Automation

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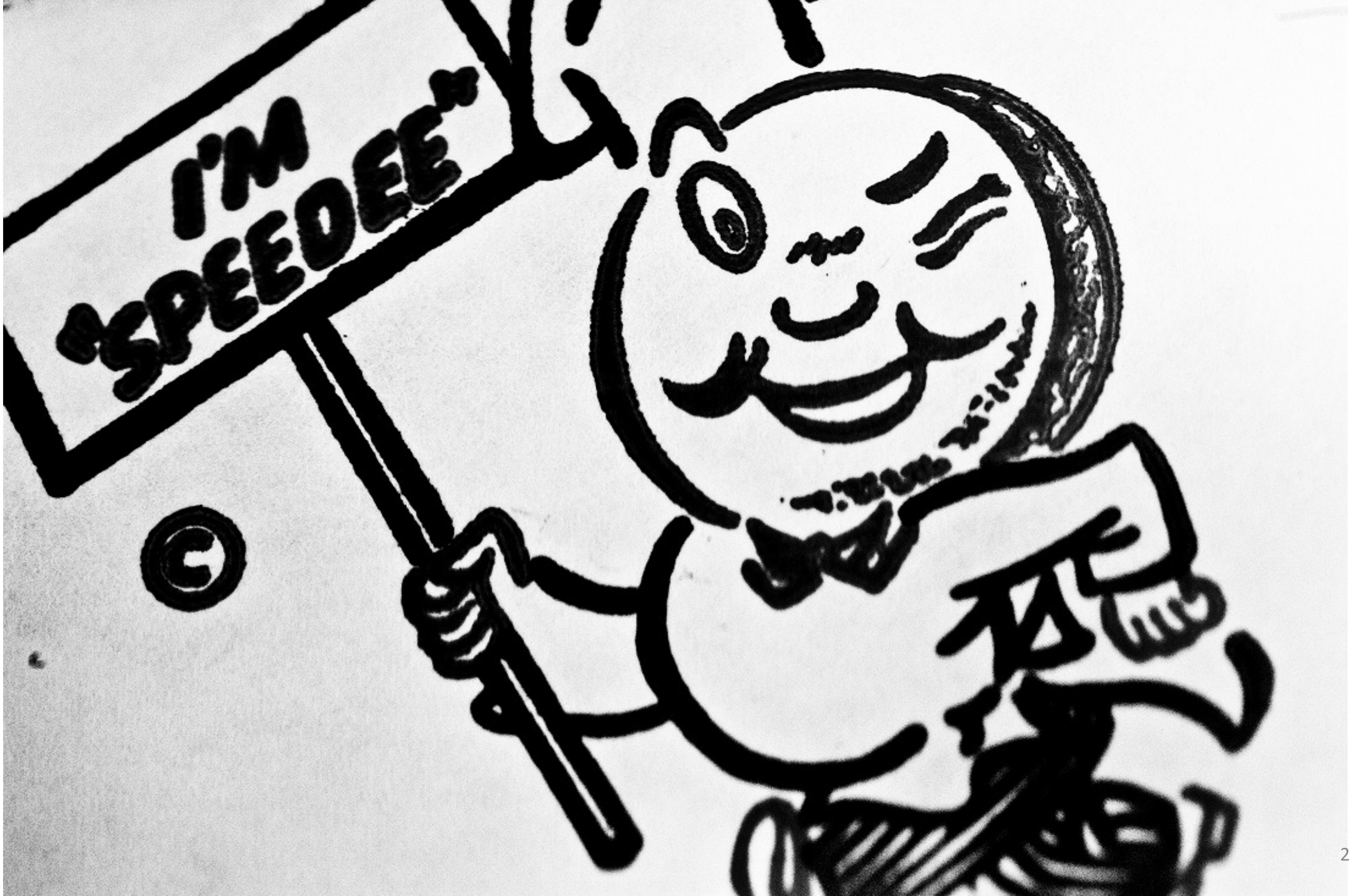
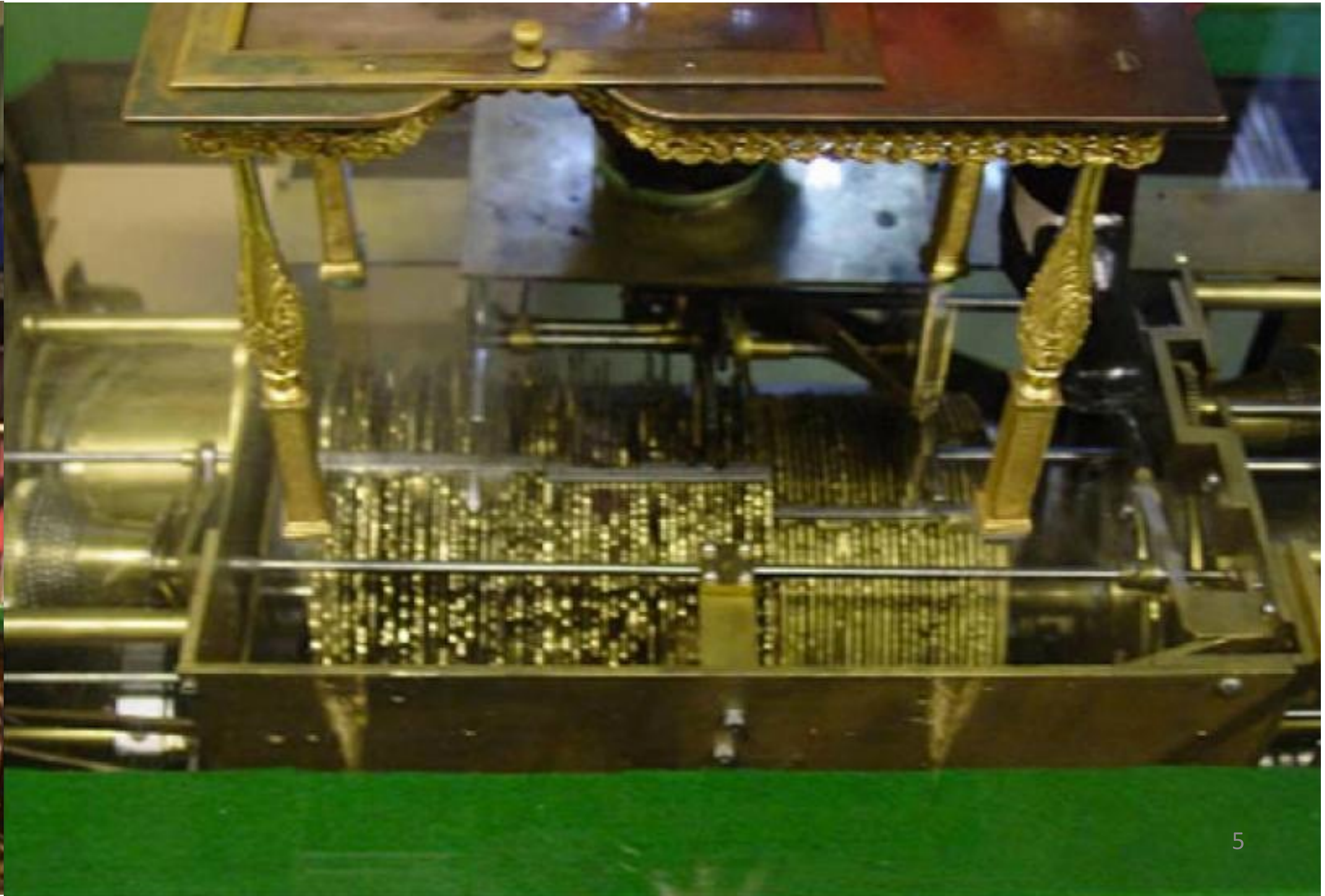
CS 4000: Harnessing AI
12 July 2021

