

Digital Education

“They couldn't even code!”
Digital illiteracy as a major
societal risk factor

Prof. Marcel Salathé, Digital Epidemiology Lab, EPFL
EPFL Extension School

 @marcelsalathe



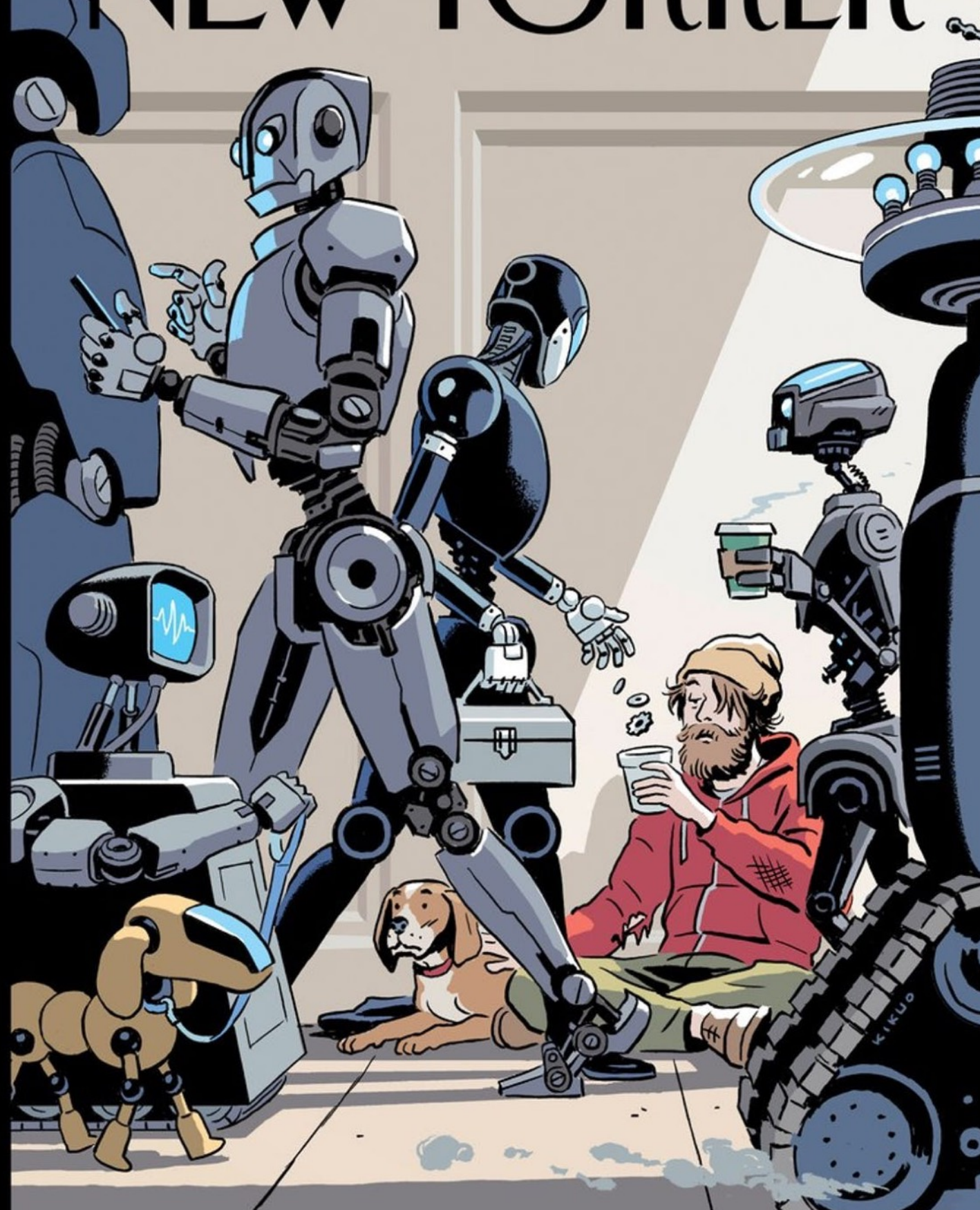
“They couldn’t even code!”

