

NUS-ISS

Problem Solving Using Pattern Recognition



Deep learning: Identify

by Dr. Tan Jen Hong

© 2019 National University of Singapore.
All Rights Reserved.

How deep learning is used to identify:
Use cases

Spotting the risk in NDA

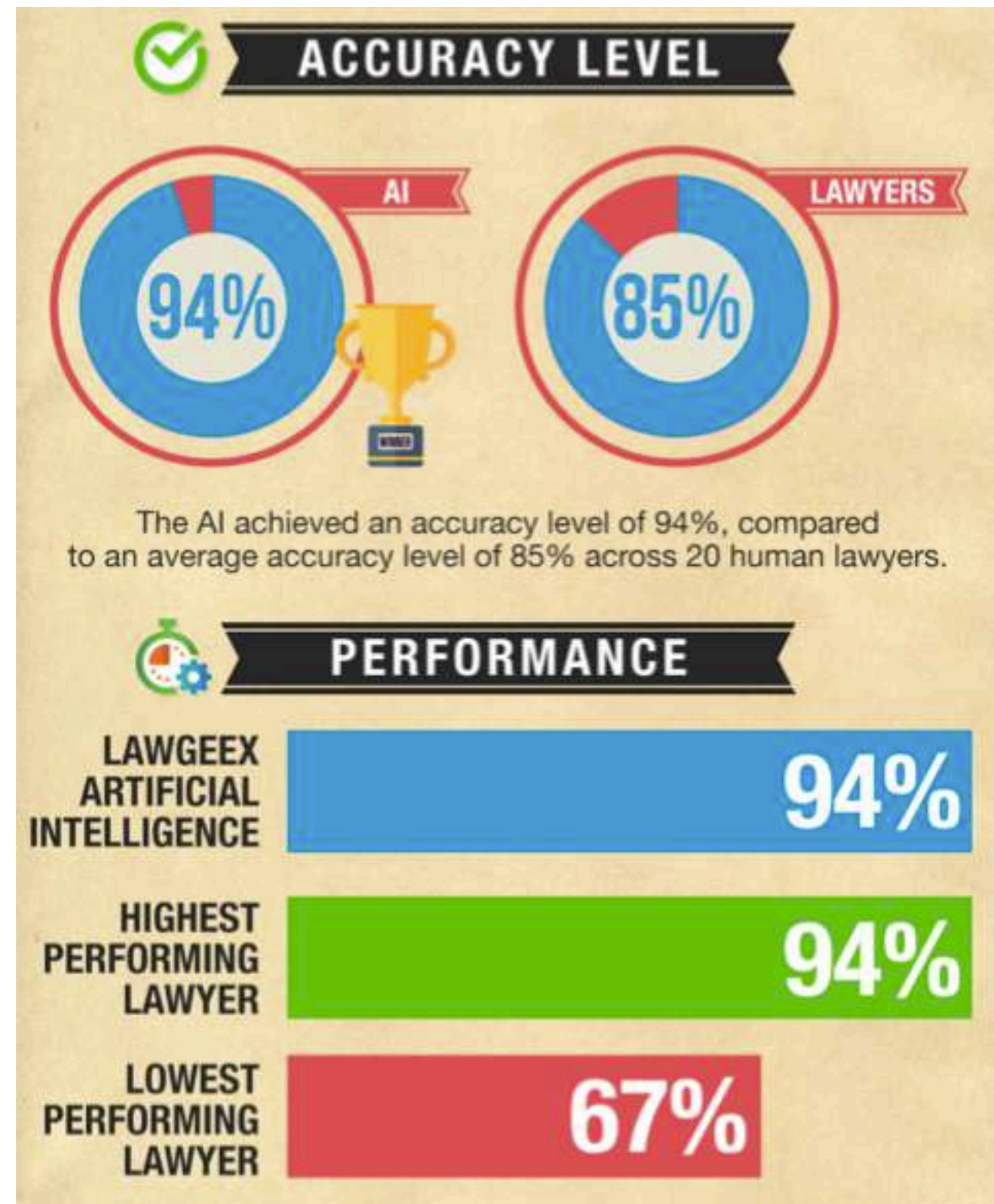
An analog clock with a white face and black numbers. The hour hand is between 1 and 2, and the minute hand is pointing at 10. The time shown is 1:50.

