

# HUML 2016

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## *The unintended consequences of chasing electric zebras*

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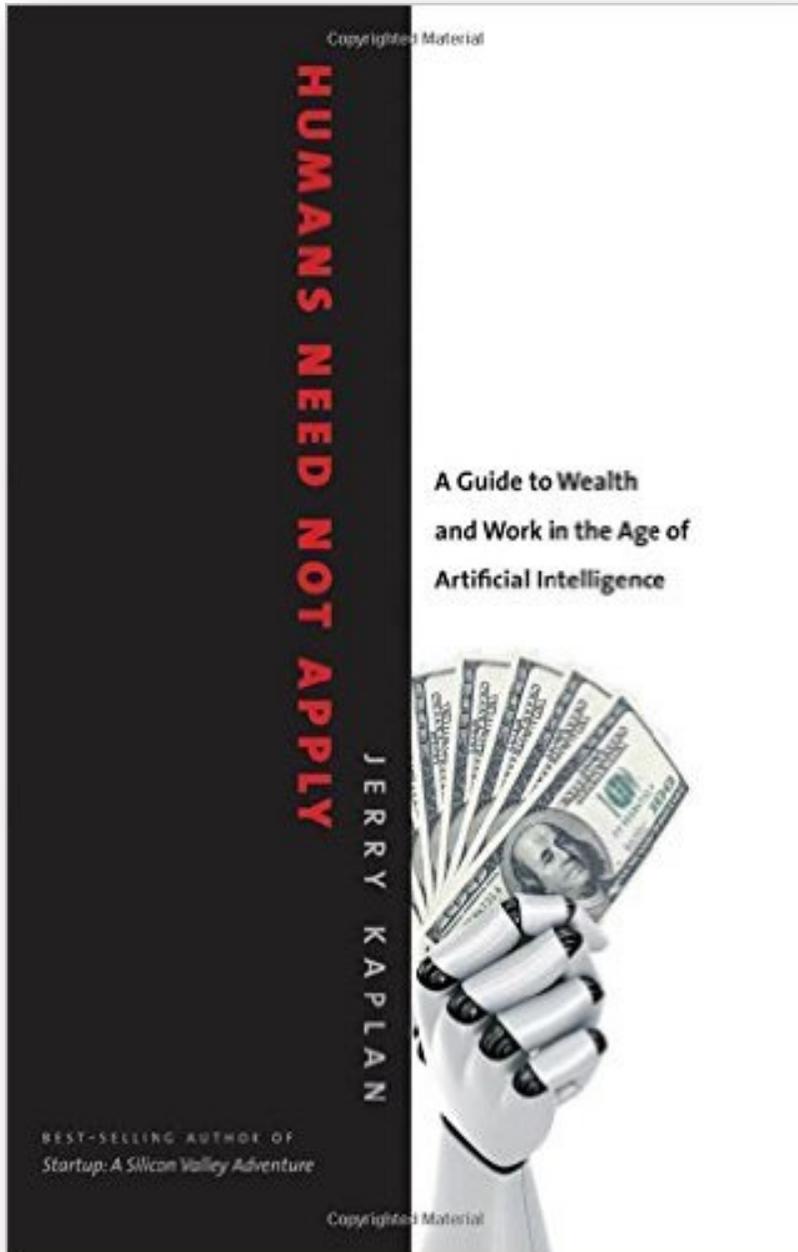


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I also work in the Scientific Management Dept. of the Orthopedic Institute Galeazzi (in Milan), which is one of the 3 research hospitals\* of the Gruppo San Donato, one of the largest in Europe with 18 Hospitals, 5,169 beds, 4,000 MDs and 3.9 million patients/yr, But also 170 university teachers, 3,000 students, and +8000 impact factor points.



