Parallel session High Tech

briskr health and high tech generator

HAN UNIVERSITY OF APPLIED SCIENCES

SMB Facilities & Support in Life Sciences

Radboud University

From Visual Inspection To Causal Discovery

April 2022, Nijmegen

Ali Bahramisharif

OUTLINE

INTRODUCTION

CAUSALITY AND EXPLAINABILITY

VISION AND INSPECTION

COOL STUFF

CONCLUSION

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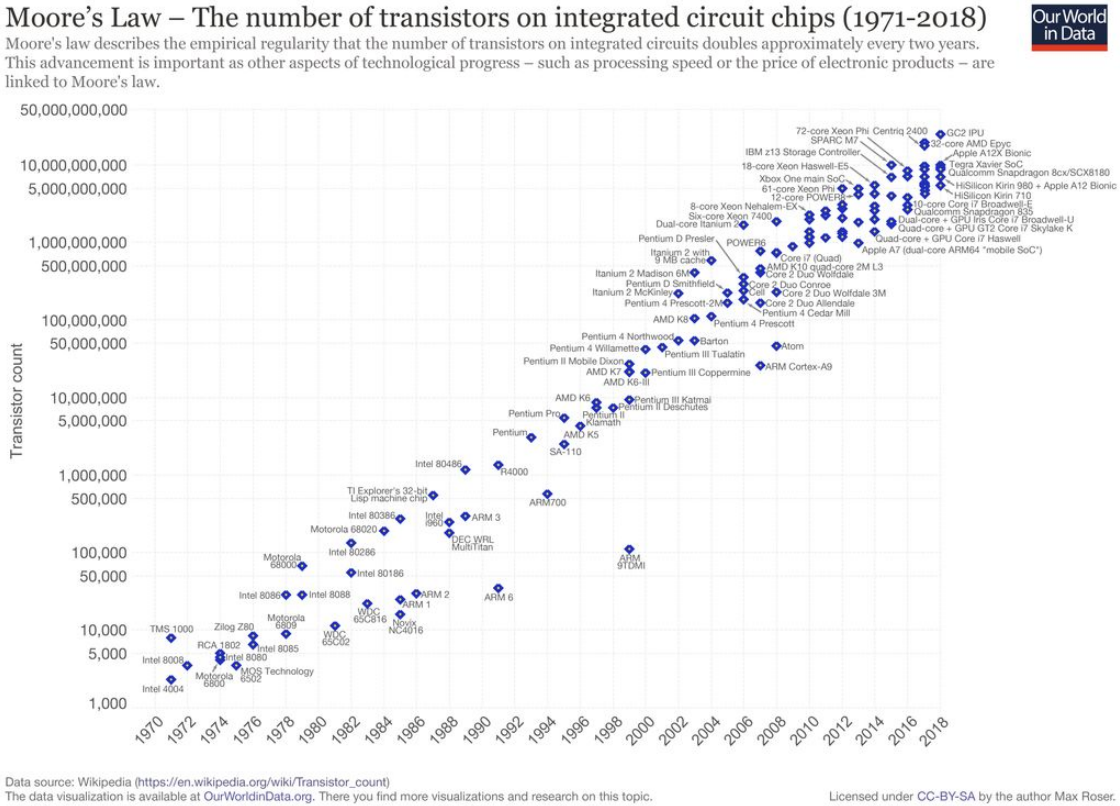
MOORE'S LAW



Data source: Wikipedia (https://en.wikipedia.org/wiki/Transistor_count)
The data visualization is available at OurWorldinData.org. There you find more visualizations and research on this topic.

Licensed under CC-BY-SA by the author Max Roser.

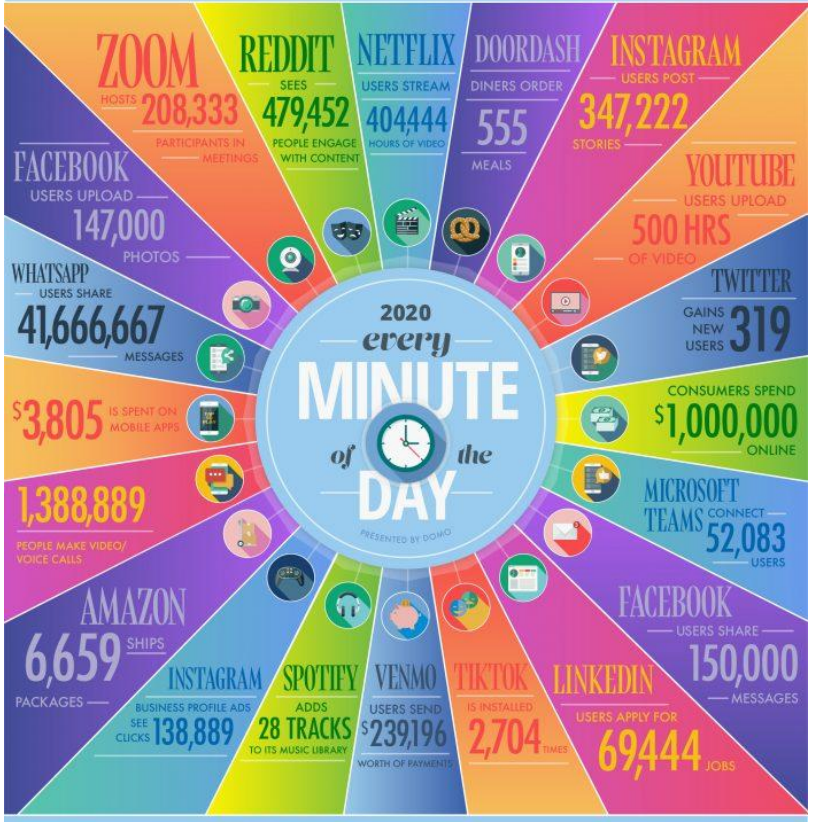
The number of transistors in a dense integrated circuit doubles about every two years.

DATA NEVER SLEEPS 8.0

DOMO

How much data is generated *every minute?*

In 2020, the world changed fundamentally—and so did the data that makes the world go round. As COVID-19 swept the globe, nearly every aspect of life—from work to working out—moved online, and people depended more and more on apps and the Internet to socialize, educate and entertain ourselves. Before quarantine, just 15% of Americans worked from home. Now over half do. And that's not the only big shift. In our 8th edition of Data Never Sleeps, we bring you the latest stats on how much data is being created in every digital minute—a trend that shows no sign of stopping.



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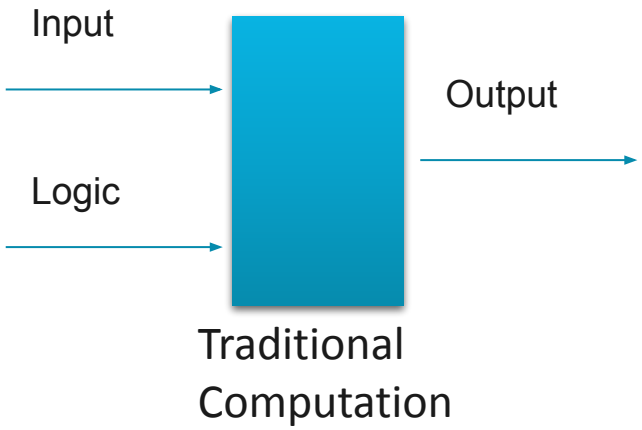
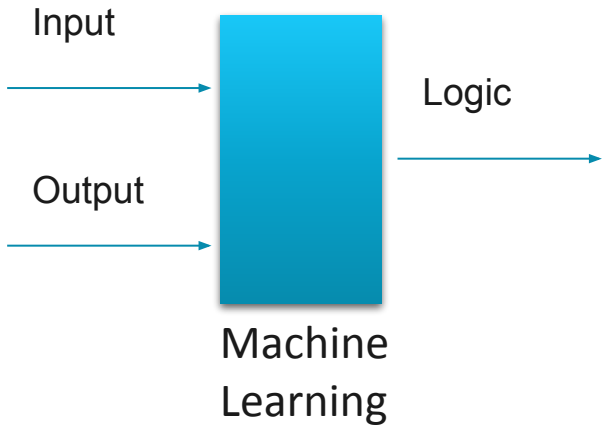
MACHINE LEARNING





