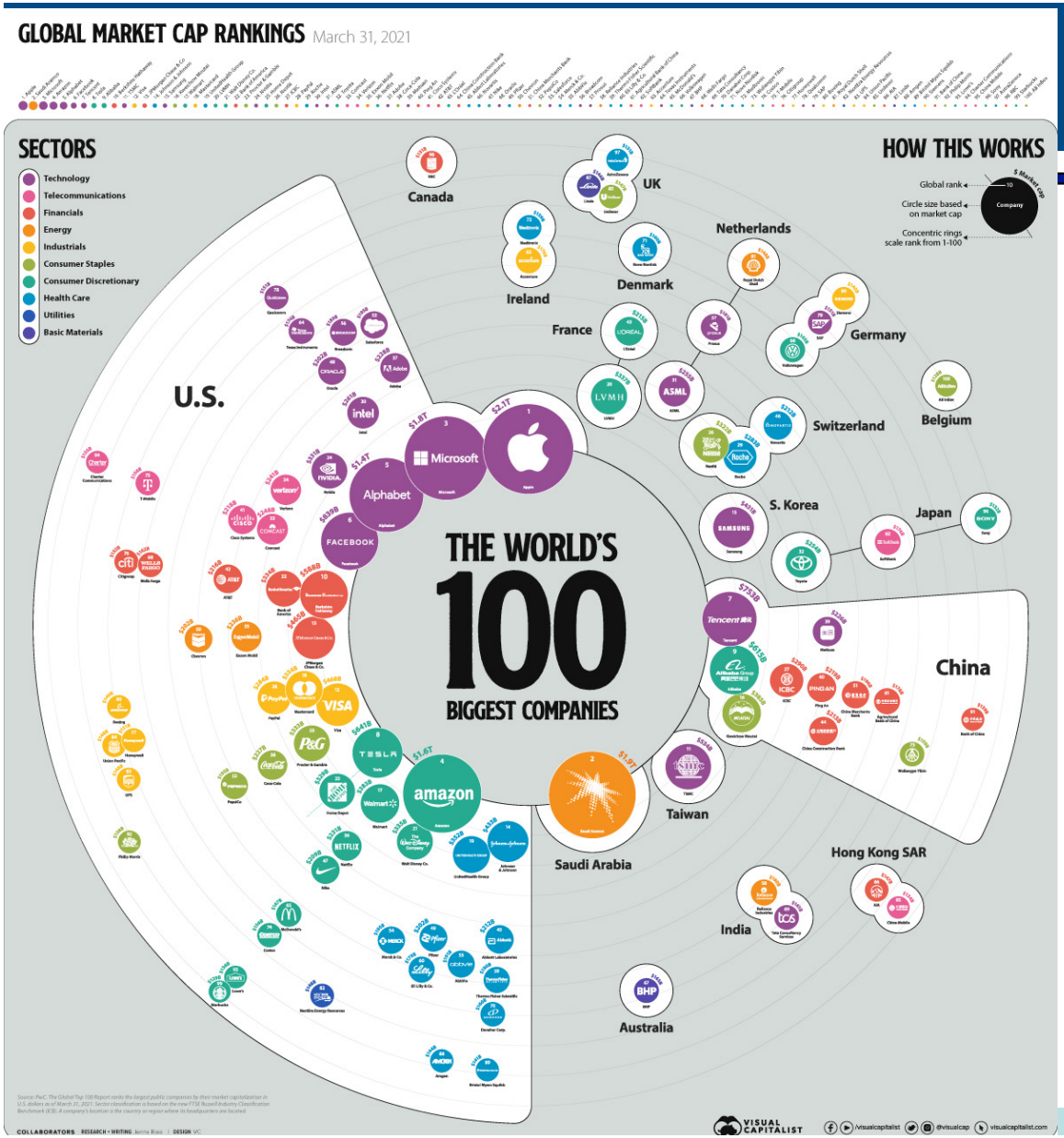
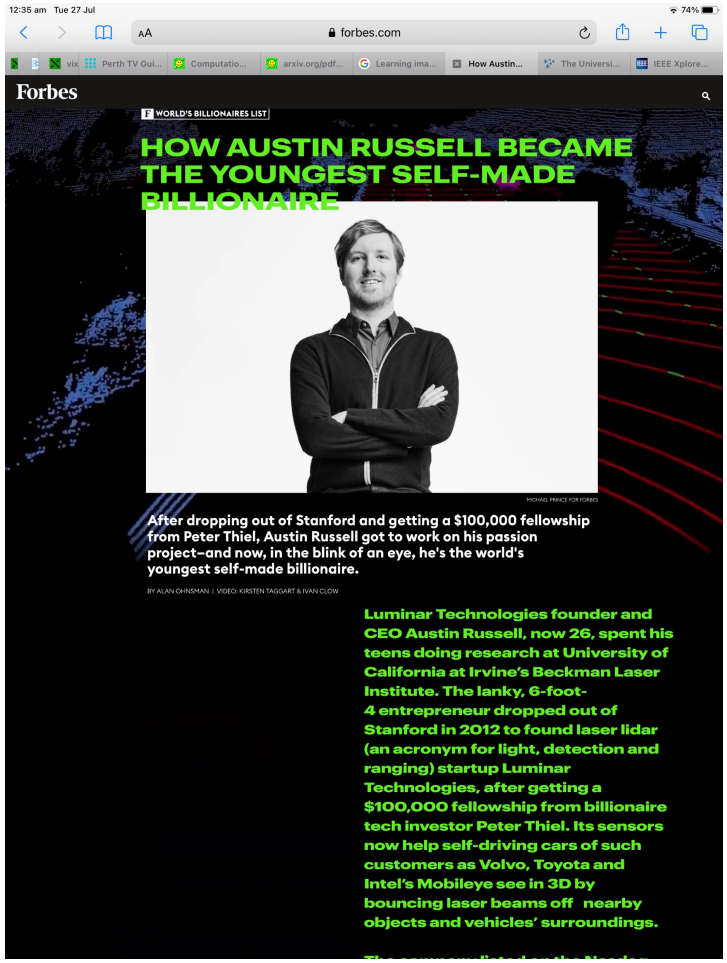
Follow the money!…who's made/making money….where investing?



Source https://www.visualcapitalist.com/the-biggest-companies-in-the-world-in-2021/

Follow the money!…who's made/making money….where investing?



#1299 Austin Russell

Founder, Luminar

PHOTO BY JAMEL TOPPIN FOR FORBES

REAL TIME NET WORTH

$1.8B as of 7/28/21

▼ $340 M | 15.75%

Reflects change since 5 PM ET of prior trading day

Follow the money! – what was it like in 1957?

Fortune's Wealthiest Americans (1957) [edit]

In 1957, *Fortune* magazine developed a list of the seventy-six *wealthiest Americans*, which was republished in many American newspapers.

Getty, when asked his reaction on being named *wealthiest American* and whether he was really worth a billion dollars, said "You know, if you can count your money, you don't have a billion dollars" and then famously added, "But remember, a billion dollars isn't worth what it used to be."[2]

$700,000,000 to $1,000,000,000

- Jean Paul Getty, Oil; business headquarters is in Los Angeles, California.

$400,000,000 to $700,000,000

- Mrs Mellon Bruce, the former Ailsa Mellon, New York, New York. Inherited wealth: Mellon Bank, Gulf Oil Company, Alcoa.
- Arthur Vining Davis, Miami, Florida; Alcoa, Florida real estate.,
- H. L. Hunt, Dallas, Texas; independent oil operator.
- Paul Mellon, Upperville, Virginia; inherited wealth.
- Richard King Mellon, Pittsburgh, Pennsylvania; inherited wealth: Alcoa, Gulf Oil, Mellon Bank, etc
- John D. Rockefeller Jr., New York inherited wealth: Standard Oil Trust.
- Mrs. Alan M. Scaife, the former Sarah Mellon, Pittsburgh. Inherited wealth.

$200,000,000 to $400,000,000

- Irénée du Pont, Wilmington, Delaware and Cuba; inherited wealth: E. I du Pont de Nemours & Co.
- William du Pont Jr., Wilmington; inherited wealth: E. I du Pont de Nemours & Co.
- Mrs. Frederick Guest, the former Amy Phipps, Palm Beach, Florida. Inherited wealth.
- Howard Hughes, Los Angeles; inherited wealth: Hughes Tool Company.
- Joseph P. Kennedy, Boston, Massachusetts-New York; real estate.

Oil

Manufacturing/
Metals

Finance

Source
Wikepedia

Clearly AI will makes some of us rich….Will AI (eventually) put us all out of jobs…ask an economist! (spoiler - not for a while at least)

Some stats….

PEER-REVIEWED AI PUBLICATIONS (% of TOTAL), 2000-19

Source: Elsevier/Scopus, 2020 | Chart: 2021 AI Index Report

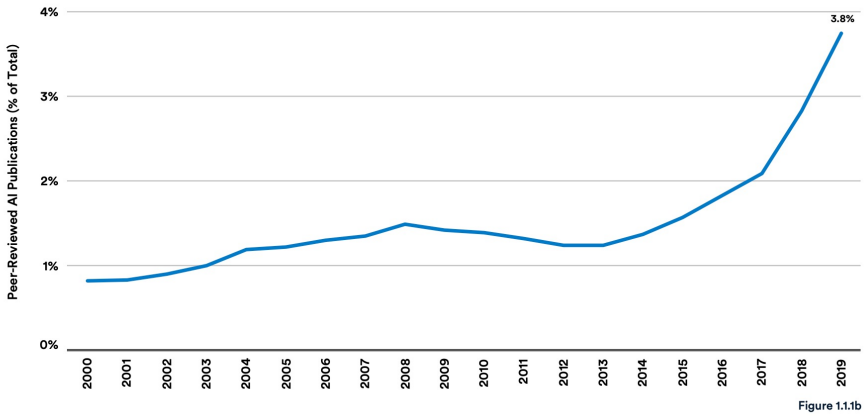


Figure 1.1.1b

PEER-REVIEWED AI PUBLICATIONS (% of TOTAL) by REGION, 2000-19

Source: Microsoft Academic Graph, 2020 | Chart: 2021 AI Index Report

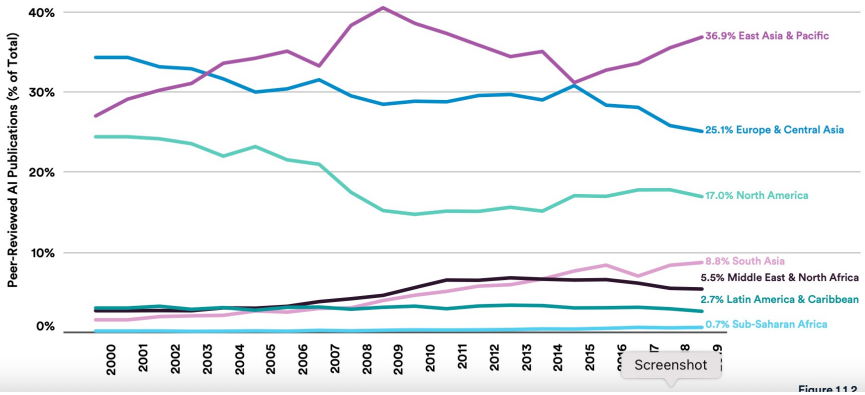


Figure 1.1.2

Some stats….