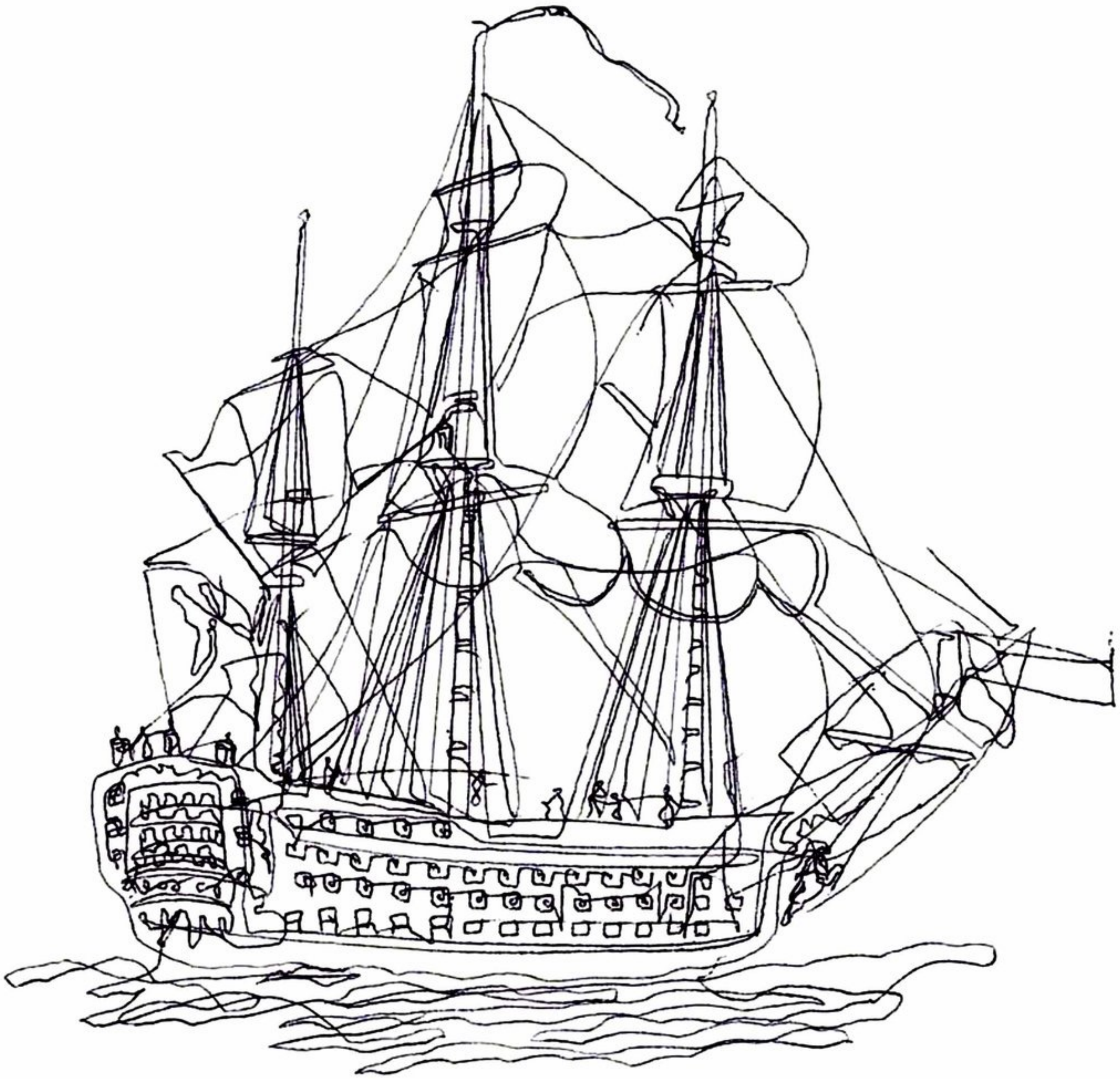

I'M "SPEEDEE"
©

What is automation?

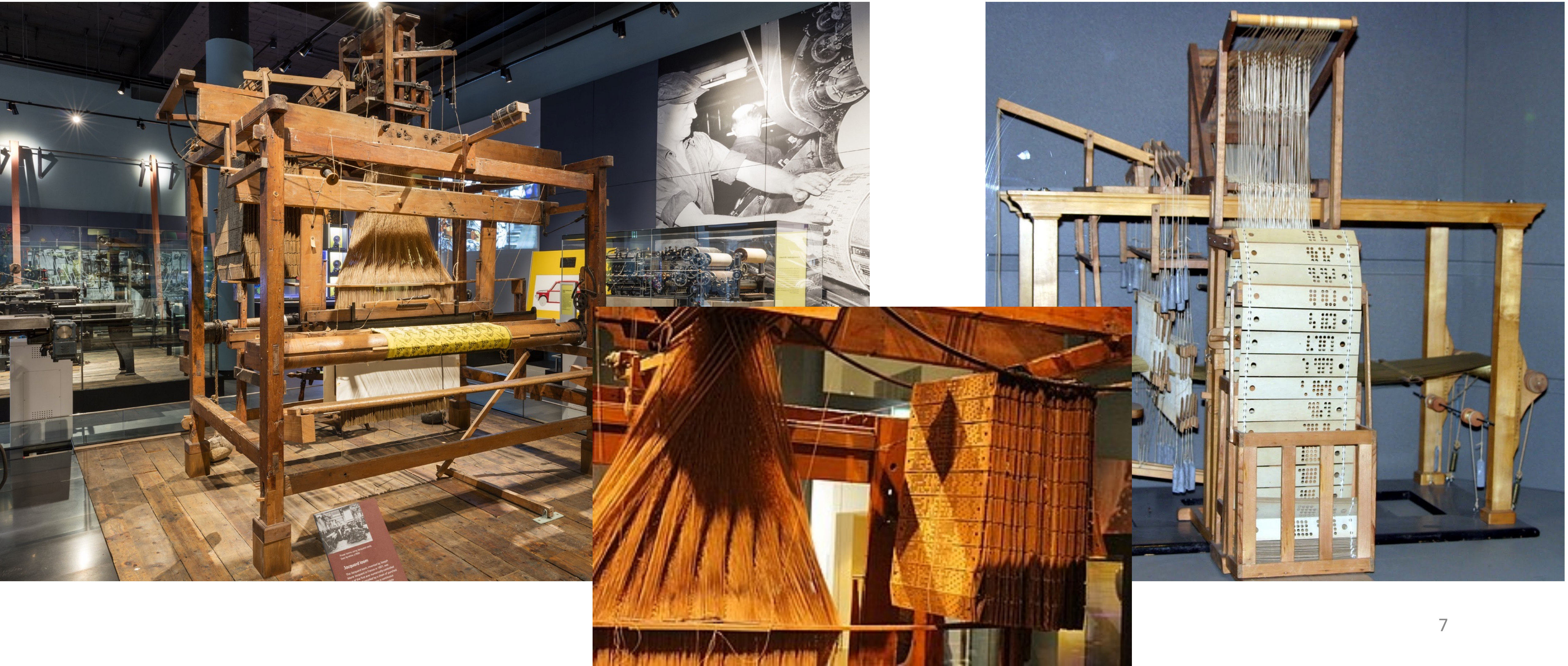
- Automation is the shifting of tasks once done by humans into machines
- Machines operate processes according to a ***set of established rules***
  - Generally, the rules are referred to as a **specification**
  - Can be implemented in a variety of ways, both human and machine
- Automation works in tandem with humans
  - No scenarios are “fully automated”
- Today, we’re going to explore what it means to automate something