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DATA

MACHINE2LEARN

Attributes

Objects

Tid	Refund	Marital Status	Taxable Income	Cheat
1	Yes	Single	125K	No
2	No	Married	100K	No
3	No	Single	70K	No
4	Yes	Married	120K	No
5	No	Divorced	95K	Yes
6	No	Married	60K	No
7	Yes	Divorced	220K	No
8	No	Single	85K	Yes
9	No	Married	75K	No
10	No	Single	90K	Yes

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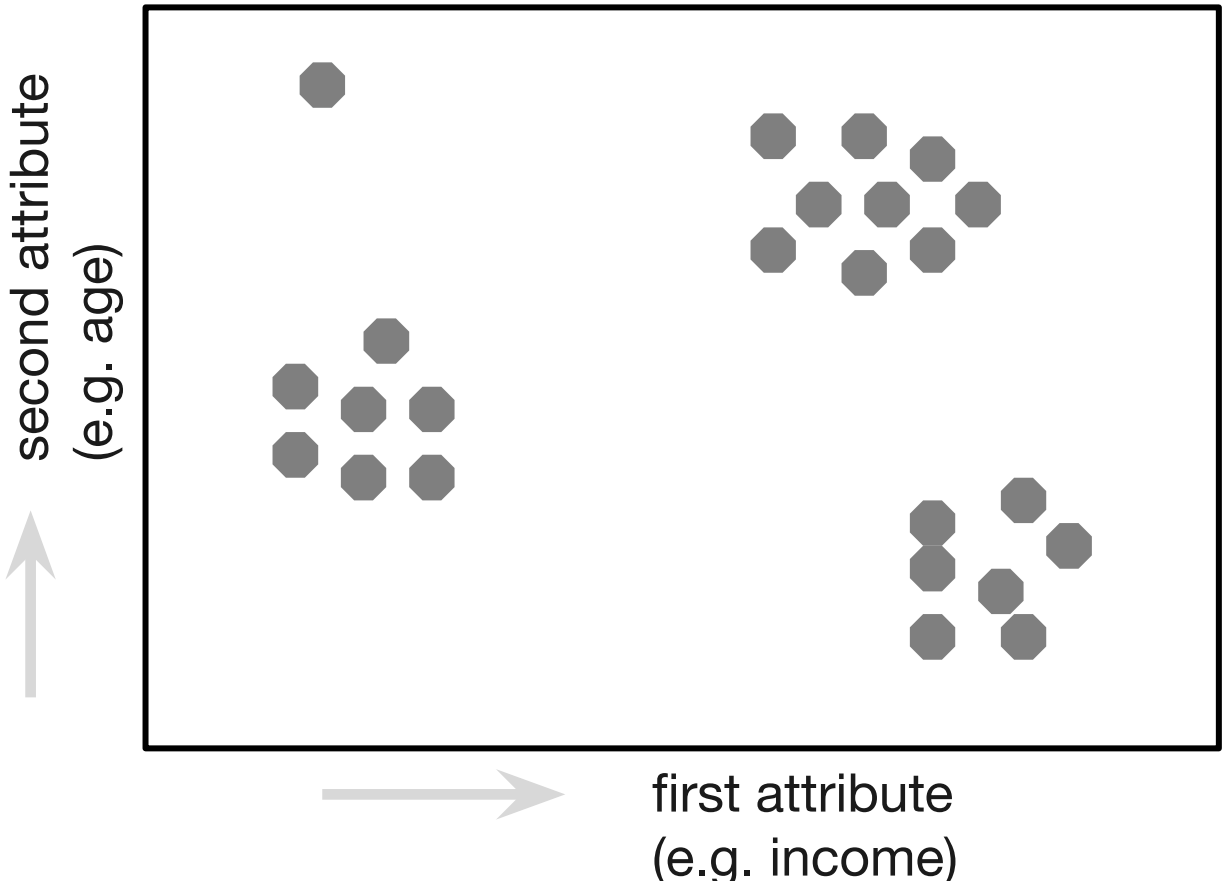
ATTRIBUTES



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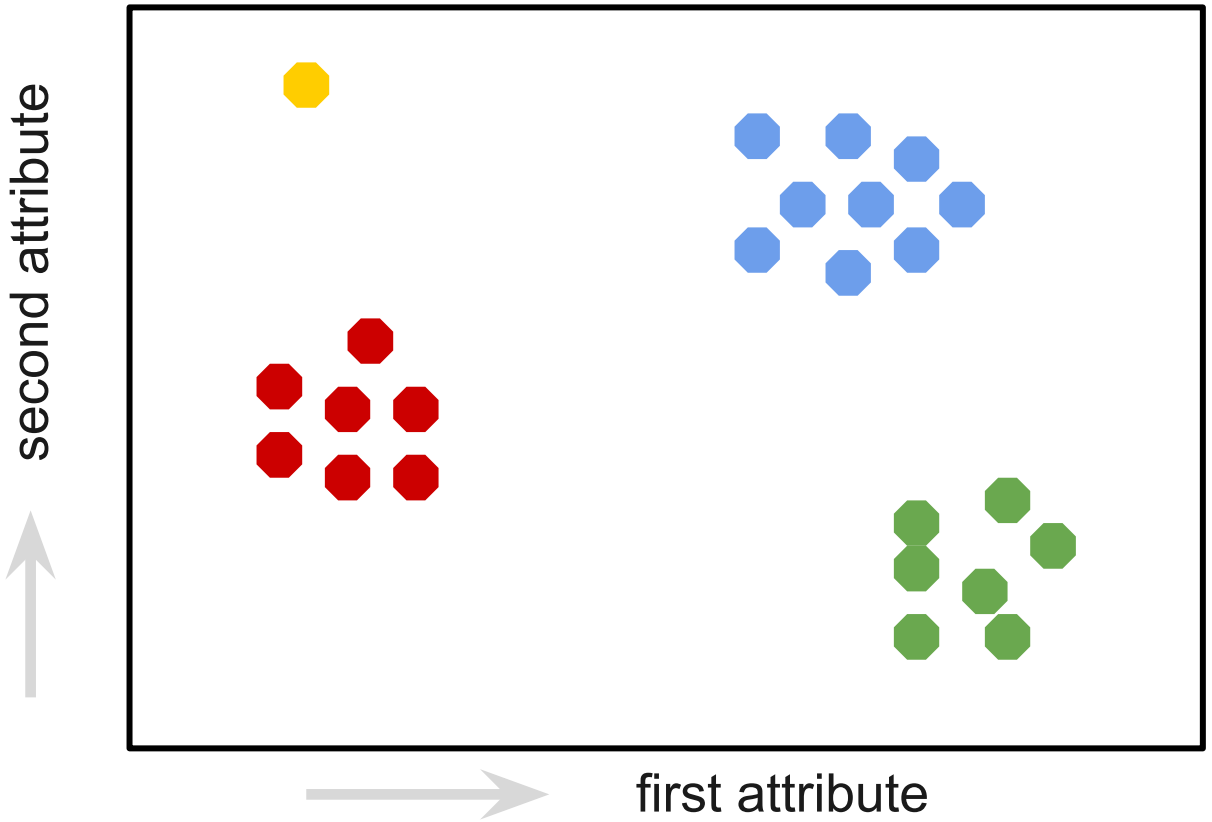
CLUSTERS



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EXPLAINABILITY

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"Why Should I Trust You?" Explaining the Predictions of Any Classifier