PRICE \$8.99

THE

OCT. 23, 2017

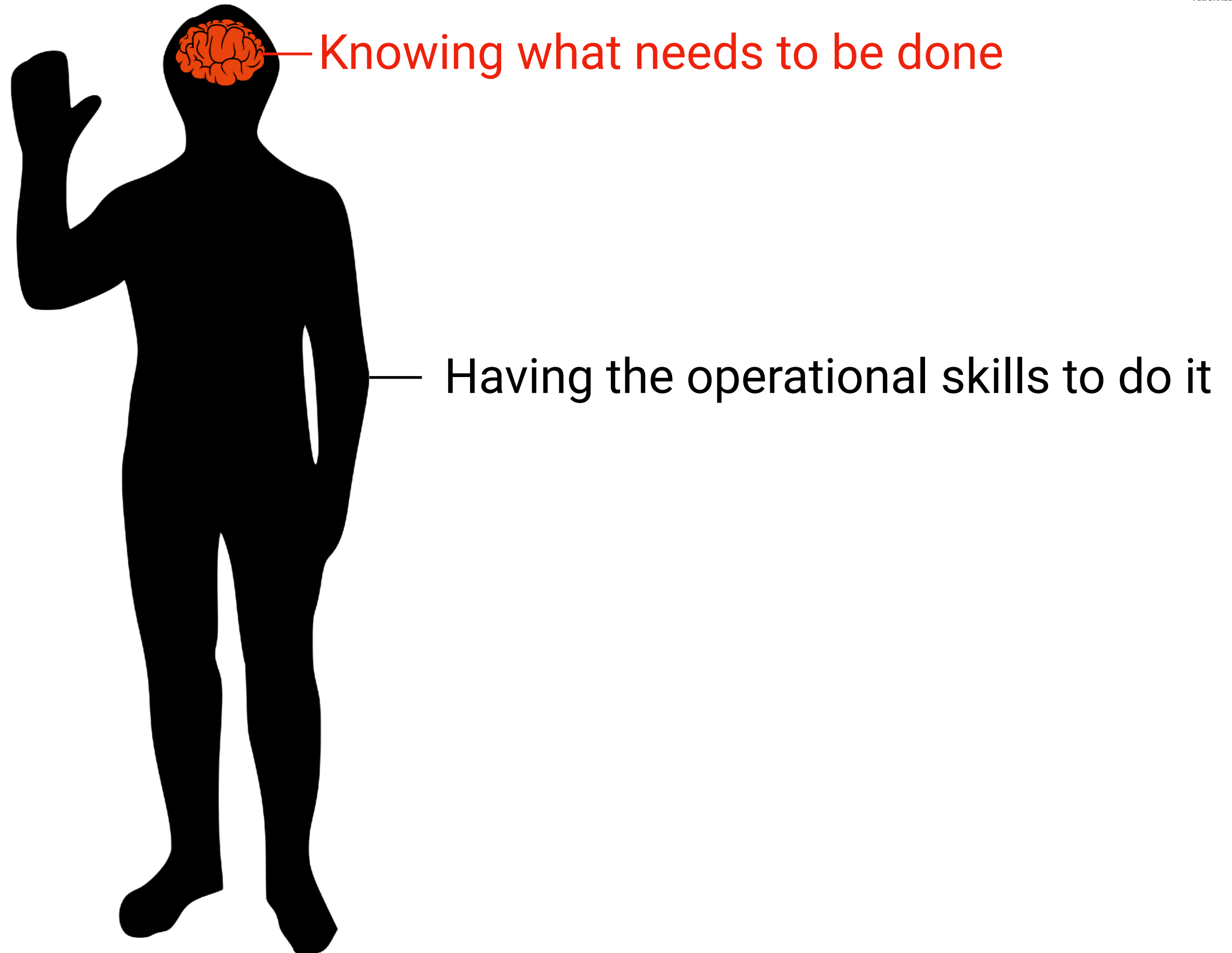
NEW YORKER

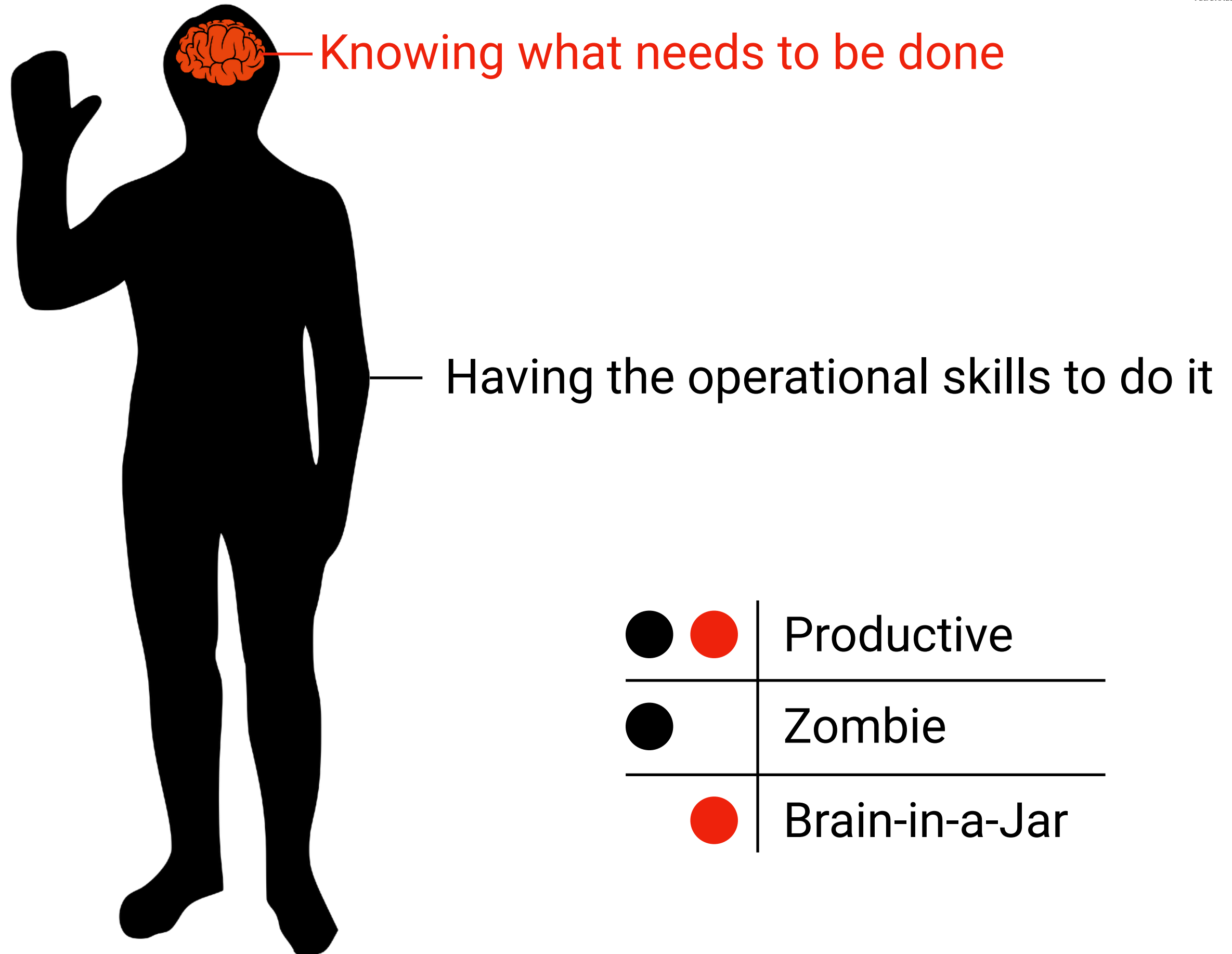


Computational skills are advanced skills.

basic

Computational skills are ~~advanced~~ skills.





