

The background is a blue-toned industrial scene featuring robotic arms and machinery. Overlaid on this are various technical icons: a wrench and screwdriver, a cloud with an upload arrow, a Wi-Fi symbol, a group of three people, an oil rig, a smartphone with a gear, a person in a hard hat, a target with a gear, a lightbulb with a gear, a globe, a gear with a checkmark, and a robotic arm. There are also circular data visualizations and a network diagram at the bottom left.

Herausforderungen von Heute sind die Chancen von Morgen

Daten, Künstliche Intelligenz, Optimierung Instandhaltung

:: csem

Deep was...?

ARTIFICIAL INTELLIGENCE

MACHINE LEARNING

DEEP LEARNING



1950's

1960's

1970's

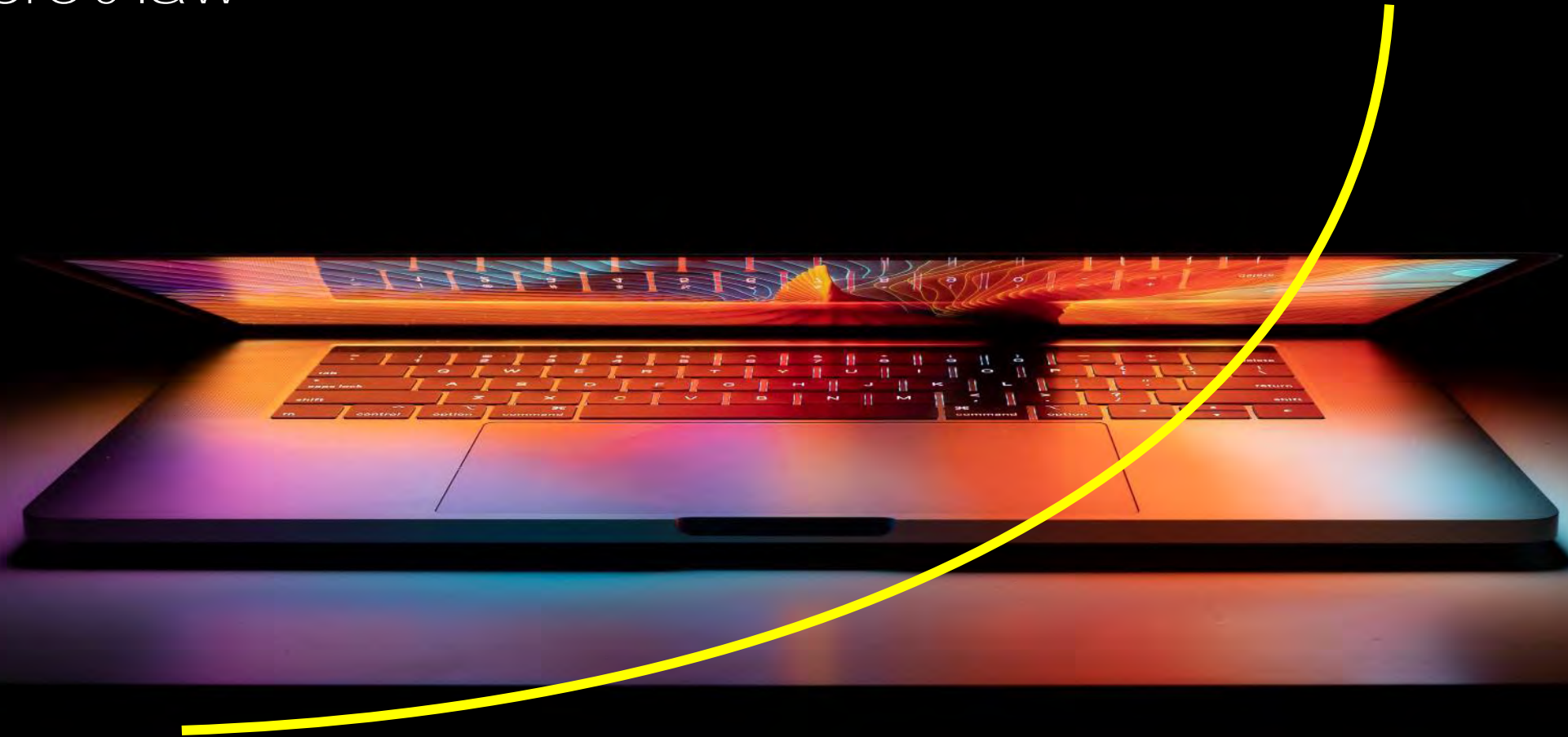
1980's

1990's

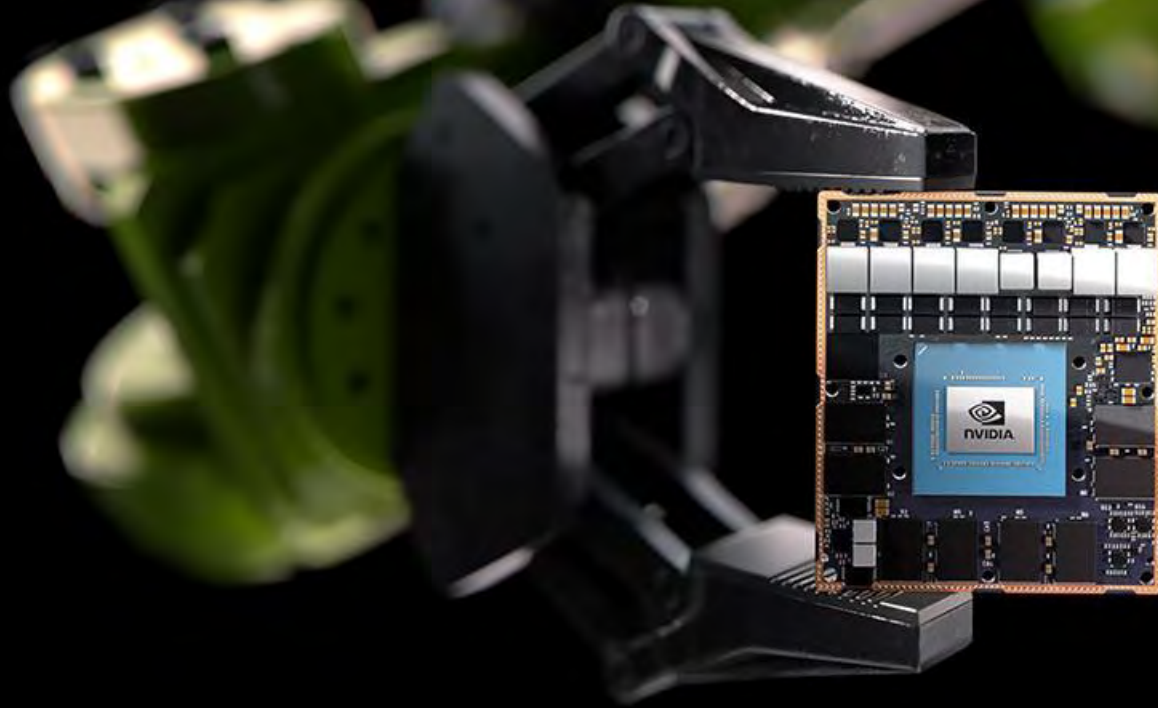
2000's

2010s

Moore's law



- ✓ Nvidia AGX Orin
- ✓ 275 TeraOPS (10^{12})
- ✓ 15-60W



«The **world's** most valuable resource is no longer oil...





...but annotated data»

A DAY IN DATA

The exponential growth of data is undisputed, but the numbers behind this exponential growth – the use of connected devices – are hard to comprehend, particularly when

500m

tweets are sent every day

Twitter

294bn

billion emails are sent

Radicati Group

3.5bn
people use emails

90% der heutigen weltweiten Daten wurden in den letzten 2 Jahren generiert

DEMYSTIFYING DATA UNITS

familiar 'bit' or 'megabyte', larger units of measurement are more frequently used to describe the masses of data