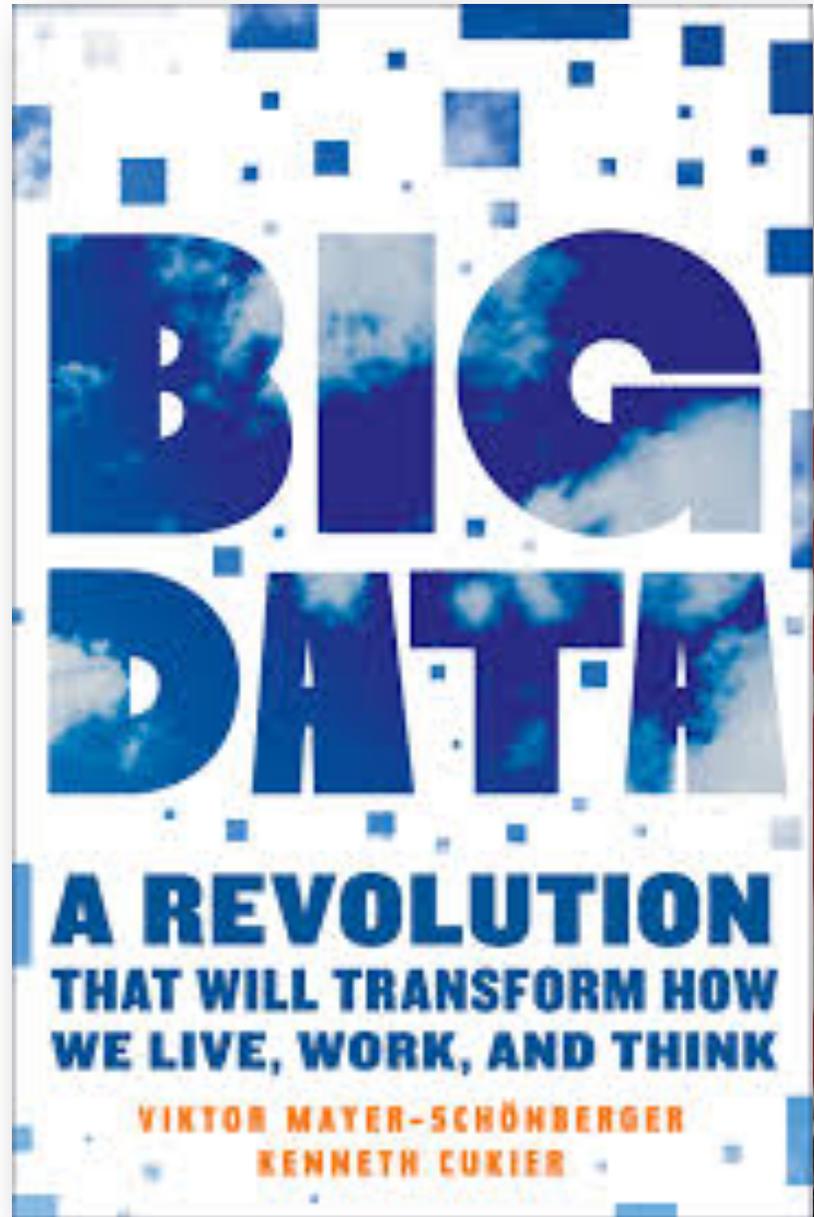


JERRY KAPLAN

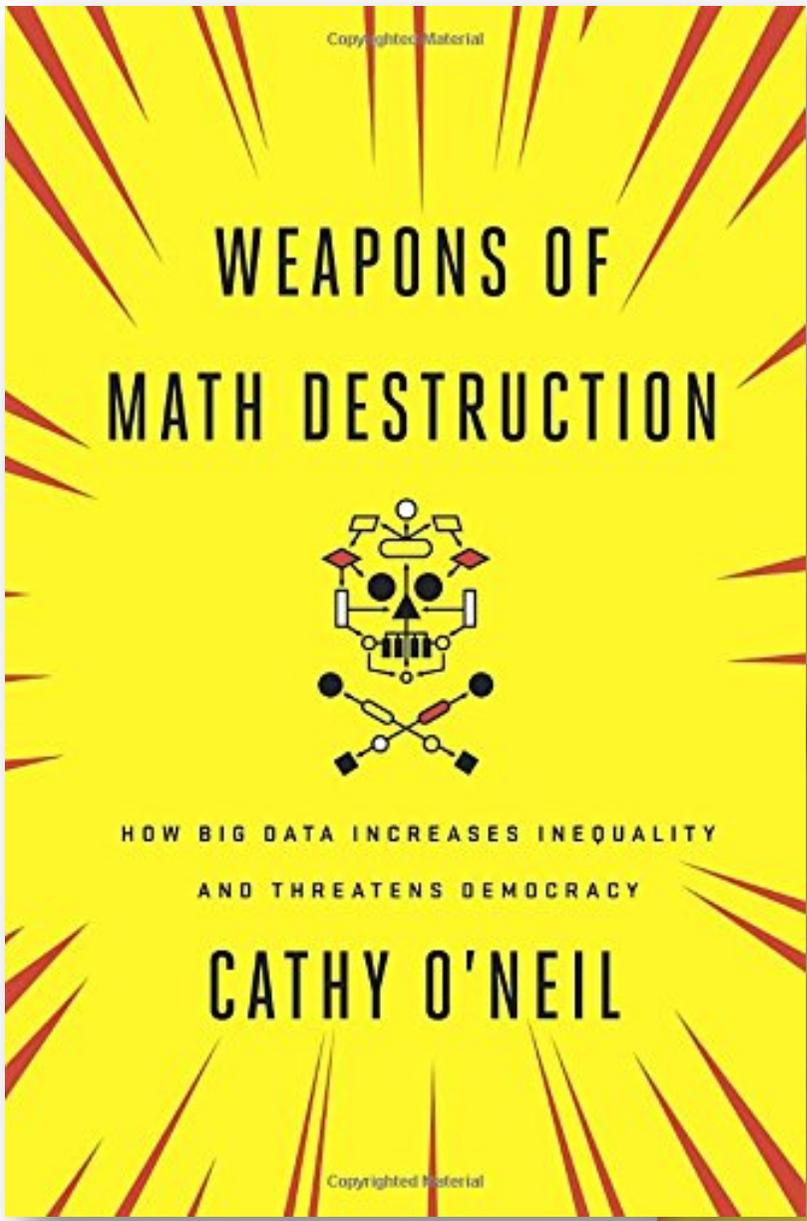
## LE PERSONE NON SERVONO

LAVORO E RICCHEZZA  
ALL'EPOCA DELL'INTELLIGENZA  
ARTIFICIALE

Most of my  