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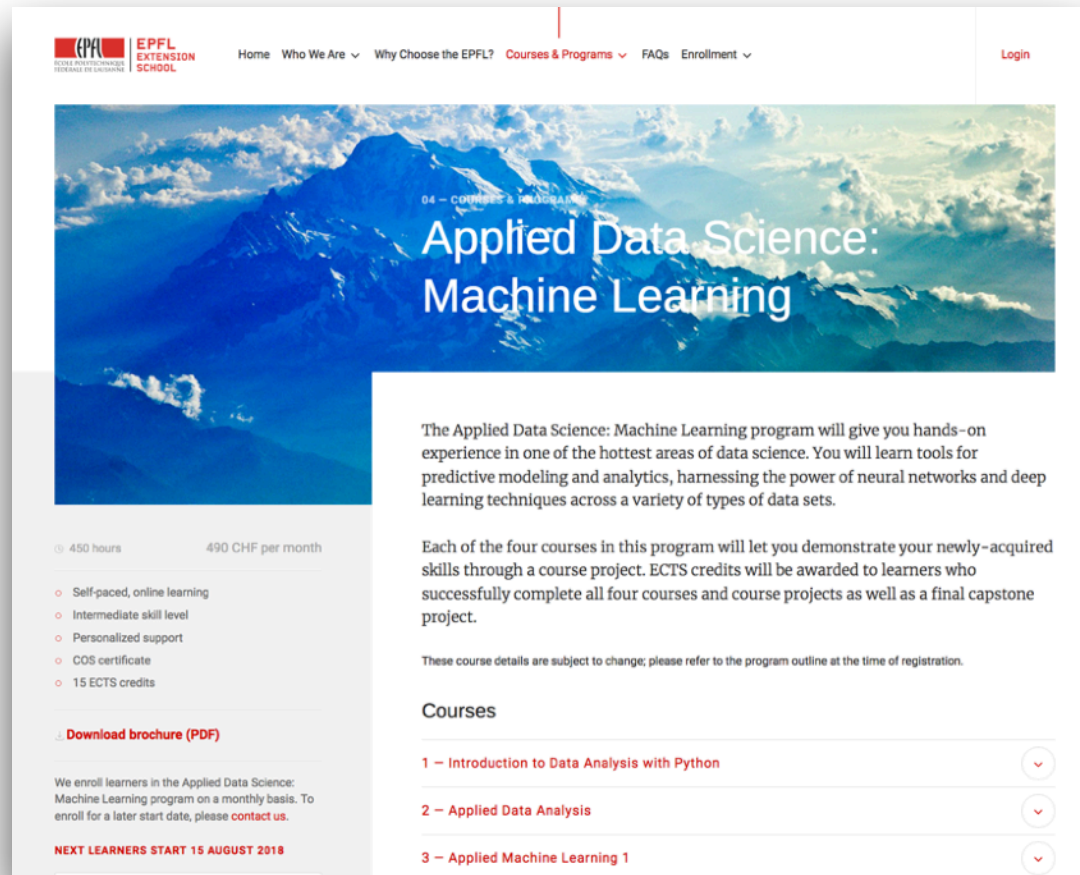


Fully **online**, with **personal** support

Open to **everyone**, programs **accredited (COS)**

Vocational training - heavy focus on **application**

exts.epfl.ch



EPFL EXTENSION SCHOOL

Home Who We Are Why Choose the EPFL? Courses & Programs FAQs Enrollment Login

04 - COURSES & PROGRAMS

Applied Data Science: Machine Learning

The Applied Data Science: Machine Learning program will give you hands-on experience in one of the hottest areas of data science. You will learn tools for predictive modeling and analytics, harnessing the power of neural networks and deep learning techniques across a variety of types of data sets.

Each of the four courses in this program will let you demonstrate your newly-acquired skills through a course project. ECTS credits will be awarded to learners who successfully complete all four courses and course projects as well as a final capstone project.

These course details are subject to change; please refer to the program outline at the time of registration.

450 hours 490 CHF per month

- Self-paced, online learning
- Intermediate skill level
- Personalized support
- COS certificate
- 15 ECTS credits

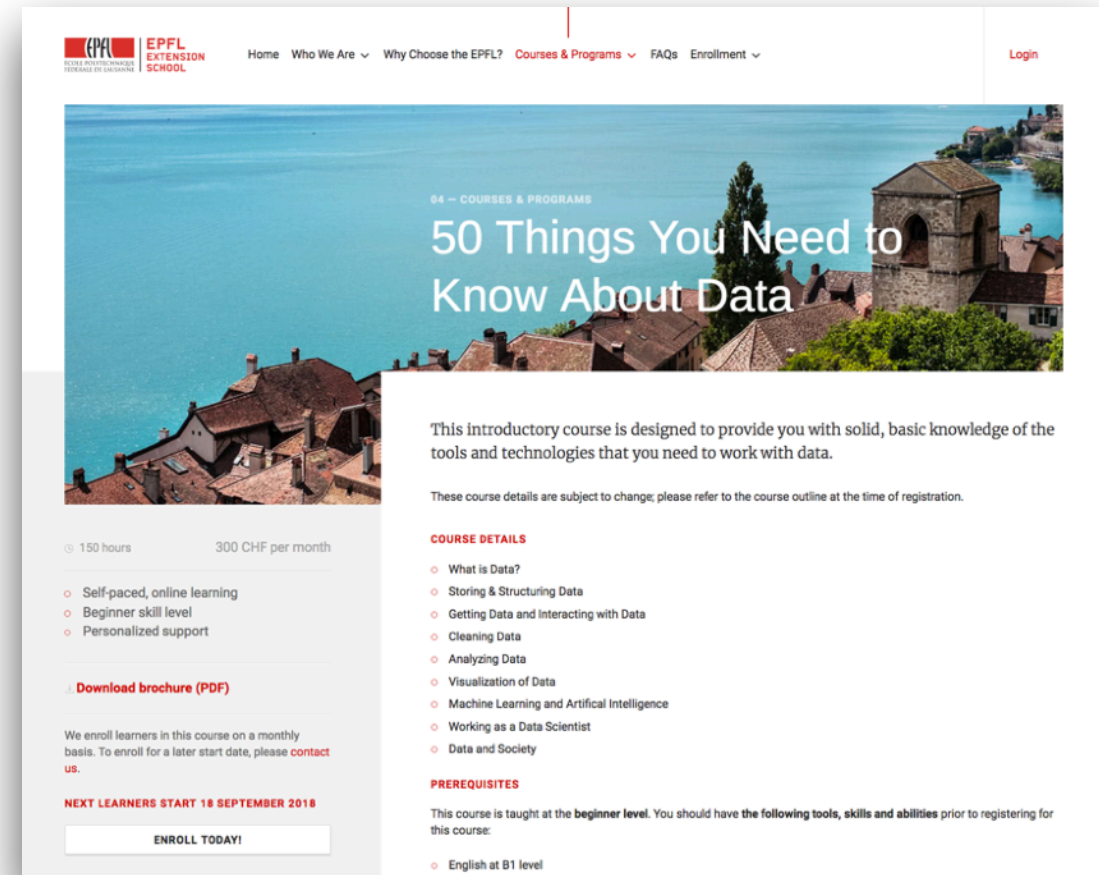
[Download brochure \(PDF\)](#)

