

NUS-ISS

Problem Solving Using Pattern Recognition



Deep learning: Identify

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Several slides have been redacted to provide better learning experience. We will upload the complete materials after the class ends.

How deep learning is used to identify: Use cases

Character recognition

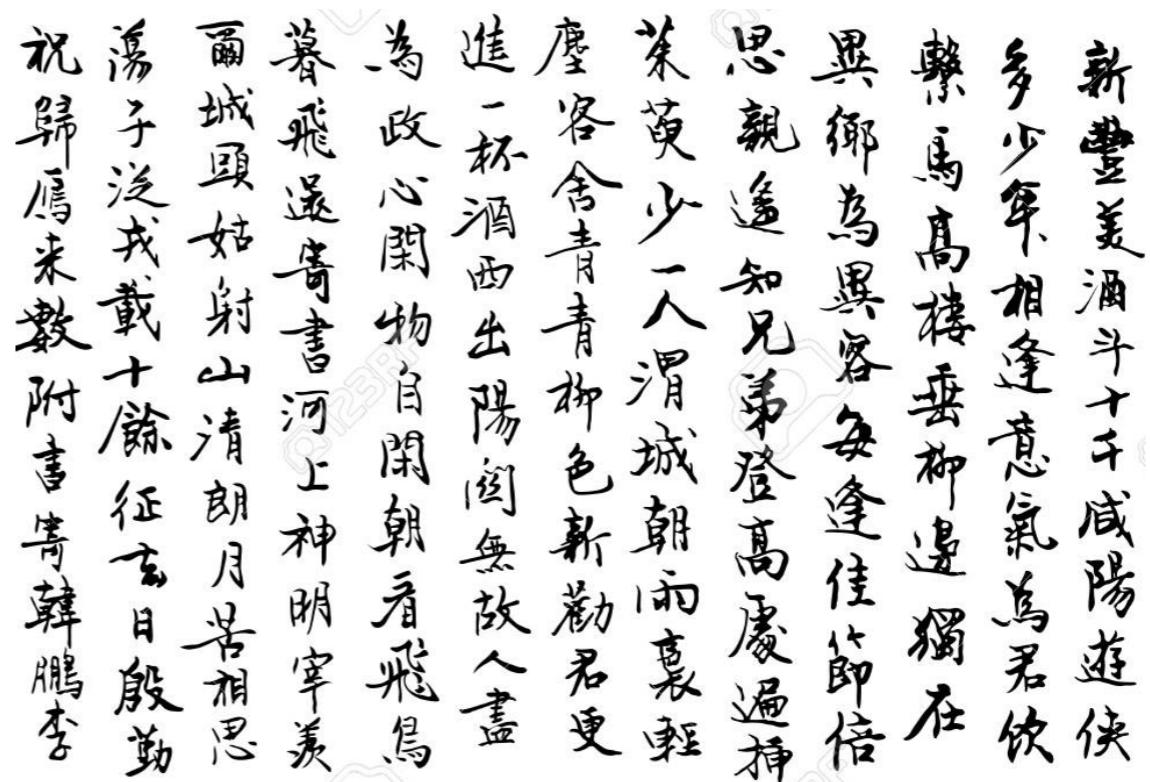
The challenge at Apple

- The number of symbols for alphabet-based writing: on the order of 100 symbols

- Chinese characters: at least 27,533 entries



Source: https://en.wikipedia.org/wiki/MNIST_database#/media/File:MnistExamples.png



Source: https://www.123rf.com/photo_106486597_stock-vector-vector-background-with-handwritten-chinese-characters-asian-calligraphy-illustration-traditional-bla.html

