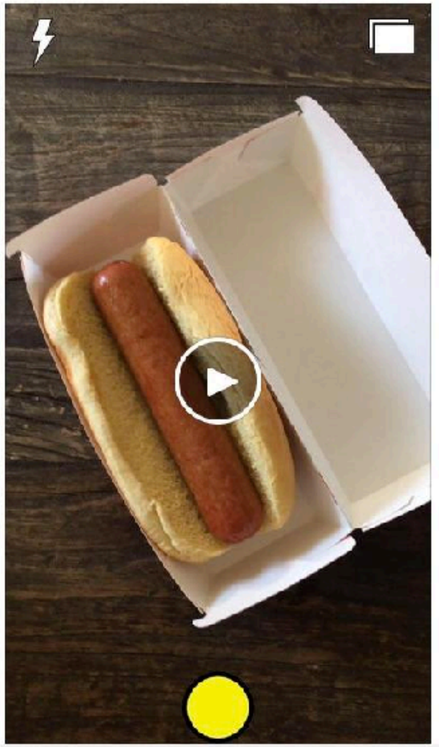

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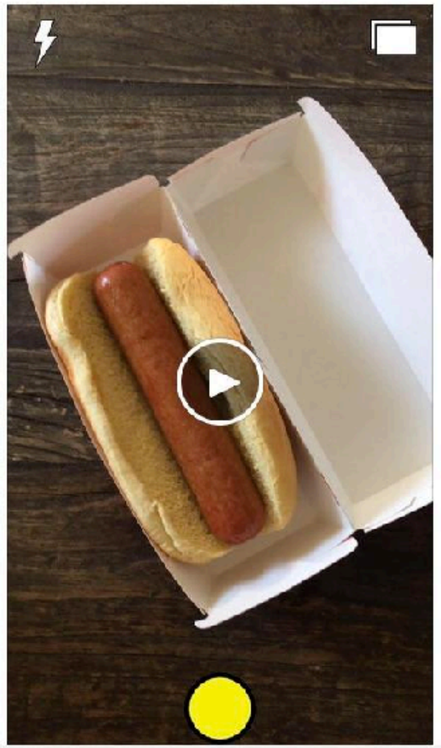

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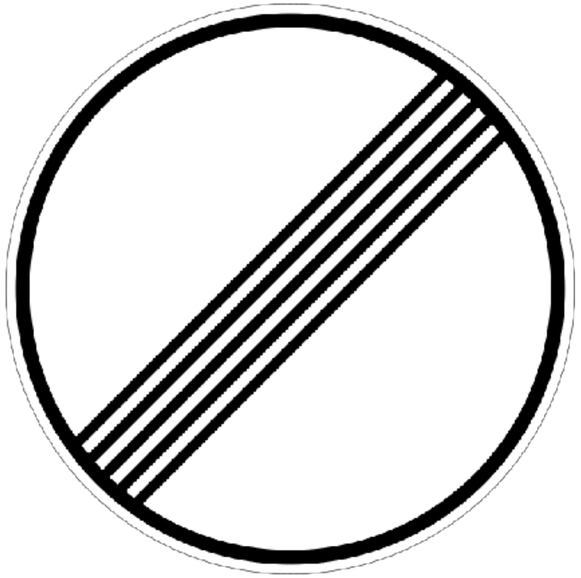

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Key-takeaways

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Key-takeaways

1. Use MLaaS to get quick wins. Switch to Open Source when necessary

2. If a human can classify an image, then an ML model can as well

3. Be careful of introducing your own biases in your data

Thank You

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