PEER-REVIEWED AI PUBLICATIONS' FIELD-WEIGHTED CITATION IMPACT and NUMBER of ACADEMIC-CORPORATE PEER-REVIEWED AI PUBLICATIONS, 2019

Source: Elsevier/Scopus, 2020 | Chart: 2021 AI Index Report

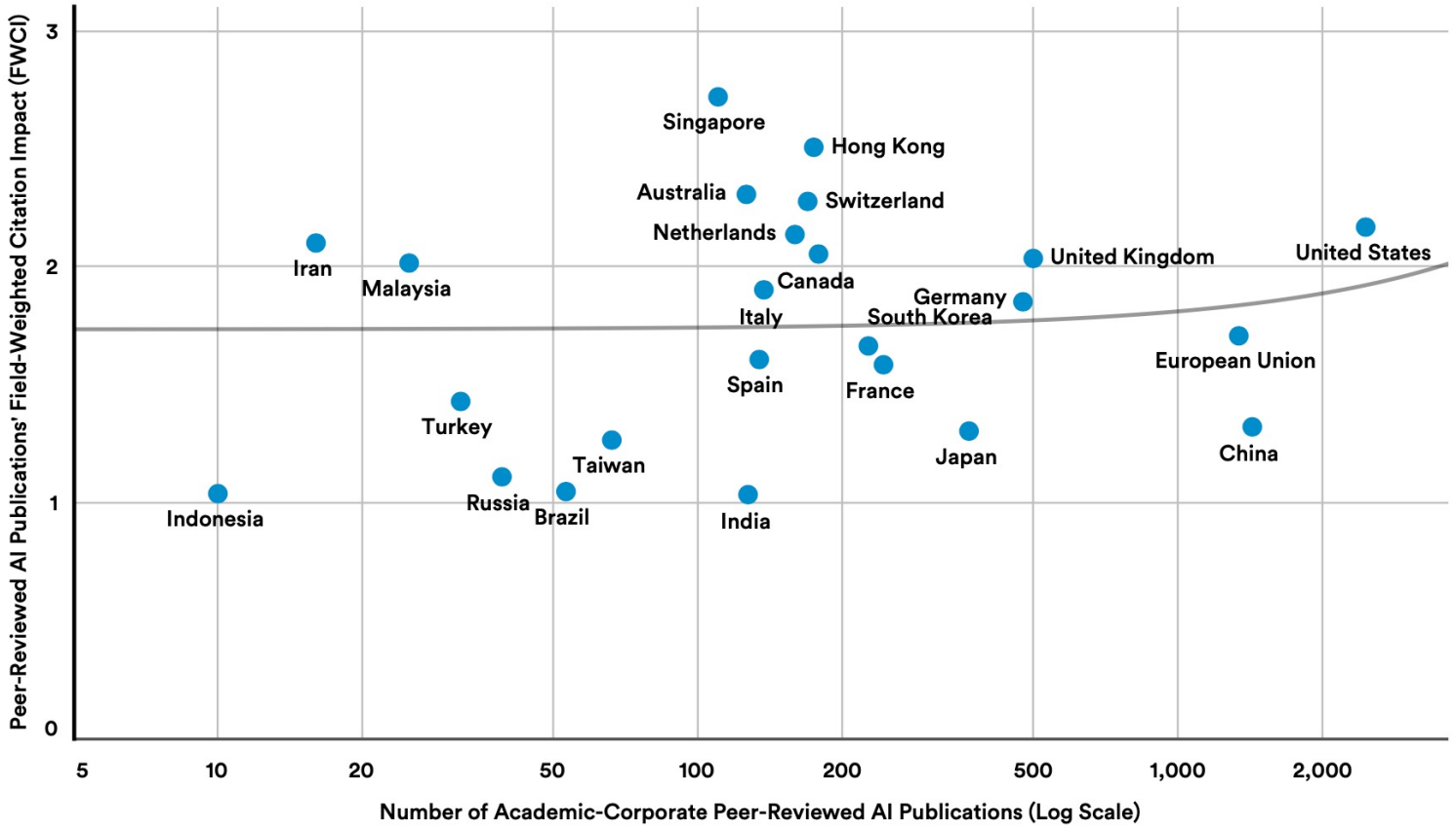


Figure 1.1.6

Some stats….

Deep Learning Papers on arXiv

With increased access to data and significant improvements in computing power, the field of deep learning (DL) is growing at breakneck speed. Researchers from Nesta used a topic modeling algorithm to identify the deep learning papers on arXiv by analyzing the abstract of arXiv papers under the Computer Science (CS) and Machine Learning in Statistics (state.ML) categories. Figure 1.1.20 suggests that in the last five years alone, the overall number of DL publications on arXiv grew almost sixfold.

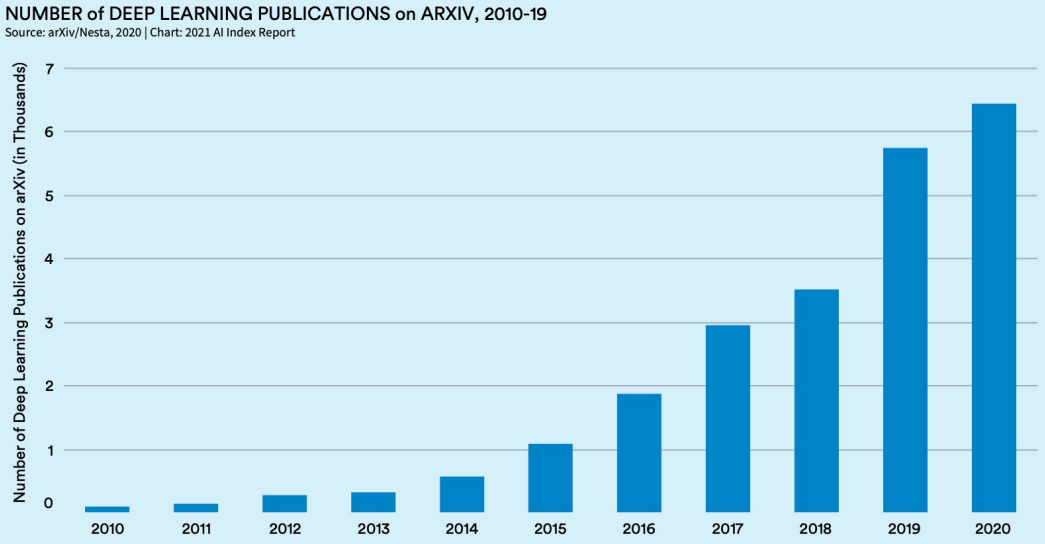


Figure 1.1.20

Some stats….

NUMBER of GITHUB STARS by AI LIBRARY, 2014-20

Source: GitHub, 2020 | Chart: 2021 AI Index Report

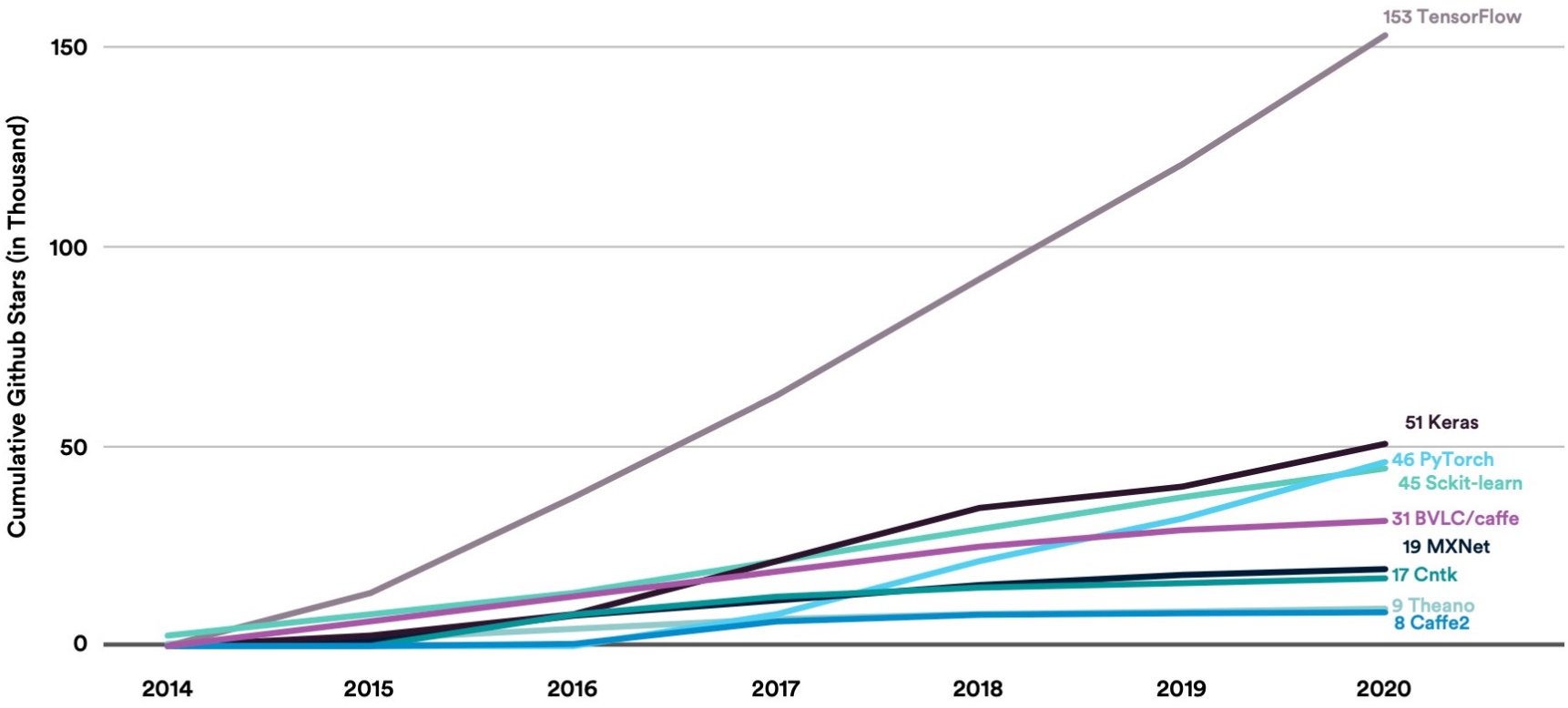


Figure 1.3.1

Some stats….