We enroll learners in the Applied Data Science: Machine Learning program on a monthly basis. To enroll for a later start date, please [contact us](#).

NEXT LEARNERS START 15 AUGUST 2018

Courses

- 1 - Introduction to Data Analysis with Python
- 2 - Applied Data Analysis
- 3 - Applied Machine Learning 1



EPFL EXTENSION SCHOOL

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04 - COURSES & PROGRAMS

50 Things You Need to Know About Data

This introductory course is designed to provide you with solid, basic knowledge of the tools and technologies that you need to work with data.

These course details are subject to change; please refer to the course outline at the time of registration.

150 hours 300 CHF per month

- Self-paced, online learning
- Beginner skill level
- Personalized support

[Download brochure \(PDF\)](#)

We enroll learners in this course on a monthly basis. To enroll for a later start date, please [contact us](#).

NEXT LEARNERS START 18 SEPTEMBER 2018

ENROLL TODAY!

COURSE DETAILS

- What is Data?
- Storing & Structuring Data
- Getting Data and Interacting with Data
- Cleaning Data
- Analyzing Data
- Visualization of Data
- Machine Learning and Artificial Intelligence
- Working as a Data Scientist
- Data and Society

PREREQUISITES

This course is taught at the **beginner level**. You should have the following tools, skills and abilities prior to registering for this course:

- English at B1 level

COURSES & PROGRAMS QUICK FACTS



100% online



Fully self-paced



1-on-1 support from instructors



Personalized capstone project



Cost-effective monthly pricing



No academic prerequisites



Applied, hands-on learning



World-class EPFL quality

EPFL delivers Switzerland's first Certificates of Open Studies



Why?

THE LARGEST COMPANIES BY MARKET CAP

The oil barons have been replaced by the whiz kids of Silicon Valley



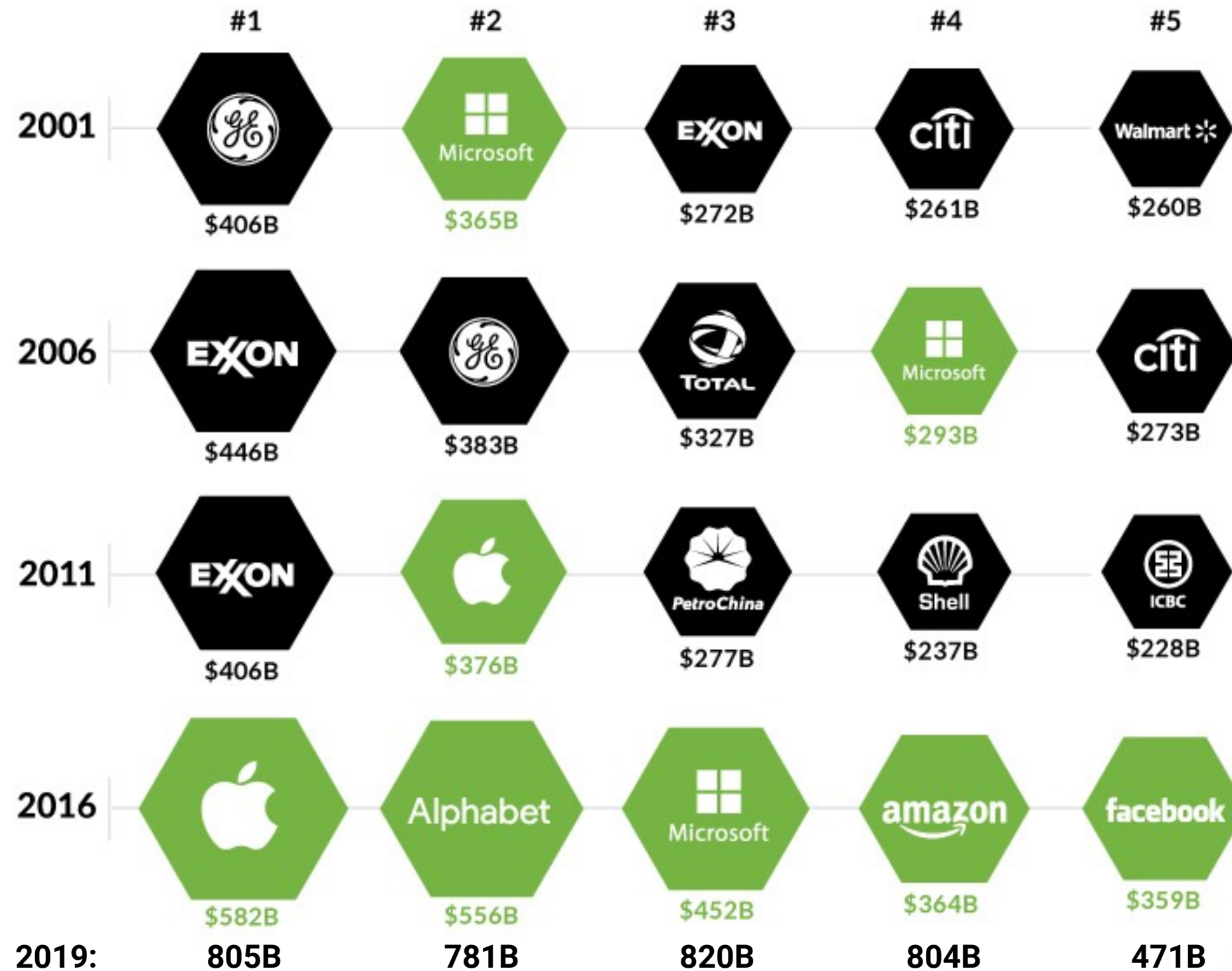
Top 5 Publicly Traded Companies (by Market Cap)