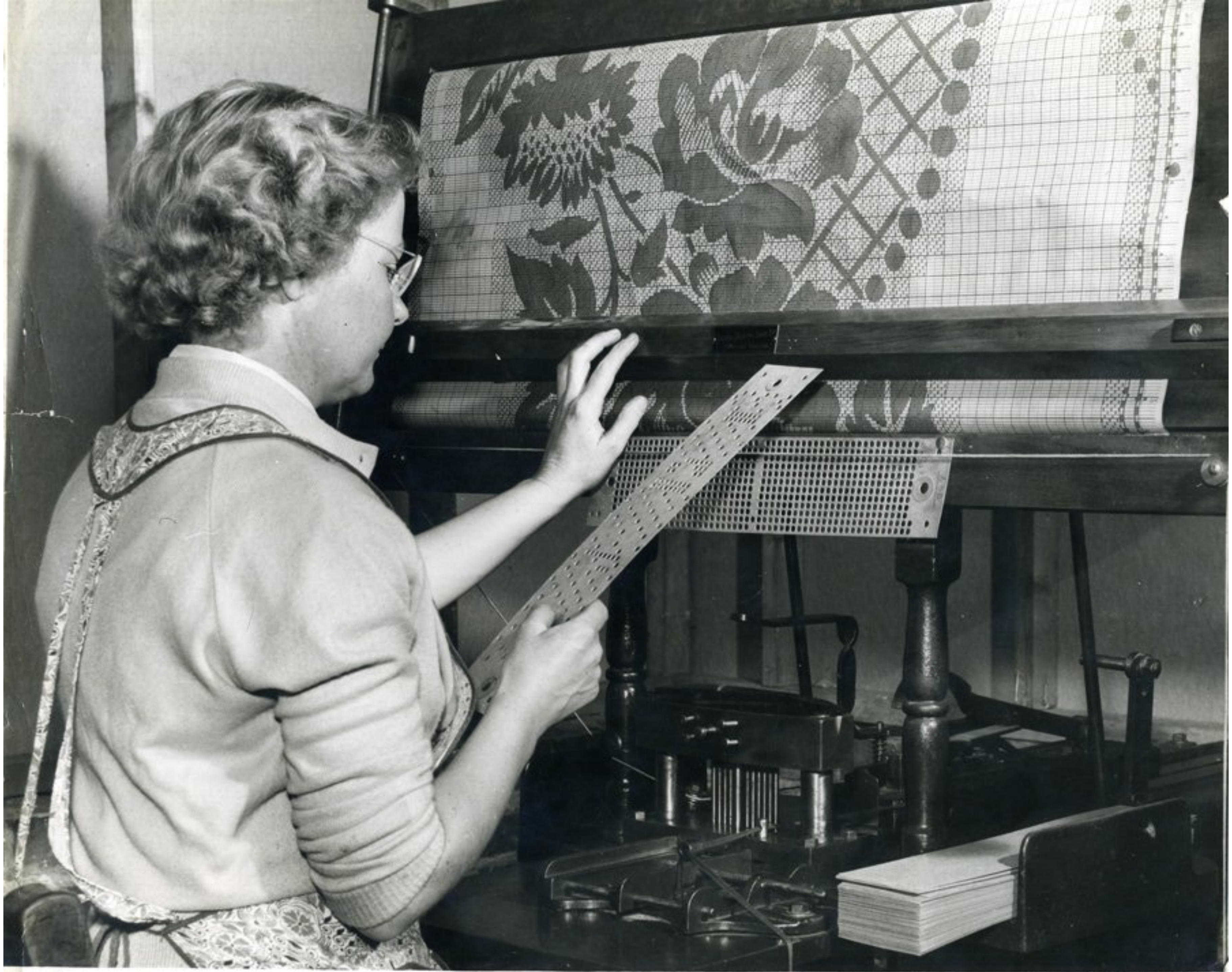
Examples of Automation: Automata





Examples of Automation: Jacquard Looms





Examples of automation: Autopilot

AIL
ELE
CAGED
TYPE A-3A
AIRCRAFT AUTOMATIC PILOT
SENSITIVITY INCREASE

Examples of automation: Autopilot

PUSH HEADREST → TO ADJUST
SEAT MUST BE IN FORWARD 7 INCHES OF TRAVEL DURING TAKEOFF AND LANDING

Examples of Automation: Computers

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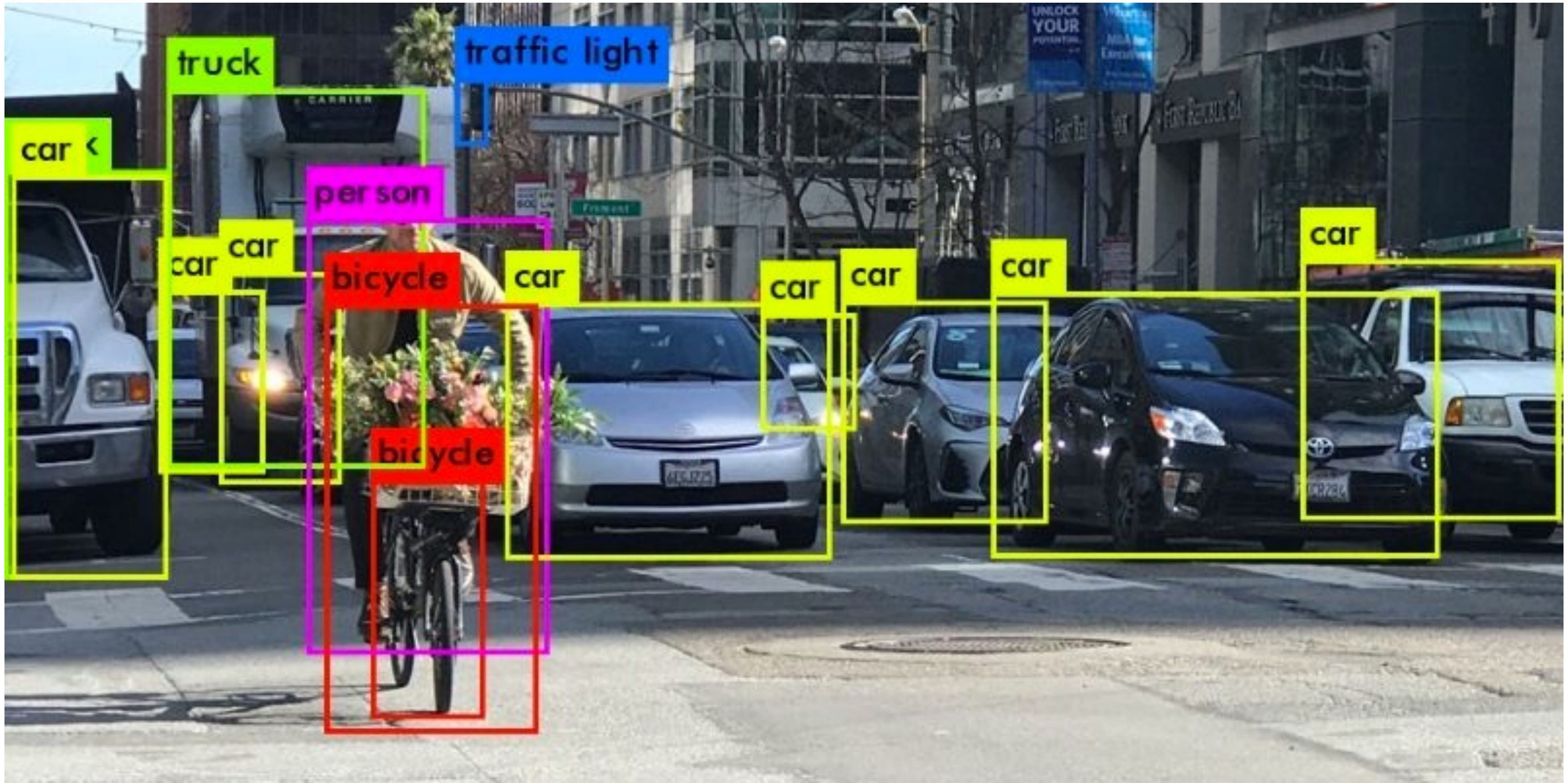
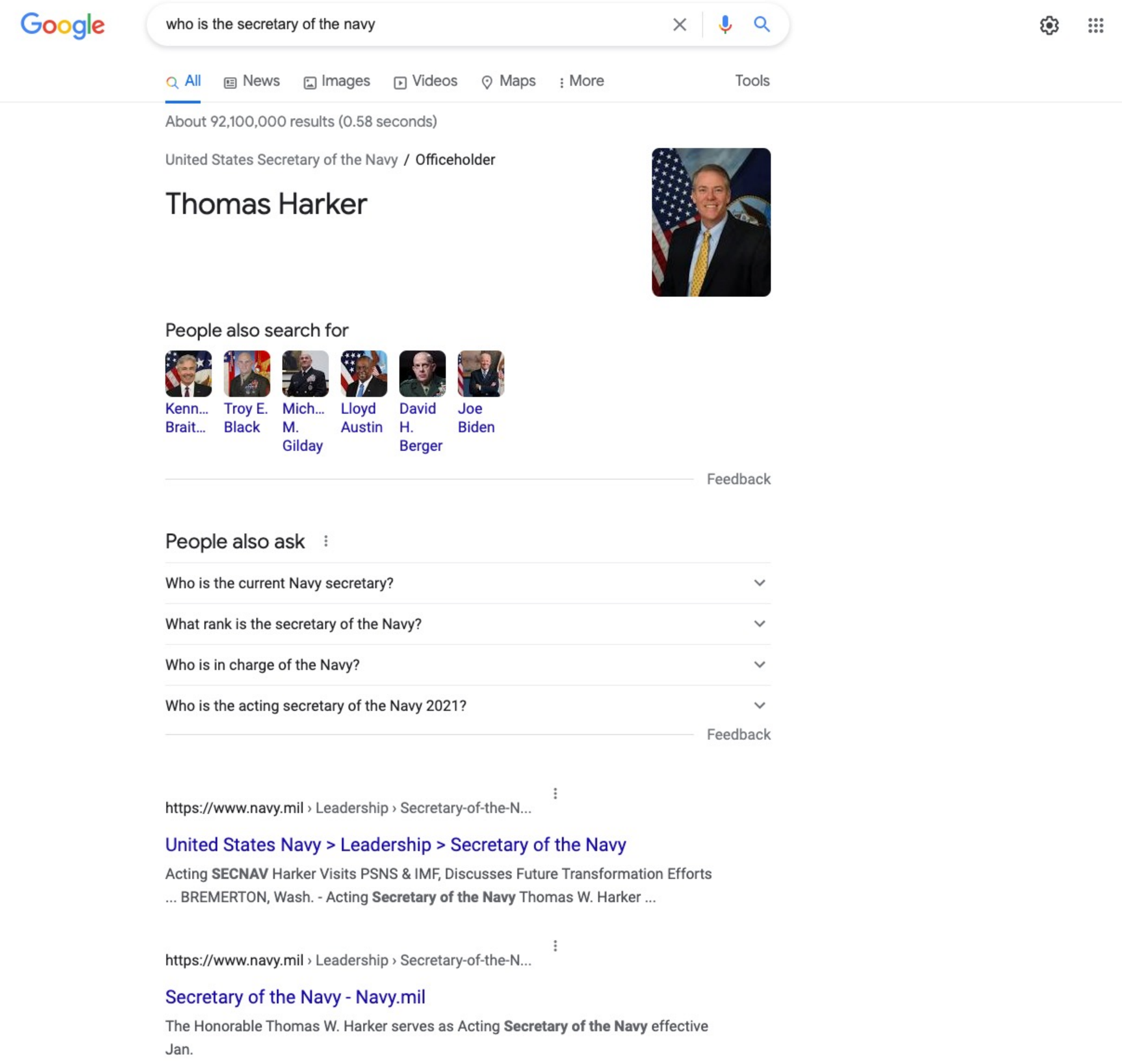
Automation and (Artificial) Intelligence

- The complexity or utility of automation doesn’t mean we necessarily ascribe intelligence to the system.
- Tasks which “require human intelligence” are increasingly automated


truck
traffic light
car
person
car
car
bicycle
car
car
car
car
car