Size

of a byte

463EB

of data will be created every day by 2025

idc

95m

photos and videos are shared on Instagram

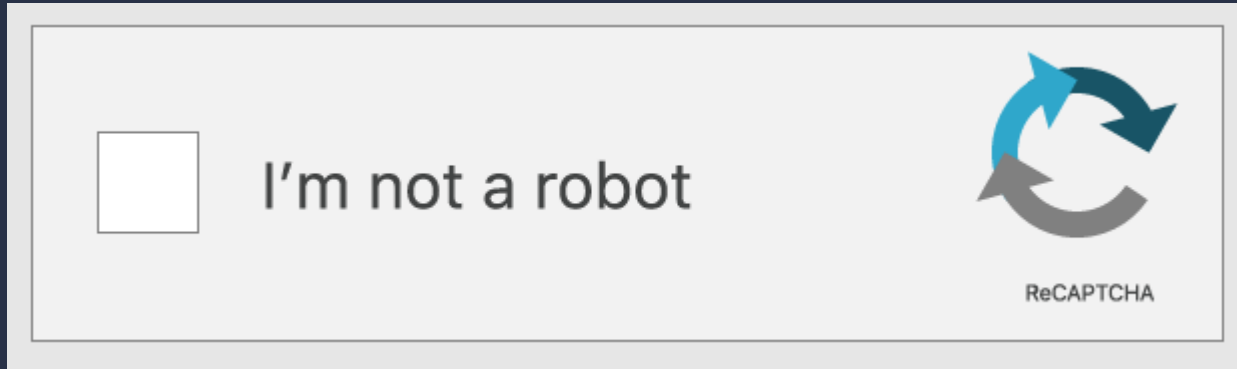
Instagram Business

28PB

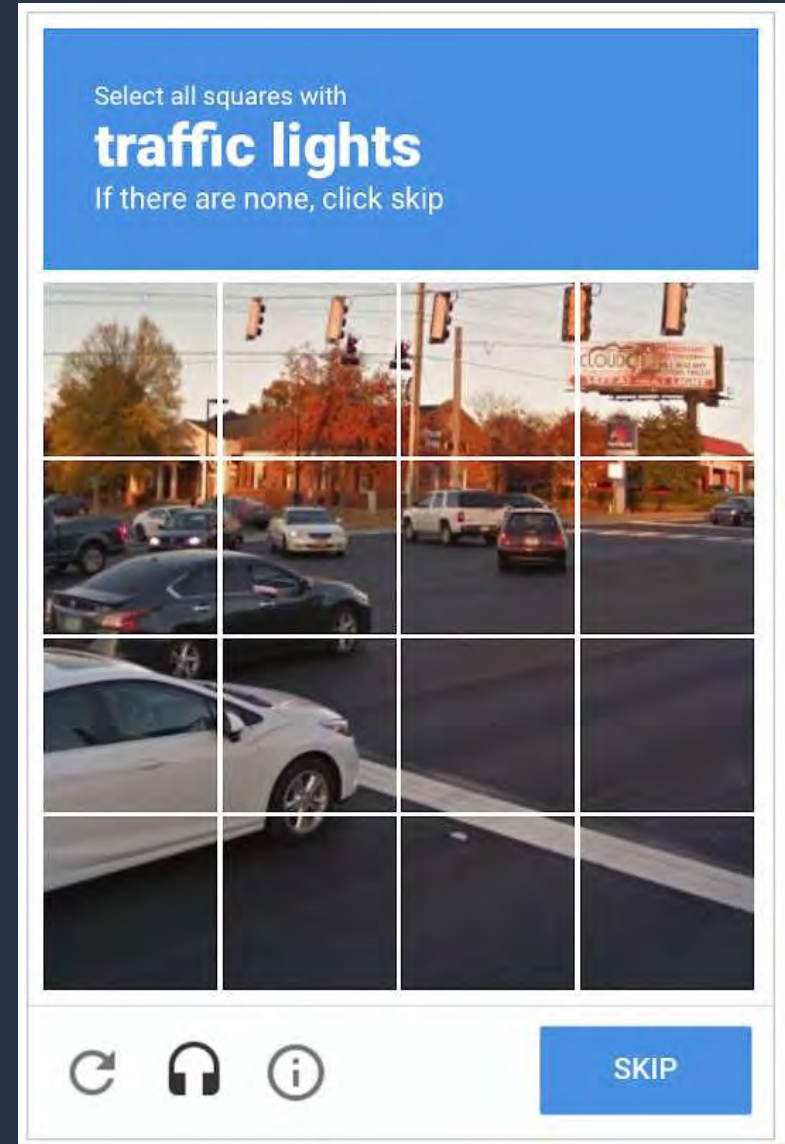
to be generated from wearable devices by 2020

Statista

Wie kriegen wir genügend **annotated** Daten?



Du bist kein Roboter,
aber du trainierst einen.

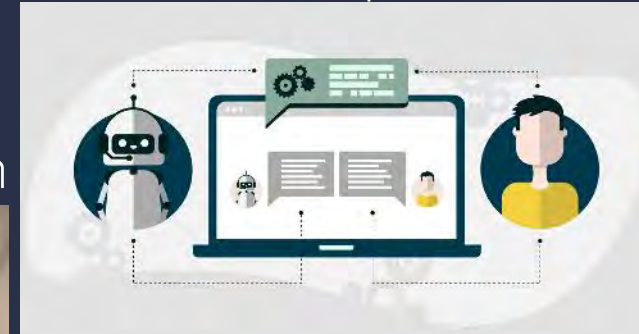


Human Parity



Human-Parity

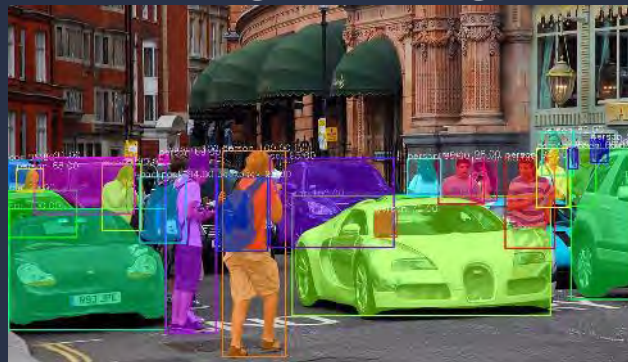
2018 – Text Comprehension



2017 – Speech Recognition

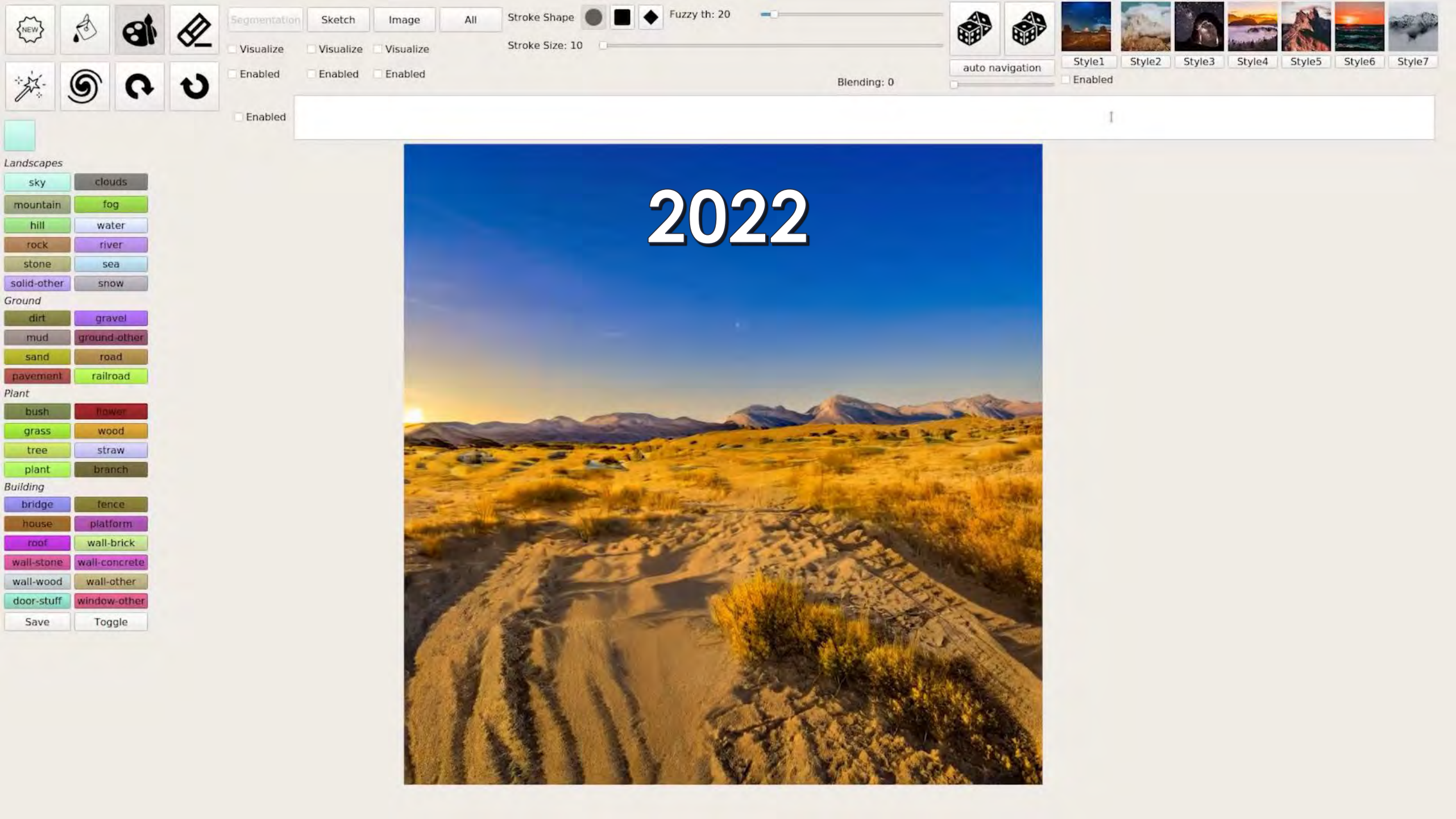


2016 – Image Recognition



2015 – Game Go





Viel Geld...

Menu **The Seattle Times** **Business** Log In Subscribe Search

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Boeing & Aerospace The A.I. Age Amazon Microsoft Technology Economy Real Estate

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Intel is buying Israel's Mobileye for more than \$15 billion, paving entry into autonomous driving technology

Originally published March 13, 2017 at 4:38 am



Sehr viel Geld...

Handelsblatt

MEINE NEWS | HOME | POLITIK | UNTERNEHMEN | **TECHNOLOGIE** | FINANZEN | MOBILITÄT | KARRIERE | ARTS & STYLE | MEINUNG | VIDEO | SERVICE

IT + Telekommunikation ▾ Gadgets Forschung + Innovation Medizin + Gesundheit ▾

Handelsblatt > Technologie > IT + Telekommunikation > Panasonic kauft KI-Spezialisten für sieben Milliarden Dollar

KÜNSTLICHE INTELLIGENZ

Panasonic kauft KI-Spezialisten für sieben Milliarden Dollar

Eine Akquisition für sieben Milliarden Dollar: Pa übernimmt Blue Yonder, die mit künstlicher Intell Nachfrage von Produkten vorhersagen.

23.04.2021 - 11:39 Uhr • [Kommentieren](#) • [Jetzt teilen](#)



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◆ WSJ NEWS EXCLUSIVE | DEALS

Cisco Made \$20 Billion-Plus Takeover Offer for Splunk

Bid was made recently though companies aren't currently in active talks, according to people familiar with the matter

A photograph of a Cisco logo on a white building sign. The sign features the Cisco logo, which consists of seven vertical bars of increasing height, followed by the word 'CISCO' in red capital letters. In the background, there are trees and a street with a pedestrian crossing sign.

**Ein schöner Tag beginnt
mit einem guten Kaffee!**

jura.

**Kaffeevollautomat
ENA 8 Touch Full
Metropolitan Black**

- 1,1 Liter Wassertank
- 125 Gramm Bohnenbehälter
- 12 Kaffeespezialitäten
- Puls-Extraktionsprozess (P.E.P.®)
optimiert die Extraktionszeit
- Touchscreen-Farbdisplay
- Auch in weiteren Farbausführungen erhältlich

Bestell-Nr.: 346 728



899.-

Abhol-Barpreis

Künstliche Intelligenz:
die am häufigsten bezogenen
Produkte ordnen sich autom. auf
den Plätzen 1 - 4 an.