Character recognition

The challenge at Apple

- Requirements: recognize 30,000 handwritten characters in real-time

- Constraint: small memory / processing footprint

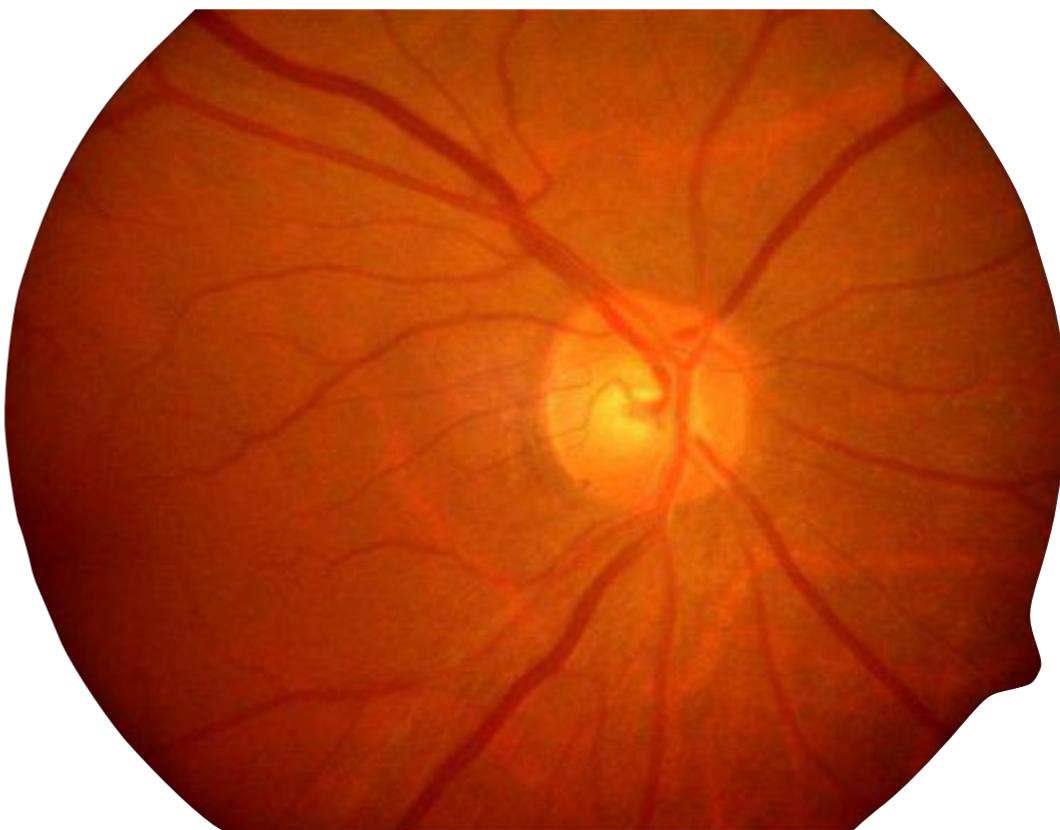
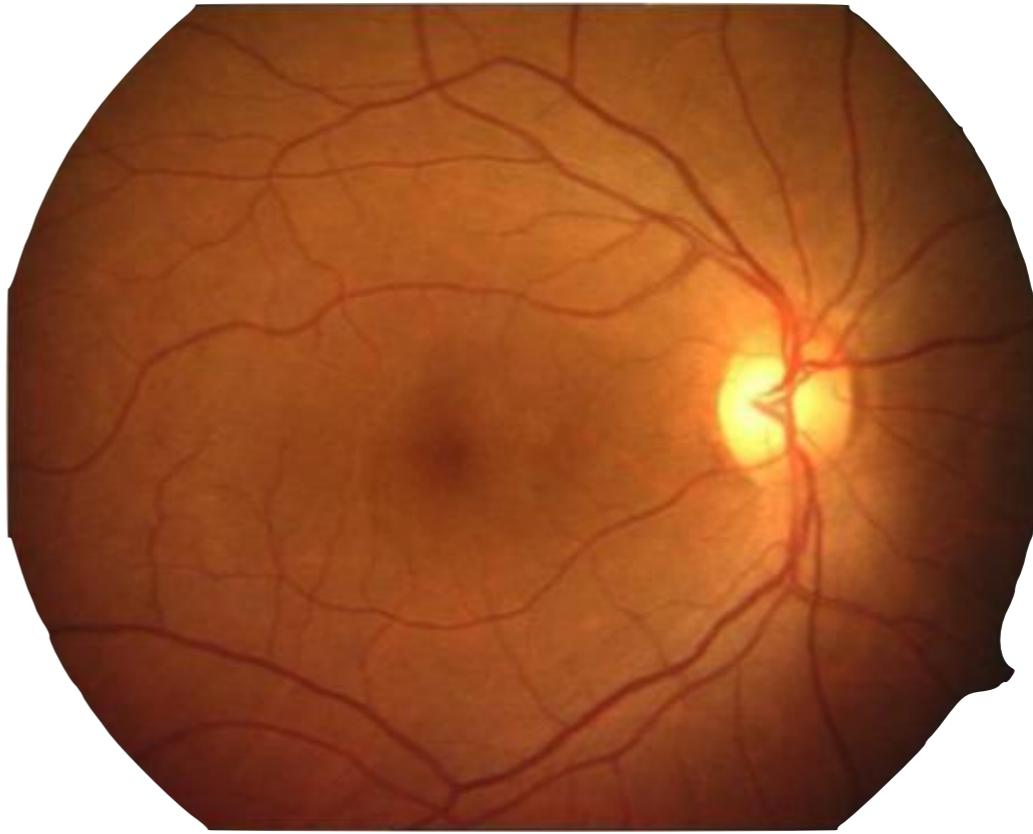
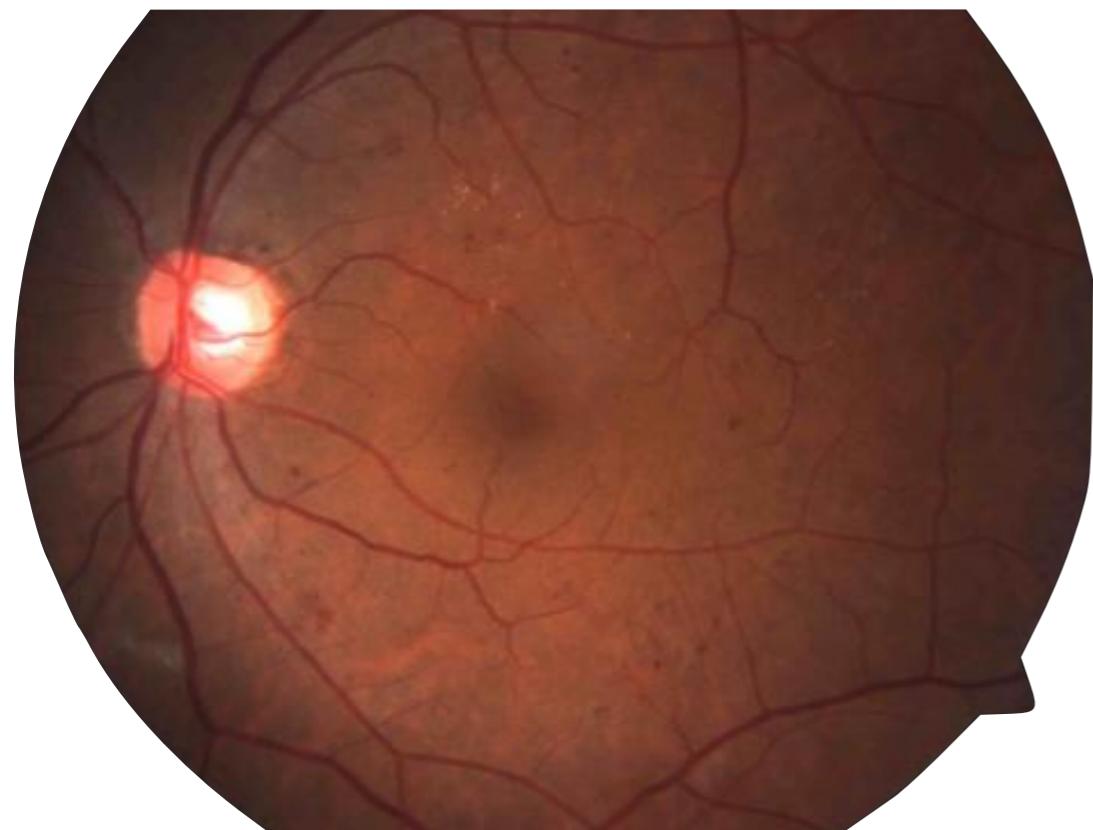
- No lag in response yet with good accuracy