colleagues and  
also medical  
interlocutors are  
positive wrt to  
the ML  
capabilities.



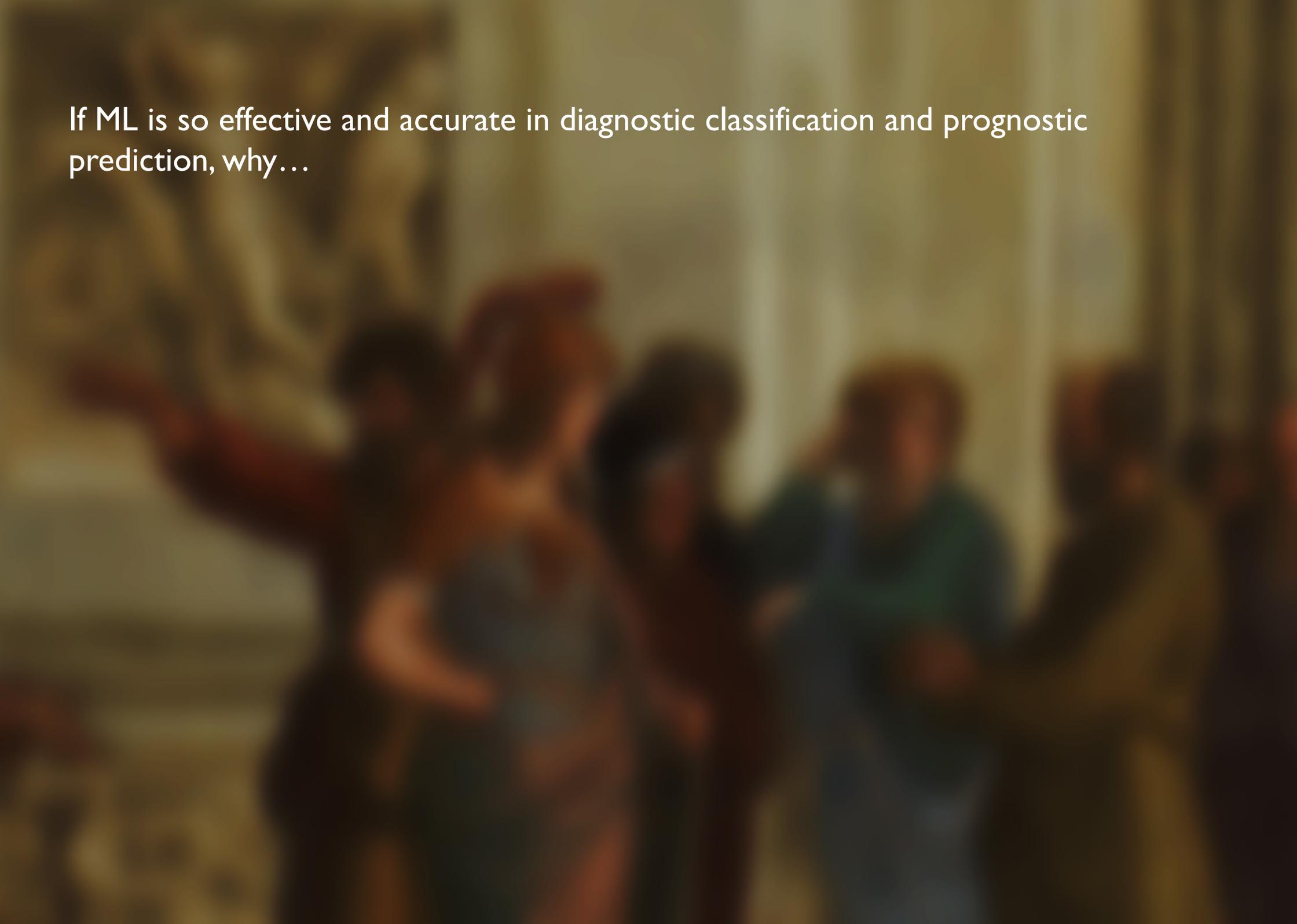
Some are a little  
wary of the  
actual  
performance of  
ML systems.