**Cappuccino, Latte Macchiato,
Cortado etc. auf Knopfdruck**

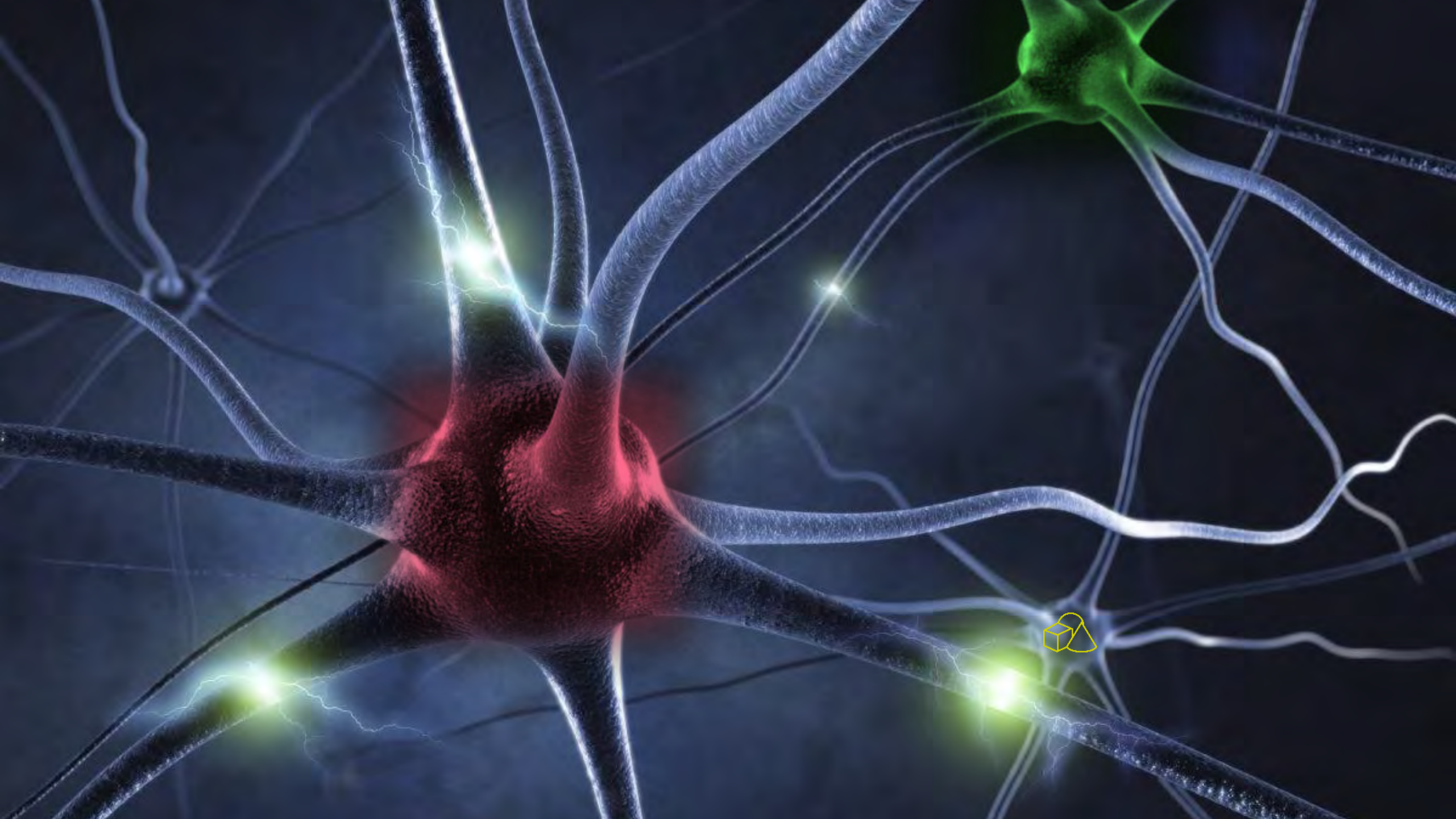
Gerät
ohne Deko

**Sonderposten
begrenzte Stückzahl**

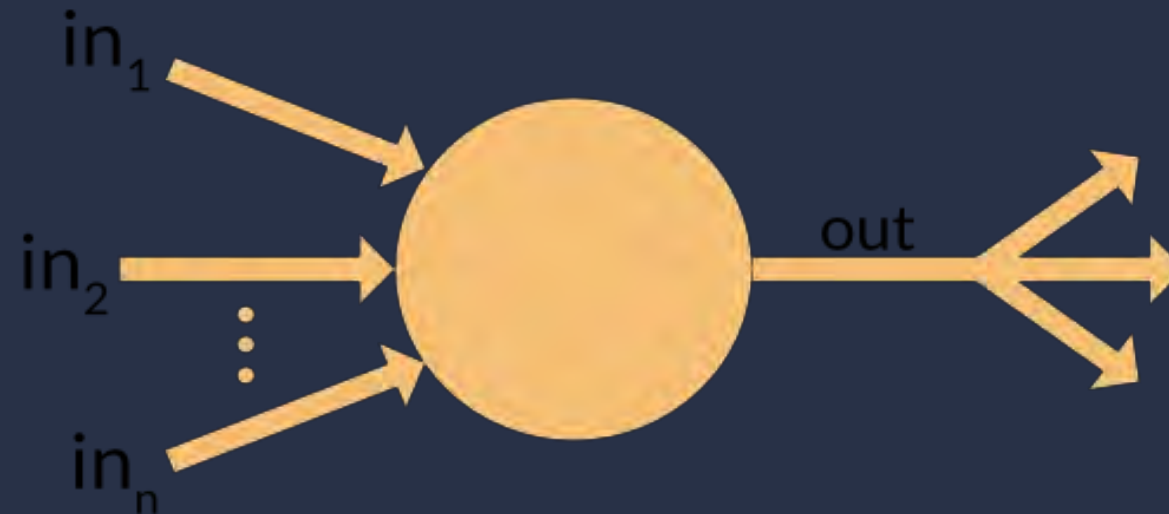
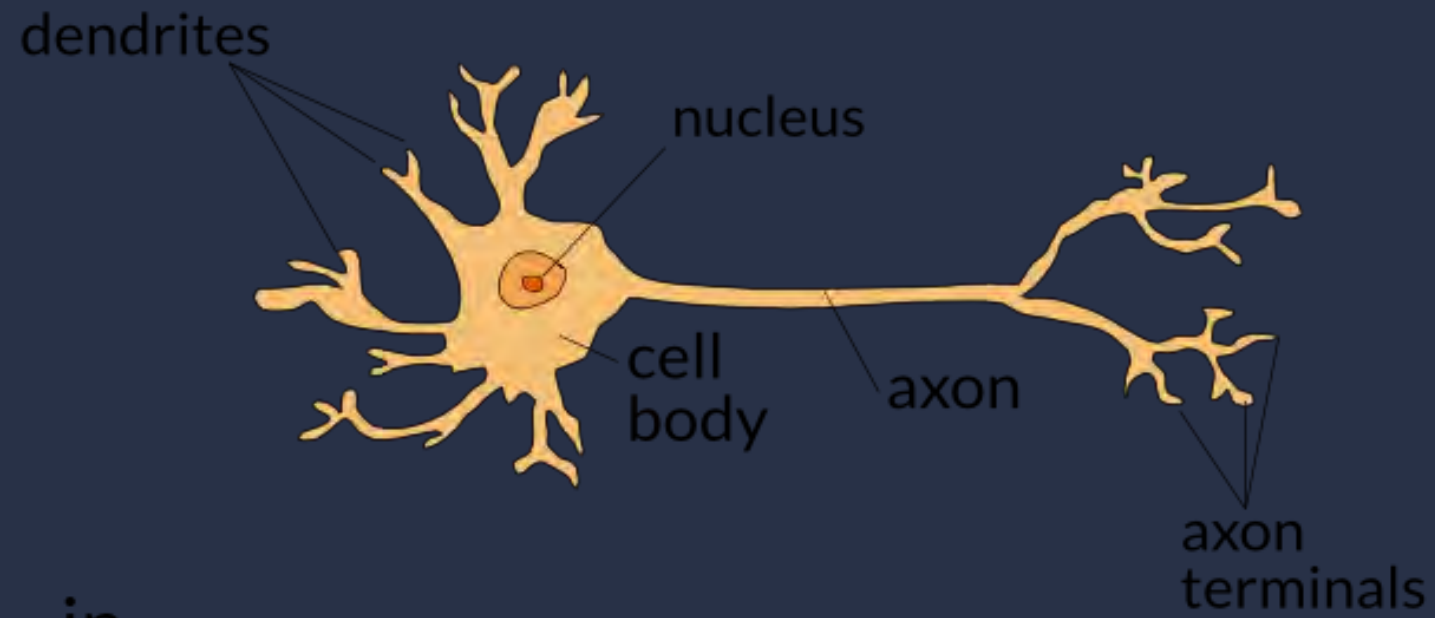
Abgabe nur in haushaltsüblichen Mengen