Source: <https://machinelearning.apple.com/2017/09/12/handwriting.html>

Automated diagnosis

On our eyes



Automated diagnosis

On our eyes

Retinal image analysis

Select file

kmc_002_0027_o.jpg

137.132.214.213

14/Mar/2019:05:11:59 +0000

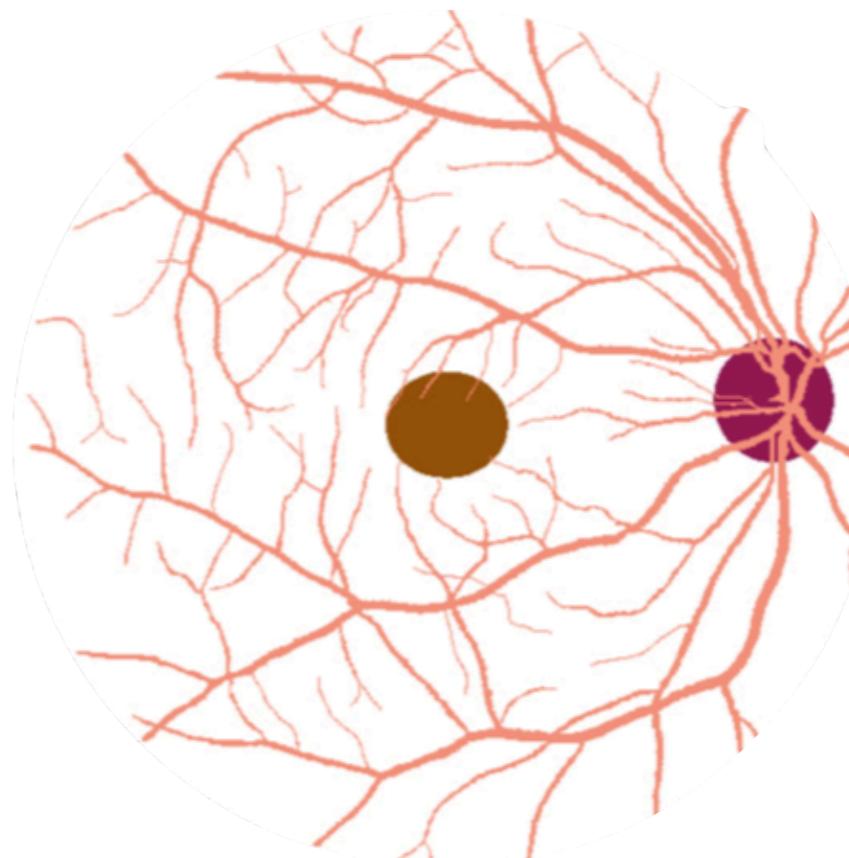
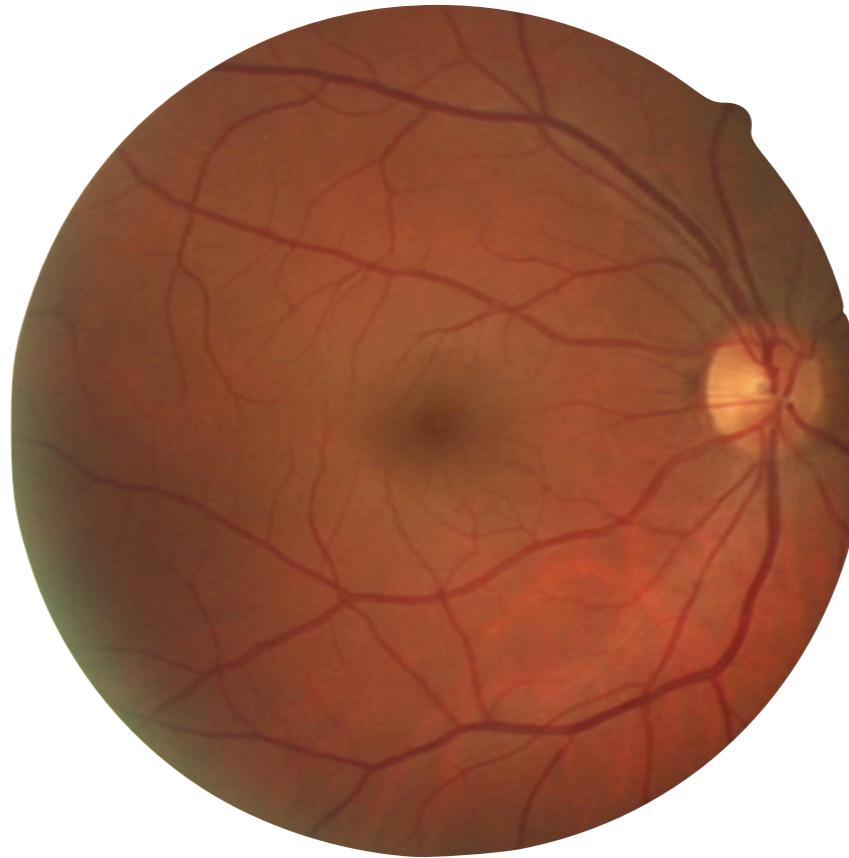
2.62s