Few are seriously worried about the more or less far consequences of its use in human work (in medicine).



If ML is so effective and accurate in diagnostic classification and prognostic prediction, why...



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m... and pain?

Mind that Health Informatics IS NOT  
“AI in medicine”.

It is the discipline considering how to  
design, develop and control (cf.  
Wiener) socio-technical systems where  
AI, IA systems and humans interact to  
improve and manage healthcare.



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- ❖ Do not computer scientists invest more effort in helping medicine save more lives and relieve more people from suffering and pain?
- ❖ Ain't Health Informatics one of the most important and attractive fields in computer science (in fact it is one of the most neglected)?
- ❖ Ain't "mechanical medicine" taught at medical schools (like there is a nuclear medicine), nor a "medical computation" (like there is a medical imaging)?

If ML is so effective and accurate in diagnostic classification and prognostic prediction, why...

- ❖ Do not computer scientists invest more effort in helping medicine save more lives and relieve more people from suffering and pain?
- ❖ Ain't Health Informatics one of the most interesting and attractive fields in computer science (in fact it is one of the most interesting and attractive fields in computer science)?
- ❖ Ain't "mechanical medicine" (like mechanical engineering), or nuclear medicine), nor a "medical imaging" (like medical imaging)?

Why should  
medical doctors  
care about  
data and  
algorithms?



**WAIT A MINUTE**

If ML is so effective and accurate in diagnostic classification and prognostic prediction, why...

❖ Do not... effort in helping medicine save  
m... and pain?

Any human use of any  
technology entails to rip the  
“black box” curtain and increase  
awareness, knowledge and  
empowerment in end-users.

The EUD approach...

and attractive fields in  
(ed)?