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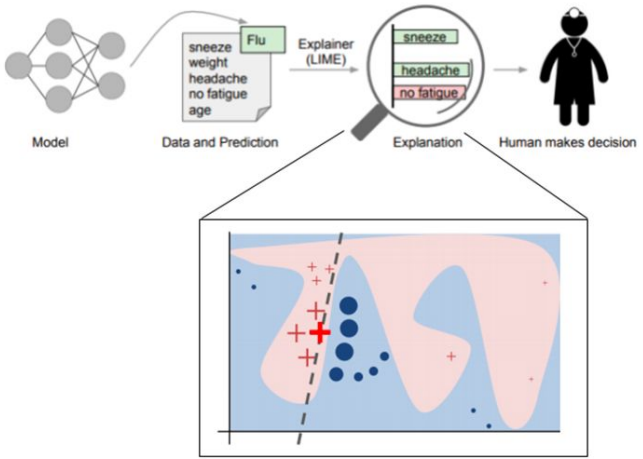

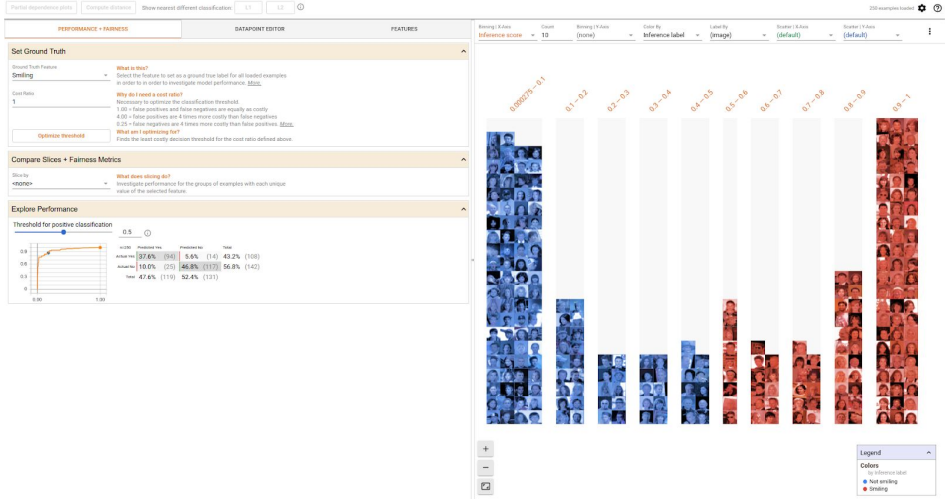

EXPLAINABILITY

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Covariates

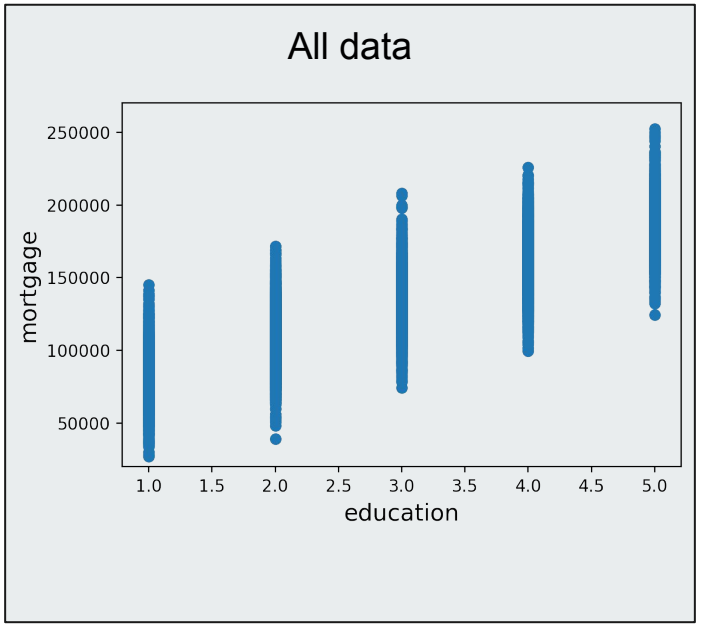
Marital Status

Education

Income

Outcome

Mortgage Amount



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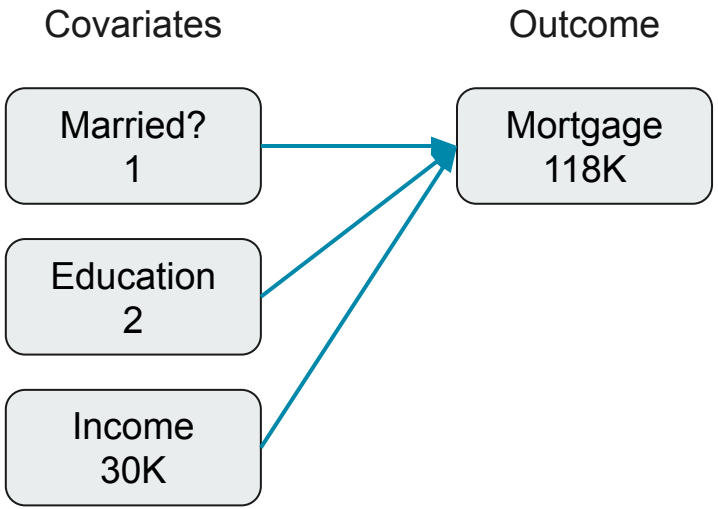
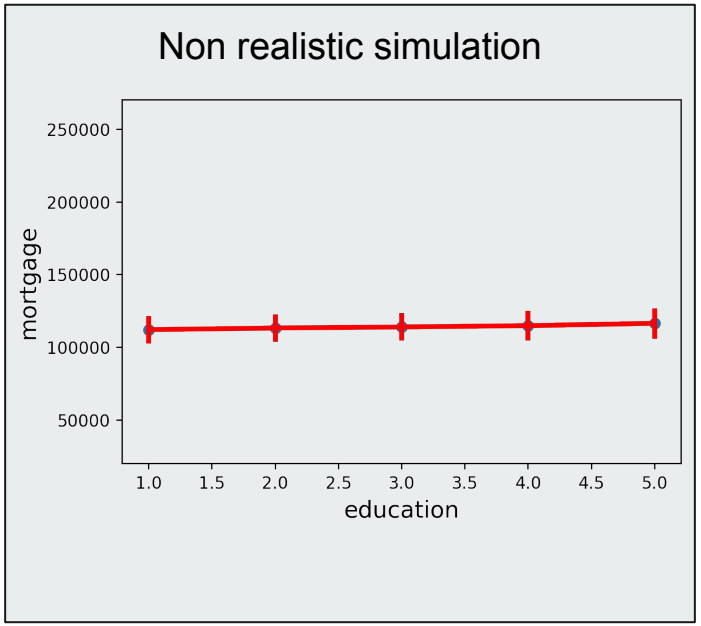
EDUCATION/MORTGAGE





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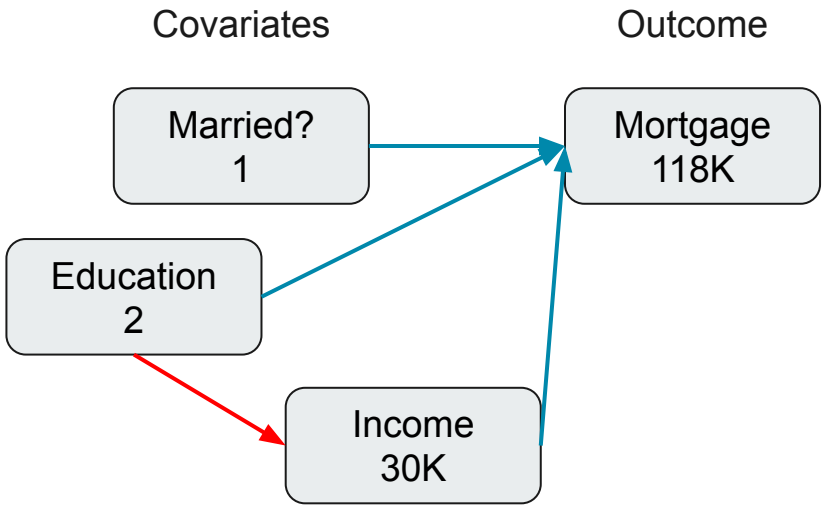
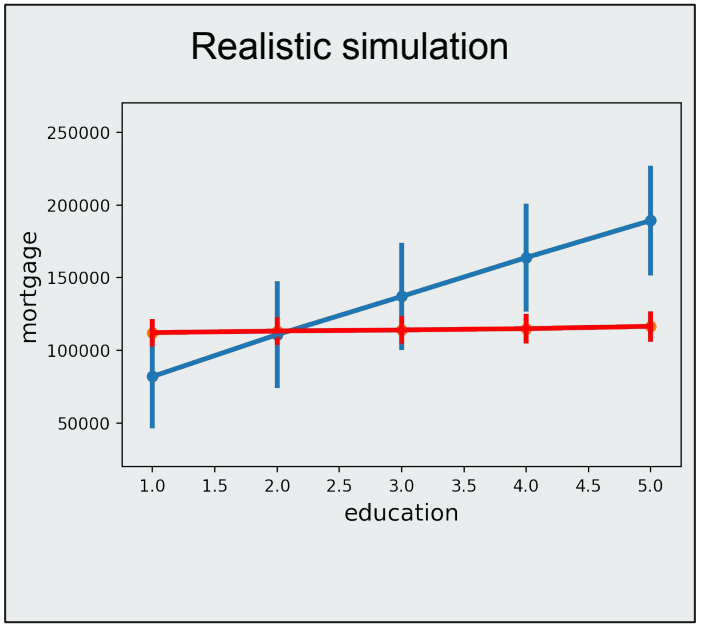
CAUSALITY BASED EXPLAINABILITY