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

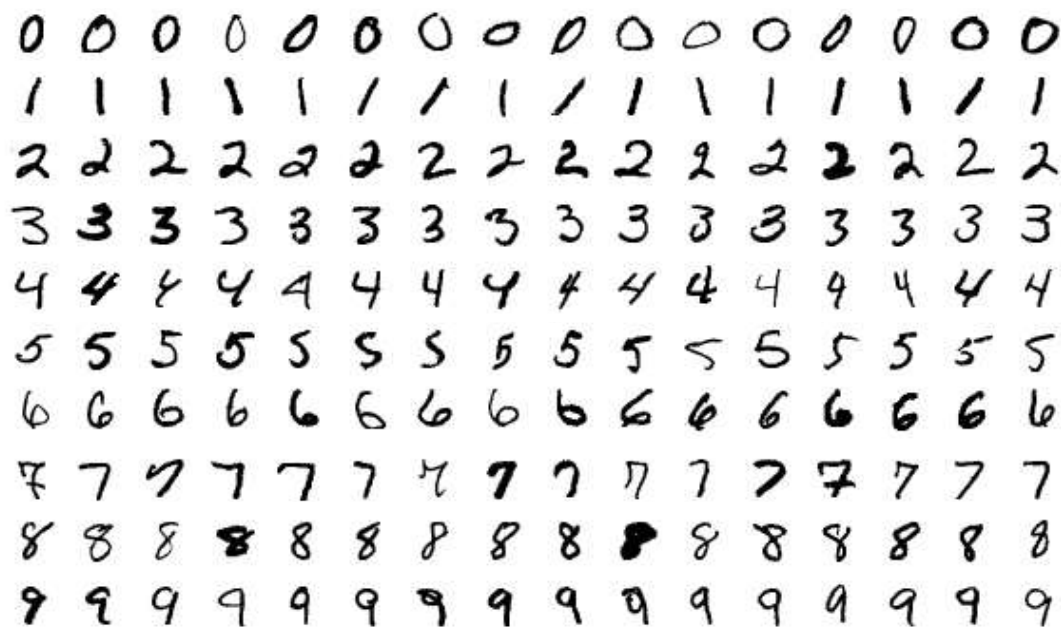
Contact

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

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



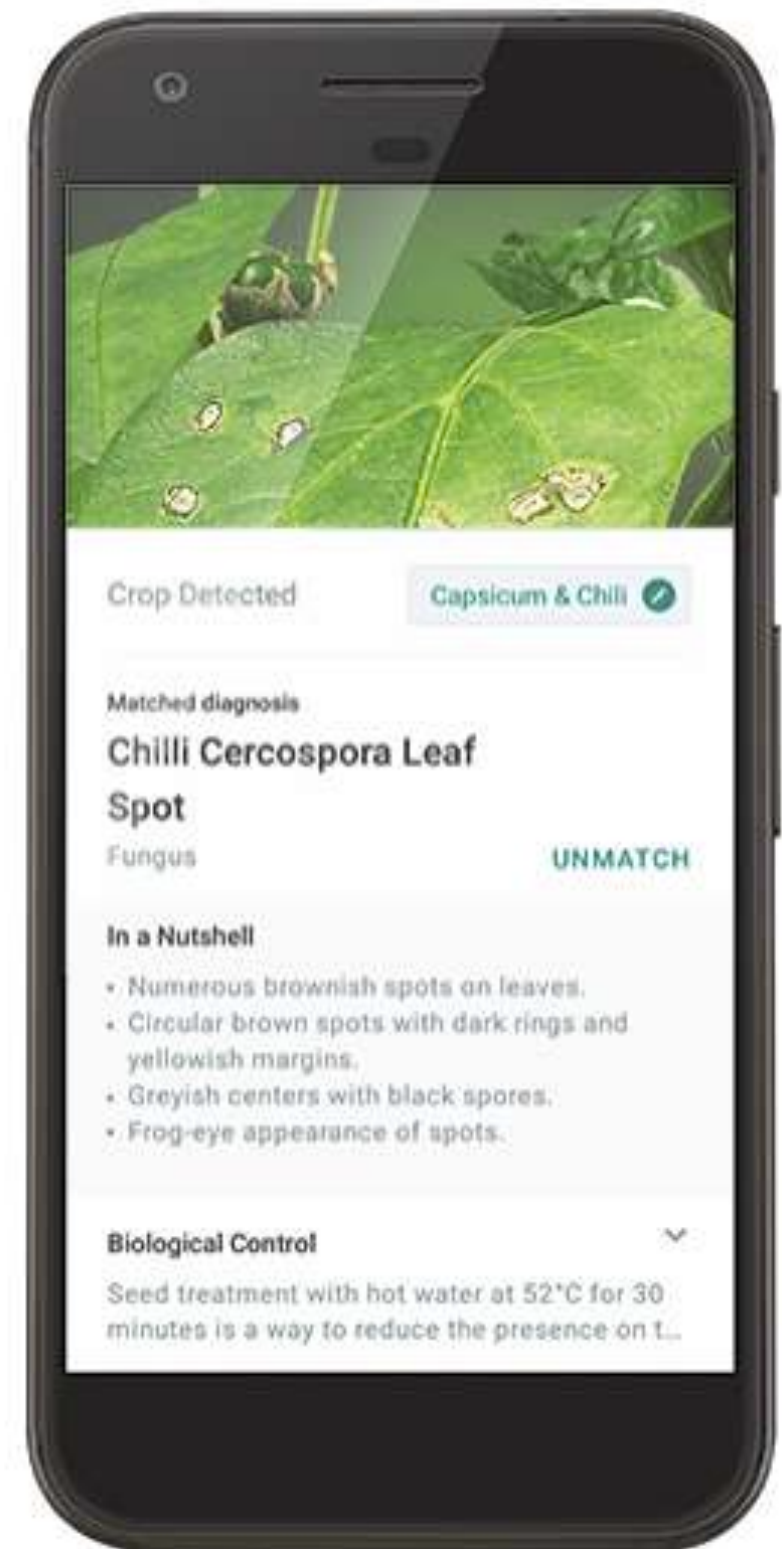
Source: <https://machinelearning.apple.com/2017/09/12/handwriting.html>