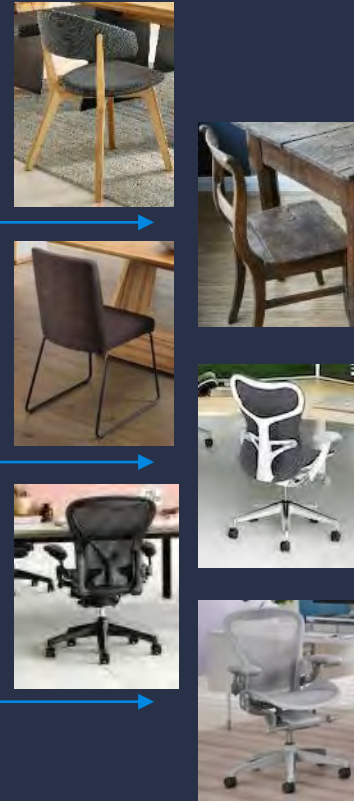
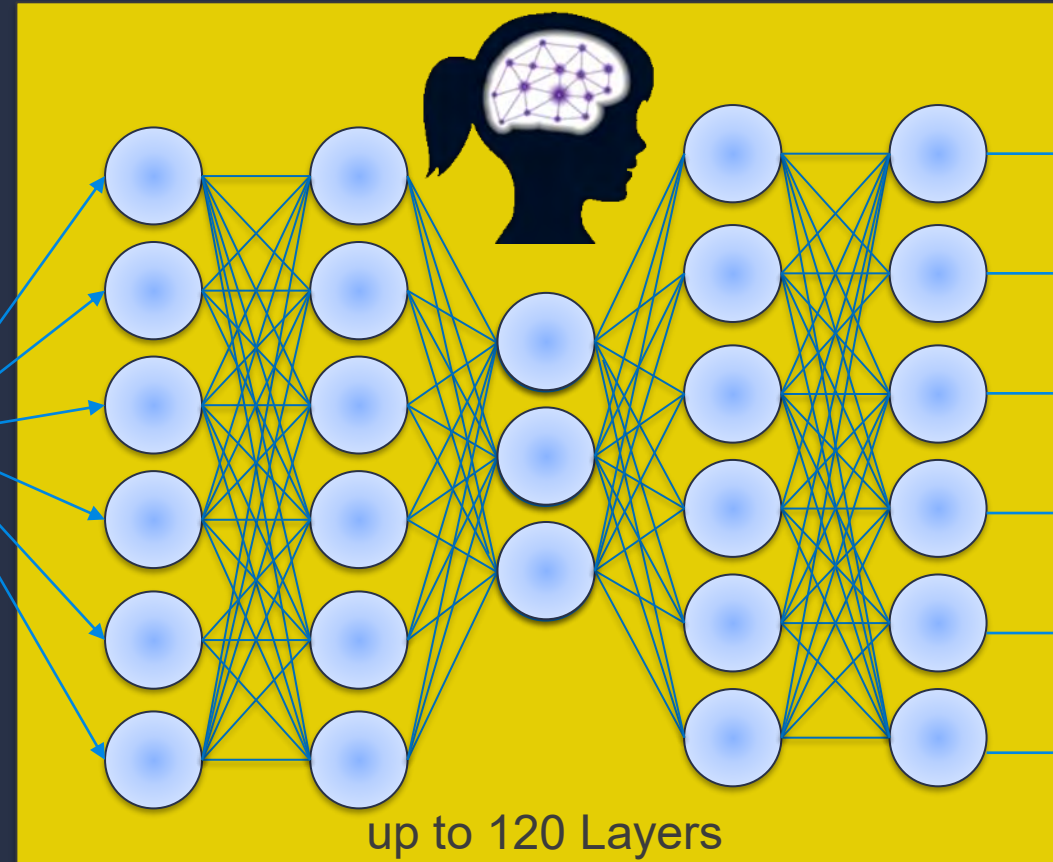
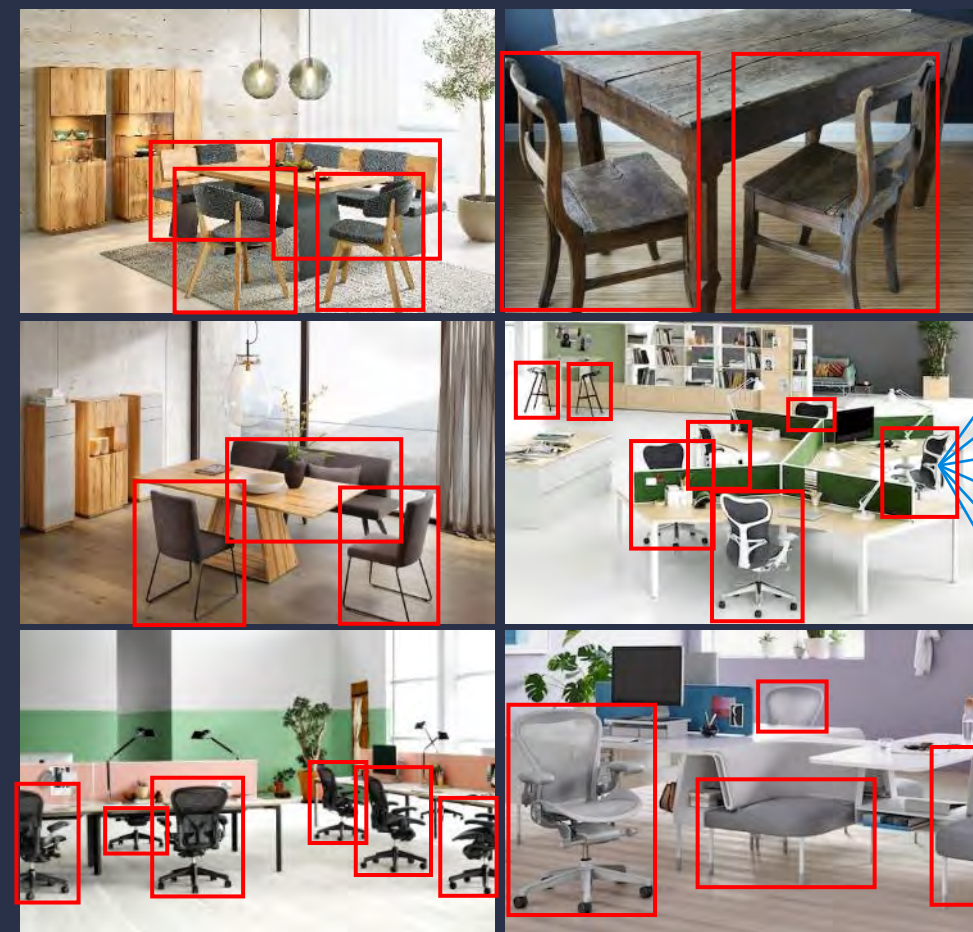




Von der Natur inspiriert

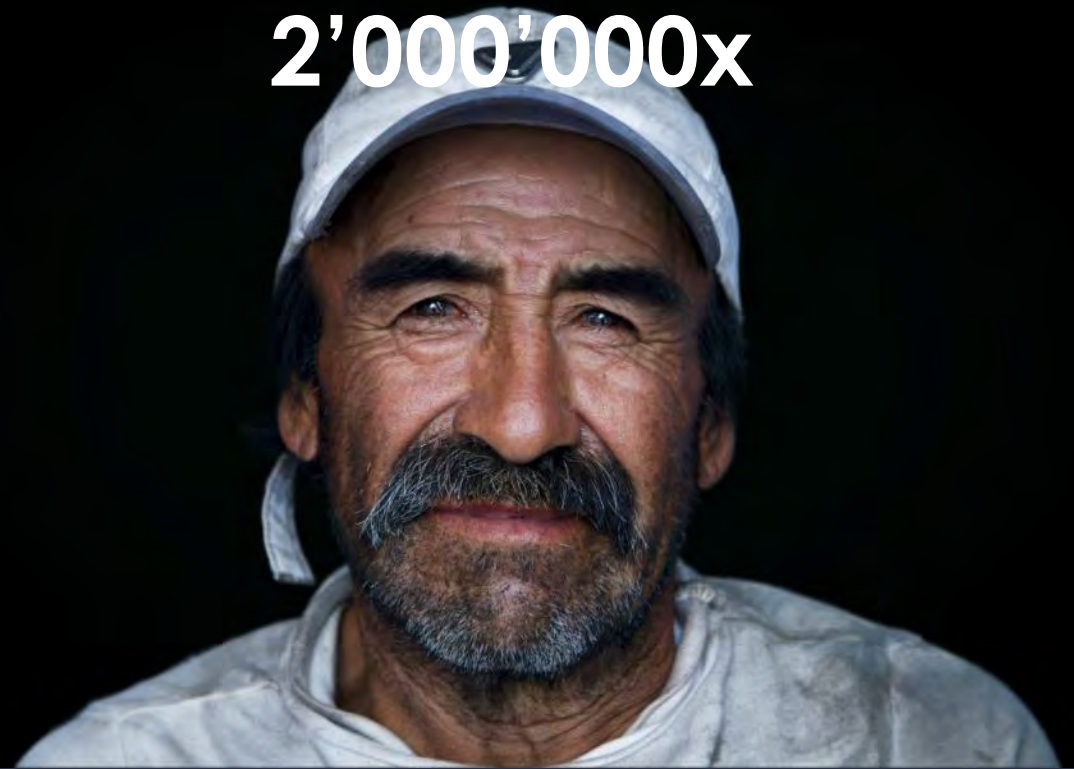


Künstliches Hirn



Deep Learning

Natur



Wie lernt ein Mensch?



Supervised Learning



Reinforcement Learning



Unsupervised Learning

An iceberg floating in the ocean. The tip of the iceberg is above the water line, and the much larger base is submerged. The background is a blue sky with white clouds.

Neural Network

Data acquisition

Data Management

Expert Knowledge

Pre-, Post-Processing

Certification

IP-Protection

Deployment

Version Control

Usability

DIAGNOSTICS TRAIN

- :: 160km/h
- :: 18 cameras
- :: 10 GB/km



BIG DATA



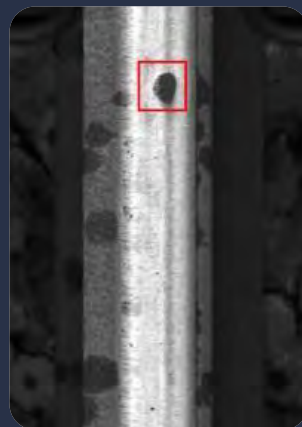
Classification



Welding



Joint



Surface defect



Chewing gum



Squat



Wheel slip

Data Labelling

SBB Labeling Tool v0.9.17.0 - RailCheck_SBB.kip

Home Image Batch Processing Export

Open... Save Save As... New

Extra Large Large Medium Small List Tiles

Back Next prev Label next Label

Labels

Image File Browser

Navigation

Image Tools

Track Information

Live Position (km)

\\MUD-SERVER01\Diamond_data\Surveys\TSIME

Valid info found for image

Official km: 73.267279

Track Information

PHName	19.09.2017 16:24
SSCount	452602
SS1Count	113200500
LineID	415
TrackName	BNK121.1-SBN701.1.2
TrackID	21163200
TrackType	1
OfficialKilometer	73.267512762046
MeasuredSpeed	118.6944
Date	19.09.2017 14:29
VehicleOrientation	Forward
Kilometrage	Decreasing
Temperature	11.49667
Latitude	47°11.41412' N
Longitude	7°37.82920' E
Altitude	461.3
PassengerSpeed	200

Label Settings

Create Template...