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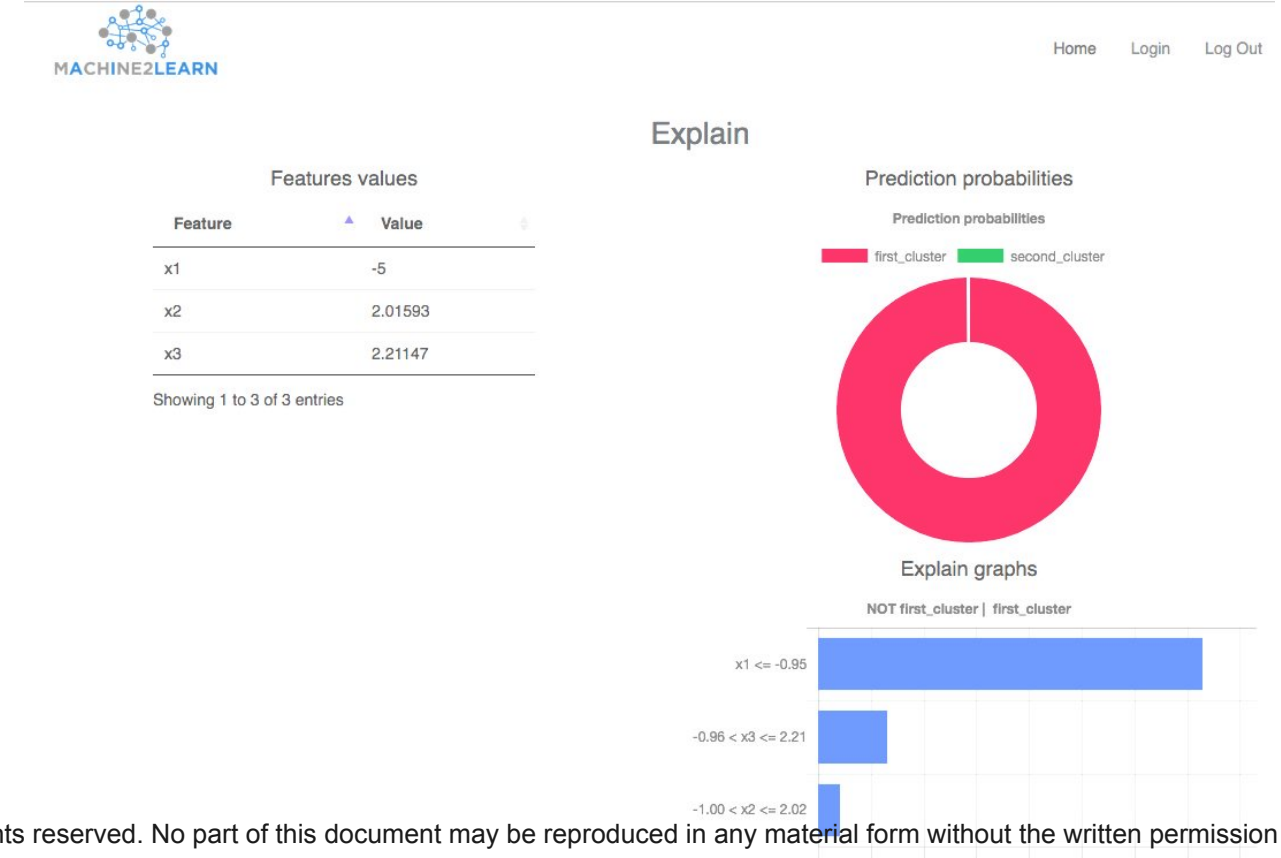
EXPLAINABILITY



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CAUSAL DISCOVERY

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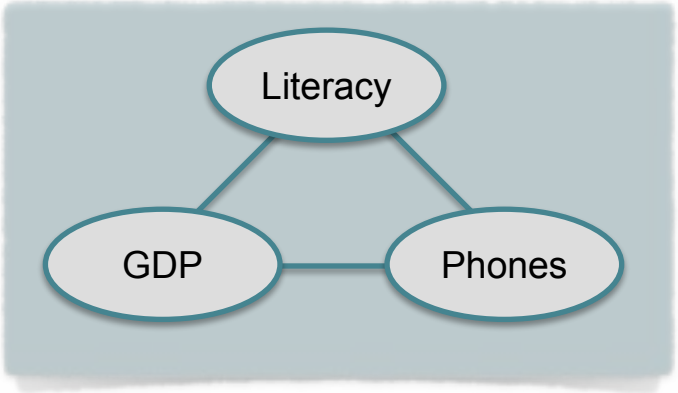
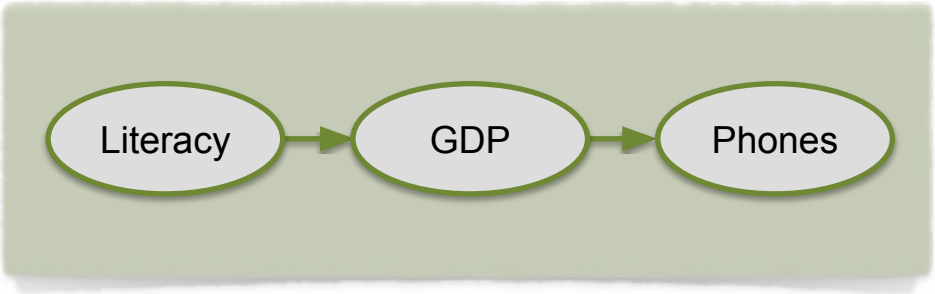
Literacy (%)	GDP ($ per capita)	Phones (per 1000)
36.0	700.0	3.2
86.5	4500.0	71.2
70.0	6000.0	78.1
97.0	8000.0	259.5
100.0	19000.0	497.2
42.0	1900.0	7.8
95.0	8600.0	460.0
89.0	11000.0	549.9
97.1	11200.0	220.4
98.6	3500.0	195.7
97.0	28000.0	516.1
100.0	29000.0	565.5
98.0	30000.0	452.2
97.0	3400.0	137.1
95.6	16700.0	460.6
89.1	16900.0	281.3
43.1	1900.0	7.3
97.4	15700.0	481.9
99.6	6100.0	319.1
98.0	29100.0	462.6
94.1	4900.0	115.7
40.9	1100.0	9.7
98.0	36000.0	851.4
42.2	1300.0	14.3
87.2	2400.0	71.9
NaN	6100.0	215.4
79.8	9000.0	80.5
86.4	7600.0	225.3
97.8	16000.0	506.5
93.9	18600.0	237.2
...	...	...