Plants' disease

Better detection



Source: <https://plantix.net/en>



Product search

For shopping



Source: <https://twitter.com/mbrennanchina/status/1183717500803932160?s=20>

Custom sorter

Sort your own items

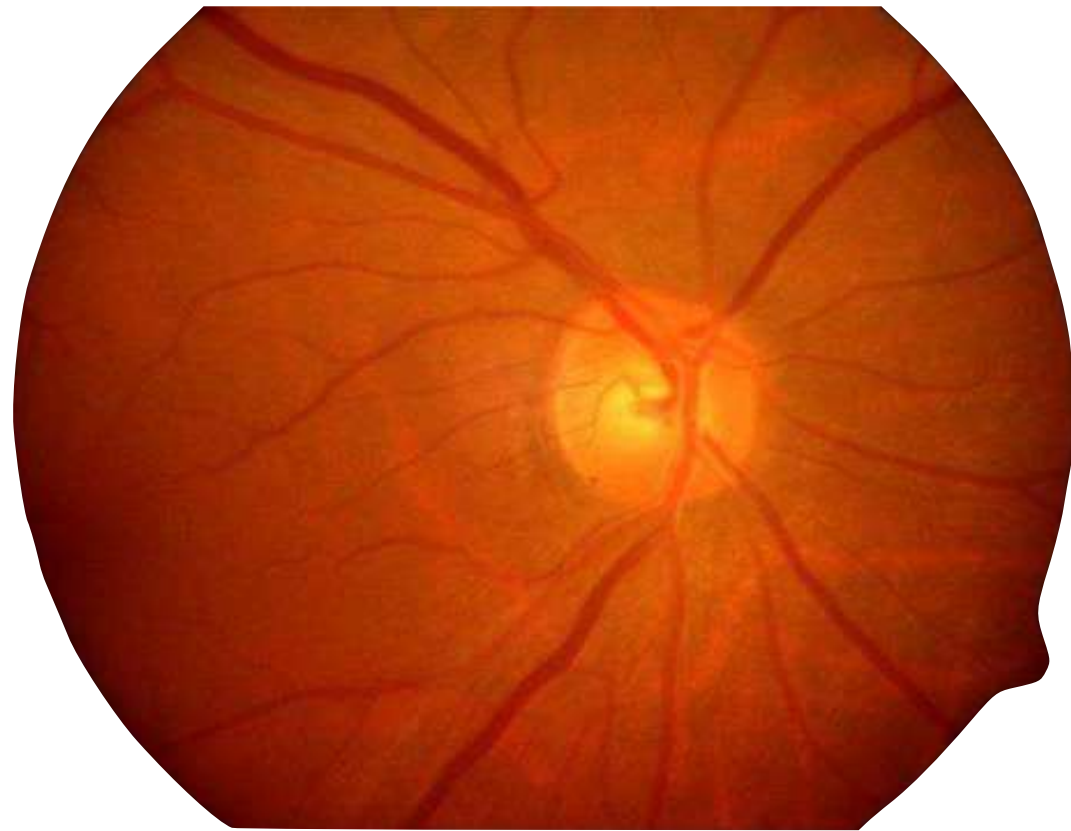
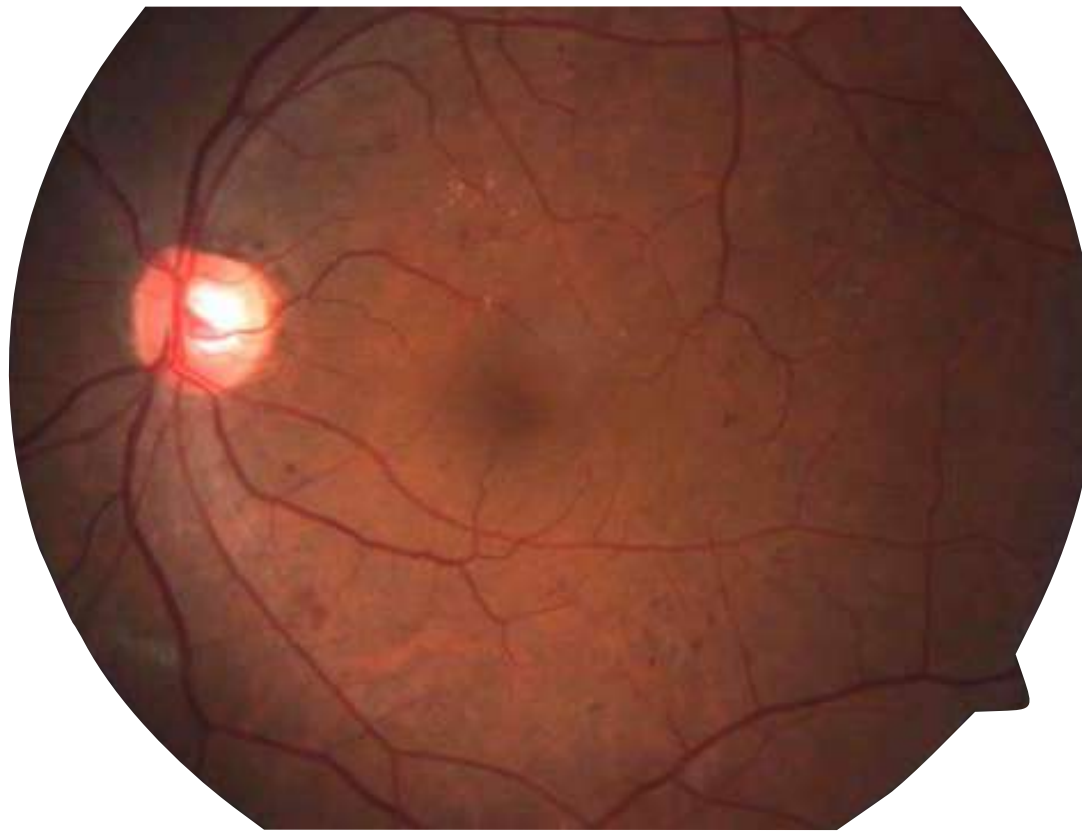
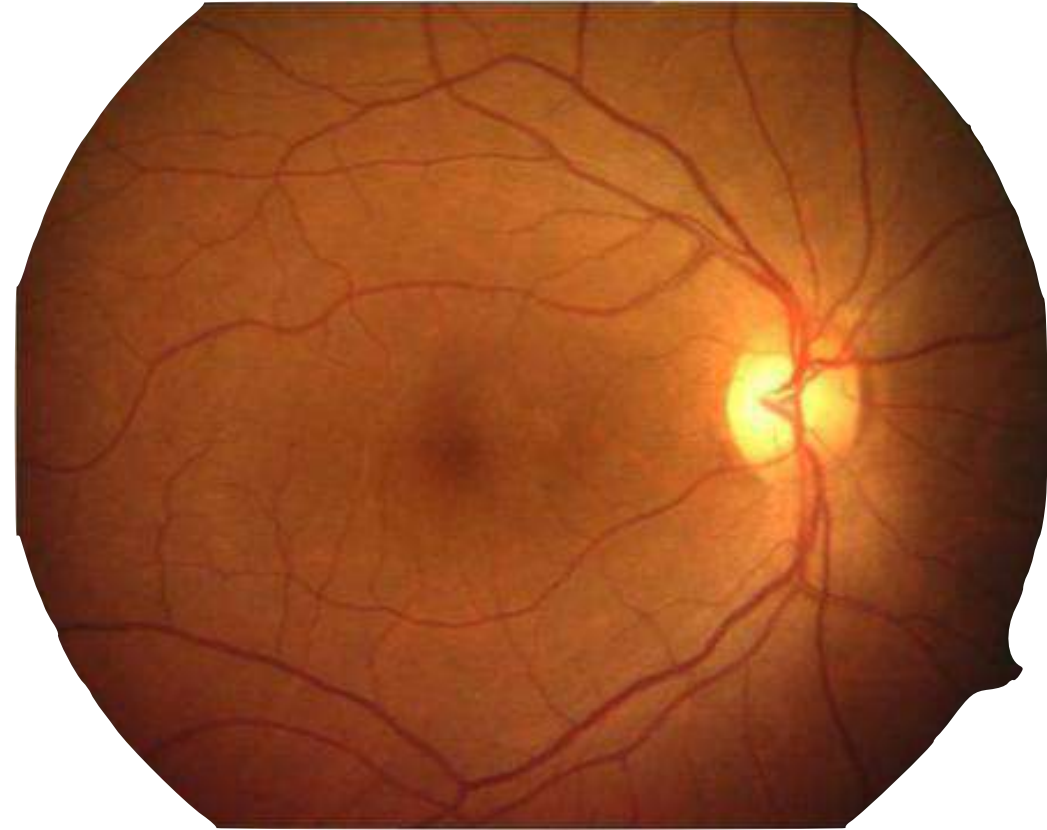
- Allow custom sorting using your own labelled images