IMAGENET CHALLENGE: TOP-5 ACCURACY

Source: Papers with Code, 2020; AI Index, 2021 | Chart: 2021 AI Index Report

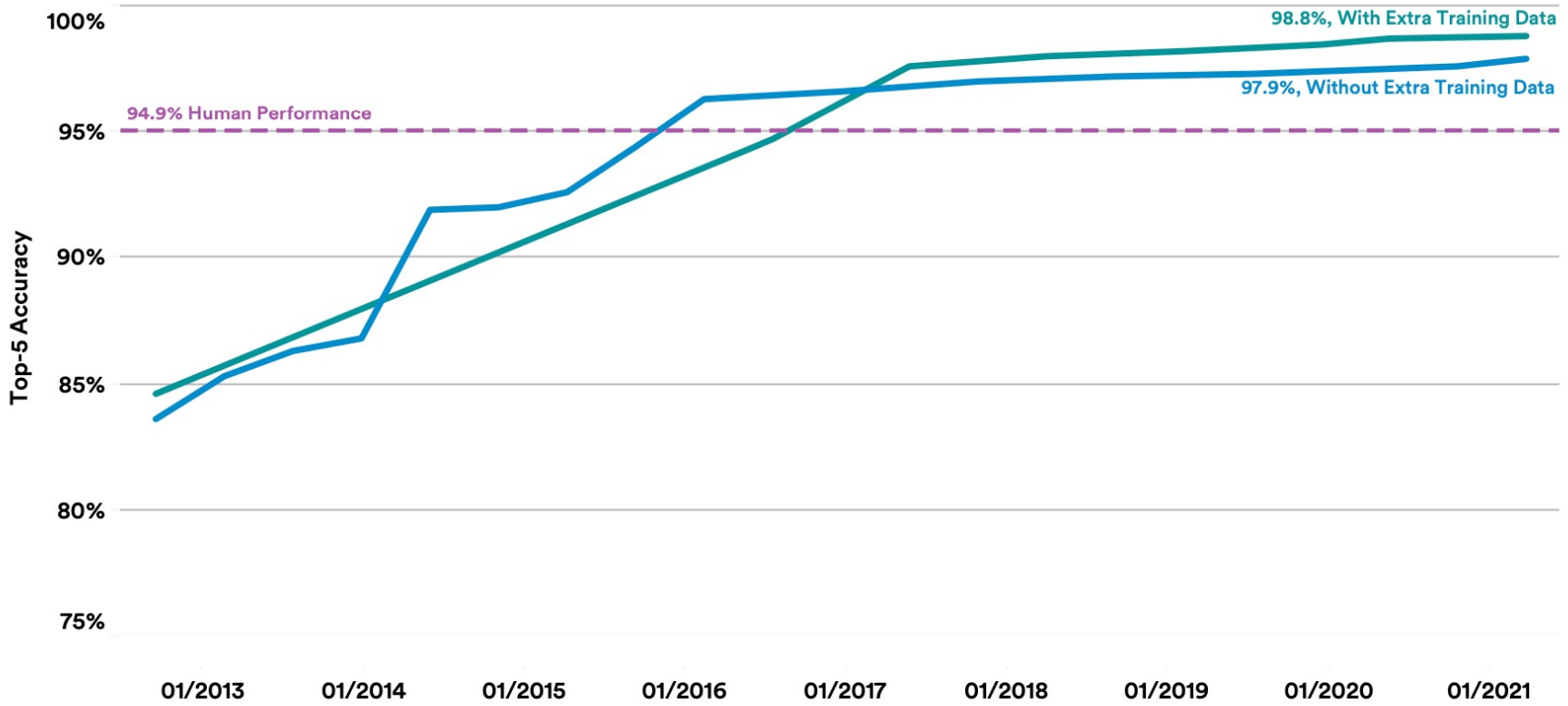


Figure 2.1.2

2 Note: For data on human error, a human was shown 500 images and then was asked to annotate 1,500 test images; their error rate was 5.1% for Top-5 classification. This is a very rough baseline, but it gives us a sense of human performance on this task.

Some stats....

ImageNet: Training Costs

How much does it cost to train a contemporary image-recognition system? The answer, according to tests run by the Stanford DAWNBench team, is a few dollars in 2020, down by around 150 times from costs in 2017 (Figure 2.1.5). To put this in perspective, what cost one entrant around USD 1,100 to do in October 2017 now costs about USD 7.43. This represents progress in algorithm design as well as a drop in the costs of cloud-computing resources.

IMAGENET: TRAINING COST (to 93% ACCURACY)

Source: DAWNBench, 2020 | Chart: 2021 AI Index Report

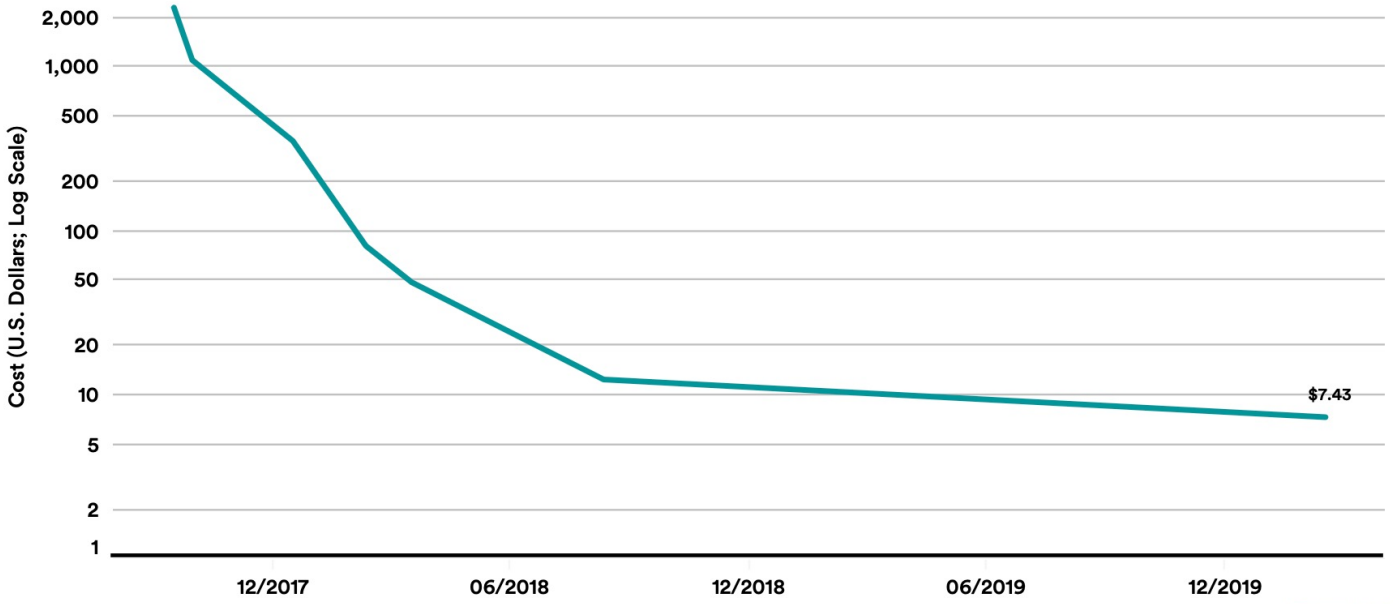


Figure 2.1.5

Some stats….

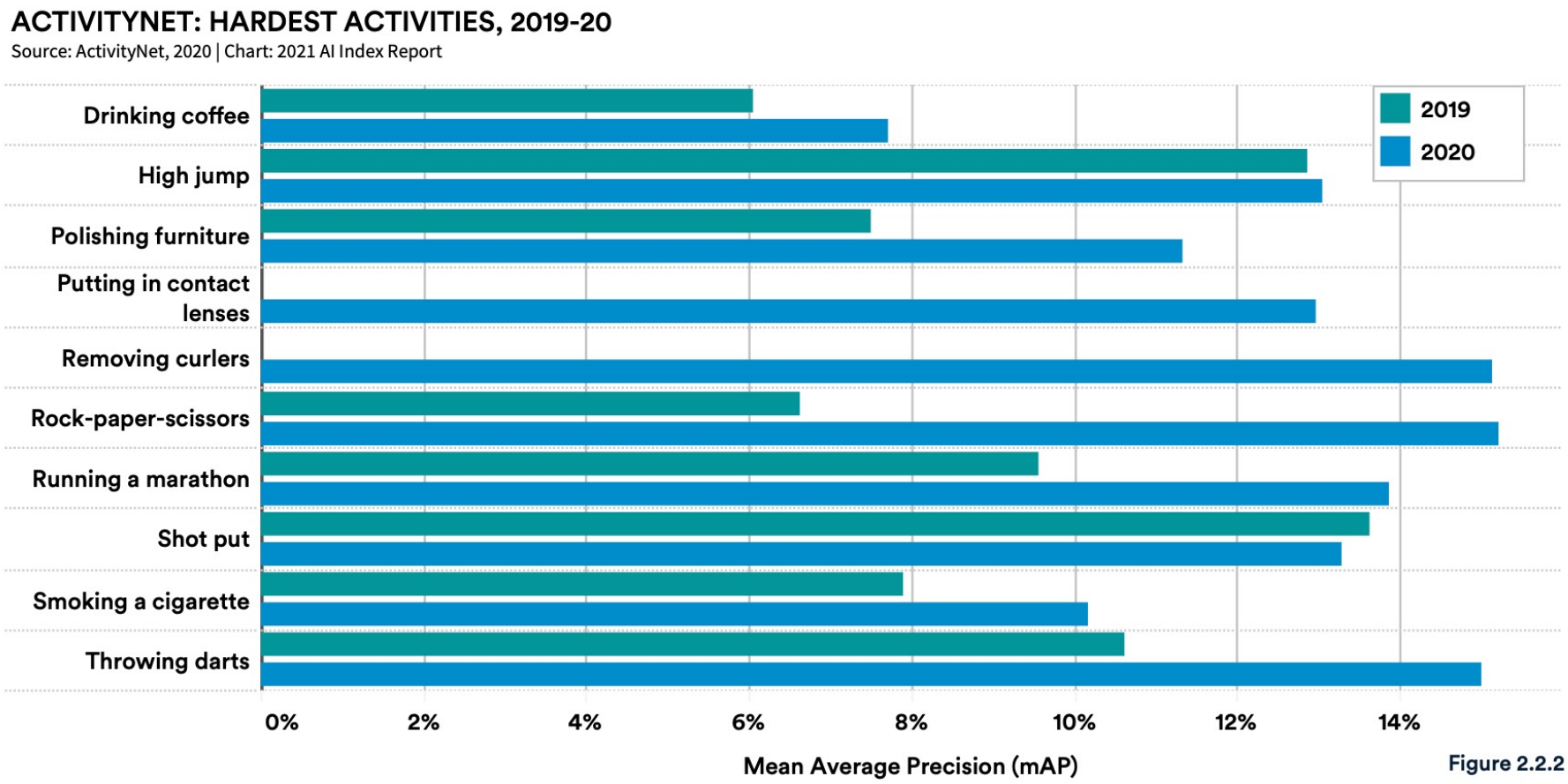


Figure 2.2.2

Some stats….