Regular statistics



Causal discovery



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CAUSAL RELATIONS

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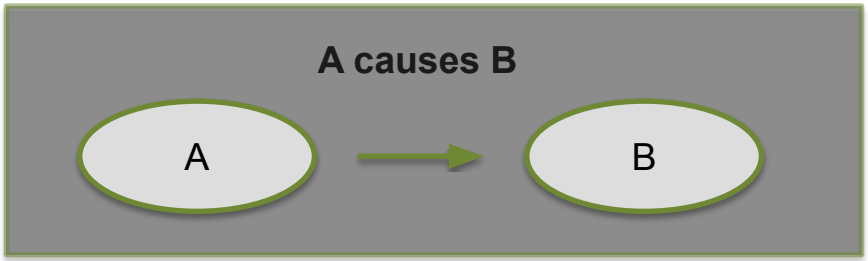

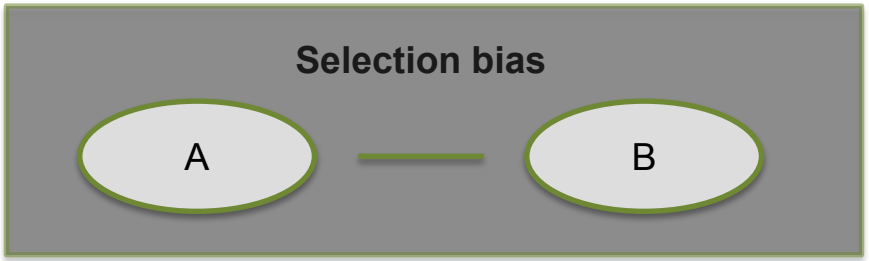

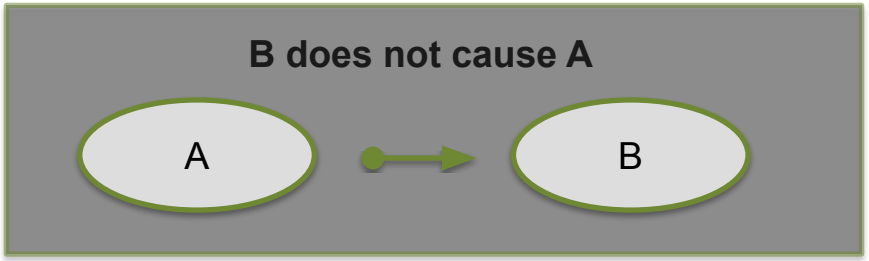

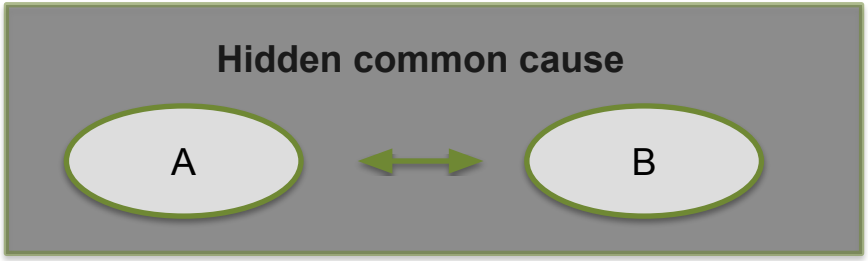

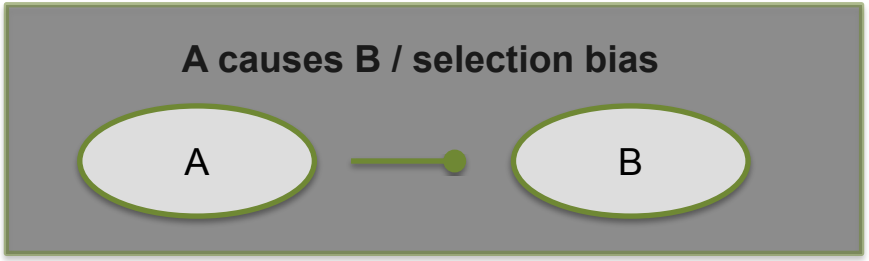

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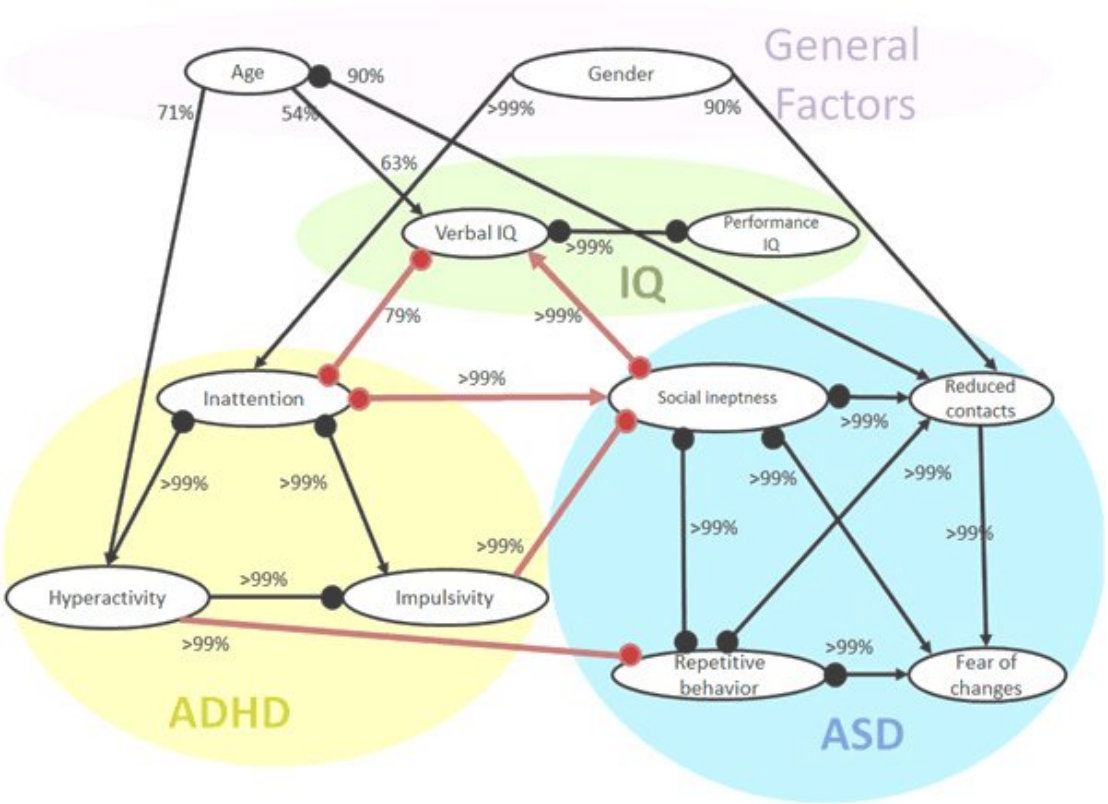
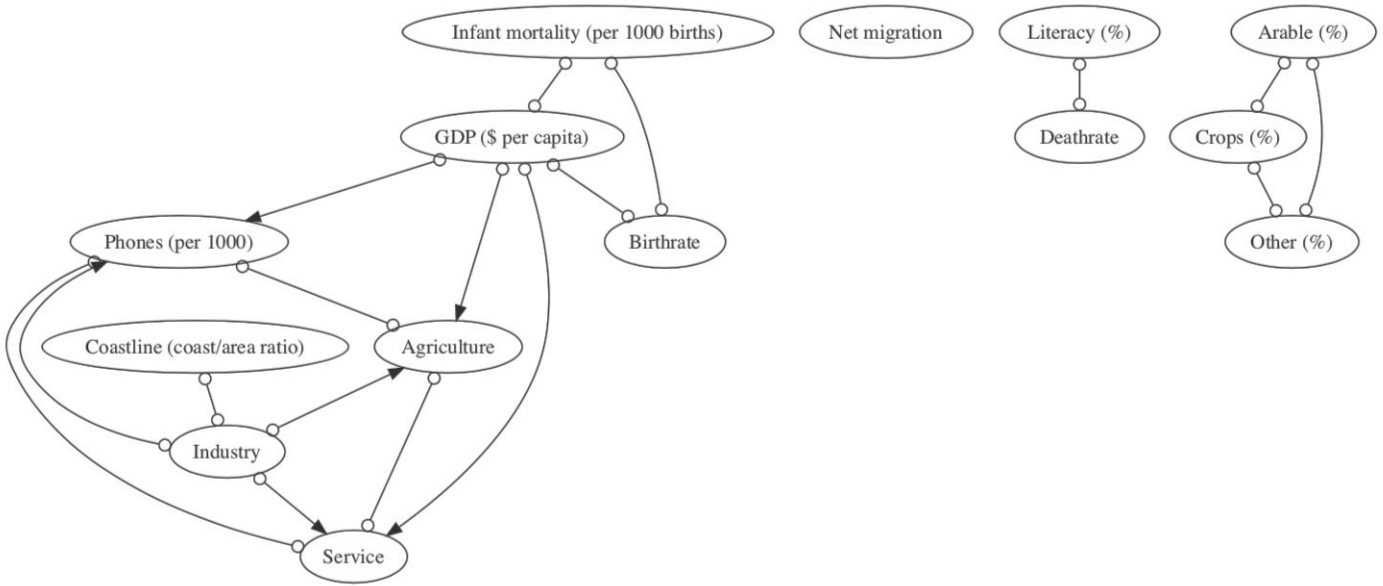
MEDICAL DATASET