Tech



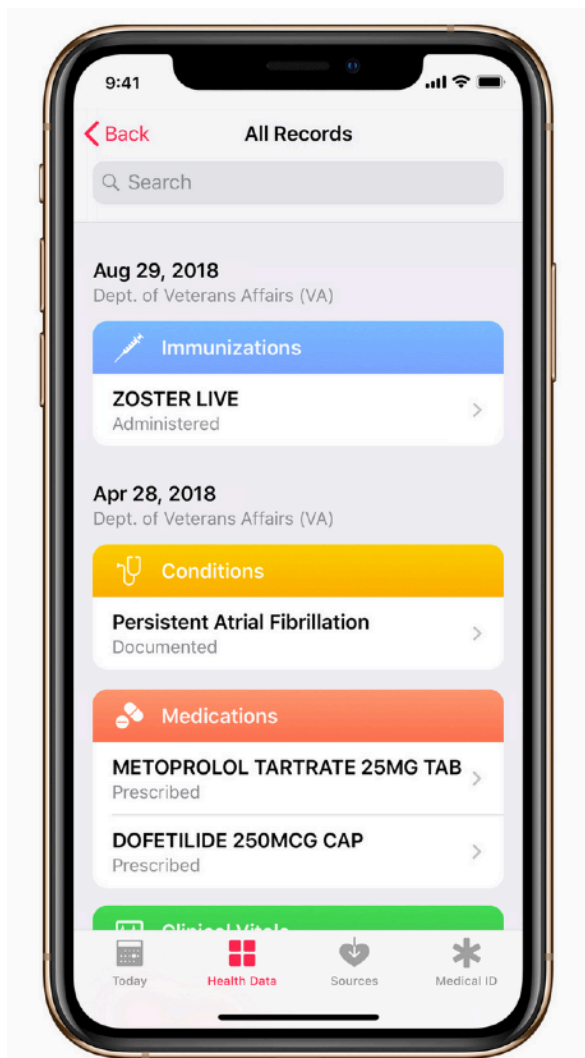
Other



UPDATE

February 11, 2019

Apple announces Health Records feature coming to veterans



The New York Times



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DealBook/

Amazon to Buy Whole Foods for \$13.4 Billion



Customers at a Whole Foods Market in Midtown Manhattan.
John Taggart for The New York Times


```

131     */
132     public static String buildMACAsBase64String(String input) {
133         return base64encoder.encodeToString(buildMAC(input));
134     }
135
136     /**
137      * Builds the mac of the input string and returns it as a string,
138      * applying a generated {@link #SALT_SIZE_BYTES} bytes salt on the message.
139      *
140      * @param input message to be MACed.
141      * @return the concatenation of the {@link #SALT_SIZE_BYTES} bytes salt and the MAC in base64
142      */
143     public static String buildSaltedMACAsBase64String(String input) {
144         final byte[] salt = SaltUtils.generateSalt(SALT_SIZE_BYTES * 8);
145         final byte[] mac = buildMAC(input, salt);
146         return base64encoder.encodeToString(mac);
147     }
148
149     /**
150      * Computes the unsalted MAC of the input
151      *
152      * @param input any string
153      * @return the MAC (using algorithm defined in the {@link #config}) of the input string
154      */
155     public static byte[] buildMAC(String input) {
156         return buildMAC(input, null);
157     }
158
159     /**
160      * Computes a salted MAC of the input
161      *
162      * @param input any string
163      * @param salt the salt to be used by the MAC
164      * @return the MAC (using algorithm defined in the {@link #config}) of the input string, using the provided salt

```

Entity	Year	Records	Organization type	Method
Yahoo	2013	3,000,000,000	web	hacked
Marriott International	2018	500,000,000	hotel	hacked
Yahoo	2014	500,000,000	web	hacked
Friend Finder Networks	2016	412,214,295	web	poor security / hacked
Massive American business hack including 7-Eleven and Nasdaq	2012	160,000,000	financial	hacked
Adobe Systems	2013	152,000,000	tech	hacked
Under Armour	2018	150,000,000	Consumer Goods	hacked
eBay	2014	145,000,000	web	hacked
Equifax	2017	143,000,000	financial, credit reporting	poor security
Heartland	2009	130,000,000	financial	hacked
Quora	2018	100,000,000	Question & Answer	hacked
Rambler.ru	2012	98,167,935	web	hacked
TK / TJ Maxx	2007	94,000,000	retail	hacked
MyHeritage	2018	92,283,889	genealogy	unknown
AOL	2004	92,000,000	web	inside job, hacked
Anthem Inc.	2015	80,000,000	healthcare	hacked
Sony PlayStation Network	2011	77,000,000	gaming	hacked
JP Morgan Chase	2014	76,000,000	financial	hacked
National Archives and Records Administration (U.S. military veterans' records)	2009	76,000,000	military	lost / stolen media

Politics in the Computational Age

“There are two types of politicians: those who know how to use Facebook, and those who loose elections.”