bicycle


Google
who is the secretary of the navy
All
News
Images
Videos
Maps
More
Tools

About 92,100,000 results (0.58 seconds)

United States Secretary of the Navy / Officeholder

Thomas Harker

People also search for

Kenn... Brait...
Troy E. Black
Mich... M. Gilday
Lloyd Austin
David H. Berger
Joe Biden

Feedback

People also ask

Who is the current Navy secretary?

What rank is the secretary of the Navy?

Who is in charge of the Navy?

Who is the acting secretary of the Navy 2021?

Feedback

https://www.navy.mil › Leadership › Secretary-of-the-N...

United States Navy > Leadership > Secretary of the Navy

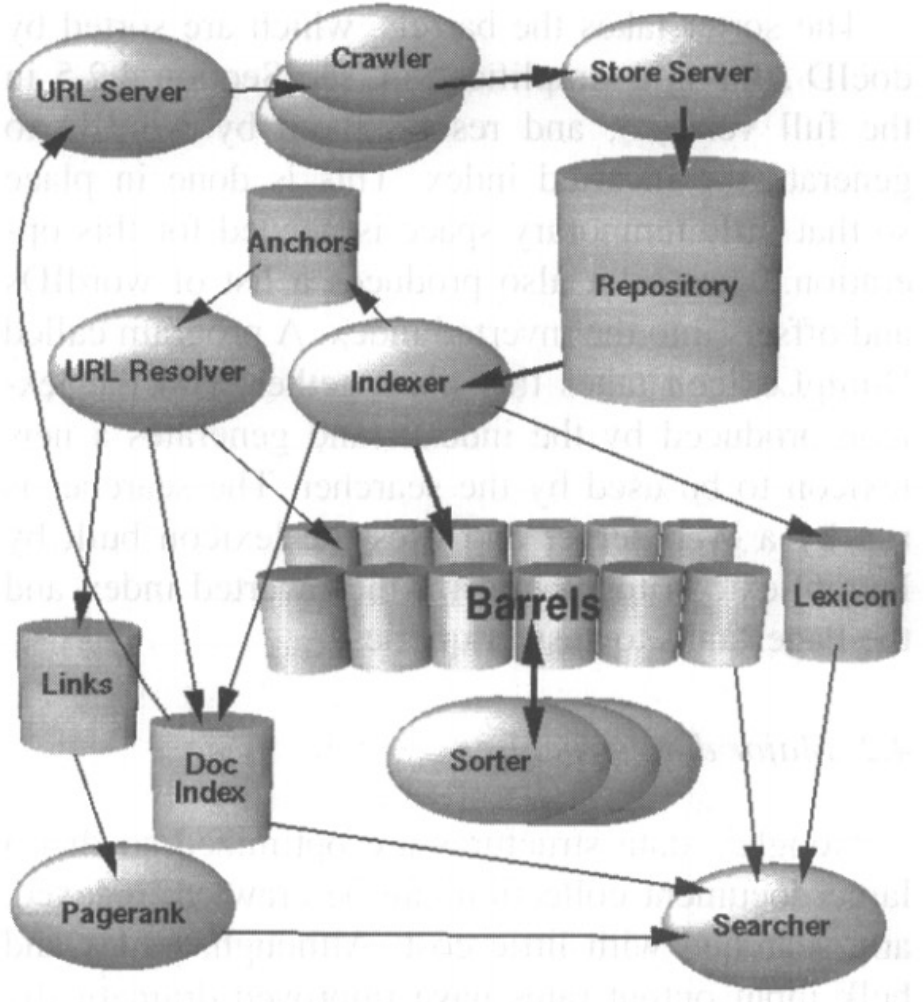
Acting **SECNAV** Harker Visits PSNS & IMF, Discusses Future Transformation Efforts ... BREMERTON, Wash. - Acting **Secretary of the Navy** Thomas W. Harker ...