Q&A
wikepedia

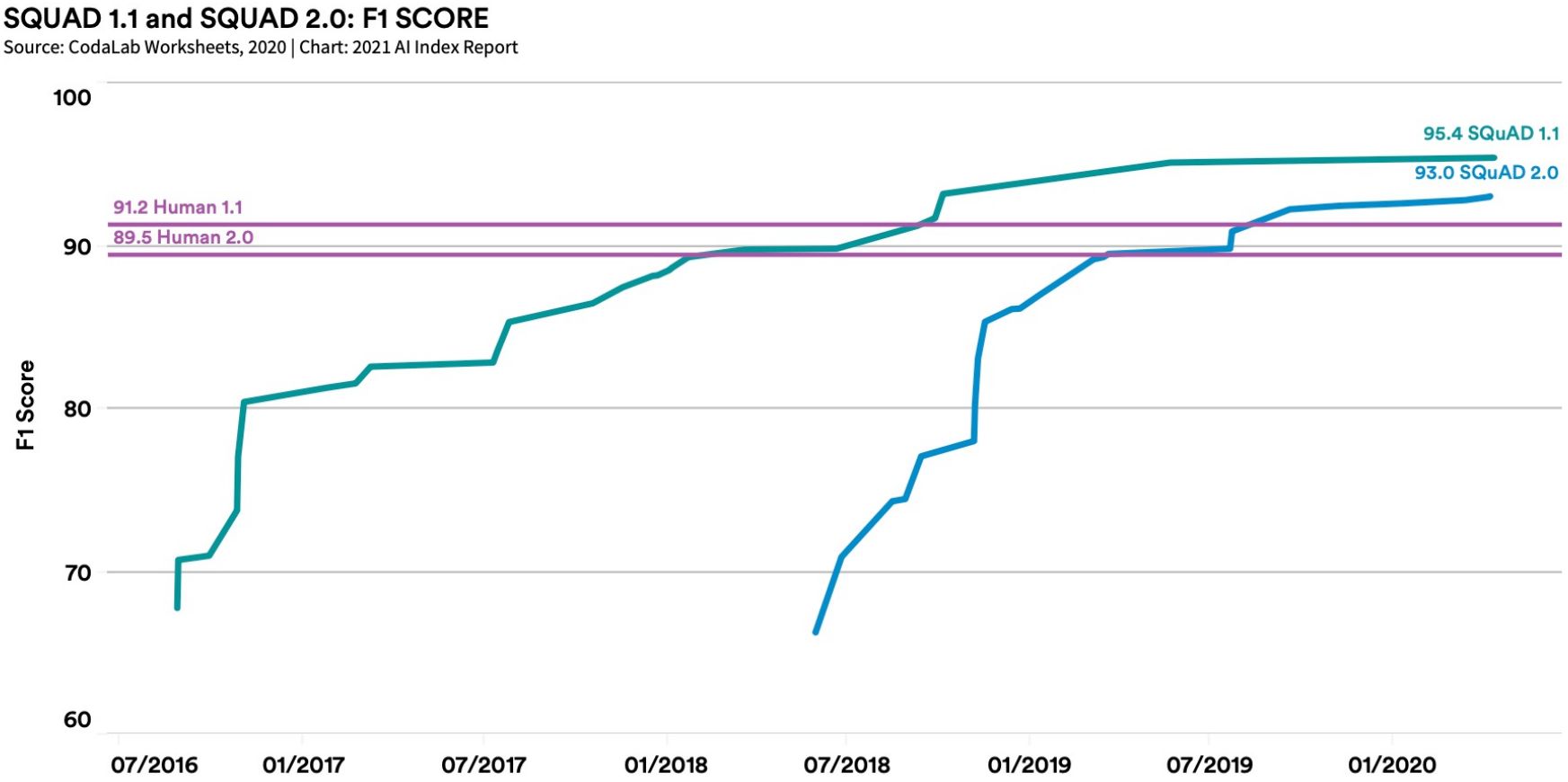


Figure 2.3.2

Some stats….

Language Understanding

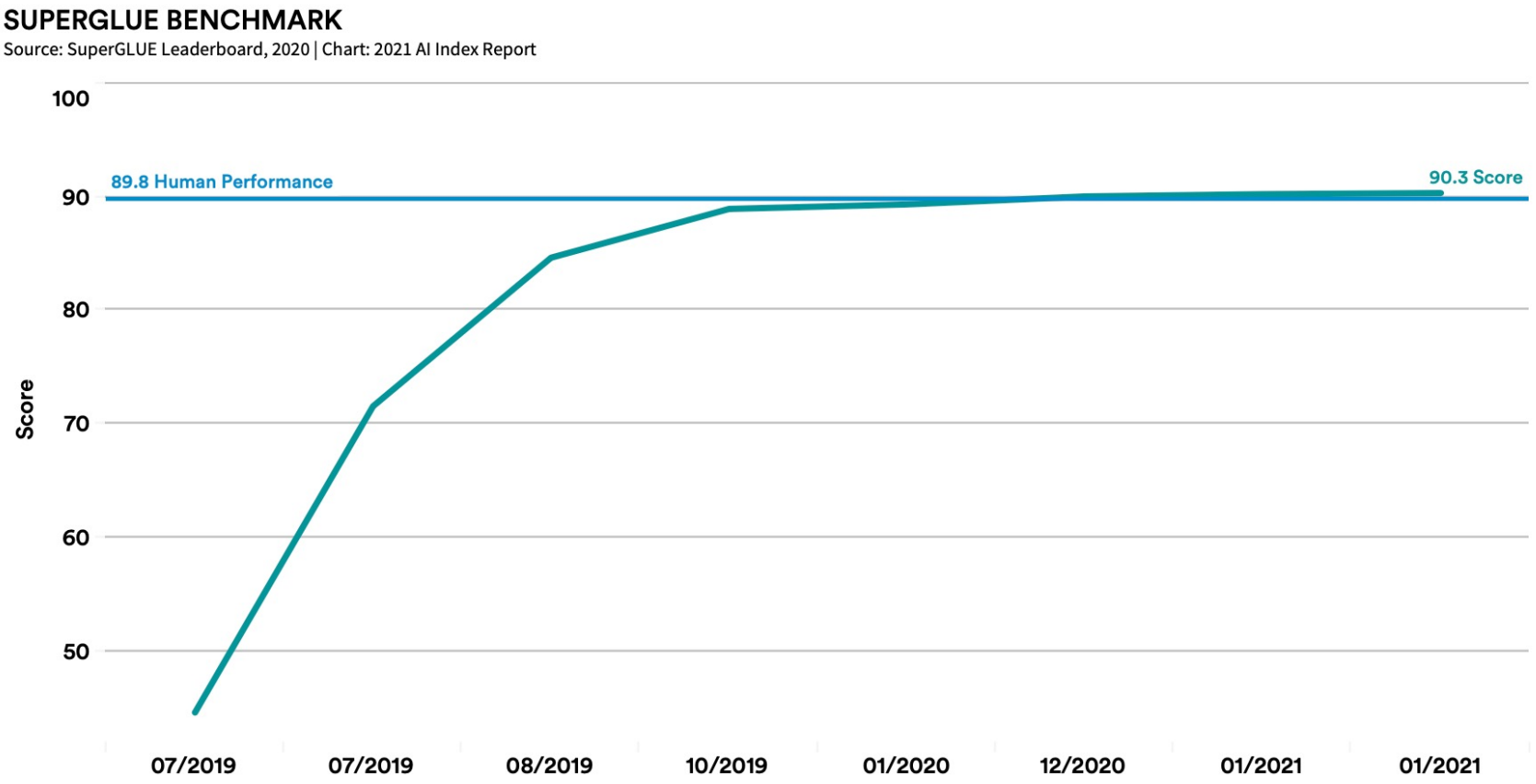


Figure 2.3.1

Some stats….

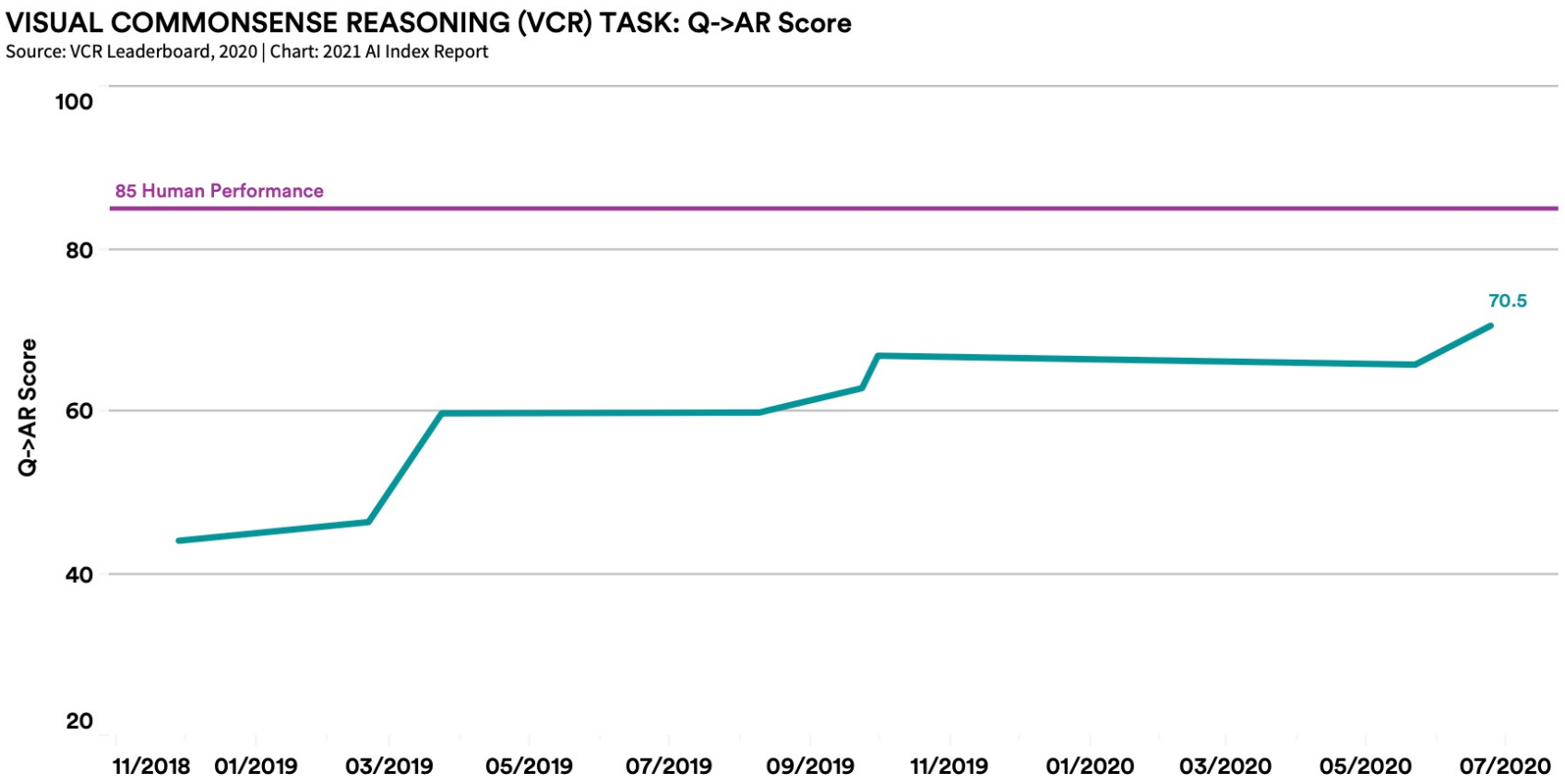


Figure 2.4.2

Some stats….