Diabetic Retinopathy retinal image

Automated segmentation

On our eyes



When it comes to vision ...

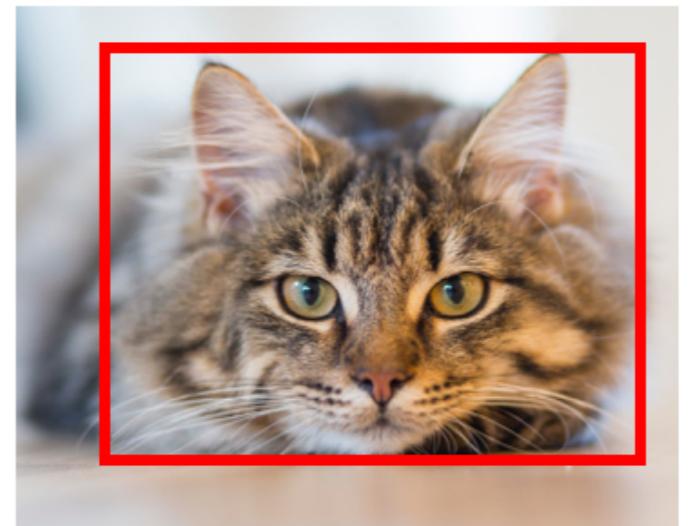
A few things to note

Classification



CAT

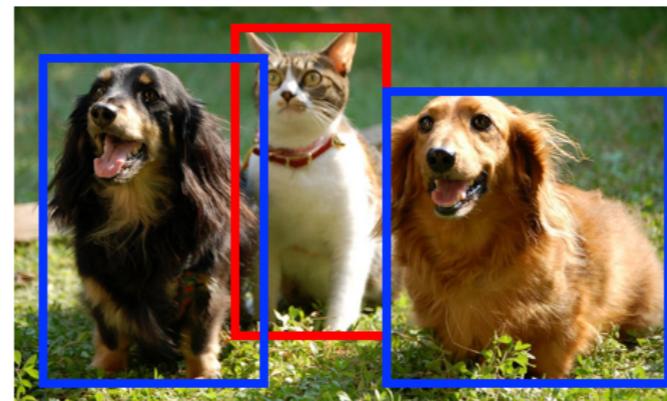
Classification + Localization



CAT

Single object

Object Detection



CAT, DOG

Instance Segmentation



CAT, DOG

Multiple objects

Source: Deep Learning for Computer Vision by
Rajalingappa Shanmugamani

Volvo in-car cameras

Combat distraction and drunk driving

- 'Pro-active' driver monitoring system

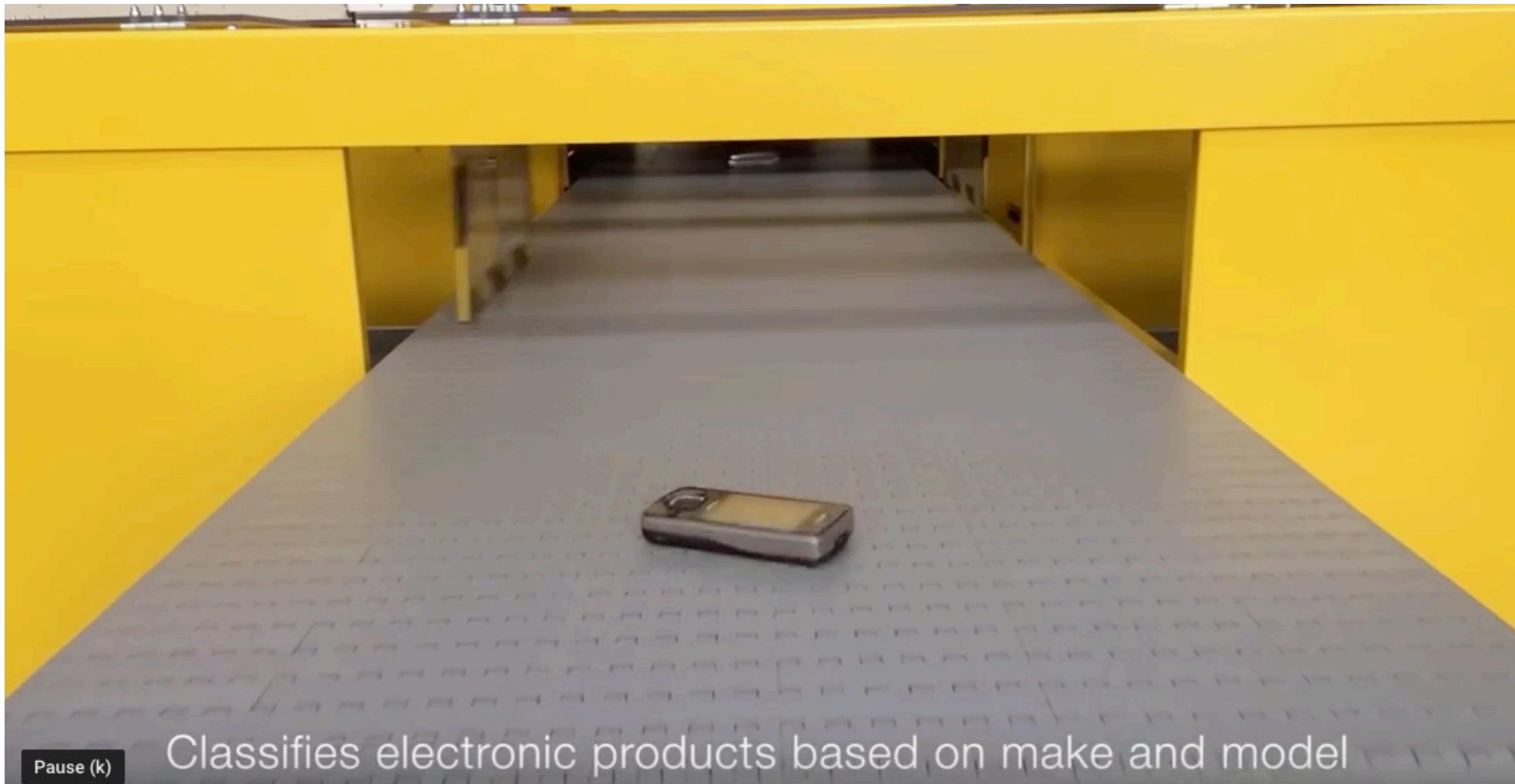


Source: <https://www.caranddriver.com/news/a26893035/volvo-interior-cameras-distraction-drunk-driving/>