https://www.navy.mil › Leadership › Secretary-of-the-N...

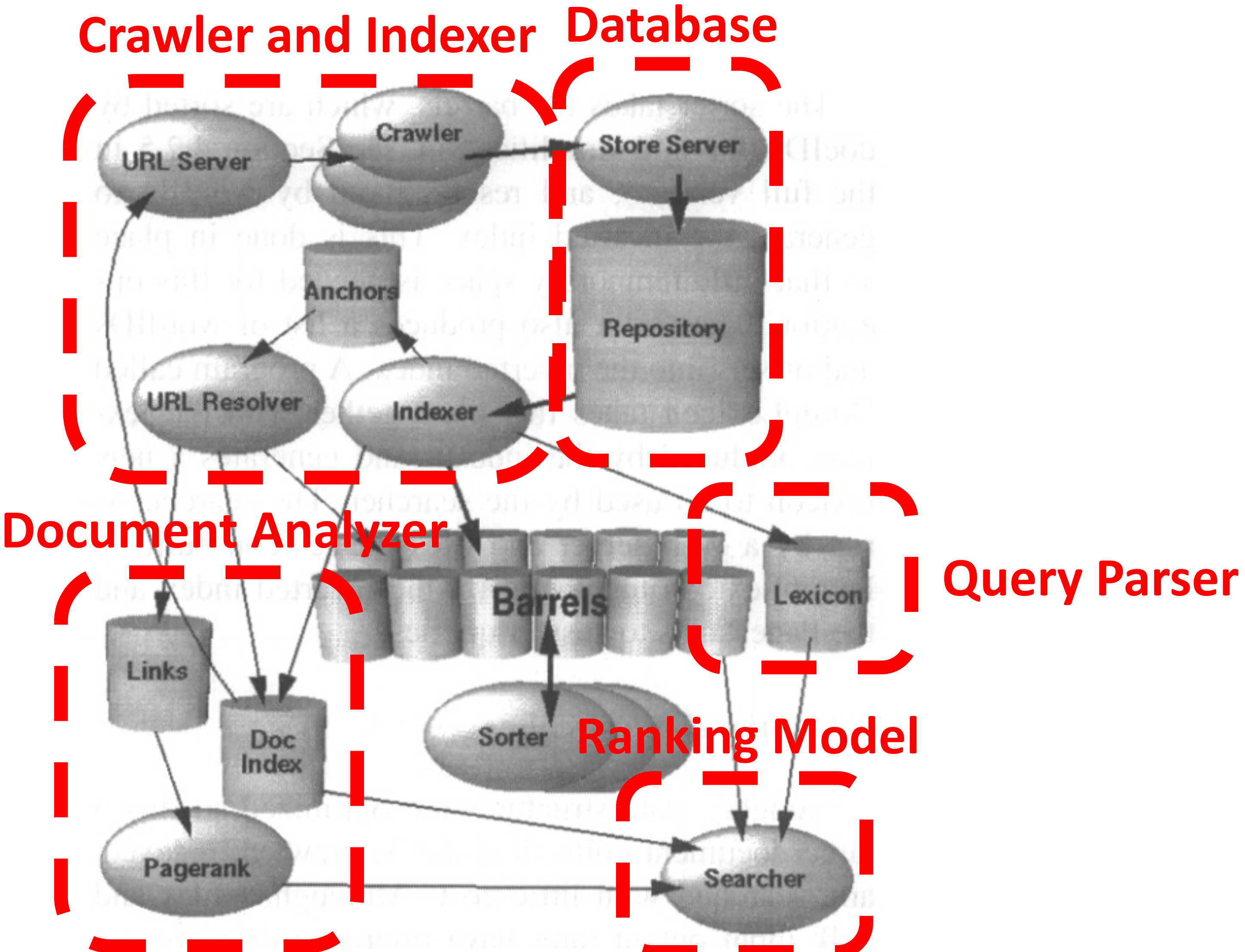
Secretary of the Navy - Navy.mil

The Honorable Thomas W. Harker serves as Acting **Secretary of the Navy** effective Jan.

Is a search engine “Artificial Intelligence”?


URL Server
Crawler
Store Server
Repository
Anchors
URL Resolver
Indexer
Barrels
Lexicon
Links
Doc Index
Sorter
Pagerank
Searcher

Is a search engine "Artificial Intelligence"?



Crawler and Indexer
Database
URL Server
Crawler
Store Server
Anchors
Repository
URL Resolver
Indexer
Document Analyzer
Barrels
Lexicon
Query Parser
Links
Doc Index
Sorter
Ranking Model
Pagerank
Searcher