Centralized vs decentralized infrastructure

E-voting

Fake vs Real

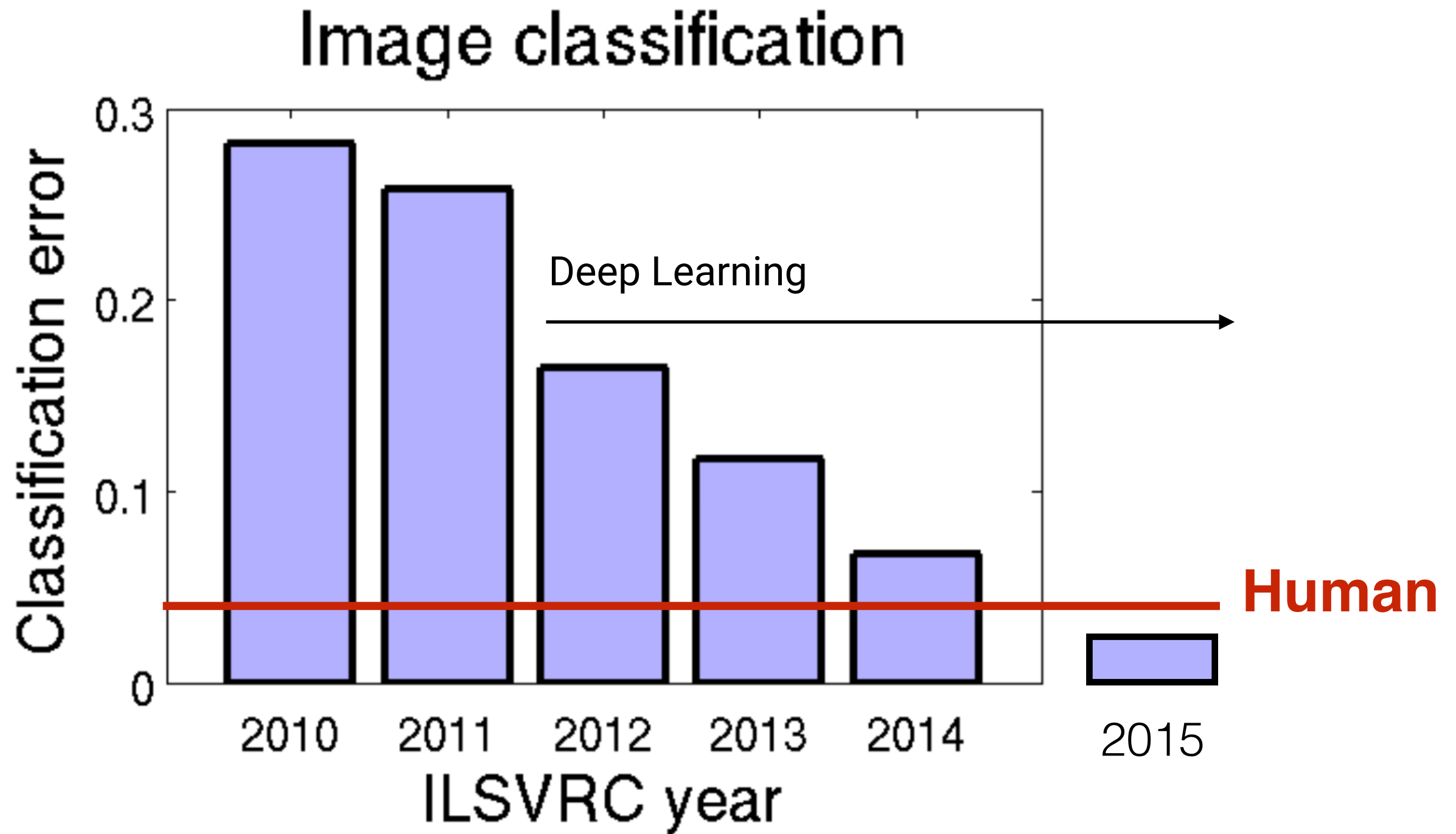
Artificial Intelligence



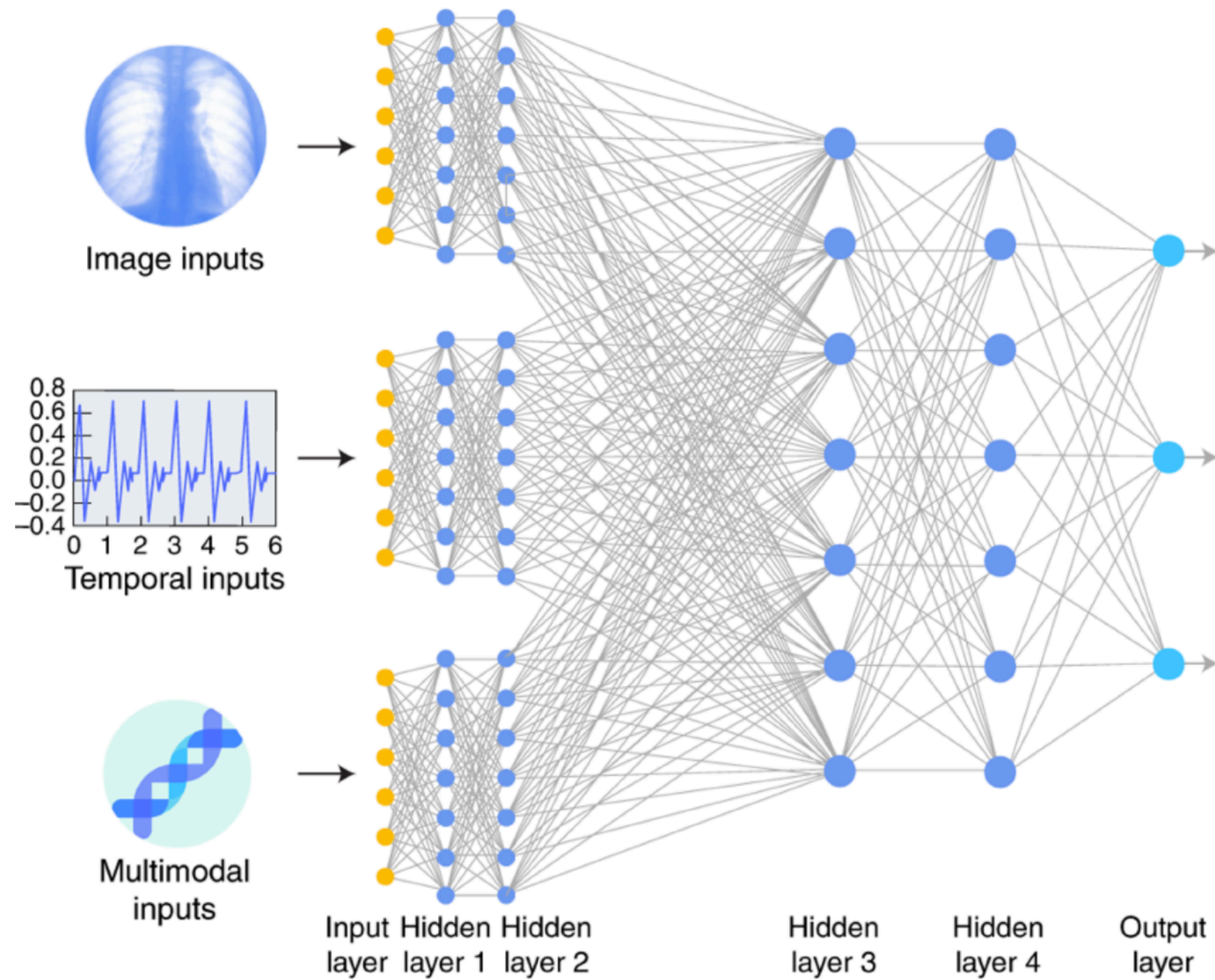
08	02	22	97	38	15	00	40	00	75	04	05	07	78	52	12	50	77	93	68
49	49	99	40	17	81	18	57	60	87	17	40	98	43	69	48	04	56	62	00
81	49	31	73	55	79	14	29	93	71	40	67	58	88	30	03	49	13	36	65
52	70	95	23	04	60	11	42	69	21	68	56	01	32	56	71	37	02	36	91
22	31	16	71	51	62	83	89	41	92	36	54	22	40	40	28	66	33	13	80
24	47	33	60	99	03	45	02	44	75	33	53	78	36	84	20	35	17	12	50
32	98	81	28	64	23	67	10	26	38	40	67	59	54	70	66	18	38	64	70
67	26	20	68	02	62	12	20	95	63	94	39	63	08	40	91	66	49	94	21
24	55	58	05	66	73	99	26	97	17	78	78	96	83	14	88	34	89	63	72
21	36	23	09	75	00	76	44	20	45	35	14	00	61	33	97	34	31	33	95