Custom sorter

Sort your own items

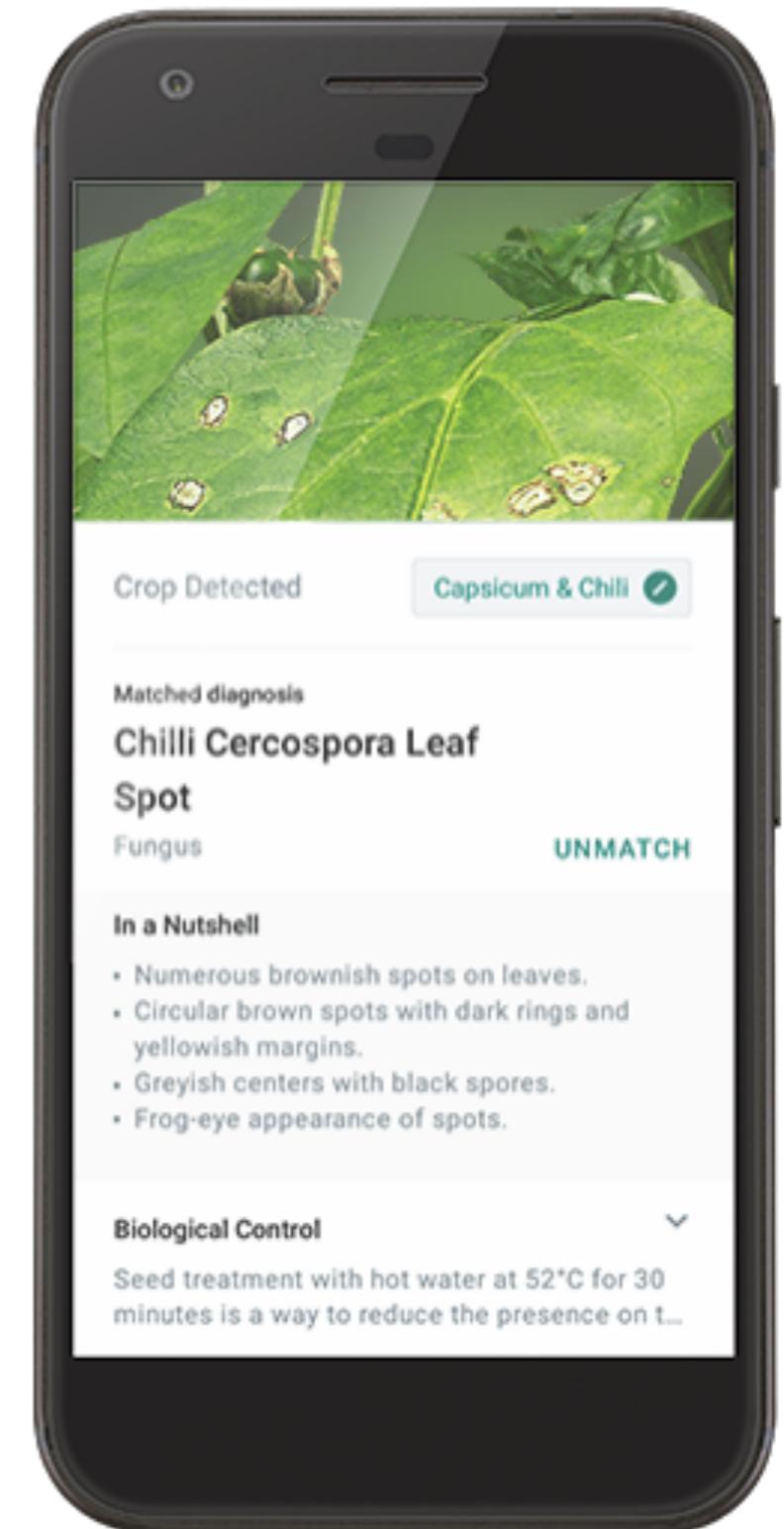
- Allow custom sorting using your own labelled images



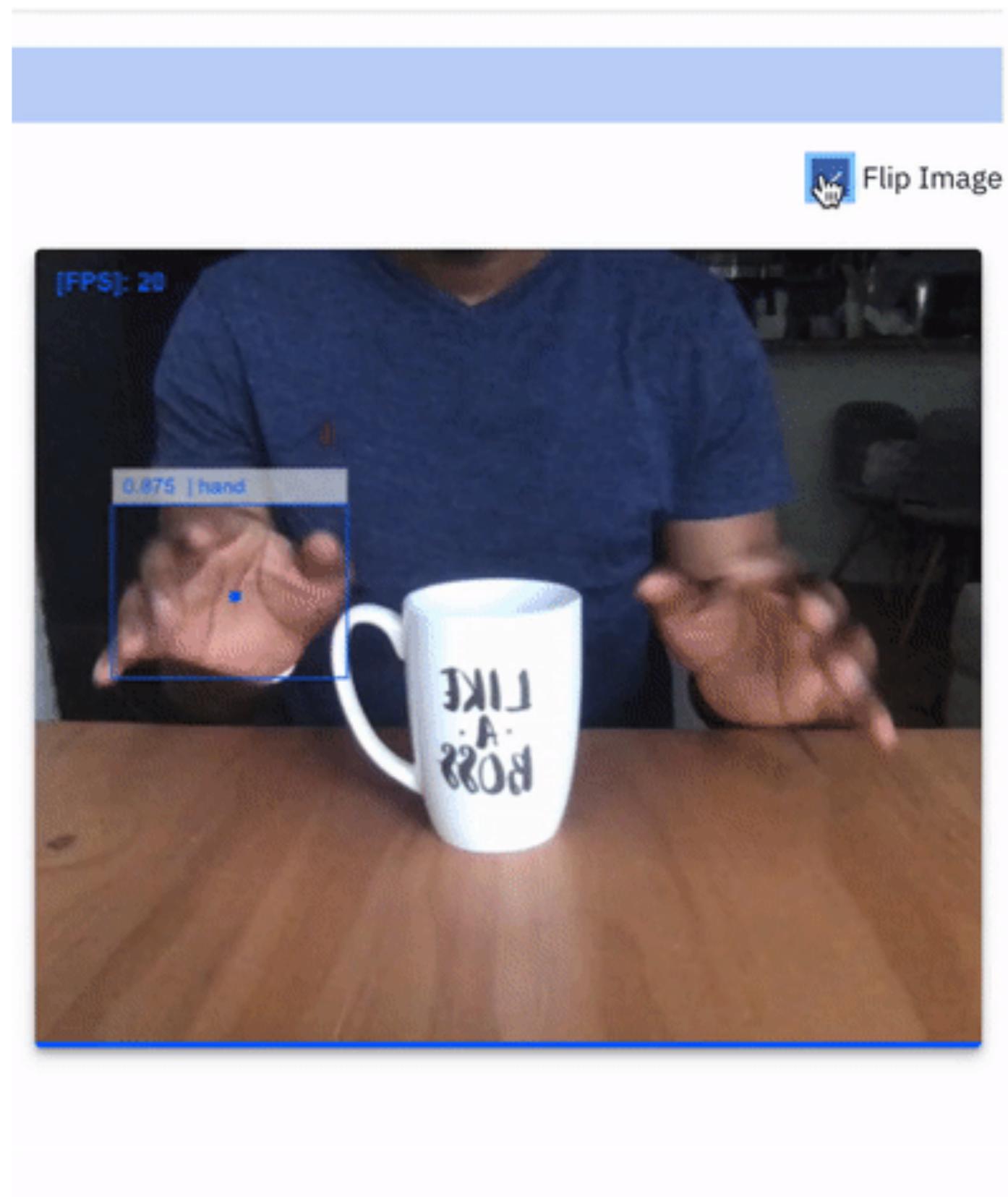
Source: <https://www.refind.se/refind-sorter>