ECONOMIC DATASET



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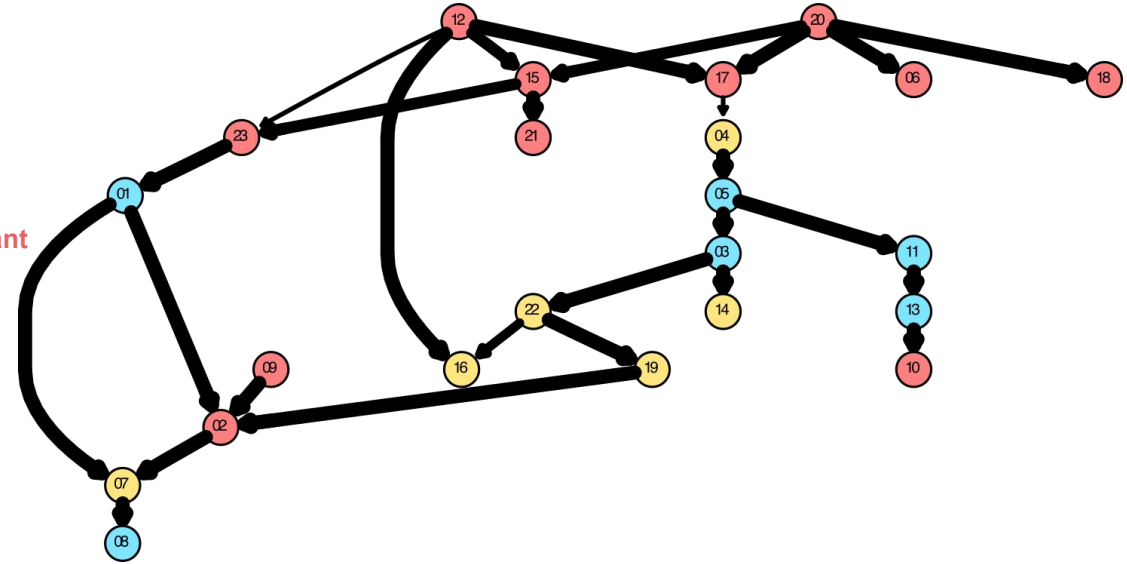
QUESTIONNAIRE

MACHINE2LEARN

1. Yelled at others when they have annoyed you
2. Had fights with others to show who was on top
3. Reacted angrily when provoked by others
4. Taken things from other students
5. Gotten angry when frustrated
6. Vandalized something for fun
7. Had temper tantrums
8. Damaged things because you felt mad
9. Had a gang fight to be cool
10. Hurt others to win a game
11. Become angry or mad when you don't get your way
12. Used physical force to get others to do what you want
13. Gotten angry or mad when you lost a game
14. Gotten angry when others threatened you
15. Used force to obtain money or things from others
16. Felt better after hitting or yelling at someone
17. Threatened and bullied someone
18. Made obscene phone calls for fun
19. Hit others to defend yourself
20. Gotten others to gang up on someone else
21. Carried a weapon to use in a fight
22. Gotten angry or mad or hit others when teased
23. Yelled at others so they would do things for you



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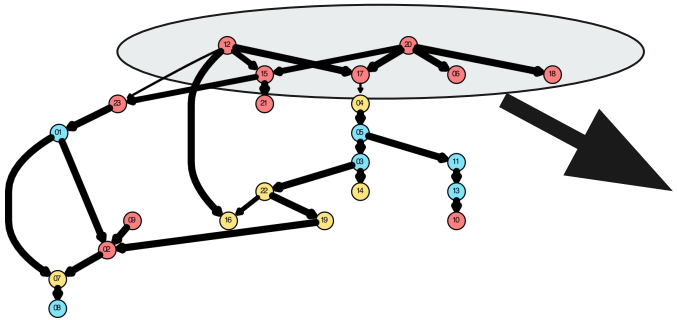

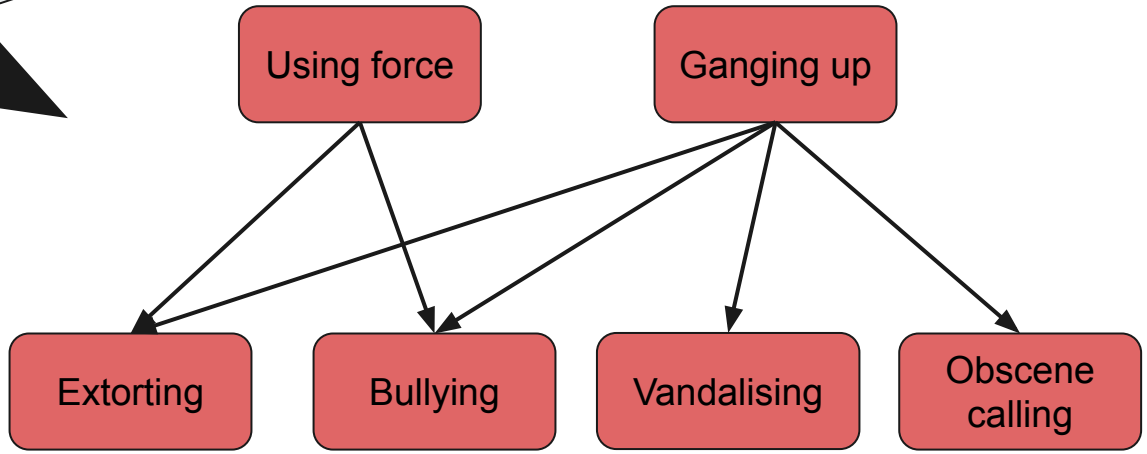

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VISION AND INSPECTION

M2L IMPLEMENTATION CYCLE

MACHINE2LEARN

Identify and React

M2L Studio Classify

Learn and Optimise

M2L Studio Customisation

Detect and Collect

M2L Studio Annotation

Support

M2L Team

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AKZONOBEL

Problem Description

Current State

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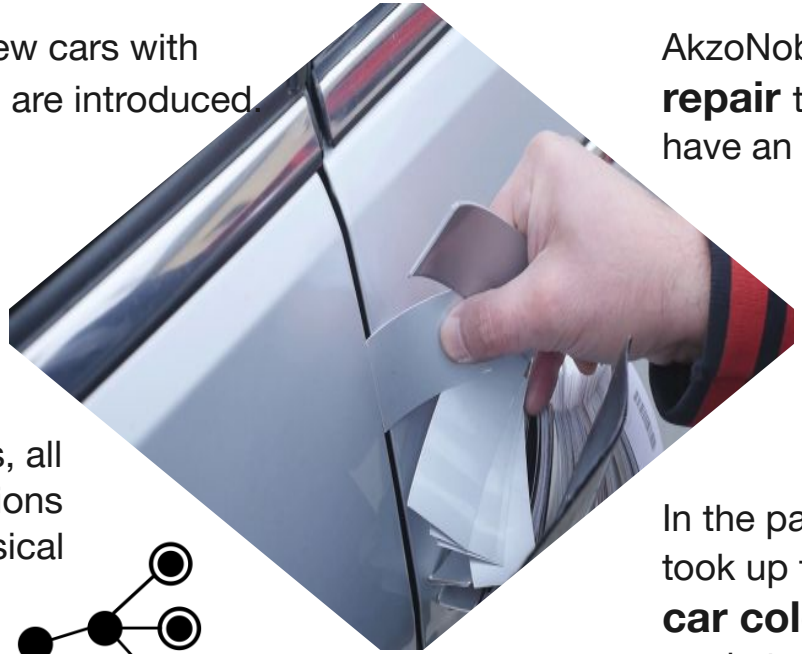
PROBLEM DESCRIPTION

Every year, new cars with **new colors** are introduced.