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

Automated diagnosis

On our eyes



Automated diagnosis

On our eyes

- Key objective: not to replace doctors, but to improve early discovery
- Intended to place such system in family clinic or polyclinic
- Such system does first-line check-up, makes referral, reduce hospital / specialist load
- In third world countries, improve medical care in rural areas (lack of doctors)



Source: <https://www.eyefficient.com/product/hand-held-fundus-camera/>

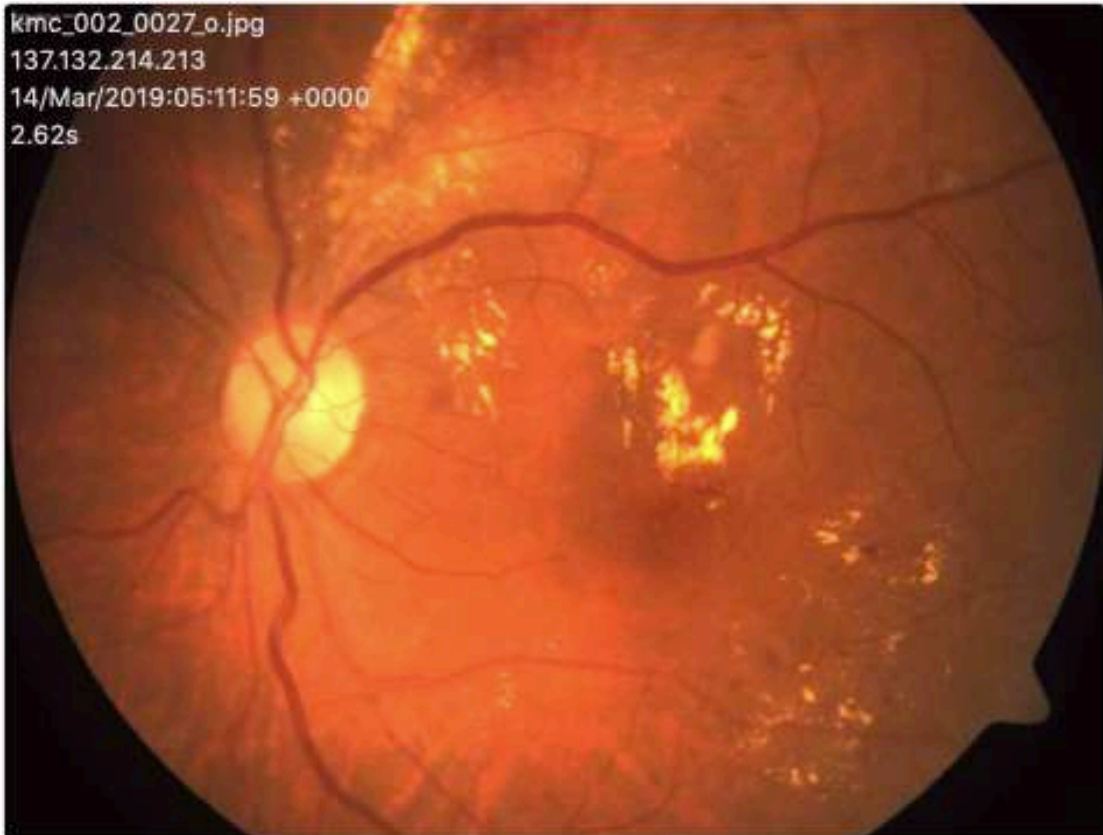
Automated diagnosis

On our eyes

Retinal image analysis

Select file

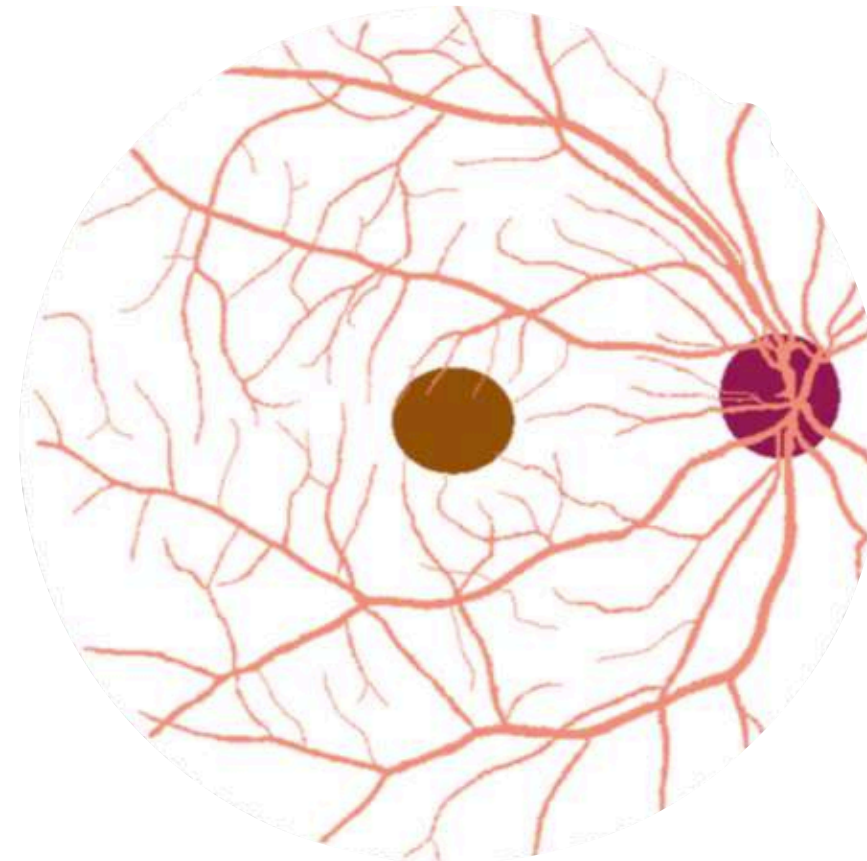
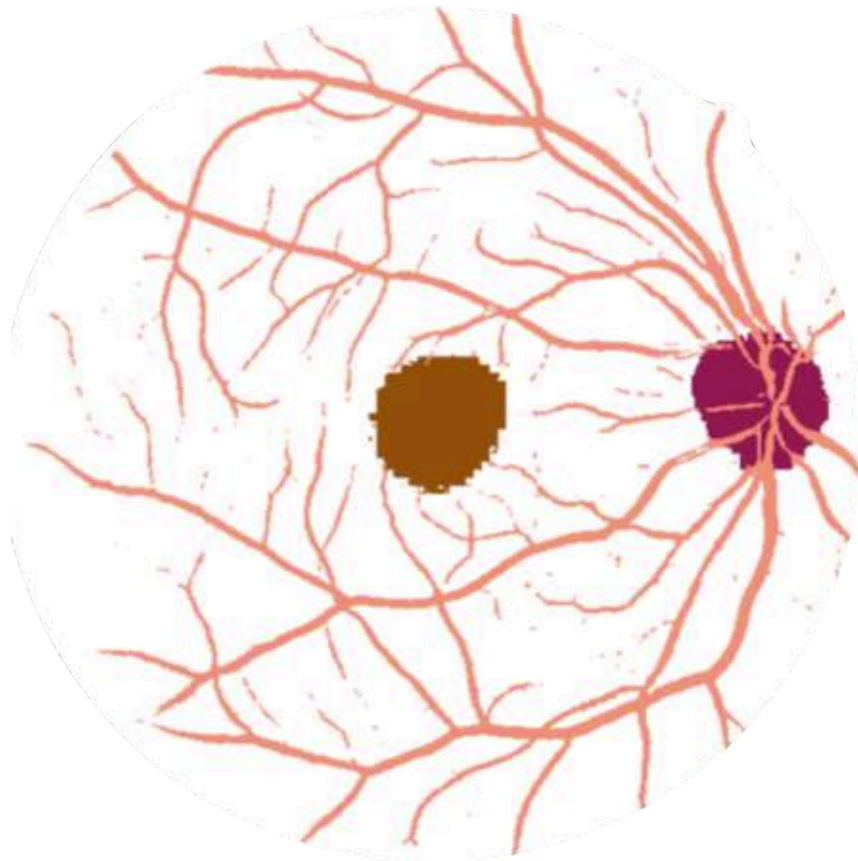
kmc_002_0027_o.jpg
137.132.214.213
14/Mar/2019:05:11:59 +0000
2.62s



Diabetic Retinopathy retinal image

Automated segmentation

On our eyes



When it comes to vision ...