Plants' disease

Better detection



Tracking hands in real time



Source: <https://victordibia.github.io/handtrack.js/#/>

Behaviour identification

by Aipoly

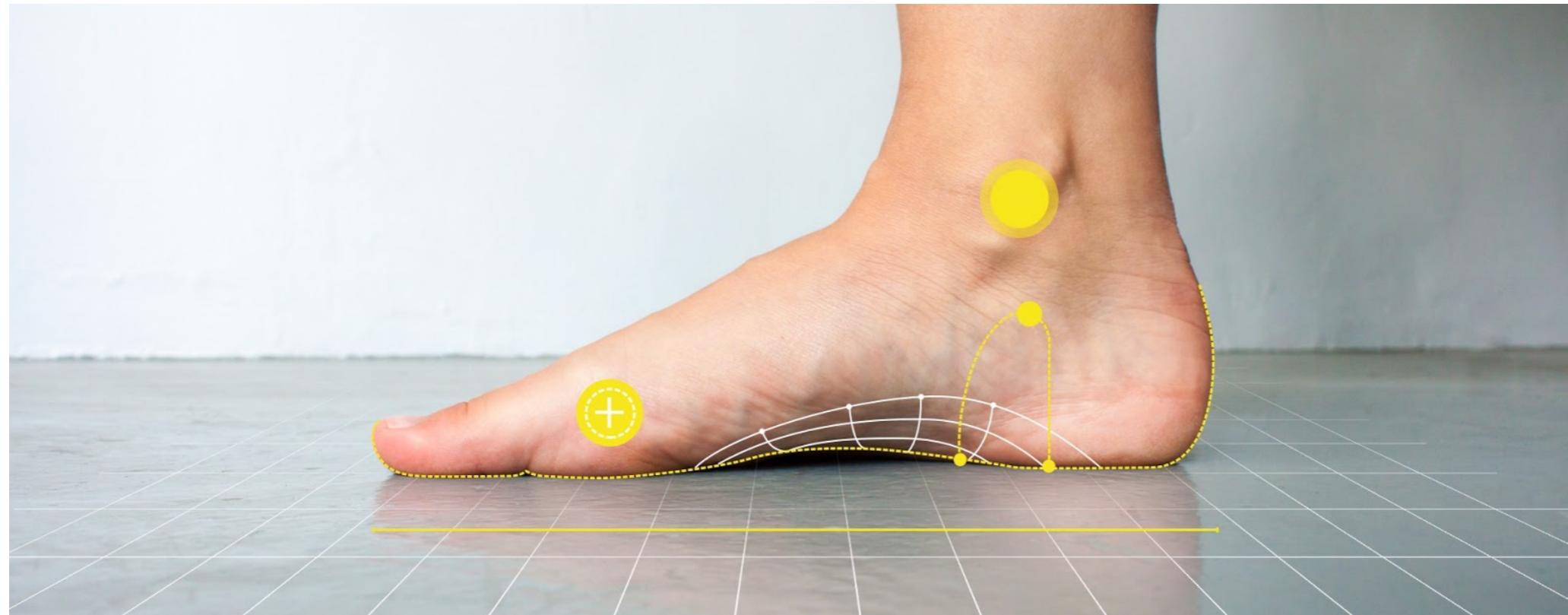


Source: <https://www.aipoly.com>

Custom-fit insoles

Almost automated

- Take one top view and one side view of foot
- Deep learning maps out the contour of the bottom of the foot
- Generate 3D structures for the insole



Source: <https://app.oxfordabstracts.com/stages/123/programme-builder/submission/19617?backHref=/events/123/sessions/281&view=published>