Misc

Category	
Color	Cyan
CreationTime	15.11.2017 11:35
Description	
ID	Oberflächenfehler
Rectangle	{x=177.0214,y=11065.95,...}
Size	83.74463; 103.6074
Tags	

Templates

Remove

#	ID	Category	Type
G	GOOD		Image
B	BAD		Image
O	Oberfläch...		Rectangular
J	Joint		Rectangular
N	NOT CLEAR		Rectangular
S	Squat_Ein...		Rectangular
T	Schleuder...		Rectangular
W	Welding		Rectangular

Go to position

Line ID

Track

Kilometer

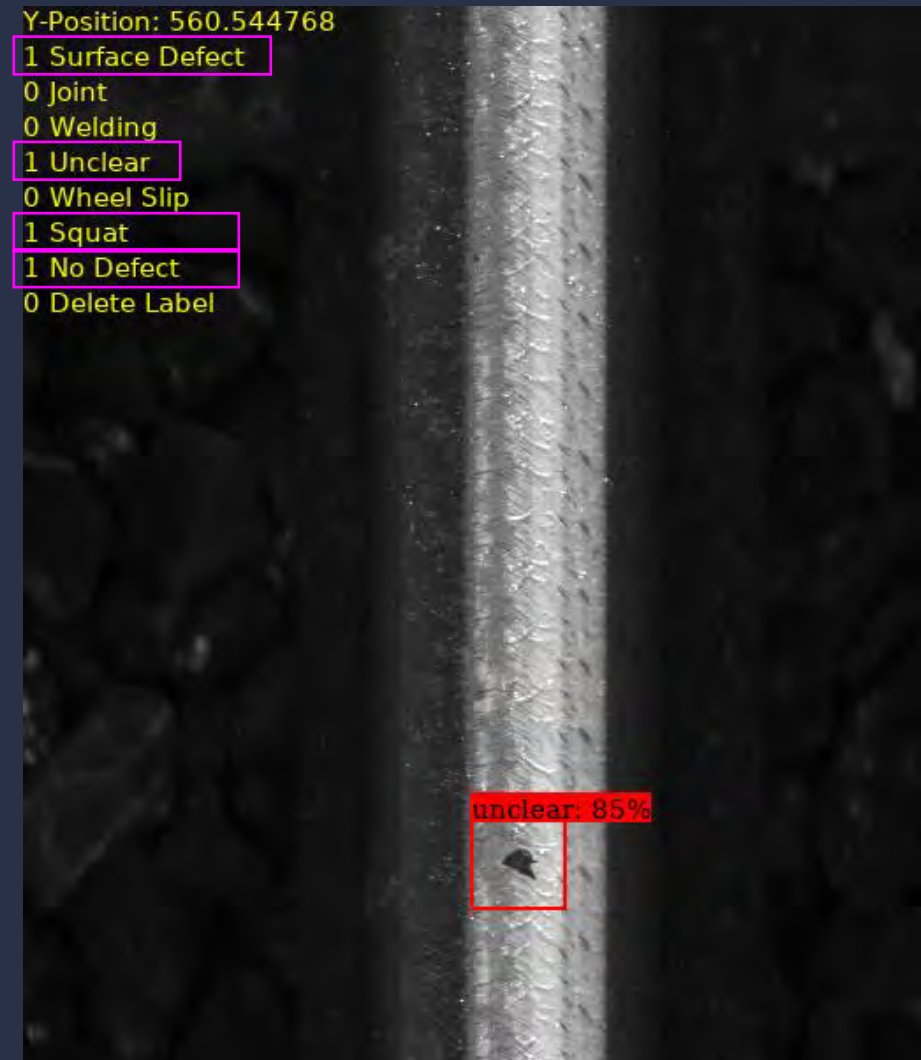
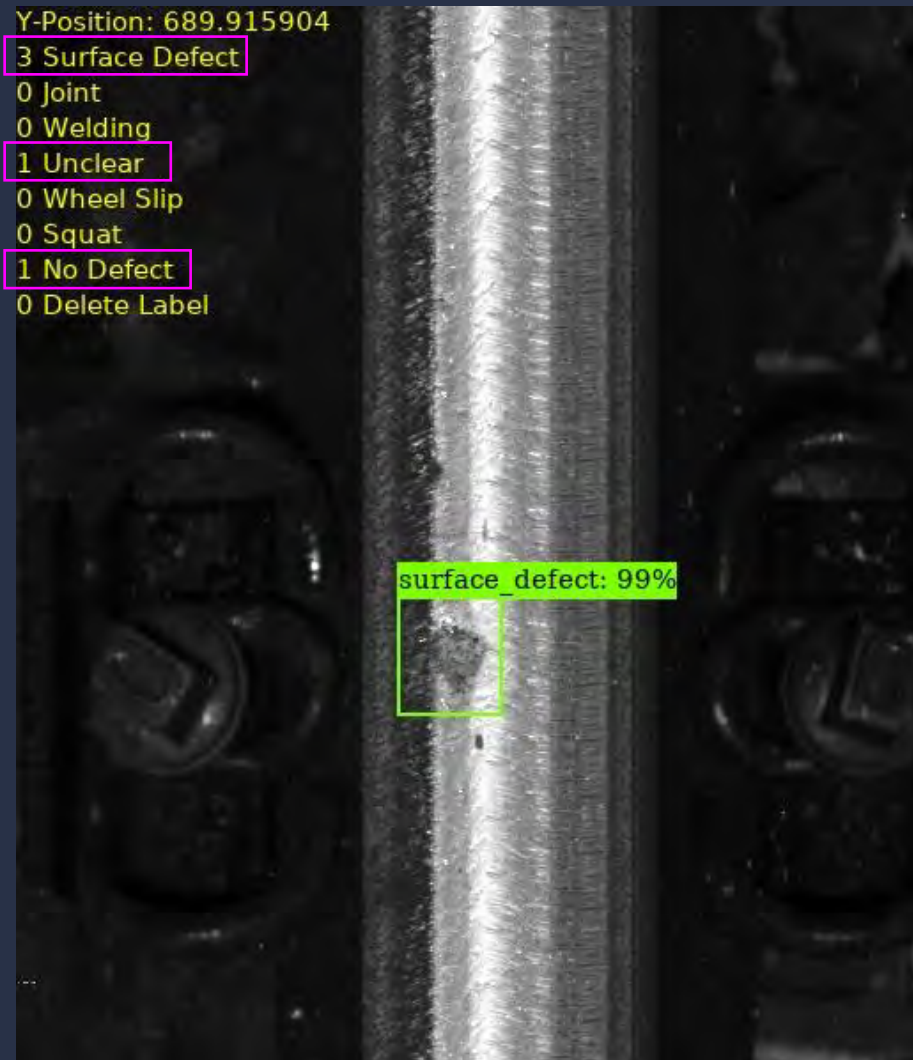
Record 639 of 1128

Search 20170919_162415

Labels of image: 3

512x1992

Experts...

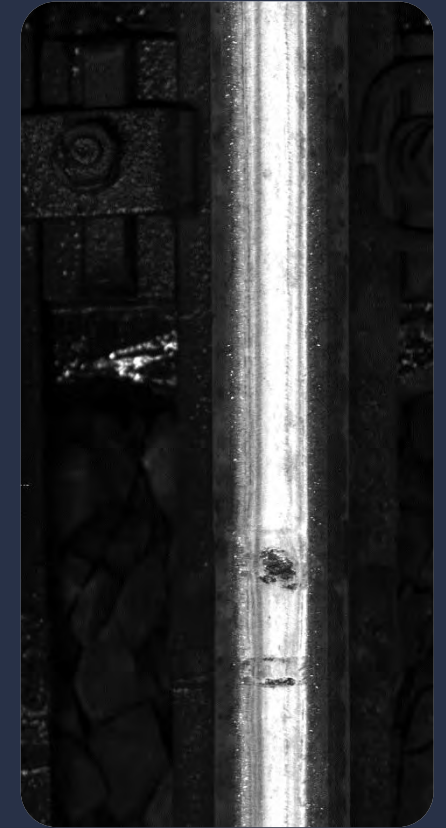




Fingerprinting



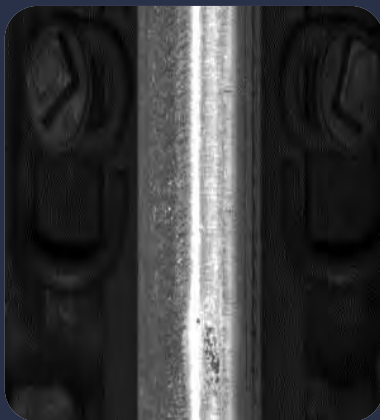
== ?