A few things to note

Classification



CAT

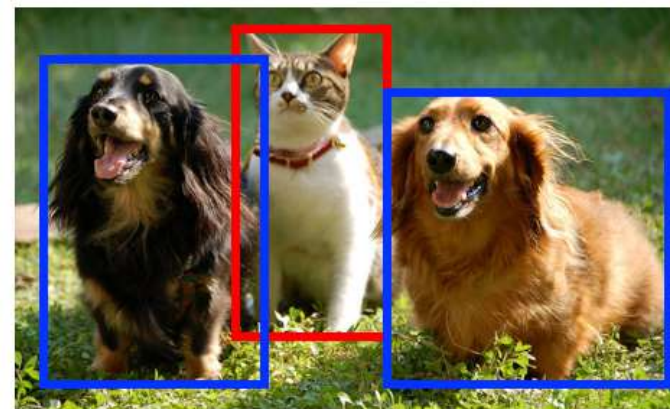
**Classification
+ Localization**



CAT

Single object

Object Detection



CAT, DOG

Instance Segmentation



CAT, DOG

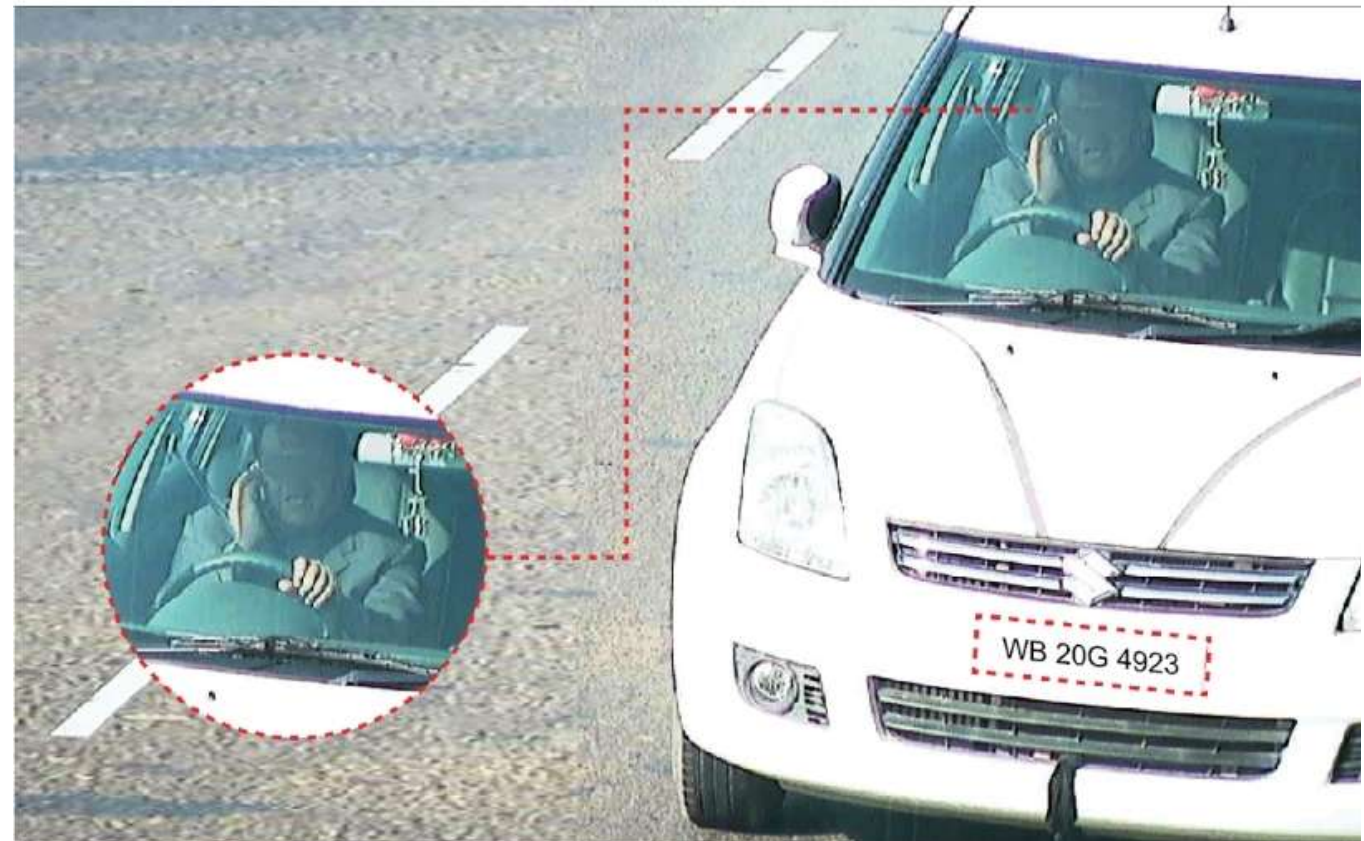
Multiple objects

Source: Deep Learning for Computer Vision by
Rajalingappaa Shanmugamani

Object detection

Identify traffic offences

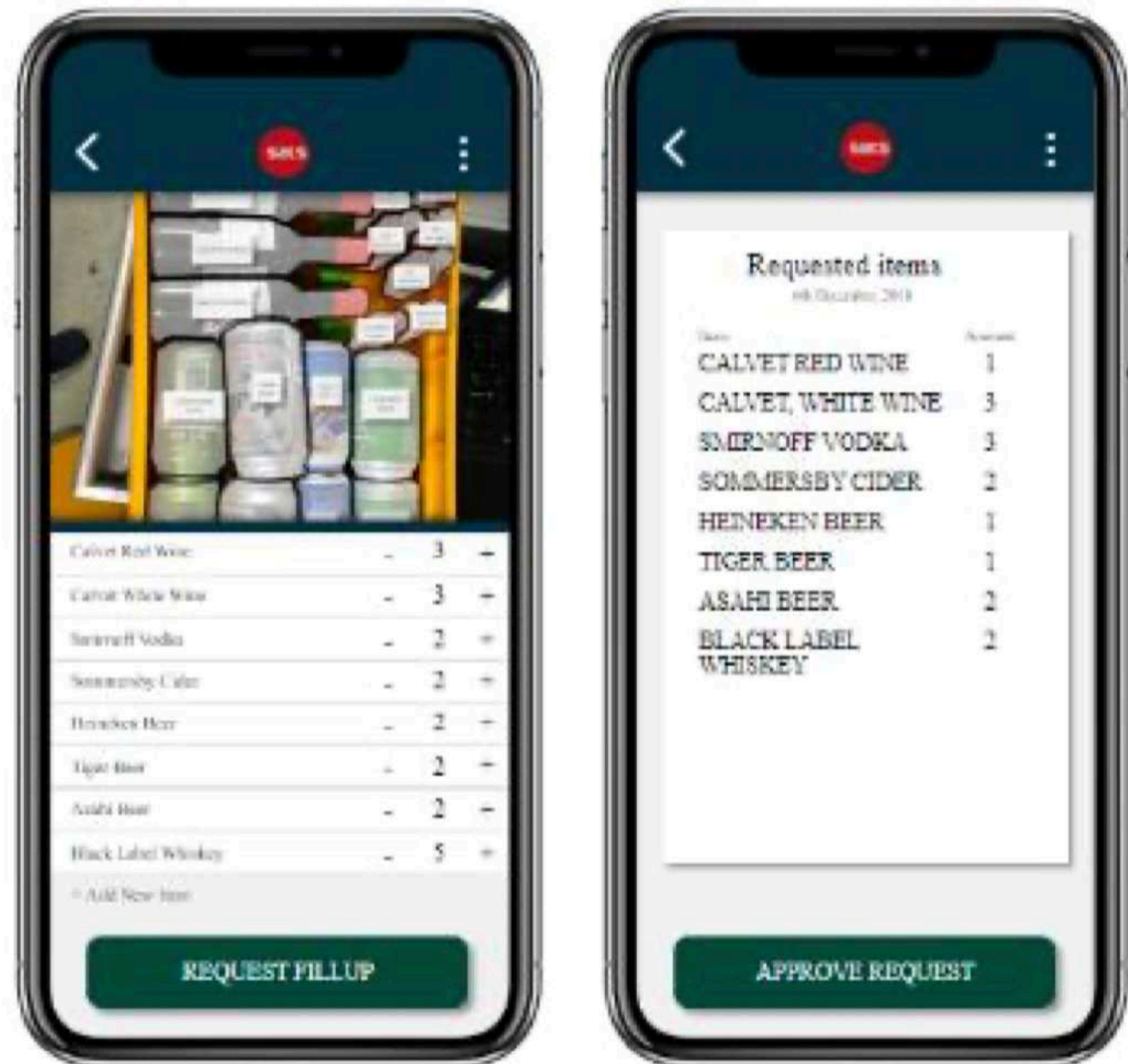
- NO seat belt detection
- Using-phone-while-driving detection



Source: <https://www.sourcesecurity.com/news/videonetics-artificial-intelligence-deep-learning-no-seat-belt-detection-co-4403-ga-npr.1551018780.html>

Airline catering

Check the correct items



Source: SATS

Object detection

For autonomous vehicle



Source: <https://www.pond5.com/stock-footage/83053263/autonomous-or-driverless-car-computer-vision-object-detectio.html>