78	17	53	28	22	75	31	67	15	94	03	80	04	62	16	14	09	53	56	92
16	39	05	42	96	35	31	47	55	58	88	24	00	17	54	24	36	29	85	57
86	56	00	48	35	71	89	07	05	44	44	37	44	60	21	58	51	54	17	58
19	80	81	68	05	94	47	69	28	73	92	13	86	52	17	77	04	89	55	40
04	52	08	83	97	35	99	16	07	97	57	32	16	26	26	79	33	27	98	66
88	46	68	87	57	62	20	72	03	46	33	67	46	55	12	32	63	93	53	69
04	42	16	73	38	25	39	11	24	94	72	18	08	46	29	32	40	62	76	36
20	69	36	41	72	30	23	88	34	68	99	69	82	67	59	85	74	04	36	16
20	73	35	29	78	31	90	01	74	31	49	71	48	88	81	16	23	57	05	54
01	70	54	71	83	51	54	69	16	92	33	48	61	43	52	01	89	17	67	48

What the computer sees

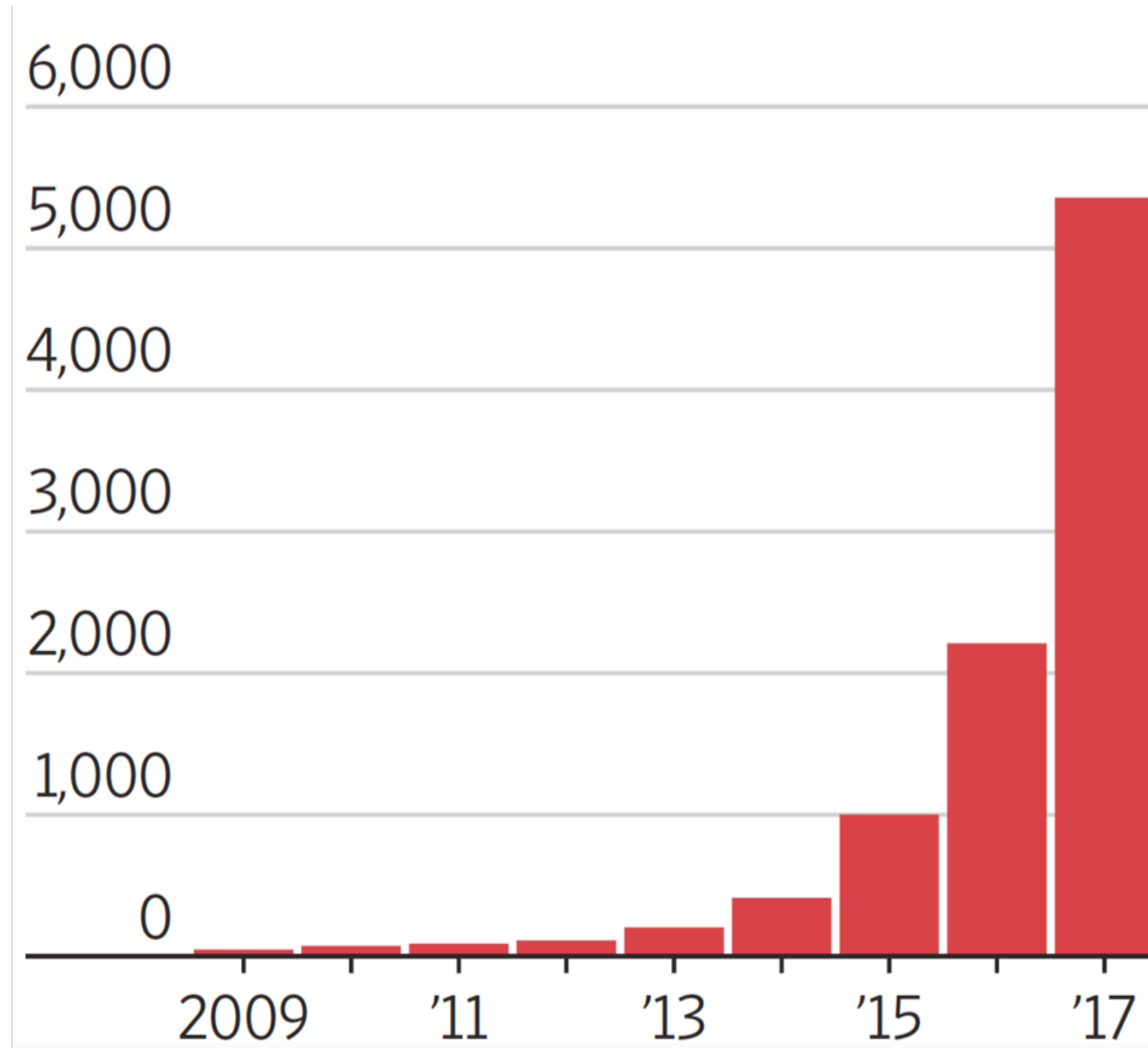
image classification → 82% cat
15% dog
2% hat
1% mug