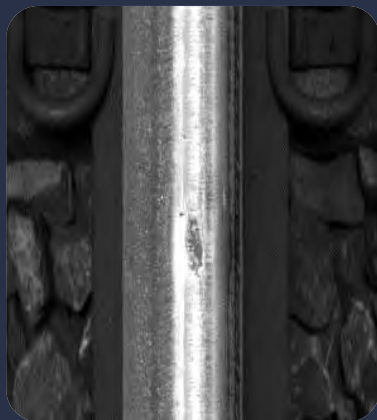
Evolution of a Defect



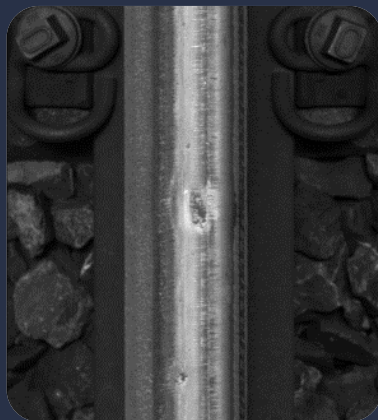
November 2016



February 2017



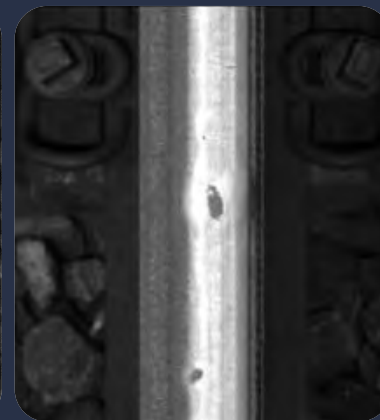
April 2017



Mai 2017

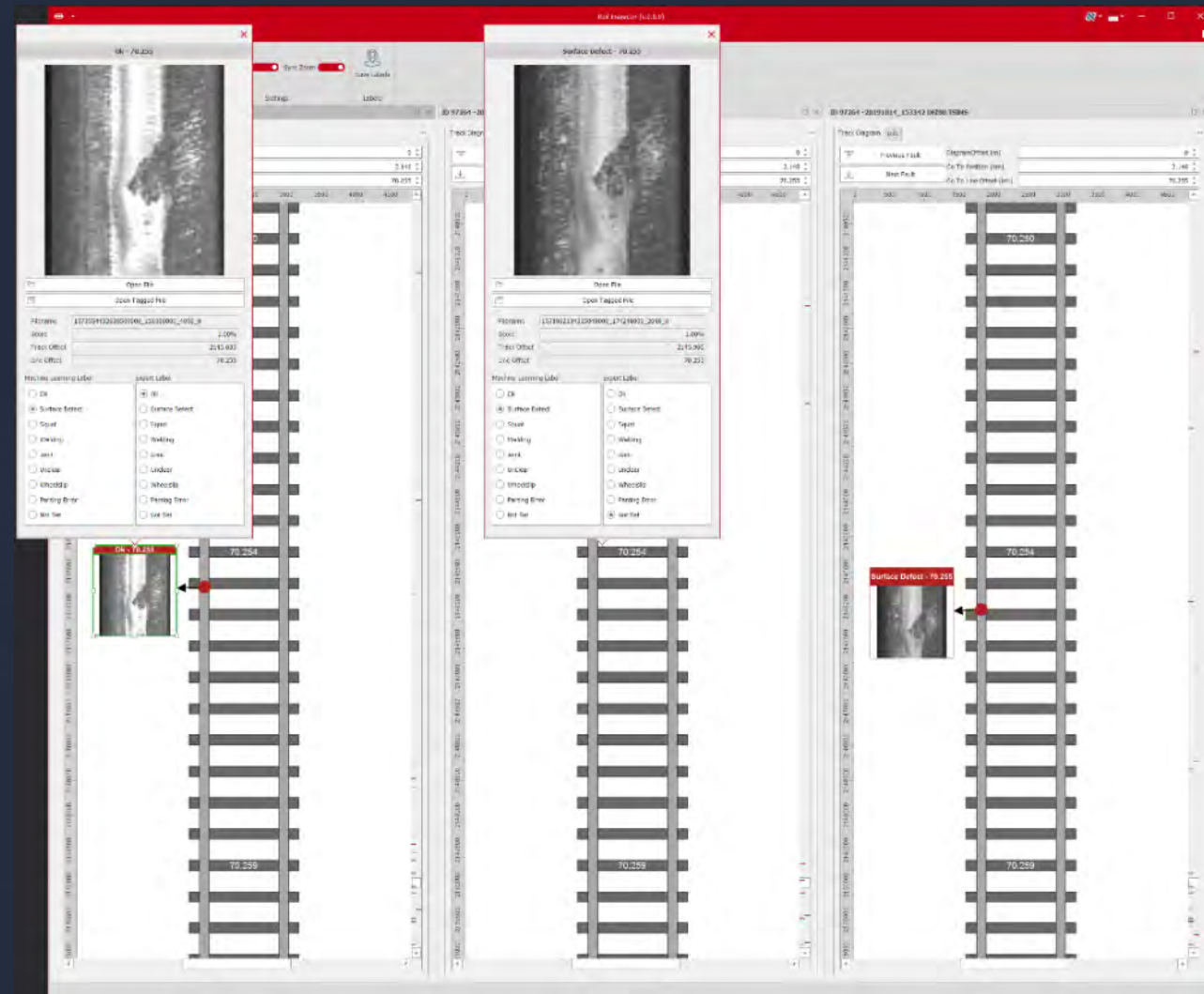
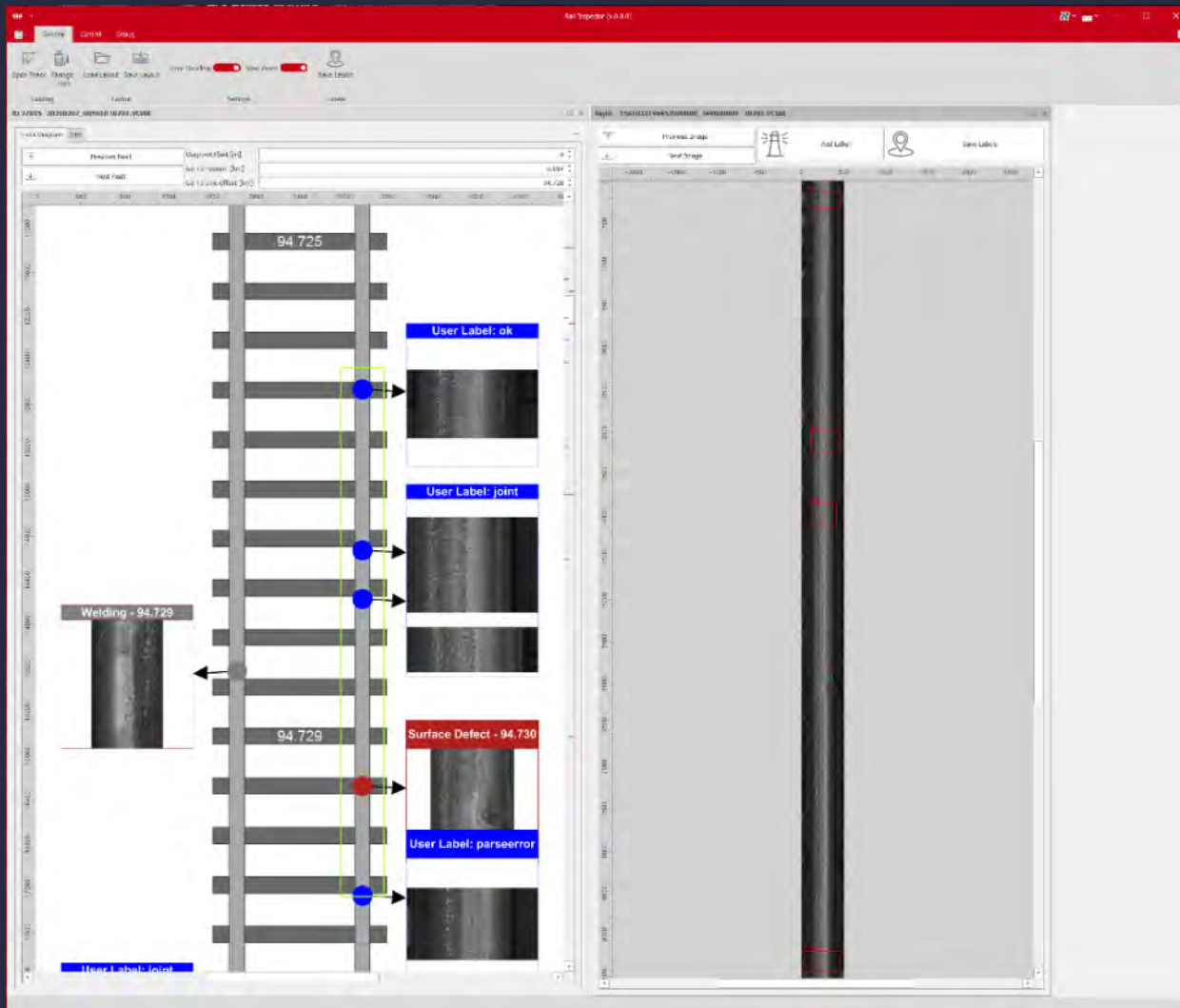


June 2017



August 2017

SBB: AI-Railinspect



18,033 views | Aug 2, 2018, 01:29pm

How Swiss Federal Railway Is Improving Passenger Safety With The Power Of Deep Learning



Renee Yao Brand Contributor
NVIDIA BRANDVOICE

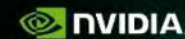
On a daily basis, Swiss Federal Railway (SBB) manages 10,671 trains, serving 1.26 million riders on 3,232 km of track. To ensure the safety of this infrastructure, as well as the safety of its passengers, SBB uses “diagnosis” trains equipped with multiple high-resolution cameras and other sensors to obtain images of railway tracks while traveling at speeds of up to 160 kmh.



August 3, 2018

DEEP LEARNING TOP 5

Insights into the new computing model



WEBINAR SERIES

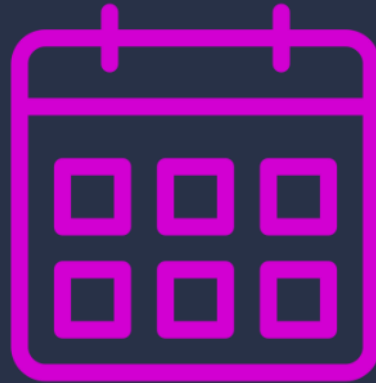
Part 1: Improving Passenger
Safety with the Power of
Deep Learning

[REGISTER NOW](#)