CHEMICAL SYNTHESIS PLANS BENCHMARK: TOP-1 TEST ACCURACY

Source: Schwaller, 2020 | Chart: 2021 AI Index Report

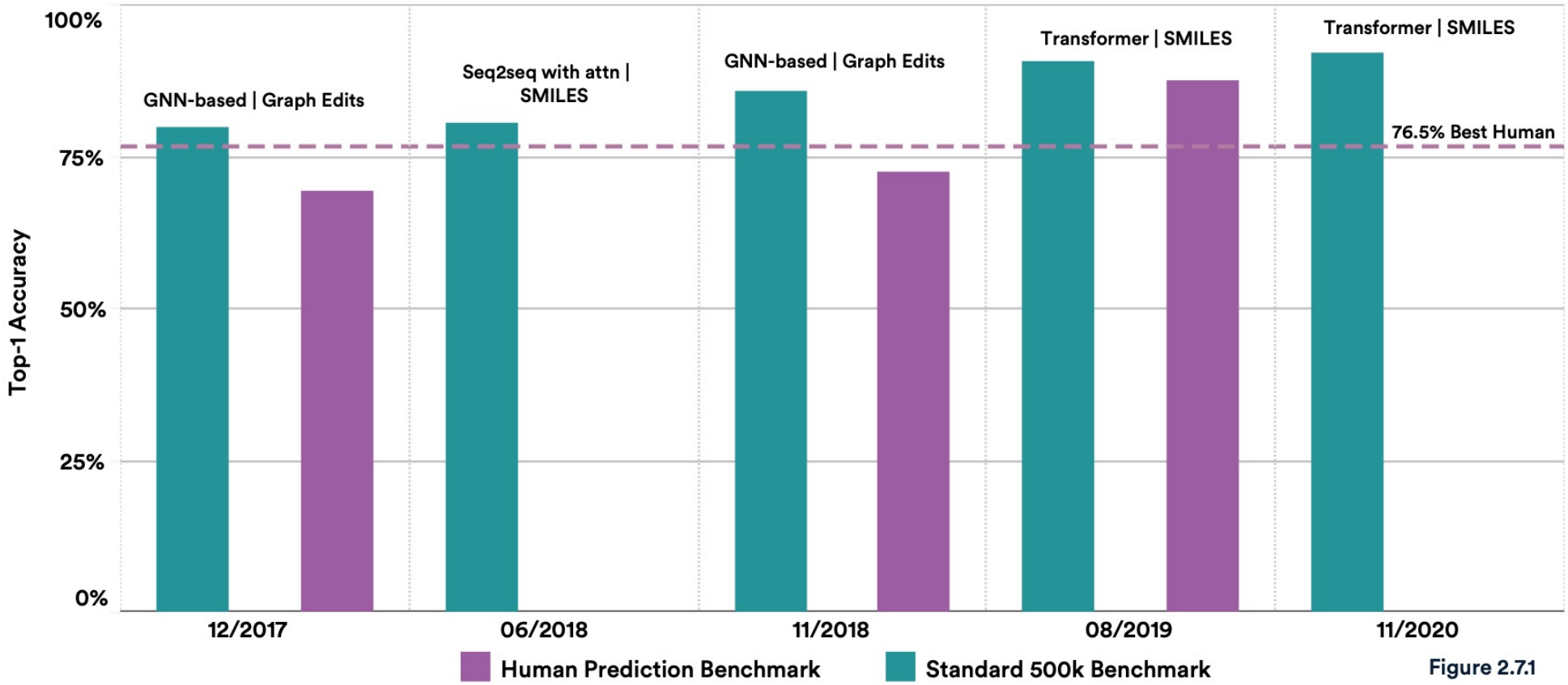


Figure 2.7.1

6 Acknowledgment: Philippe Schwaller at IBM Research–Europe and the University of Bern provided instructions and resources for gathering and analyzing the data.

Some stats….

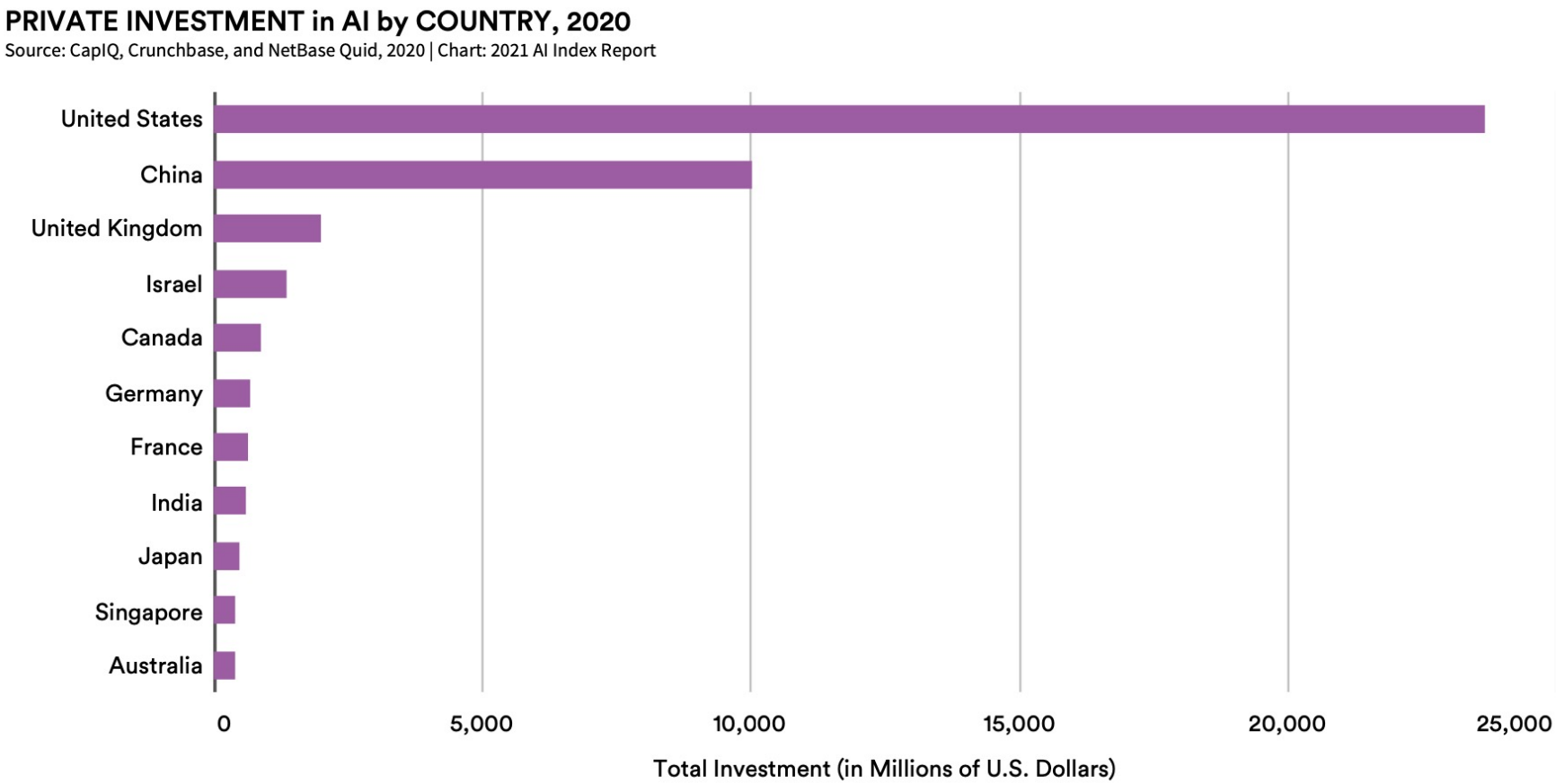


Figure 3.2.4

Some stats….

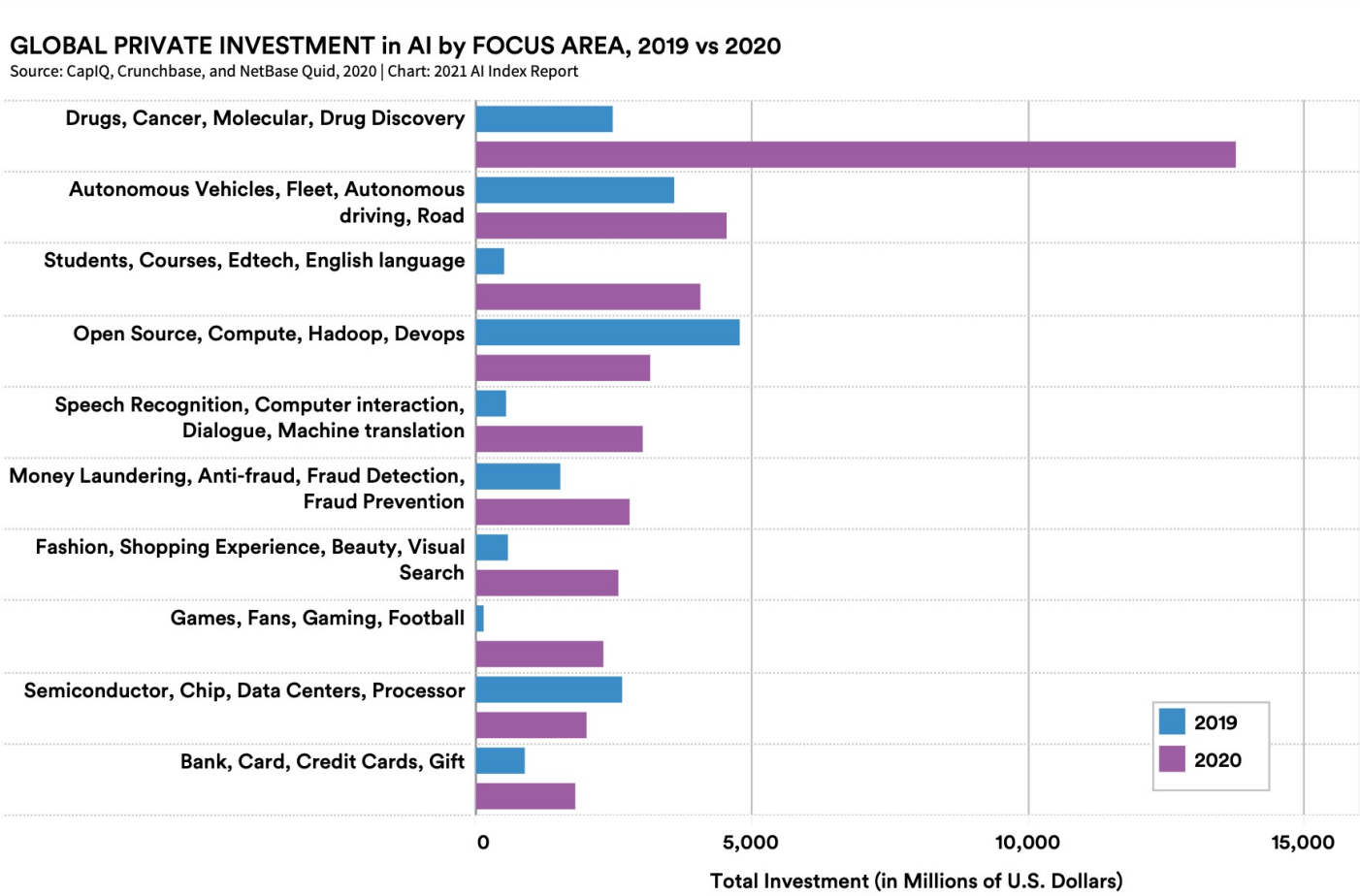


Figure 3.2.6

Some stats….