Predict early death

by deep learning

- Tested on a database of more than 500,000 people between 2006 and 2016

- In that period, nearly 14,500 participants died

- Accuracy comparison
Deep learning: 76 %
Random forest: 64%
Cox model: 44%



Source: <https://www.livescience.com/65087-ai-premature-death-prediction.html>

Lawyers vs AI

Spotting the risk in NDA

4 HOURS



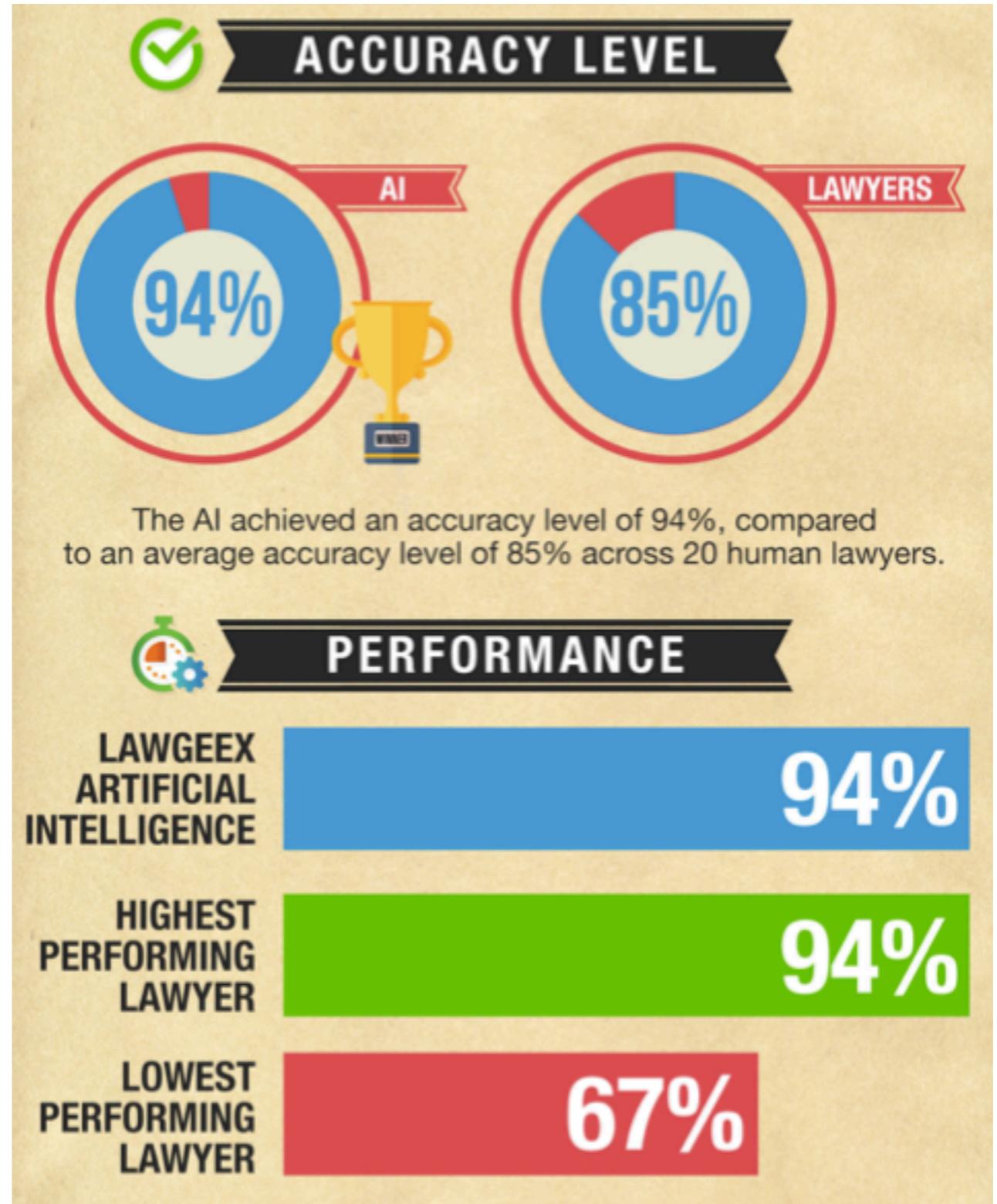
20 lawyers with experience reviewing contracts at companies including Goldman Sachs, Cisco and etc.

Source: <https://www.lawgeex.com/resources/AlvsLawyer/>



Lawyers vs AI

Spotting the risk in NDA



It took an average of **92 minutes** for the lawyers to review all 5 NDAs. In contrast, it took the AI a total time of **26 seconds** to review all 5 NDAs

Source: <https://www.lawgeex.com/resources/AlvsLawyer/>

To spot unfair clauses?

Claudette comes to rescue

- Visit <http://claudette.eui.eu/use-our-tools/index.html>

CLAUDETTE

An Automated Detector of Potentially Unfair Clauses

Claudette found 4 potentially unfair clauses (displayed in **bold**) out of 5 sentences.

By hovering your cursor over each unfair sentence, you can see the most likely unfairness category.

[...]

Unilateral Change unfair clause

As such, the Services may change from time to time, at our discretion.

We may stop (permanently or temporarily) providing the Services or any features within the Services to you or to users generally.

We also retain the right to create limits on use and storage at our sole discretion at any time.

We may also remove or refuse to distribute any Content on the Services, suspend or terminate users, and reclaim usernames without liability to you.

Share link

Save results

Try Again Contact

Source: <https://arxiv.org/pdf/1805.01217.pdf>

Customeomer service

Probably no need to outsource

- Company receives tremendous amount of queries, e.g. billing, change address etc
- First classify queries, then process requests and take action
- Queries are complex, rule-based not working, neither existing machine learning techniques
- Use deep learning to classify queries (over 40 categories), furthermore route emails
- Classification accuracy is 22% higher than manual identification of email



Source: <https://medium.com/tensorflow/how-swisscoms-custom-built-tensorflow-model-improved-business-operations-by-classifying-text-ad5e76c88124?linkId=65648176>