Example of Automation and Intelligence

Examples of Automation: Warehouses

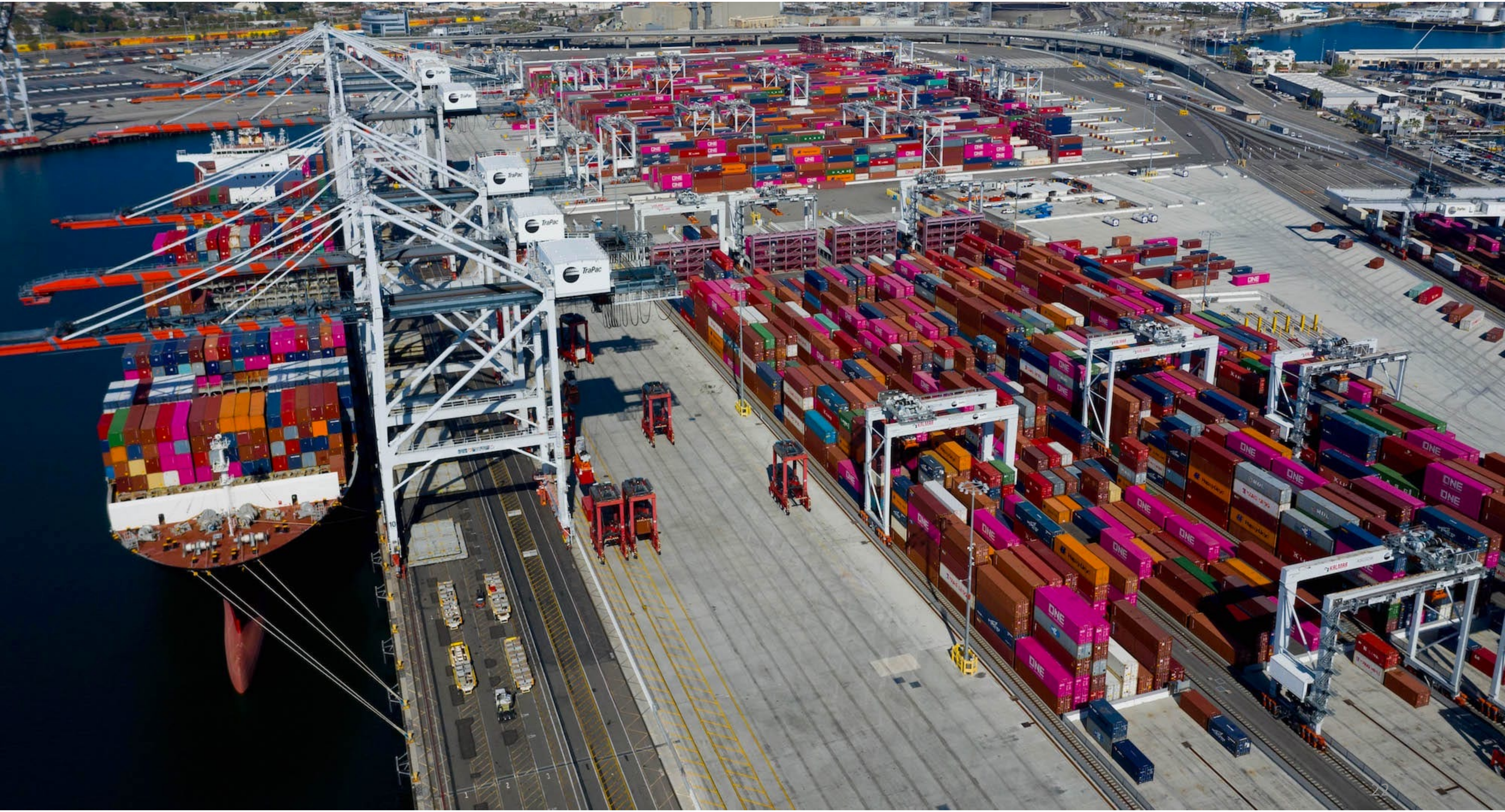
1348
1374
1375
1377

45082
46057
45795
45645
51283
45406

Examples of Automation: Warehouses

LANE 28
LANE 26
OAK5
UPS-OAKCA-T
CPT 1700
FEDEX-NEXT
CPT 1500
FedEx

Problem Concepts and Automation


TraPac
ONE

ITALIA
HAMBURG SÜD
MAERSK
CHINA SHIPPING
Hapag-Lloyd
5A

Problem Concepts and Automation

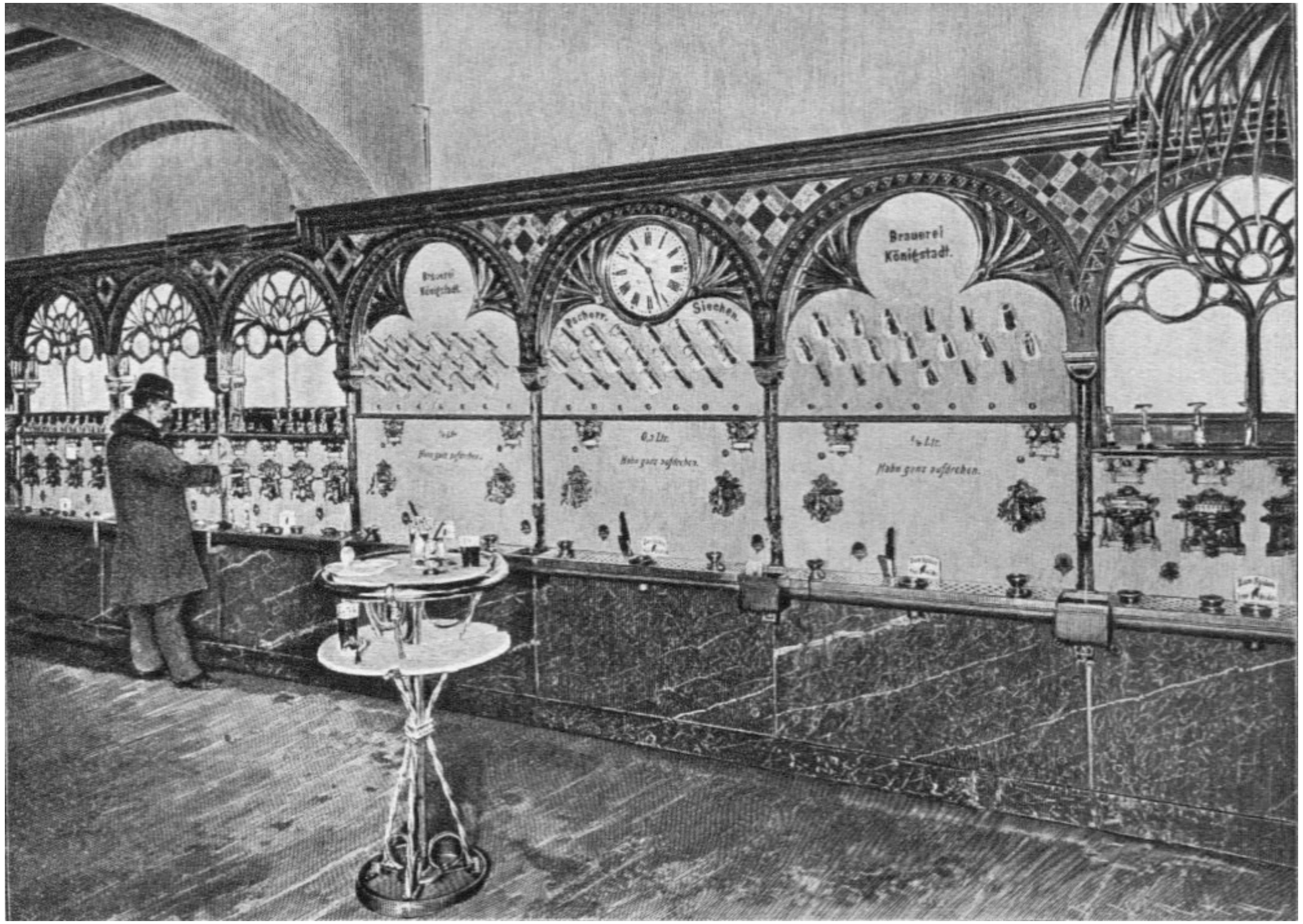
Conductor
AMTRAK

→

Entry
F
J
M
Z
Special entry

EXPRESS SERVICES
EXPRESS SERVICES
LINQ
MAKR SHAKR

Coca-Cola
Coca-Cola
Enjoy!
Coca-Cola
Enjoy!
Coca-Cola
GEORGIA
カレー
まんて
かつカレー・・・・・600円
コロッケカレー・・・550円
シュウマイカレー・・550円
ジャンボカレー・・・550円
大盛カレー・・・・・500円
並カレー・・・・・・450円
営業時間
平　日：AM11:00～PM8:00
土曜日：AM11:00～PM4:00
※売切れ次第早く終了することがあります。
定休日　日曜日・祝日
ライスカレー　まんてん
ライ
カレ
ライ
カレ
まんて


Brauerei Königstadt.
Pschorr.
Siechen.
Brauerei Königstadt.
0,3 Ltr.
Hahn ganz aufdrehen.
Hahn ganz aufdrehen.

eatsa

26
Order up!
22
27
Don't be shy. Give that bowl a shake.
25
23
Welcome to eatsa

Automation acts on Tasks not Jobs

Jobs	**Tasks**
Truck driver	Highway driving, loading/unloading, navigation
Restaurant worker	Food preparation, serving, collecting payment
Longshoreman/stevedore	Loading cargo, tying ships on/off, counting/weighing shipments
Warehouse worker	Picking, packing, operating warehouse machinery

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“Replacement” by machine is a myth!