AkzoNobel provides the **paint to repair** these cars when drivers have an accident.

Up until recent years, all **prediction** calculations were based on physical models.

In the past, it sometimes took up to **two years to get a car color available** for the market.

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CURRENT STATE

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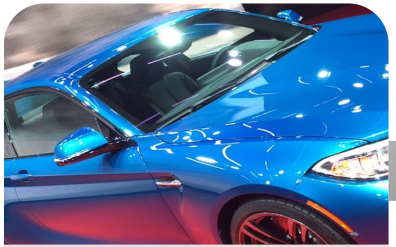
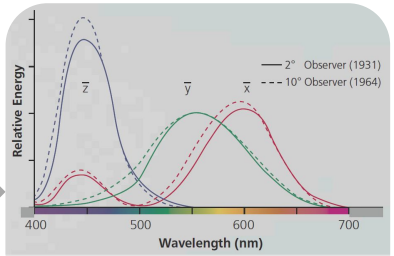


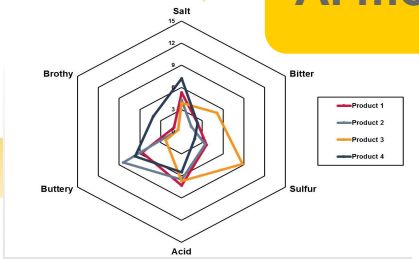
Color sample

Color measurement



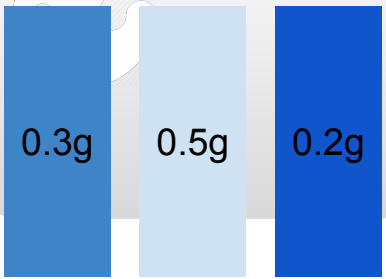
Color data

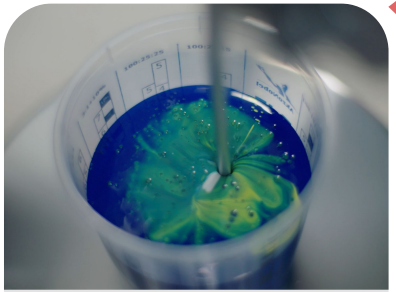
AI model



adjust

Color formula





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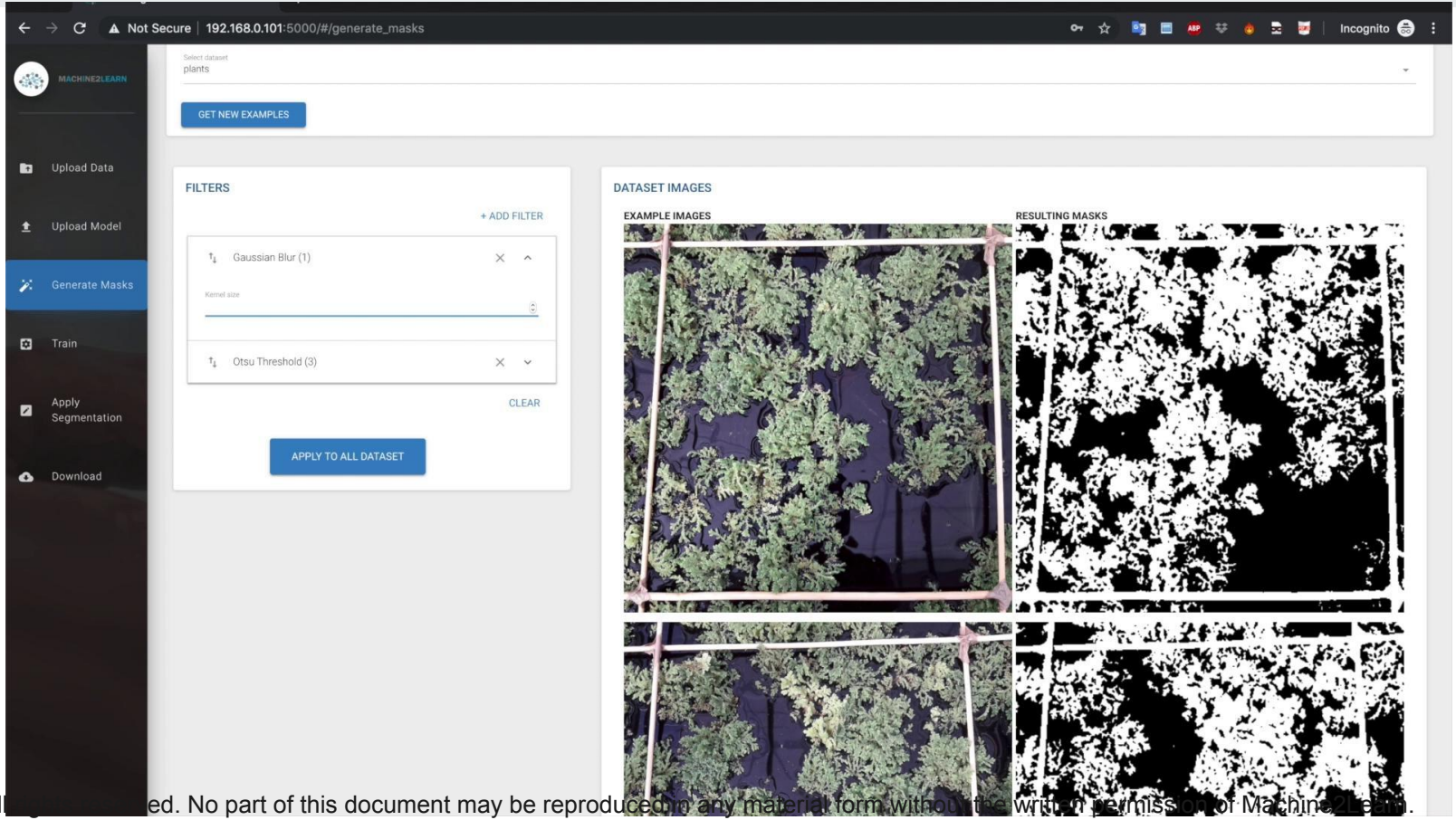
COOL STUFF