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/>

Aircraft

Monitoring check-in

assaia
The Apron AI

Learn more

19:35:05

NZ176 PER-AKL
Gate 53 ETD 19:35 AWST

Name	Time
------	------

Download CSV

In-Block

Aircraft ready

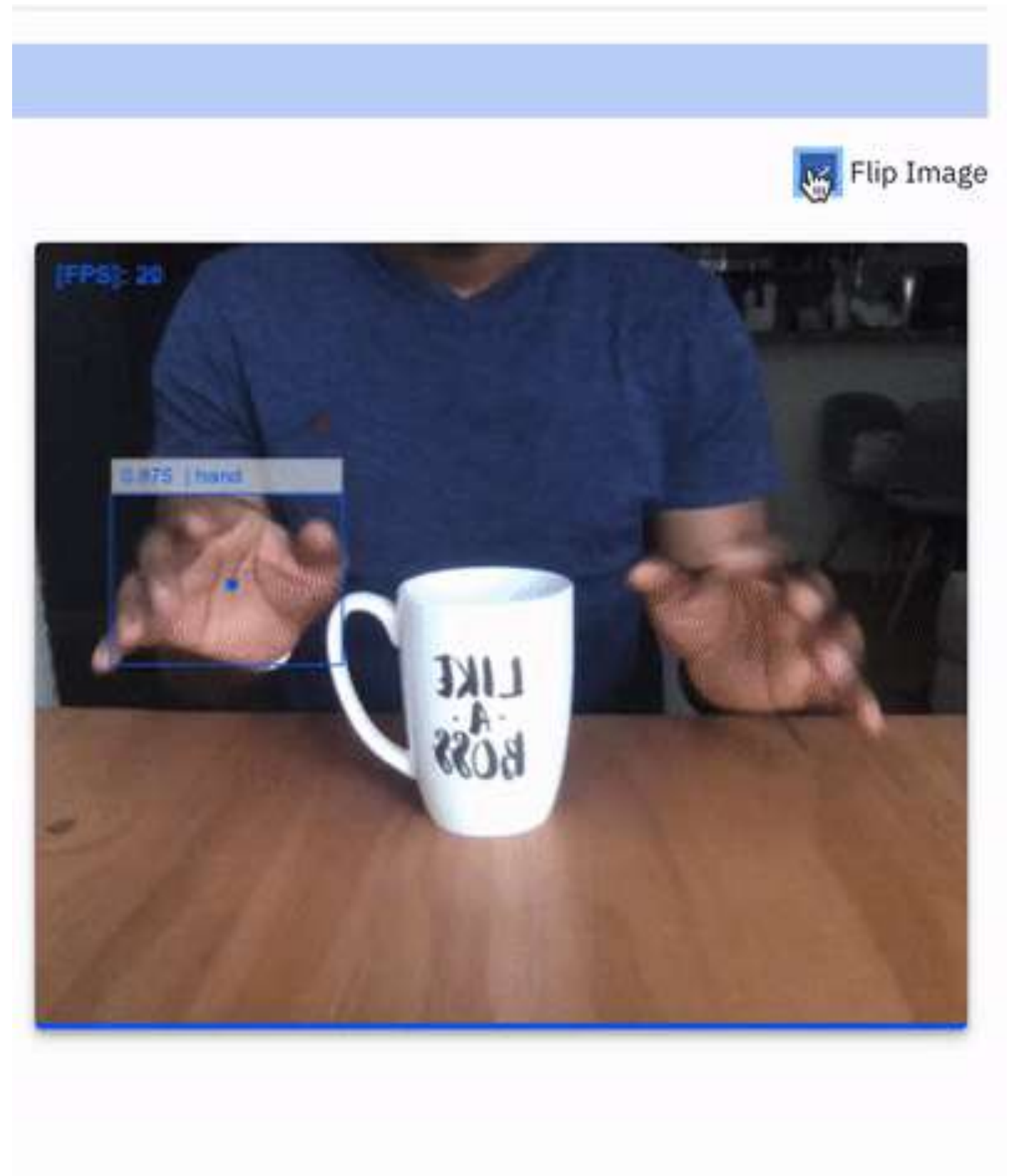
Off-Block

General					
Doors					
Cargo doors					
Containers out					
Containers in					
	19:35:00	19:53:00	20:11:00	20:35:00	20:53:00

Source: <https://assaia.com/tmc/>

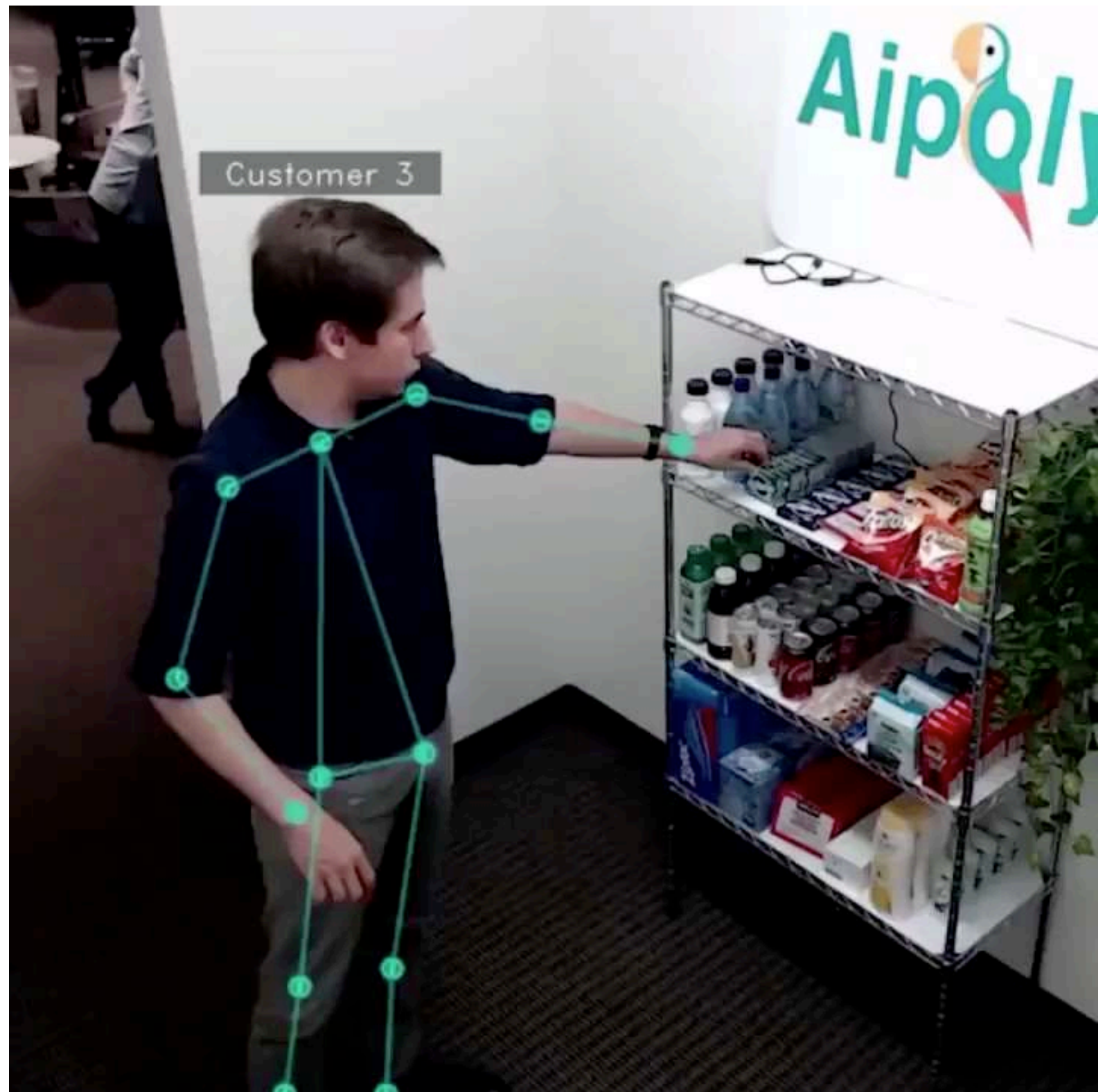
Tracking hands

in real time



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

Behaviour identification by Aipoly



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

Object detection

Auto referee?

- Track ball and players
- Report score based on the events in scene

TTNet: Real-time temporal and spatial video analysis of table tennis

Accepted for publication at 6th International Workshop on Computer Vision in Sports (CVsports) at CVPR 2020



Source: <https://arxiv.org/abs/2004.09927>