Rules vs. Standards

- **Rules** require no interpretation, so can be objectively applied both quickly and in a large number of cases
- **Standards** are more flexible, allowing for some discretion in application
- **Principles** are open-ended but mandatory considerations

GATSO
METER

40
90

How does Automation Fail?

- **Specification Error**: When the system’s rules are somehow substantively incorrect or incomplete.
- **Implementation Error**: When the rules are correct, but the system doesn’t implement them properly.

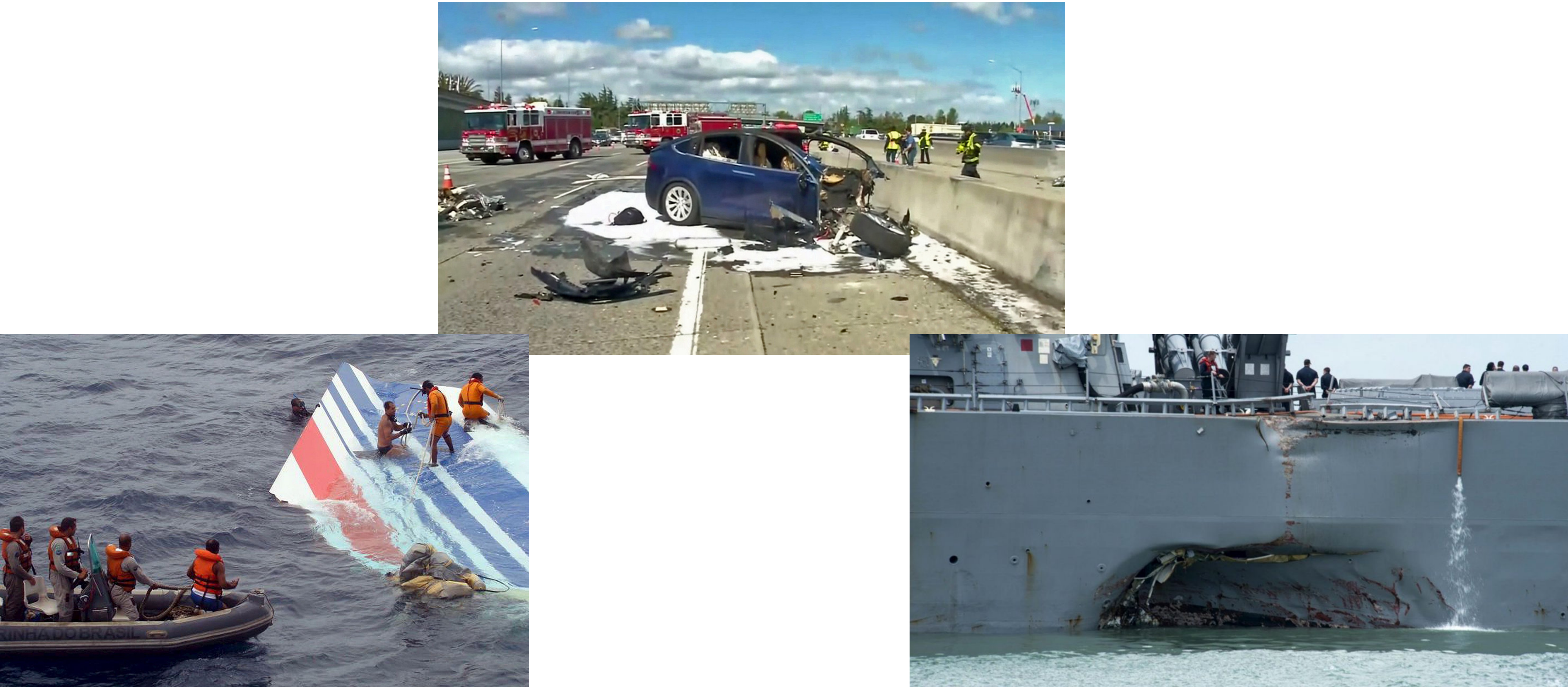
Automation vs. Autonomy

- **Autonomy** describes how directly the outcomes of a system depend on human decisions.
  - “Full Autonomy” is a myth – humans are always involved

Teaming Failures: Automation Dependency, Mode Confusion, & Automation Ironies

- **Automation Dependency**: By taking tasks away from humans, we deny them the ability to practice performing those tasks, *deskilling* the humans. Also: *passive vigilance*.
- **Mode Confusion**: Humans can be confused about how the system will react to their interactions and do things that would be correct under some circumstances but are not correct in the moment.
- **“Automation Ironies”**: Fewer humans are responsible for more output, but have less control