Maintenance



Preventive
Maintenance



Risk-based
Maintenance



Corrective
Maintenance

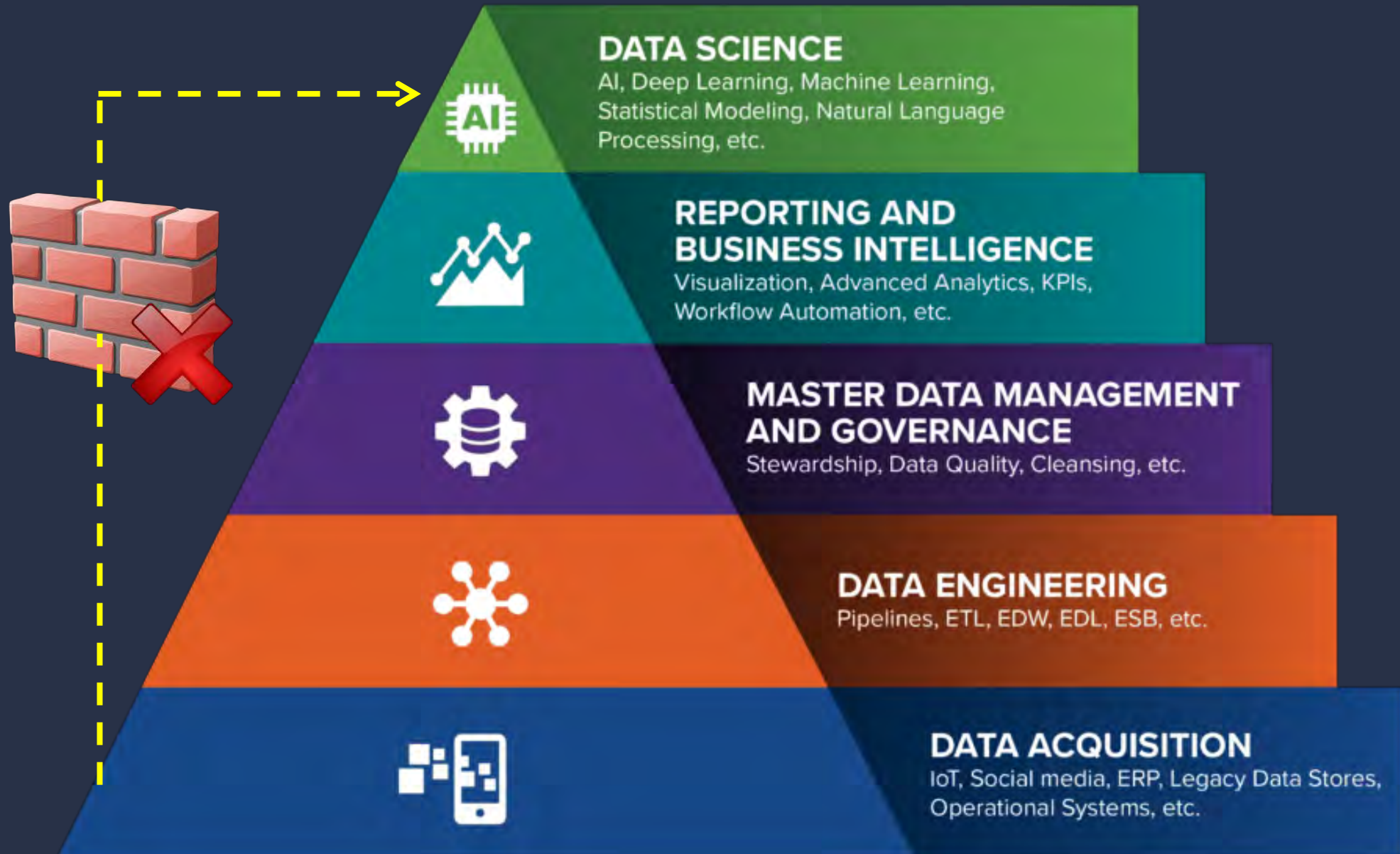


Predictive
Maintenance

Time Series Data



The Data Science Pyramid



Zeitreihen

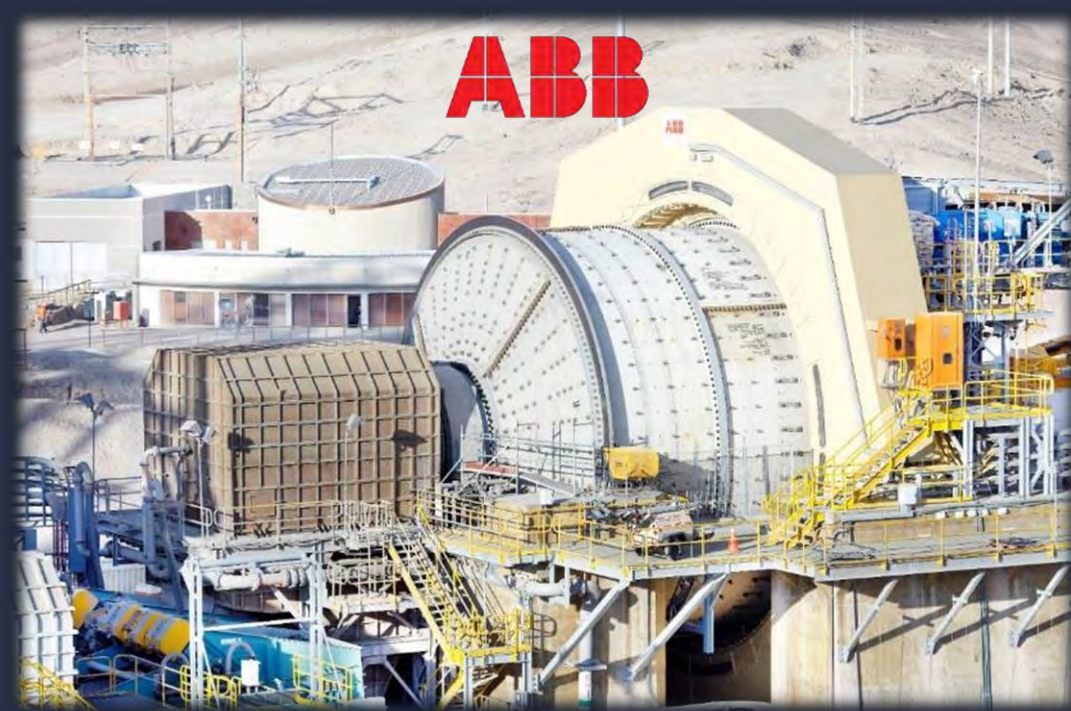


X Mean: 54.2659224
Y Mean: 47.8313998
X SD : 16.7649829
Y SD : 26.9342120
Corr. : -0.0642526

Predictive Maintenance for industrial assets



- Unseen **instances**
- Interpretability
- Operational **parameters**





influxdata[®]



elasticsearch

Data Storage & Search

HealthDBSettingsForm

Home

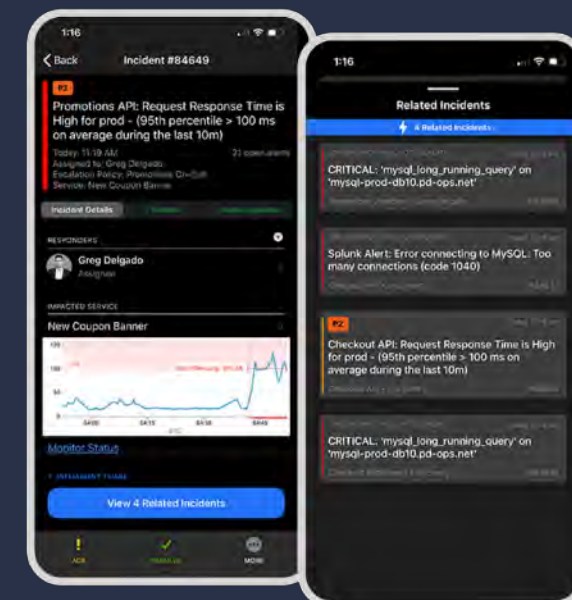
OK Cancel Disconnect Add New Database... Drop Database Create Influx Config... Start InfluxDB Server

Close Connection Database Setup

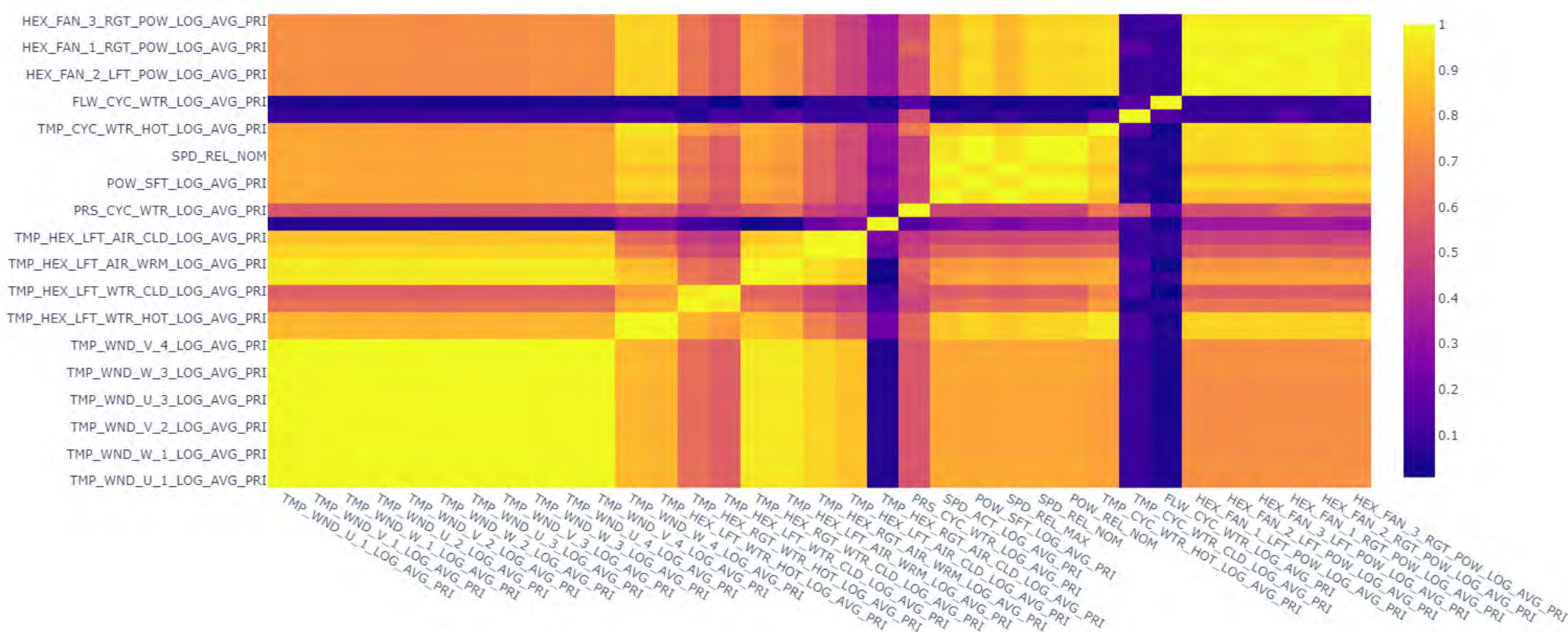
Name	Description	Type	Count
InfluxDB			
InfluxServerPath	C:\checkloud\Visual\Int...		
InfluxServerConfig	C:\Users\mbc\Documen...		
Auto9.influxDB	True		
ServerURL	http://localhost:8006/		
DBName	HealthTest		
Username			
Password			
Grafana			
GrafanaPath	C:\Users\mbc\Download...		
GrafanaConfig	C:\Users\mbc\Download...		
Visual			
SamplePeriod	10000 msec		
WriteLogs	True		
anyTest			
Visual.Events		Measurement	3 Series
Visual.Logs		Measurement	4 Series
CpuTemperature		Measurement	1 Series
Ping		Measurement	1 Series
ProcessCpuLoadNormalized		Measurement	1 Series
ProcessMemoryConsumption		Measurement	1 Series
Test1		Measurement	1 Series
TotalCpuLoadNormalized		Measurement	1 Series
TotalMemoryConsumption		Measurement	1 Series
HealthTest			
Visual.Events		Measurement	6 Series
Visual.Logs		Measurement	1 Series
CpuTemperature		Measurement	9 Series
ProcessCpuLoadNormalized		Measurement	11 Series
ProcessMemoryConsumption		Measurement	11 Series
Test1		Measurement	11 Series