Deep Learning



Deep Learning - it works

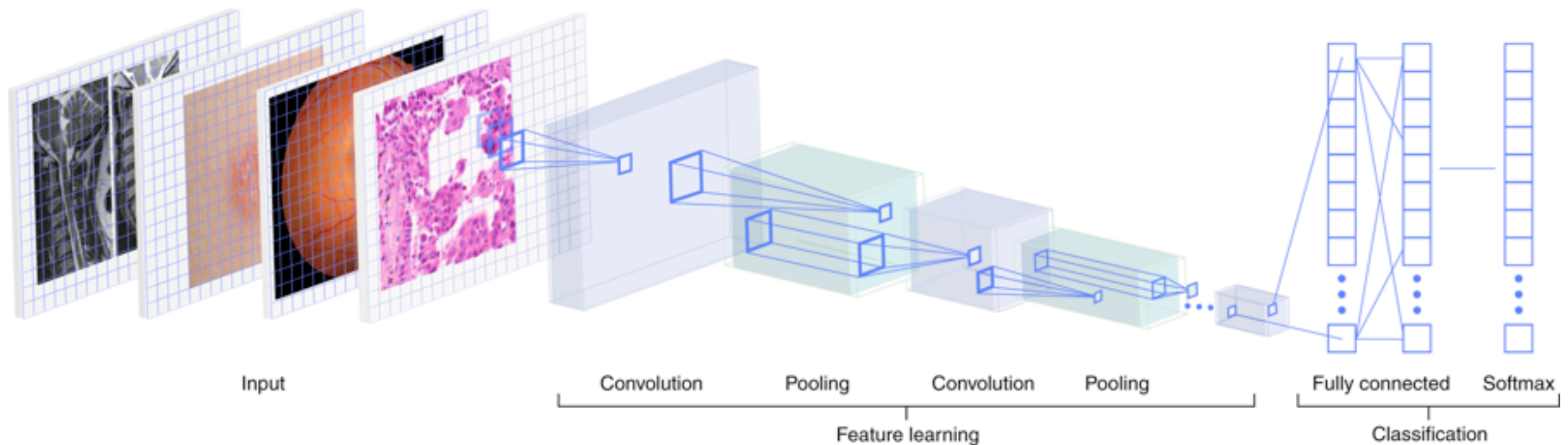


Number of papers with “Deep Learning” in the title or abstract (excluding preprints)

The Case of Image Recognition

Training requires many annotated images

Learning is end-to-end:
from image to classification



The Case of Image Recognition

Basic observations:

1. The more data, the better the outcome.

Implications: Organizations become data hungry. Who has the data, has the power.

The Case of Image Recognition

Basic observations:

2. The learning is “end-to-end” - i.e. from input layer, to output layer, there is nothing else - no expertise.

Implications: All value is in the data and its labels. There is no domain expertise required anywhere else. But we do not understand what the network does - it just works.

The Case of Image Recognition

Basic observations:

2. The learning is “end-to-end” - i.e. from input layer, to output layer, there is nothing else - no expertise.

This is a complete reversal in science and engineering. Normally, we first understand something, and then use that knowledge to build better tools.

The Case of Image Recognition

Basic observations:

3. The network is learning on the data it has been given, and will only be able to learn patterns from that data.

If the data is biased, then the network will be biased. We are increasingly seeing cases of biased, discriminatory algorithms.

The Case of Image Recognition

Basic observations:

4. Companies like Google, Facebook, etc. are increasingly open sourcing their algorithms and frameworks (e.g. TensorFlow, PyTorch, etc.)

The AI software frameworks are accessible to all. It is the data that is the limiting factor / competitive advantage.

Deep Learning

Domains where deep learning has made substantial progress:

- Image Recognition
- Natural Language Processing
- Decision Making in Complex Environments

These are extremely broad domains, which is why AI is suddenly everywhere.



Will AI replace [insert job]?

No. [insert job] with AI will
replace [insert job] without AI.



Michael Baeriswyl

@michaelbaeris

Following

We will educate over 1000 employees in the modern ways of working with #data and applying #AI.

@Swisscom_de partners with @epfl_exts to access top-tier classes and #learning resources about data, analytics and AI.

Thank you, @marcelsalathe @EPFL @MartinVetterli!



9:00 PM - 13 Dec 2018

POWER

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Vision 2024: **Educate!**

In 5 years: 50% of the employable Swiss population (2.5M people) shall have basic technological competences and some programming skills.

Everything is in place - **it is 100% a question of political will.**

Digital Education

Thank you!

Prof. Marcel Salathé, Digital Epidemiology Lab, EPFL
EPFL Extension School

 @marcelsalathe