GREEN SEGMENTATION



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VISUAL ANOMALY DETECTION

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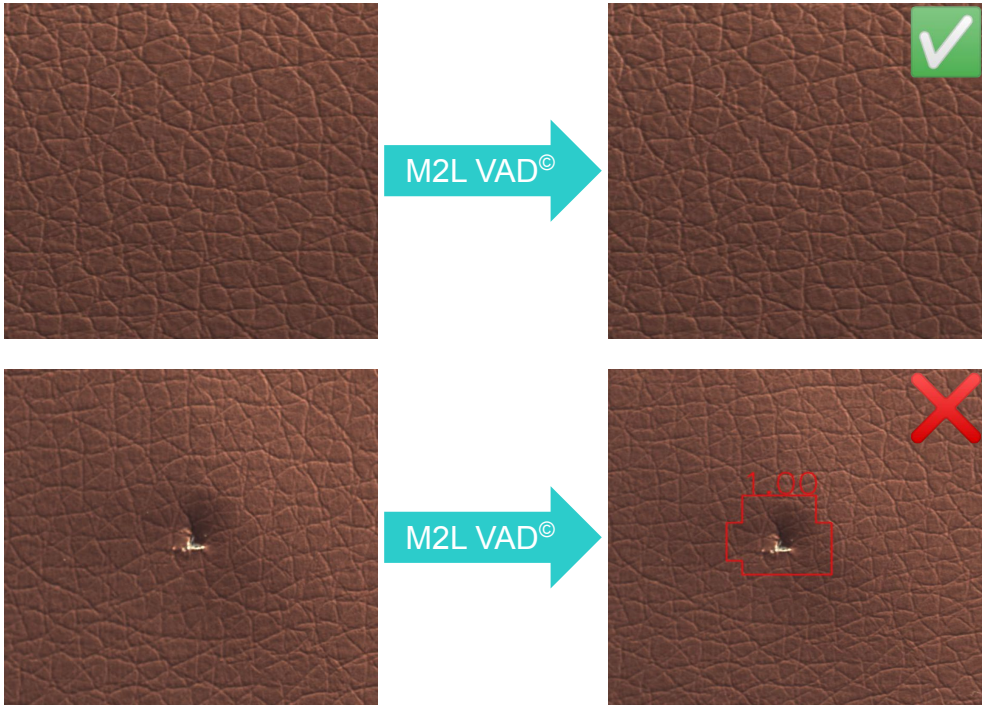

http://anomaly.machine2learn.com

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ANOMALY PREVENTION

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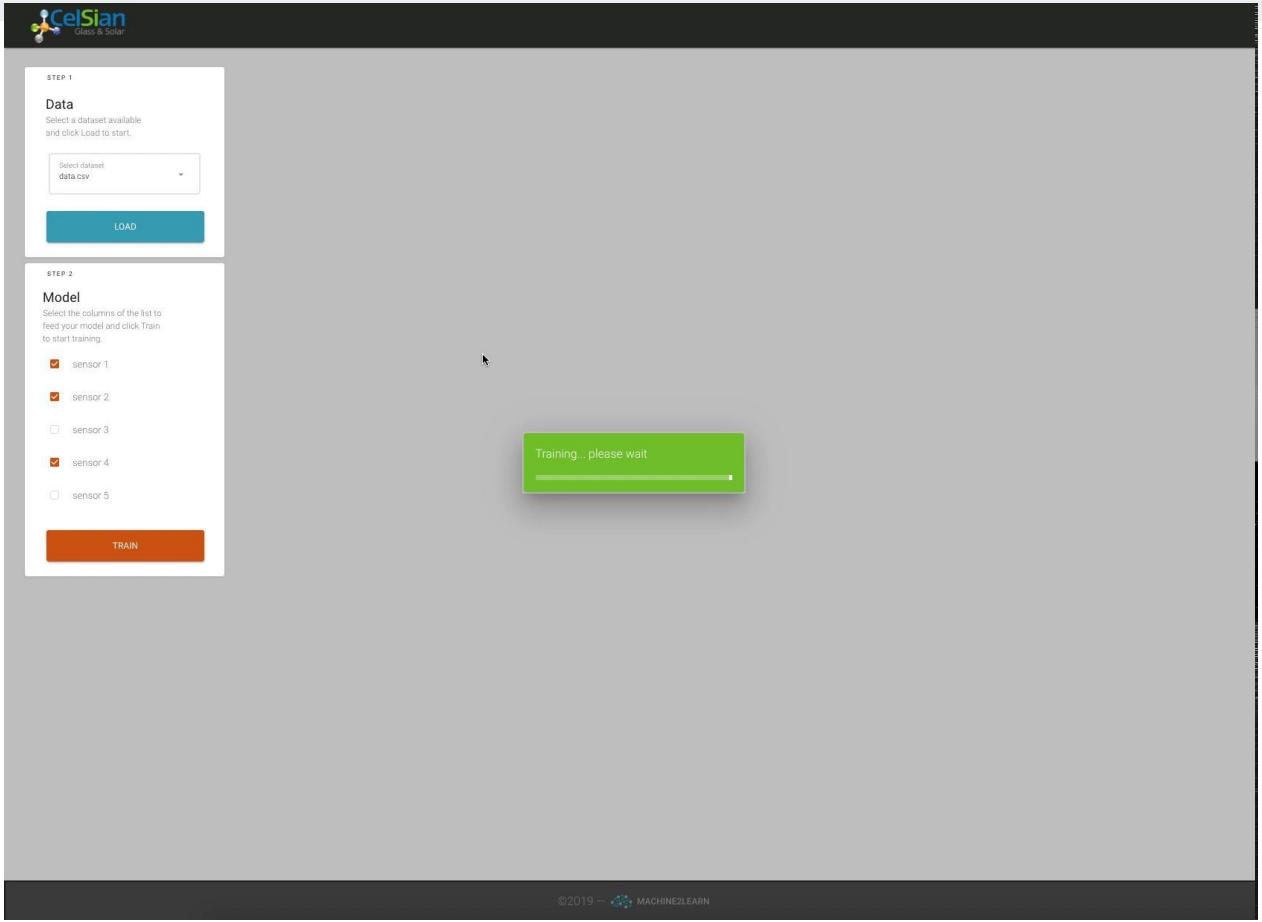
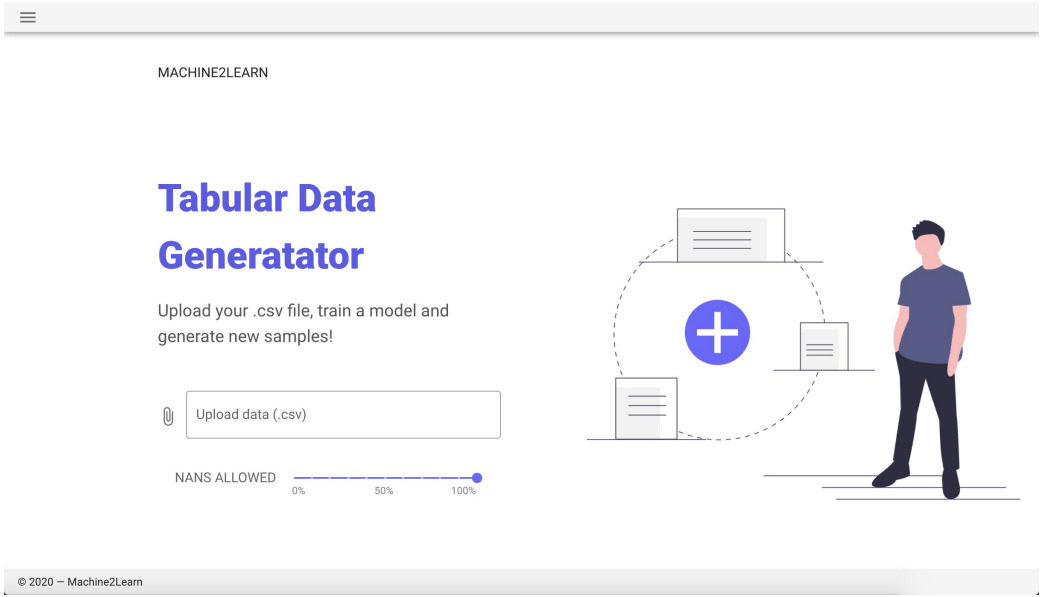


DATA GENERATION



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ROBOT NAVIGATION

MUSIC GENRE TRANSFER

IMAGE STYLE TRANSFER

MUSIC GENRE TRANSFER

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Content Musical Piece		Style (Musical Piece)		Output Musical Piece
Metallica's Master of Puppets	+	Beethoven's 5th Symphony	=	Beethoven's Master of Puppets?
		OR		
Stevie Wonder's Isn't She Lovely	+	Hip-hop	=	Hip-hoppy Isn't She Lovely?

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METALLICA-ENTER SANDMAN JAZZ

EXAMPLE
EUROPOP TO SOUL

Source

Transfer

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TAKE HOME MESSAGES

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Deep learning is cool, especially for computer vision.

Explainability / transparency is essential for gaining trust.

Causal inference if you care about the effect of interventions.

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Empowering Smart Industry

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Parallel session High Tech

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