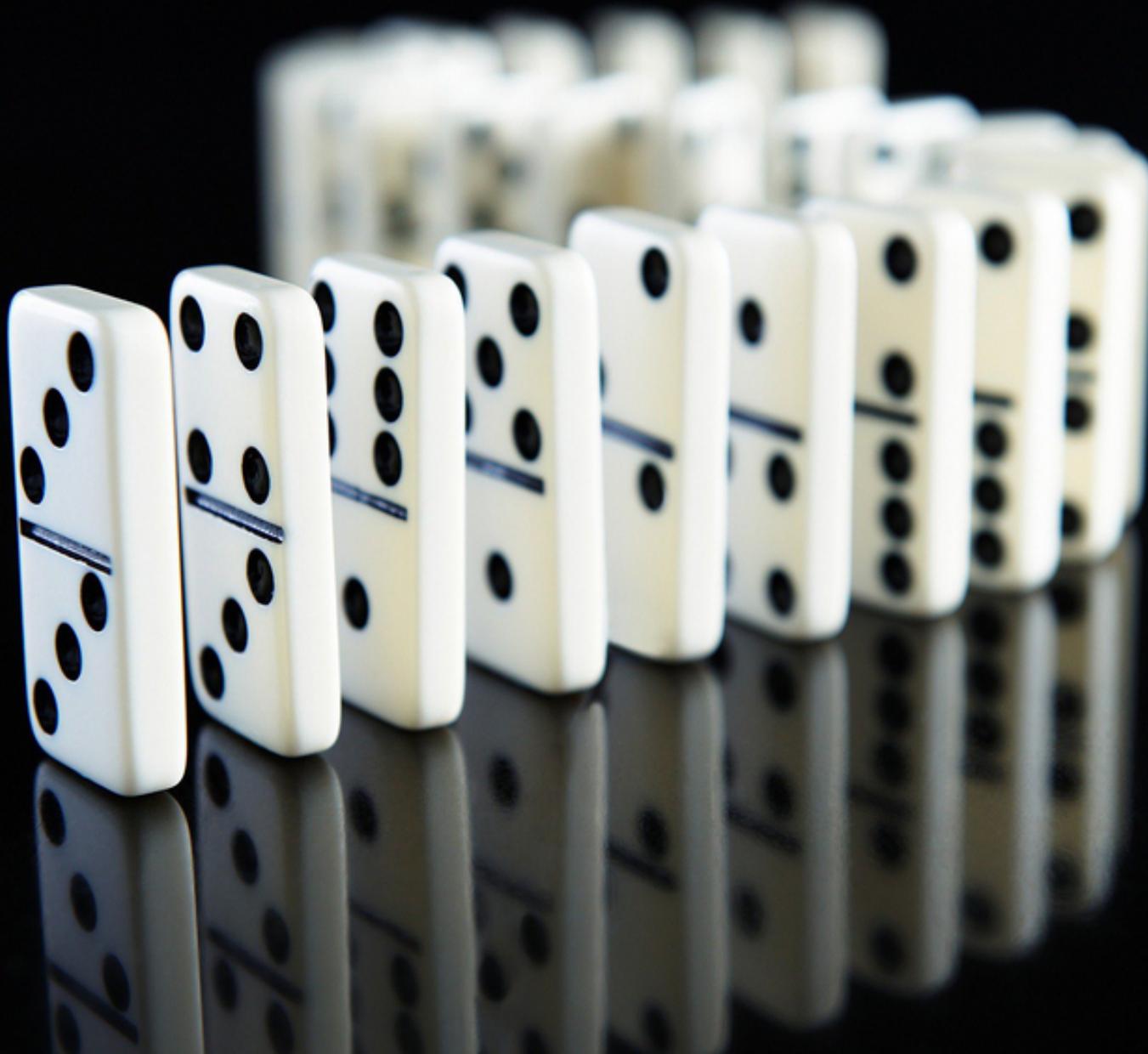
like there is a  
here is a medical



What are the unintended consequences of deploying accurate ML systems in medicine?