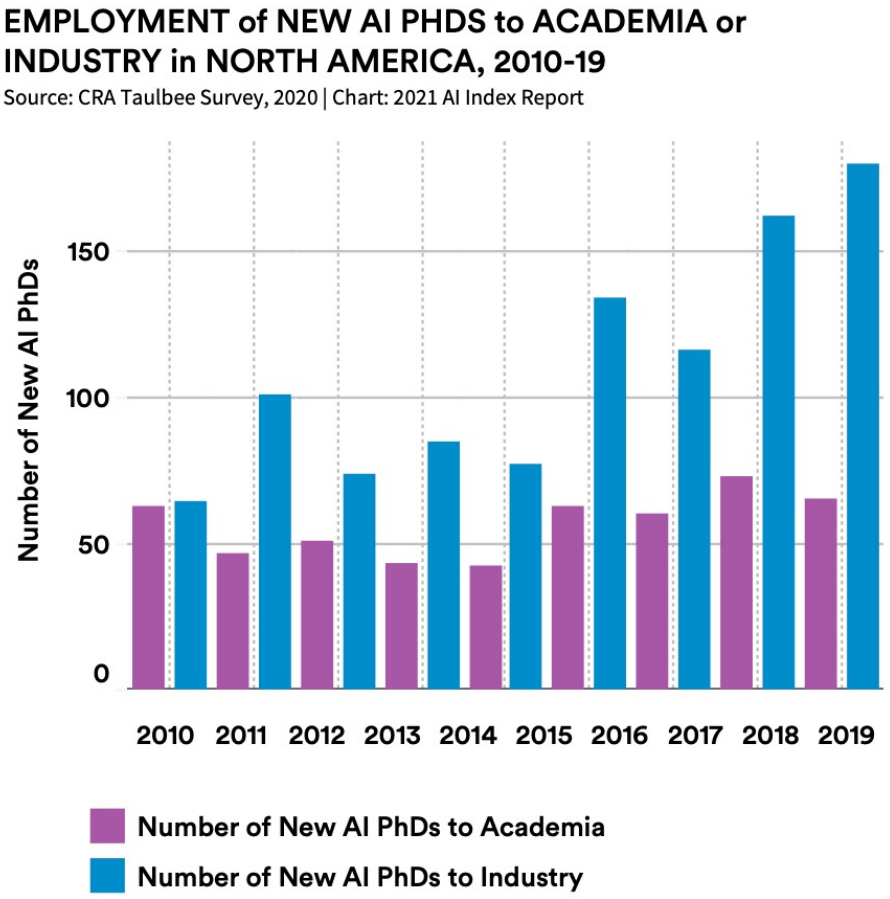


Figure 4.2.5a

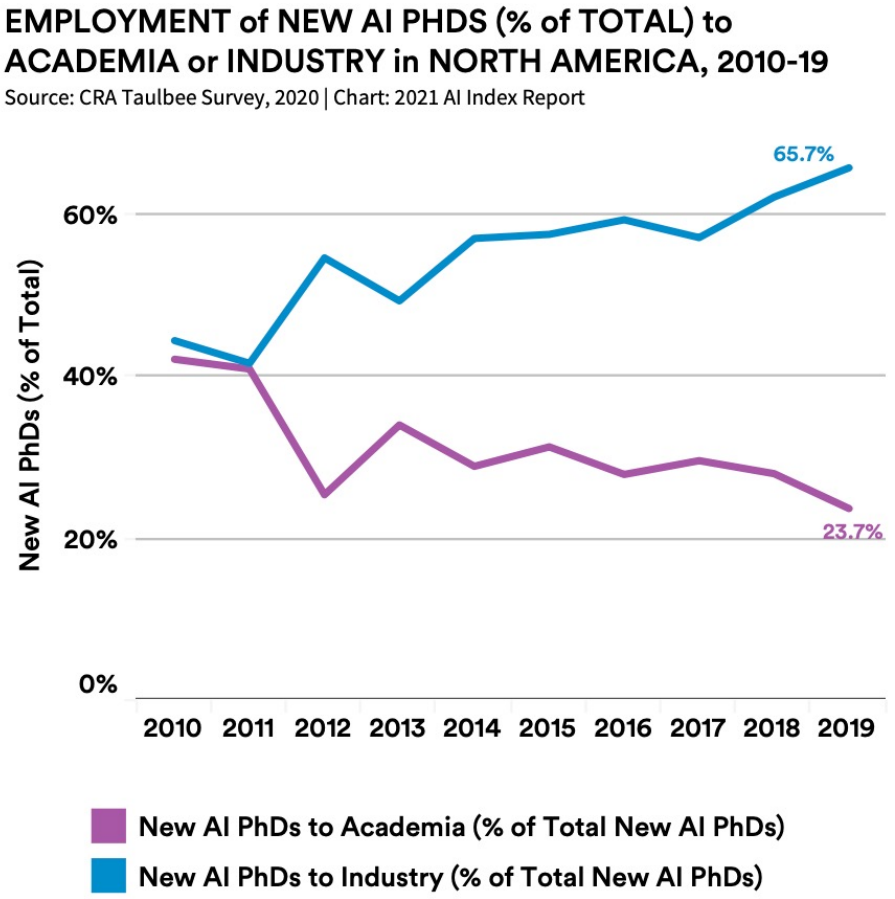


Figure 4.2.5b

So let's create a classifier for a task ***most of you*** would ***not know how to do*** without clues/teaching….

Google has MLKit for machine learning (especially for android), Apple has CoreML 2; IBM, Amazon, Google have cloud based speech recognition and chatbot frameworks you can build/access in your apps…

You don't need to be an AI expert (or to some extent an "expert programmer") to invent the next AI app/market!

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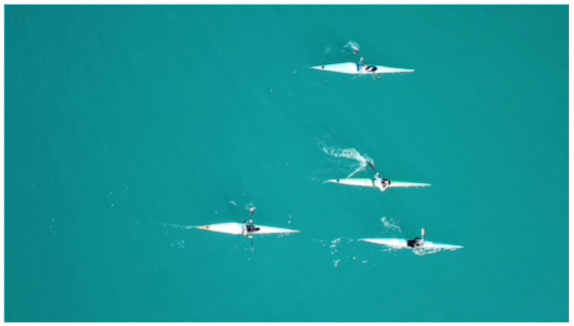
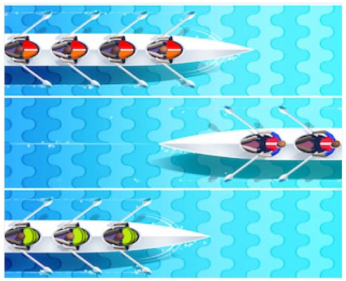









To teach my machine to distinguish “kayak race” from “rowing race”

Scrape google images for 300 of each

Curate images (remove “wrong” or “not useful” images)

Throw away some rowing images because need balanced training data

Put aside some of each for training and testing..

Around 145 of each for training

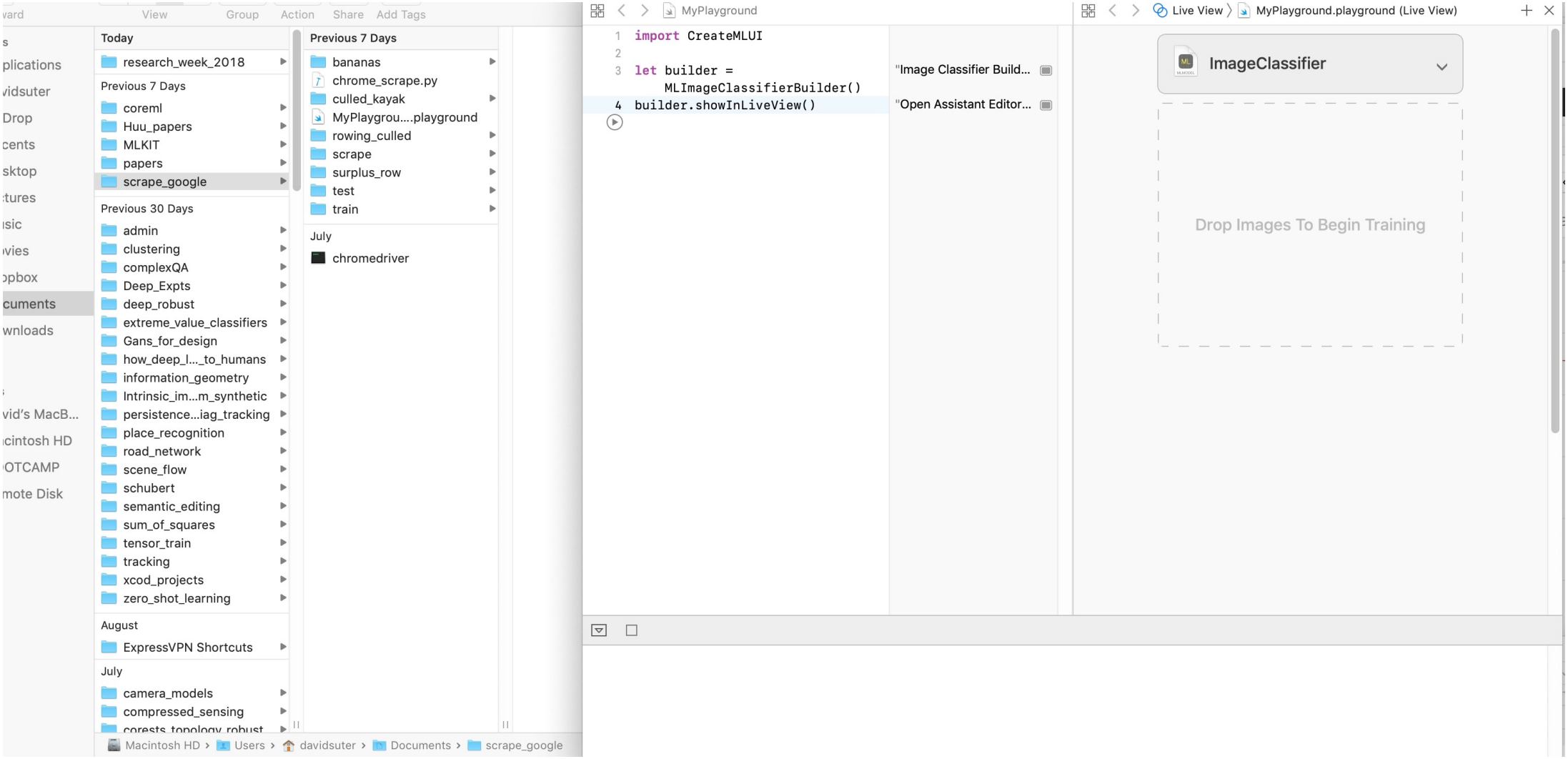
Around 30 of each for testing

Simply doing random choice (Head and Tails coin toss), probability of getting 100% right is (½)^60…i.e. 1 in around 1,152,921,504,606,850,000