Automation Accidents

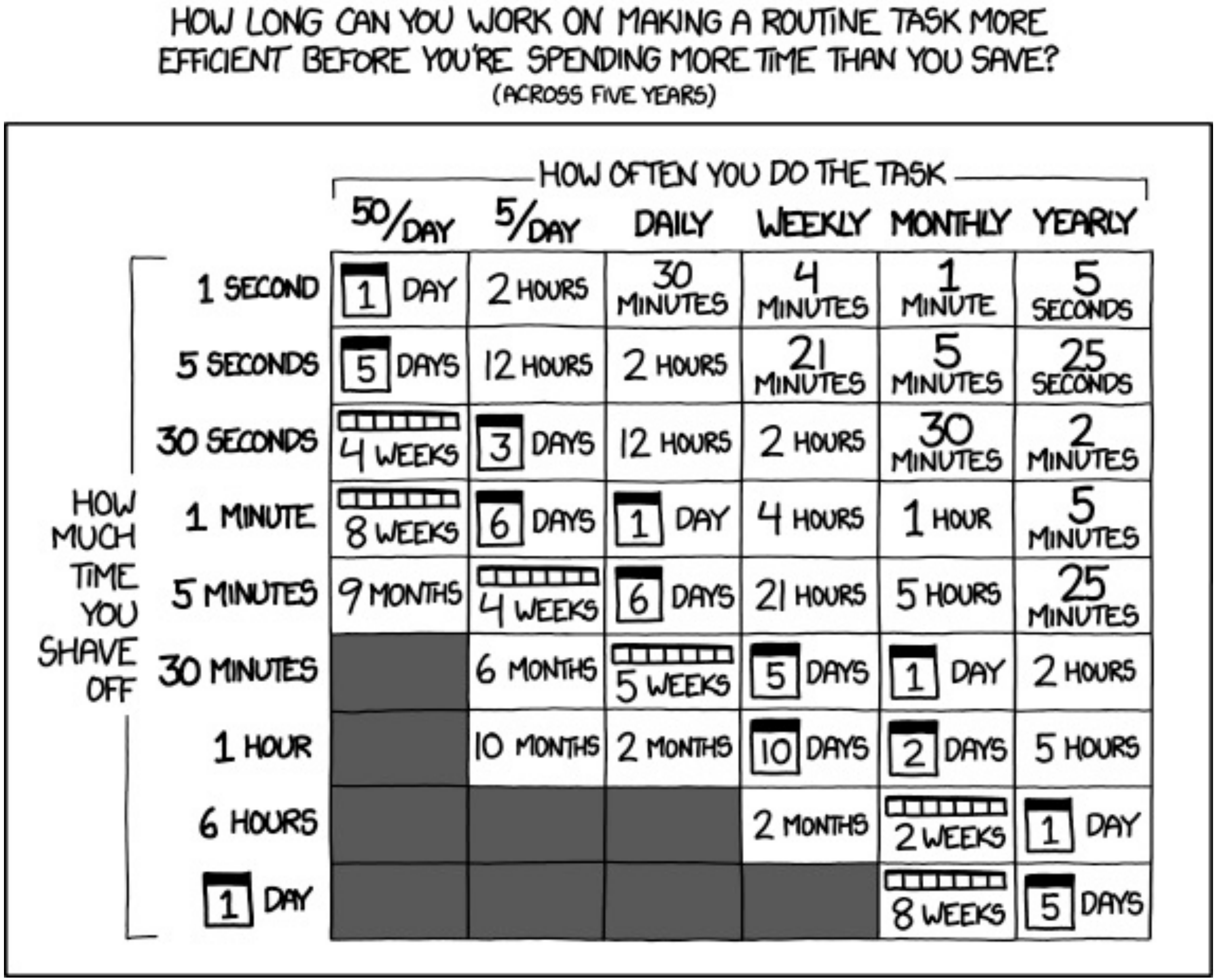

RINHADOBRASIL

Tradeoffs: When and what should we automate?

Benefits of Automation	Risks of Automation
Speed/scale	Failures can propagate
Consistent, reliable, predictable	Models are not truth
Remove tedious human work	Deskilling humans
Structure a process	Loss of human autonomy/dignity

What do we gain by automation?

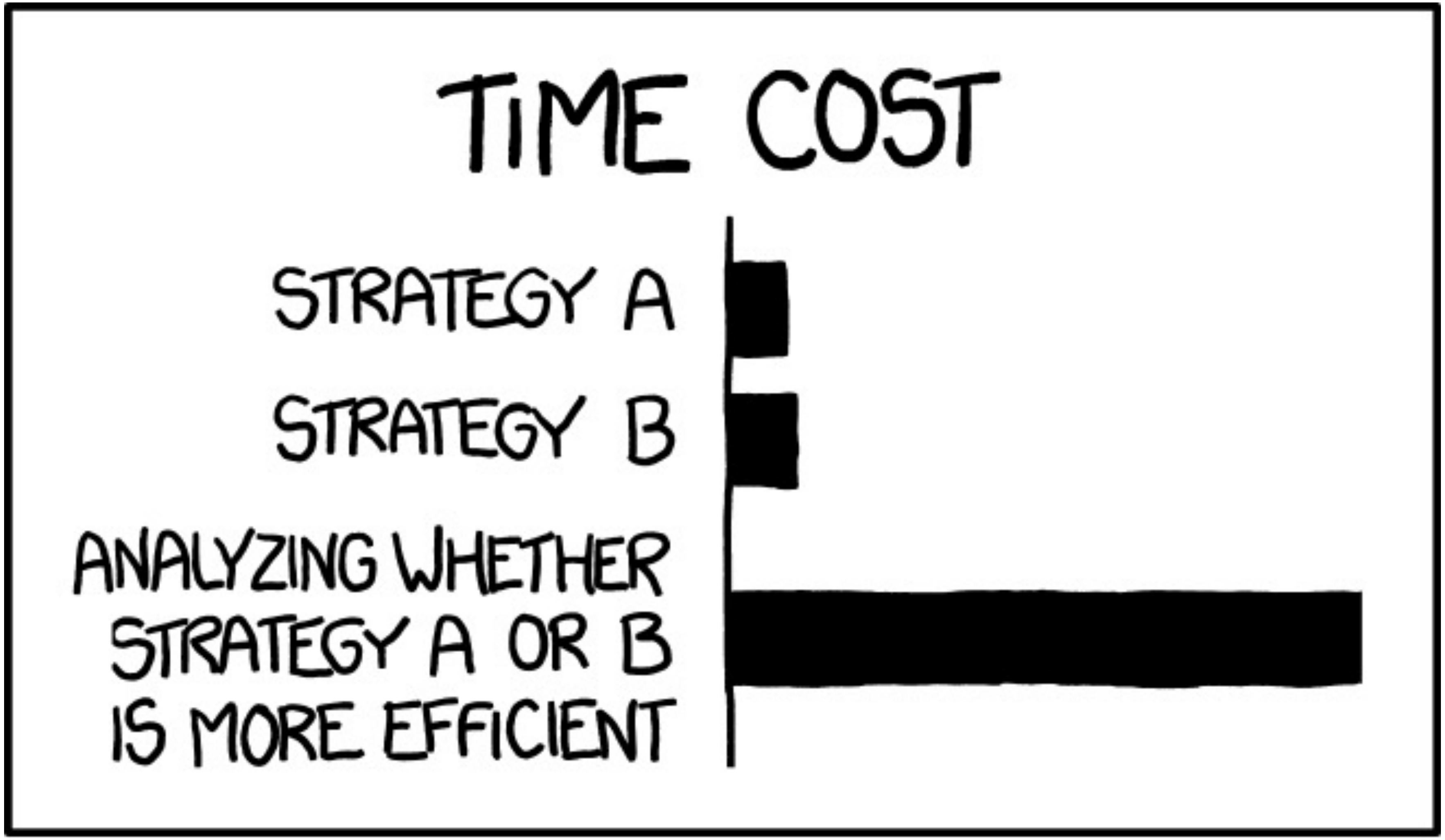
- Automation is often faster than humans
- Automation avoids human foibles
- Automation reframes problems, leaving different work for humans
- Automated systems fail differently to human-operated systems
- Need to understand what to automate, how to automate it, and why



HOW LONG CAN YOU WORK ON MAKING A ROUTINE TASK MORE EFFICIENT BEFORE YOU'RE SPENDING MORE TIME THAN YOU SAVE?

(ACROSS FIVE YEARS)

HOW MUCH TIME YOU SHAVE OFF	HOW OFTEN YOU DO THE TASK					
	50/DAY	5/DAY	DAILY	WEEKLY	MONTHLY	YEARLY
1 SECOND	1 DAY	2 HOURS	30 MINUTES	4 MINUTES	1 MINUTE	5 SECONDS
5 SECONDS	5 DAYS	12 HOURS	2 HOURS	21 MINUTES	5 MINUTES	25 SECONDS
30 SECONDS	4 WEEKS	3 DAYS	12 HOURS	2 HOURS	30 MINUTES	2 MINUTES
1 MINUTE	8 WEEKS	6 DAYS	1 DAY	4 HOURS	1 HOUR	5 MINUTES
5 MINUTES	9 MONTHS	4 WEEKS	6 DAYS	21 HOURS	5 HOURS	25 MINUTES
30 MINUTES		6 MONTHS	5 WEEKS	5 DAYS	1 DAY	2 HOURS
1 HOUR		10 MONTHS	2 MONTHS	10 DAYS	2 DAYS	5 HOURS
6 HOURS				2 MONTHS	2 WEEKS	1 DAY
1 DAY					8 WEEKS	5 DAYS


TIME COST
STRATEGY A
STRATEGY B
ANALYZING WHETHER STRATEGY A OR B IS MORE EFFICIENT

THE REASON I AM SO INEFFICIENT