# SEMIOTIC DESENSITIZATION EMPIRICAL SCLEROSIS OVERRELIANCE



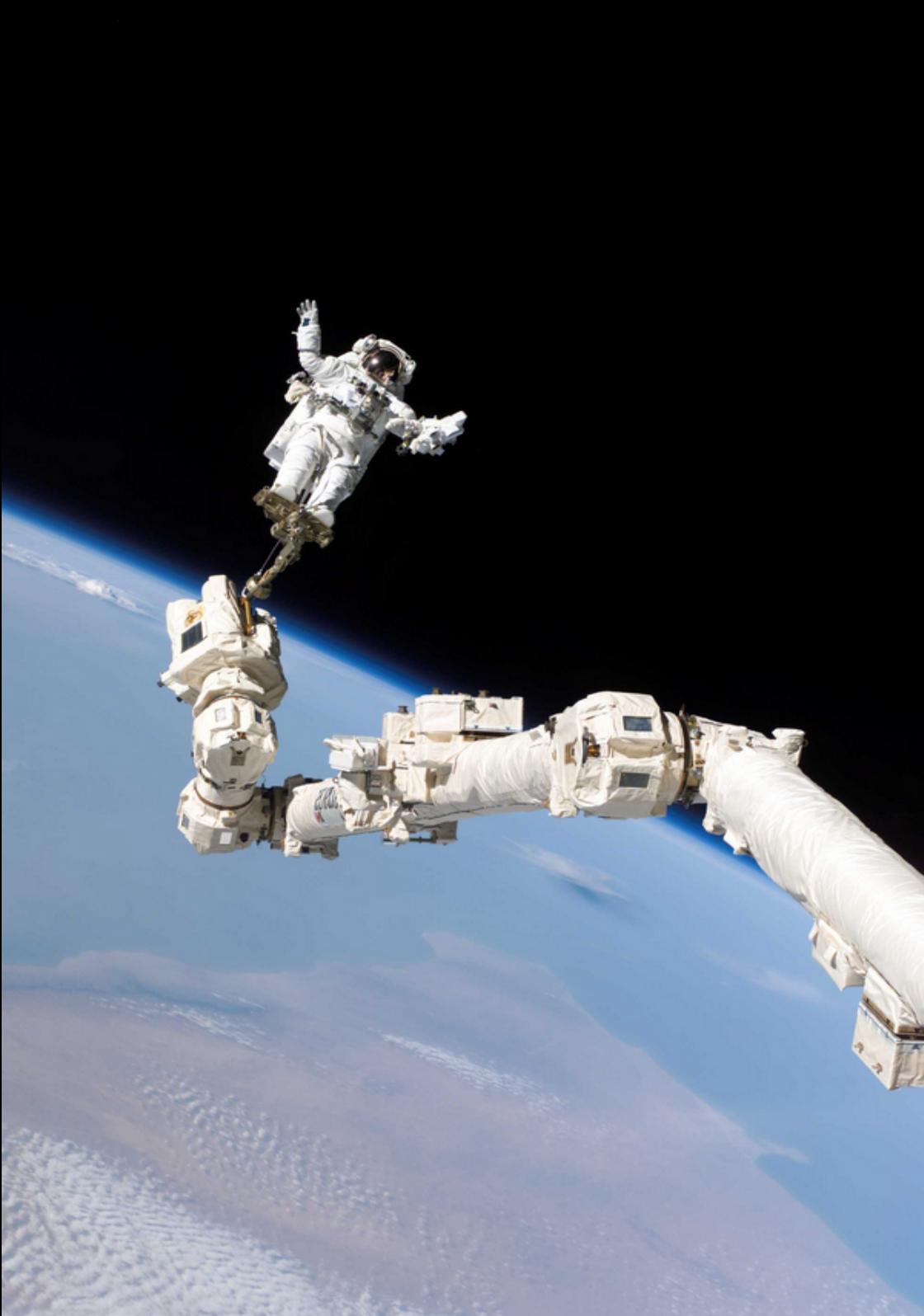
**OVERRELIANCE**



OVERDEPENDENCE

OVERCONFIDENCE





# OVERRELIANCE



## OVERDEPENDENCE

## OVERCONFIDENCE

- Lack, oblivion or ignorance of plan B, i.e., either contingency plan or alternatives.
- Lack of autonomy;
- Abuse, i.e., use beyond actual need;



## OVERRELIANCE

OVERDEPENDENCE

OVERCONFIDENCE

- Thinking it will never fail;
- Thinking it will never harm;
- Thinking it will never be wrong;

# SEMIOTIC DESENSITIZATION

$$\frac{10}{3} = 3,333333333333333$$



## SEMIOTIC DESENSITIZATION

the progressive decrease of responsiveness and sensitivity of physicians with respect to material, bodily signs of the patient in favor of their quantified representation in electronic patient records, and decision support tools.

$$\frac{10}{3} = 3,333333333333333$$



# EMPIRICAL SCLEROSIS



## **EMPIRICAL SCLEROSIS**

Supervised ML techniques learn the underlying structure binding empirical data (features) to their categorical interpretation (classes)



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## EMPIRICAL SCLEROSIS

Supervised ML techniques learn the underlying structure binding empirical data (features) to their categorical interpretation (classes). However this risks to freeze the always-to-some-extent arbitrary, unreliable, idiosyncratic sign-data-class mapping of one (or few) observers. Who could not agree with others and even with themselves (cf. inter and intra-rater reliability, or observer



## EMPIRICAL SCLEROSIS AND COMPLACENCY



SPOCK: Medical banks, compute described subject's physical age, using established norms as comparative base.  
COMPUTER: Working. Subject's physical age based on physiological profile, between sixty and seventy two. Aging rapidly.

KIRK: No, I'm thirty four. I'm thirty four years old.

STOCKER: The computer differs with you, Captain.

SPOCK: Doctor McCoy.

MCCOY: Yes.

SPOCK: Will you give us your professional evaluation of Captain Kirk's present physical condition.

MCCOY: Captain Kirk is suffering from a, a peculiar physical degeneration which strongly resembles aging.

SPOCK: Is not his mental capacity degenerating even more rapidly?

MCCOY: Yes, yes, but he's a better man right now

SPOCK: Doctor, you heard the computer's analysis of Captain Kirk's physical age. Do you agree with it?

MCCOY: It's a blasted machine, Spock! You can't argue with a machine.

SPOCK: Do you agree with it, Doctor?

MCCOY: Yes. Yes, I do, agree. And I am sorry, Jim.



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