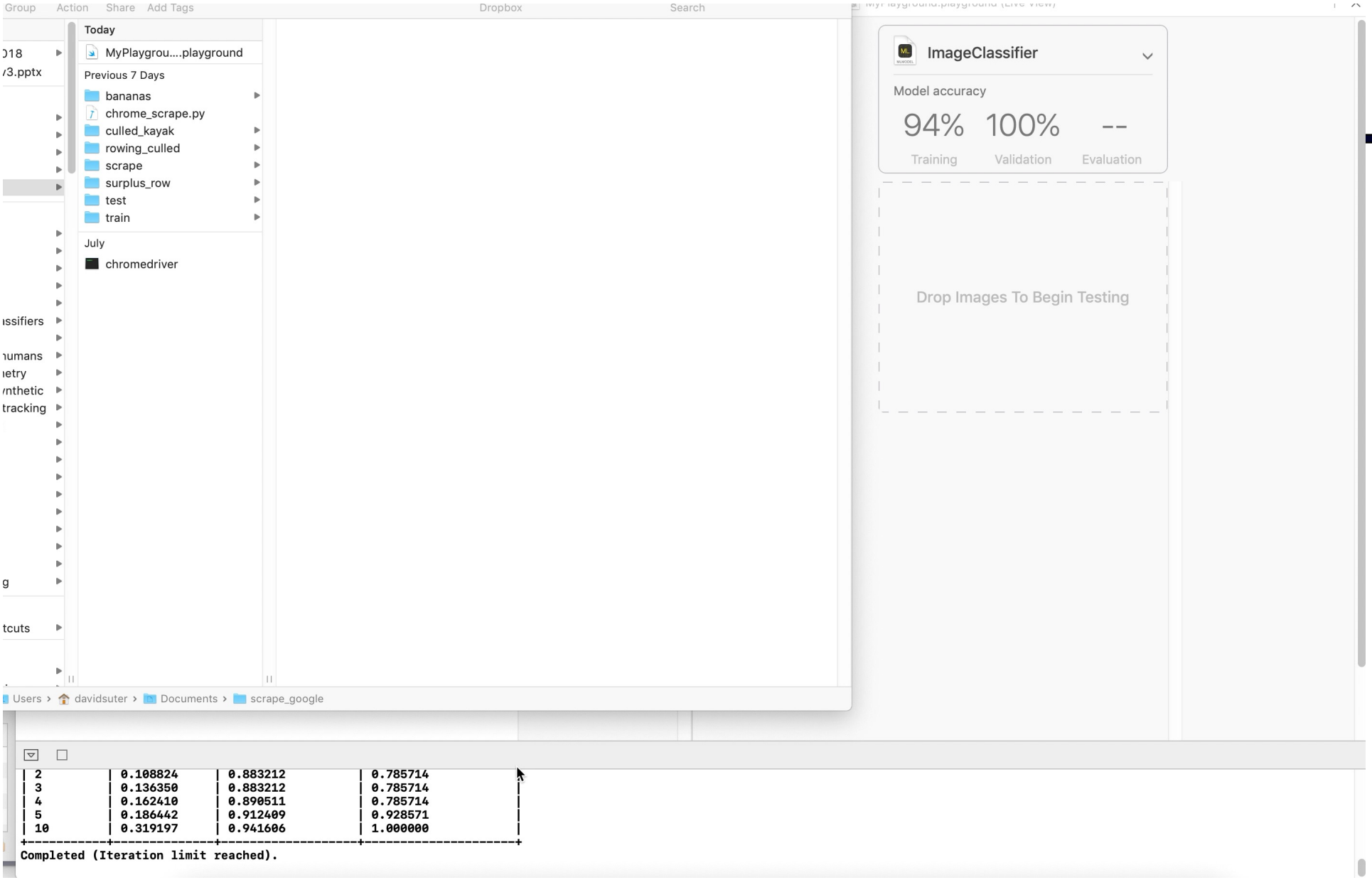
And on average would expect it would get around 30 wrong…

Examples of culled Kayak

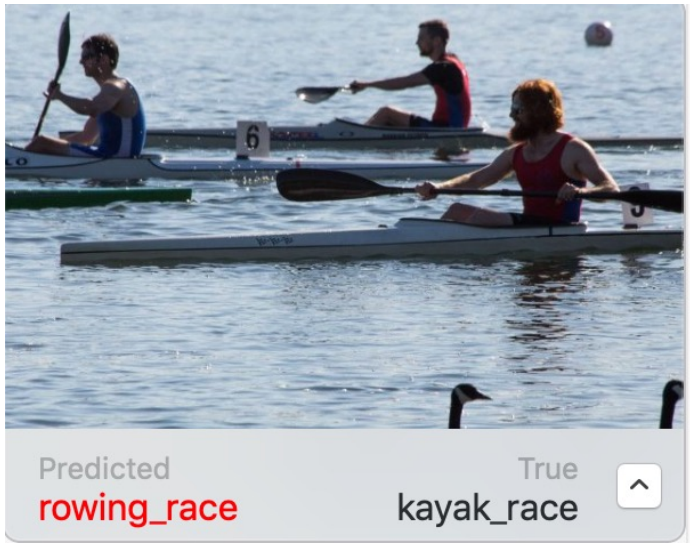
Examples of culled rowing race

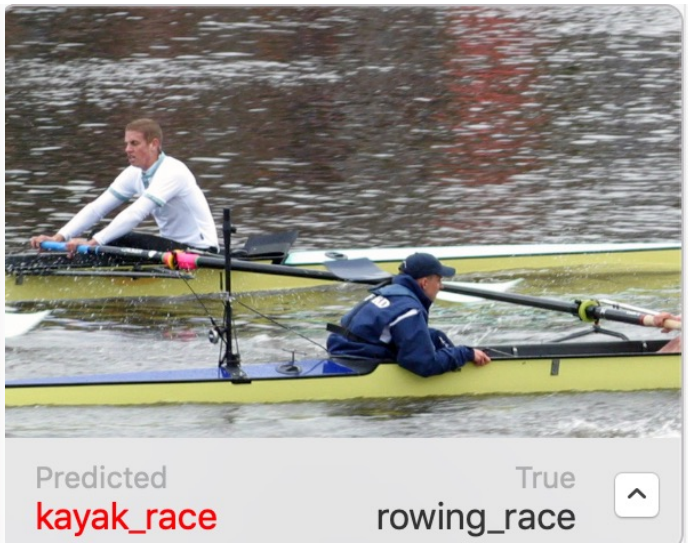

View
Group
Action
Share
Add Tags
Today
research_week_2018
Previous 7 Days
coreml
Huu_papers
MLKIT
papers
scrape_google
Previous 30 Days
admin
clustering
complexQA
Deep_Expts
deep_robust
extreme_value_classifiers
Gans_for_design
how_deep_l..._to_humans
information_geometry
Intrinsic_im...m_synthetic
persistence...iag_tracking
place_recognition
road_network
scene_flow
schubert
semantic_editing
sum_of_squares
tensor_train
tracking
xcod_projects
zero_shot_learning
August
ExpressVPN Shortcuts
July
camera_models
compressed_sensing
Previous 7 Days
bananas
chrome_scrape.py
culled_kayak
MyPlaygrou....playground
rowing_culled
scrape
surplus_row
test
train
July
chromedriver
Macintosh HD
Users
davidsuter
Documents
scrape_google
MyPlayground
import CreateMLUI
let builder =
MLImageClassifierBuilder()
builder.showInLiveView()
"Image Classifier Build...
"Open Assistant Editor...
Live View
MyPlayground.playground (Live View)
ImageClassifier
Drop Images To Begin Training

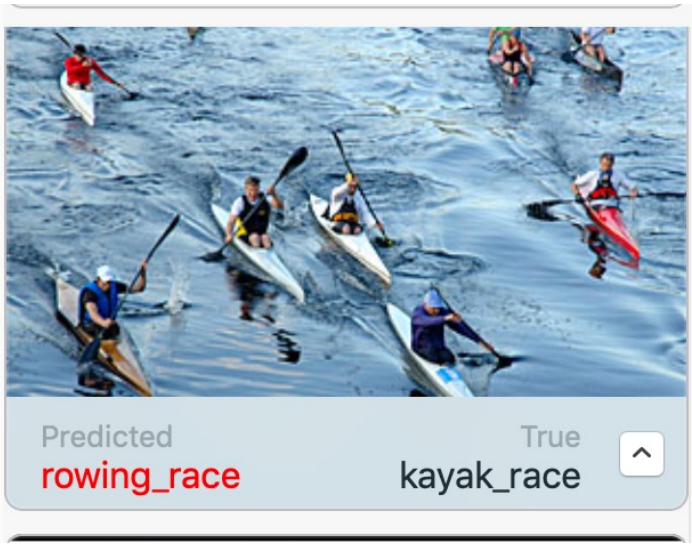
But training accuracy is one thing…testing accuracy is another…


Group
Action
Share
Add Tags
Dropbox
Search
Today
MyPlaygrou....playground
Previous 7 Days
bananas
chrome_scrape.py
culled_kayak
rowing_culled
scrape
surplus_row
test
train
July
chromedriver
ImageClassifier
Model accuracy
94%
100%
--
Training
Validation
Evaluation
Drop Images To Begin Testing
Users
davidsuter
Documents
scrape_google
2	0.108824	0.883212	0.785714
3	0.136350	0.883212	0.785714
4	0.162410	0.890511	0.785714
5	0.186442	0.912409	0.928571
10	0.319197	0.941606	1.000000
Completed (Iteration limit reached).

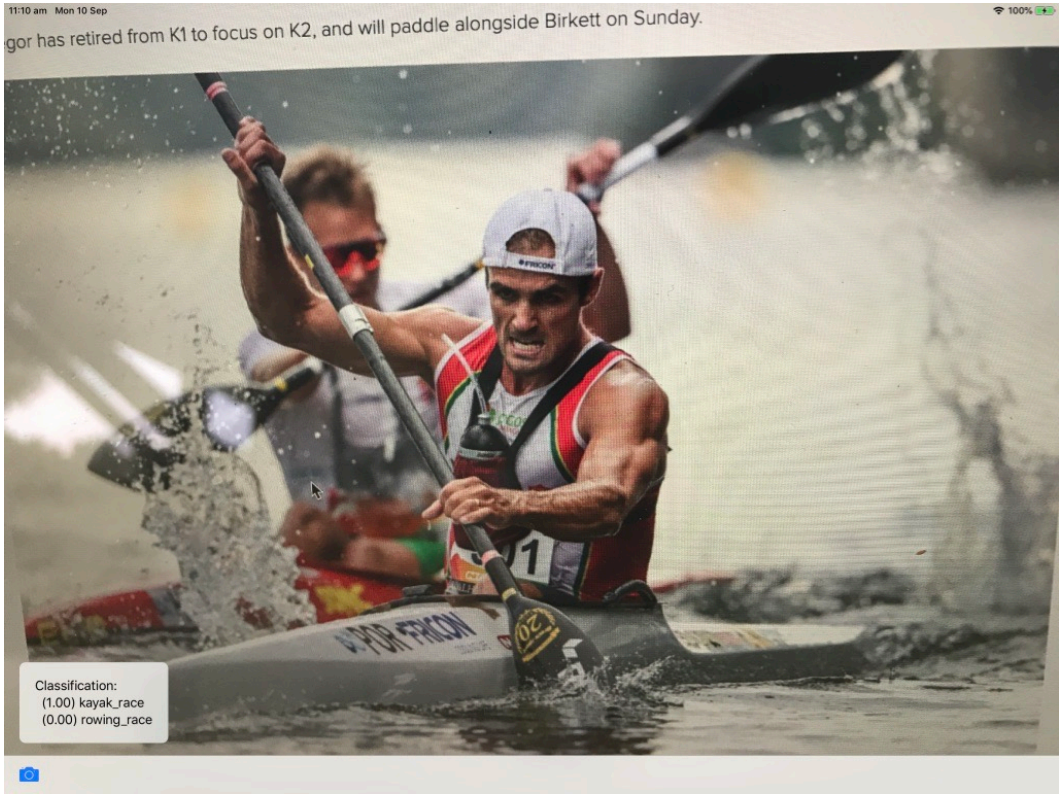
3 images of 60, misclassified..







Once trained, save model, drag and drop to project for mobile device…



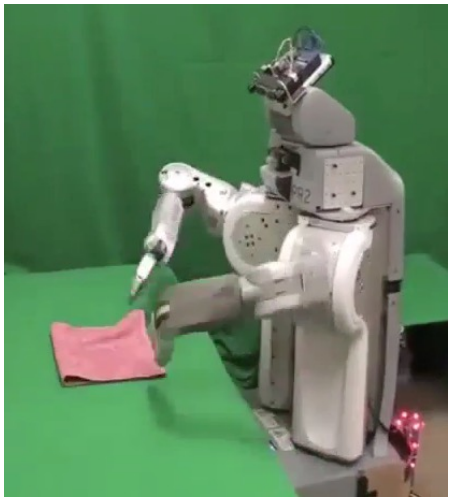
The world's *first* (and only…) device "capable" of telling a racing kayak from a racing row boat…you can tell your grandchildren you were around to see it! ☺ ☺

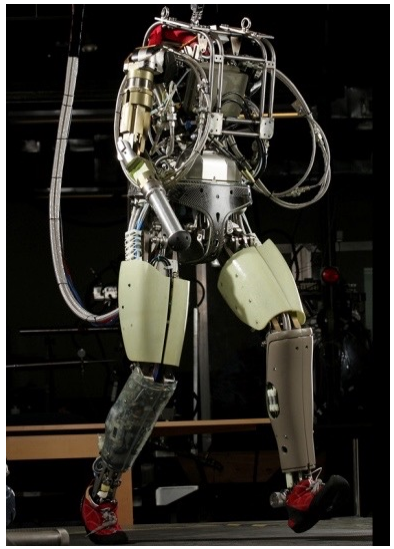
Vision (Perception)

Take a look at CoreML (Apple) or MLKit (Google)!!

Robotics

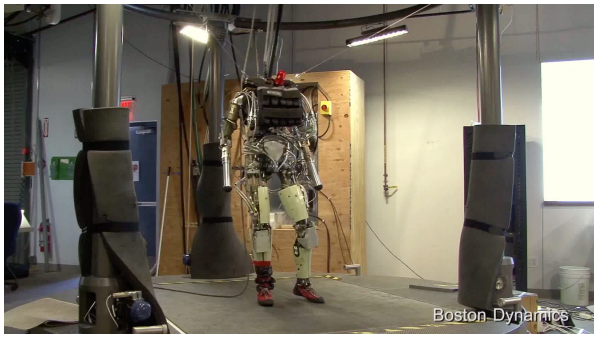
- Robotics
  - Part mech. eng.
  - Part AI
  - Reality much harder than simulations!
- Technologies
  - Vehicles
  - Rescue
  - Soccer!
  - Lots of automation…
- In this class:
  - We ignore mechanical aspects
  - Methods for planning
  - Methods for control





Images from UC Berkeley, Boston Dynamics, RoboCup, Google

Robotics



Images from UC Berkeley, Boston Dynamics, RoboCup, Google

Logic

- Logical systems
  - Theorem provers
  - NASA fault diagnosis
  - Question answering
- Methods:
  - Deduction systems
  - Constraint satisfaction
  - Satisfiability solvers (huge advances!)

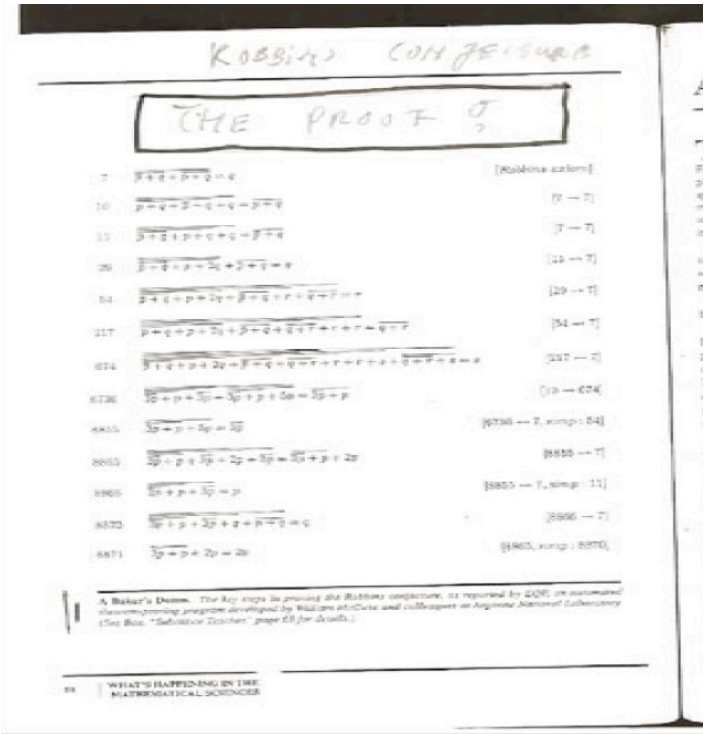
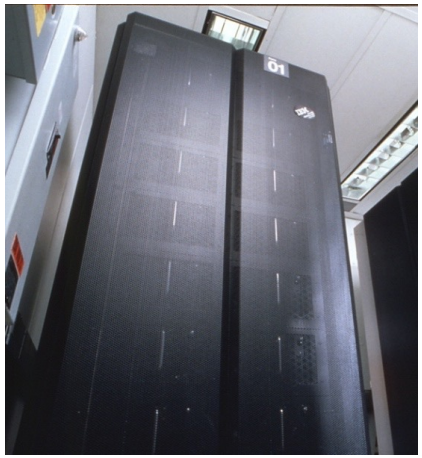


Image from Bart Selman

Game Playing

- Classic Moment: May, '97: Deep Blue vs. Kasparov
  - First match won against world champion
  - “Intelligent creative” play
  - 200 million board positions per second
  - Humans understood 99.9 of Deep Blue's moves
  - Can do about the same now with a PC cluster

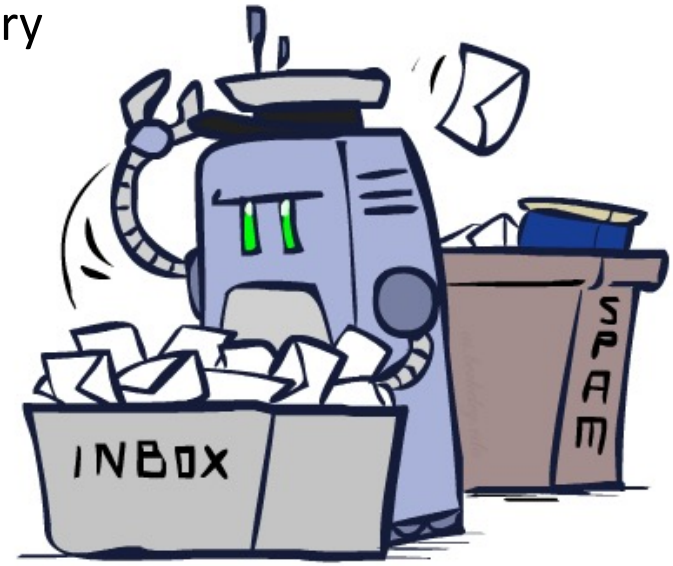


- Open question:
  - How does human cognition deal with the search space explosion of chess?
  - Or: how can humans compete with computers at all??
- 1996: Kasparov Beats Deep Blue
  “I could feel --- I could smell --- a new kind of intelligence across the table.”
- 1997: Deep Blue Beats Kasparov
- Huge game-playing advances recently, e.g. in Go!

Text from Bart Selman, image from IBM’s Deep Blue pages

Decision Making

- Applied AI involves many kinds of automation
  - Scheduling, e.g. airline routing, military
  - Route planning, e.g. Google maps
  - Medical diagnosis
  - Web search engines
  - Spam classifiers
  - Automated help desks
  - Fraud detection
  - Product recommendations
  - … Lots more!



Current and past students

- Giang (expected completion ”end of year” – internship NVIDIA Automative)
- Zhipeng (2020) Intel Intelligent Systems Lab (California)
- Truong (2014) NVIDIA Automotive (California)
- Huy (2014) Own startup – was with NEC Labs US
- Julio (2014) Apple research California
- Alvaro (2012) (Centre for Robotic Vision)
- Plus “lots” in academic positions including Professors at Adelaide, RMIT, NTU Singapore, Xiamen PRC……postdocs at prestigious Unis (Sweden, Australia, China…)