csem

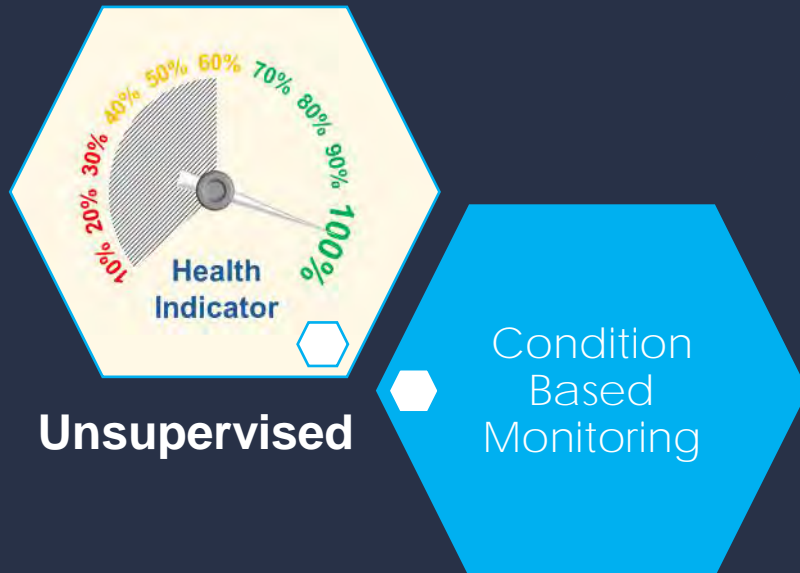
Visualization & Analytics



Sensor Cross-Correlations



Condition Based Monitoring

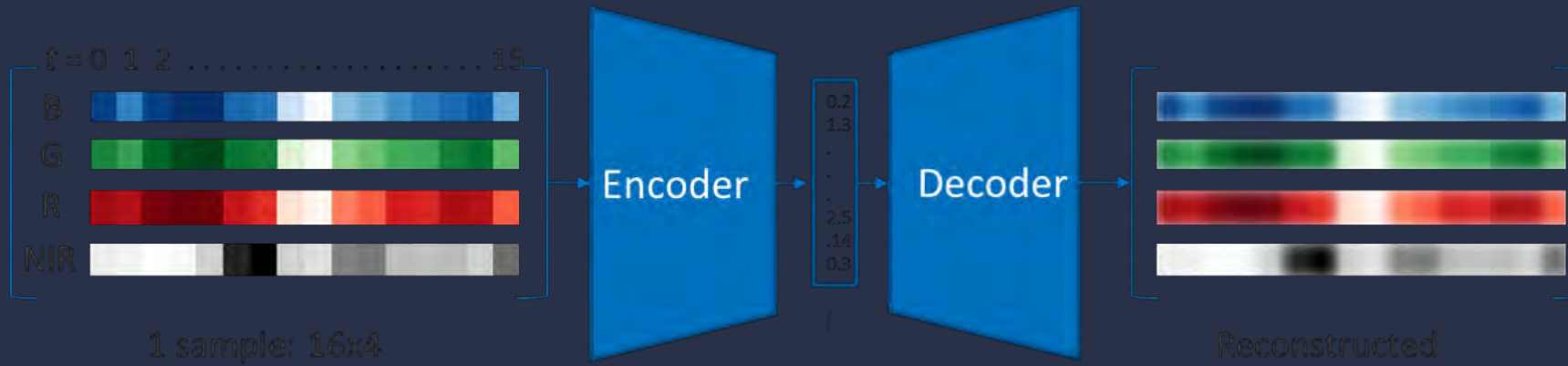




Lab-Setup

- 24/7 Operation
- 10 Fehlerklassen
- 12 Monate detailliertes Logging

Condition Based Monitoring



97.7%



Good

Defect

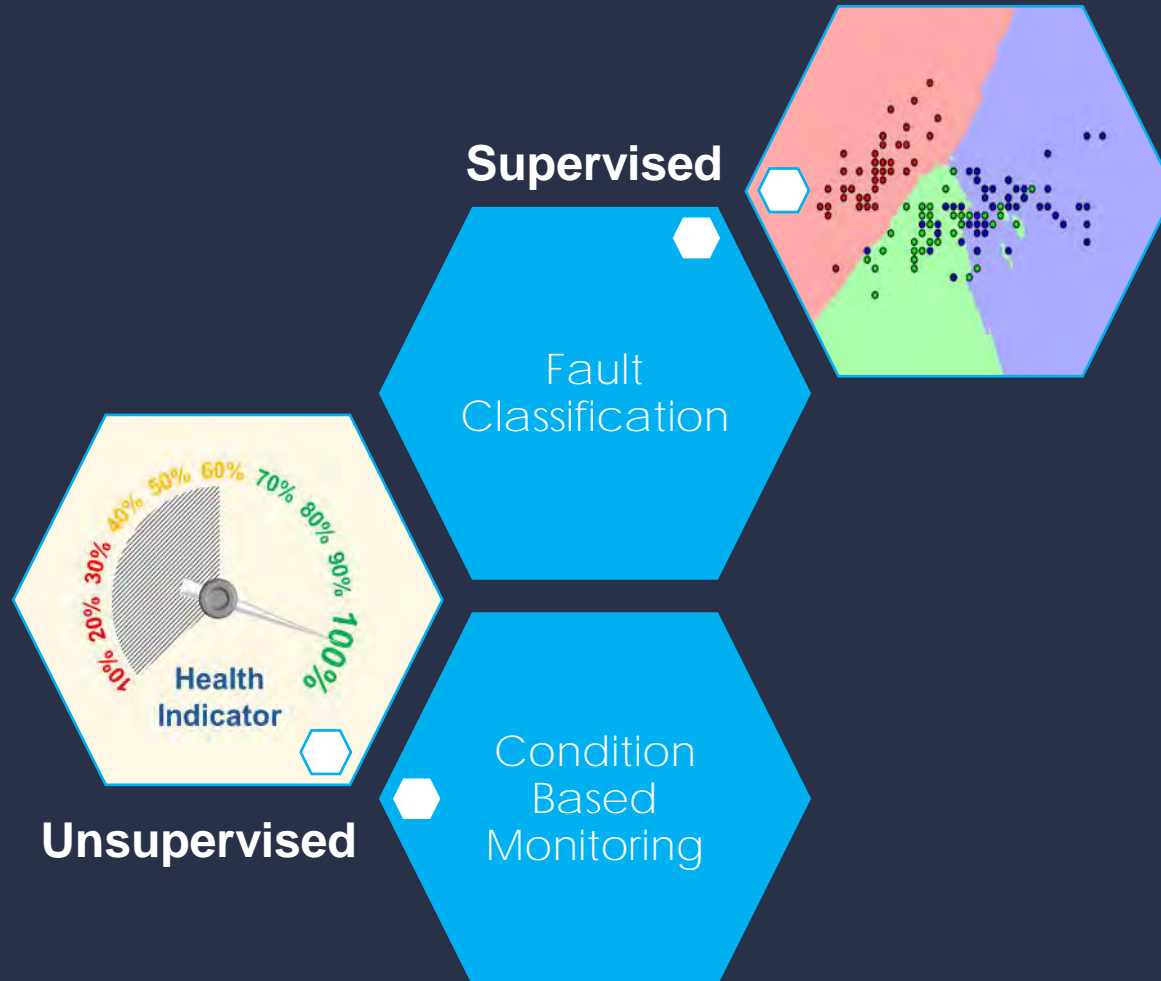
167	9
2	309

Good

Defect

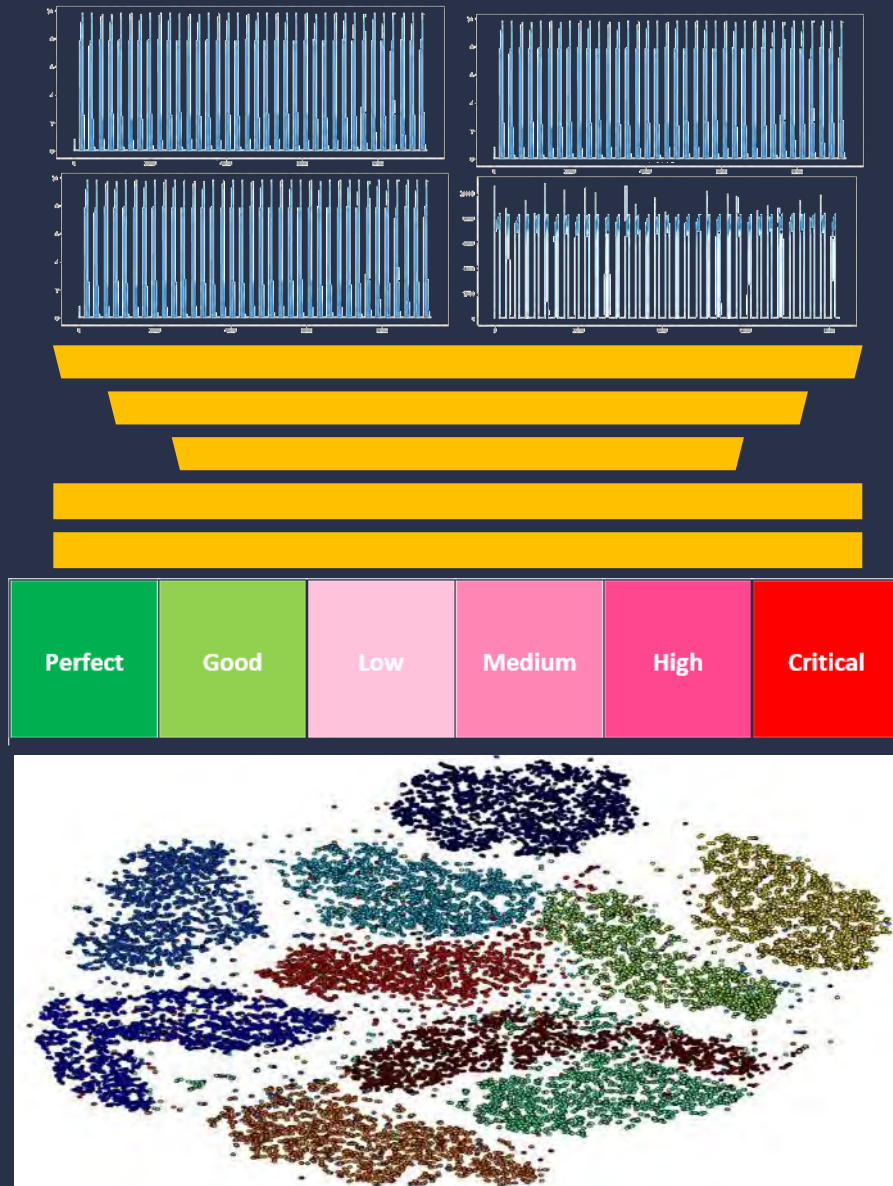
Train

Fehlerklassifizierung



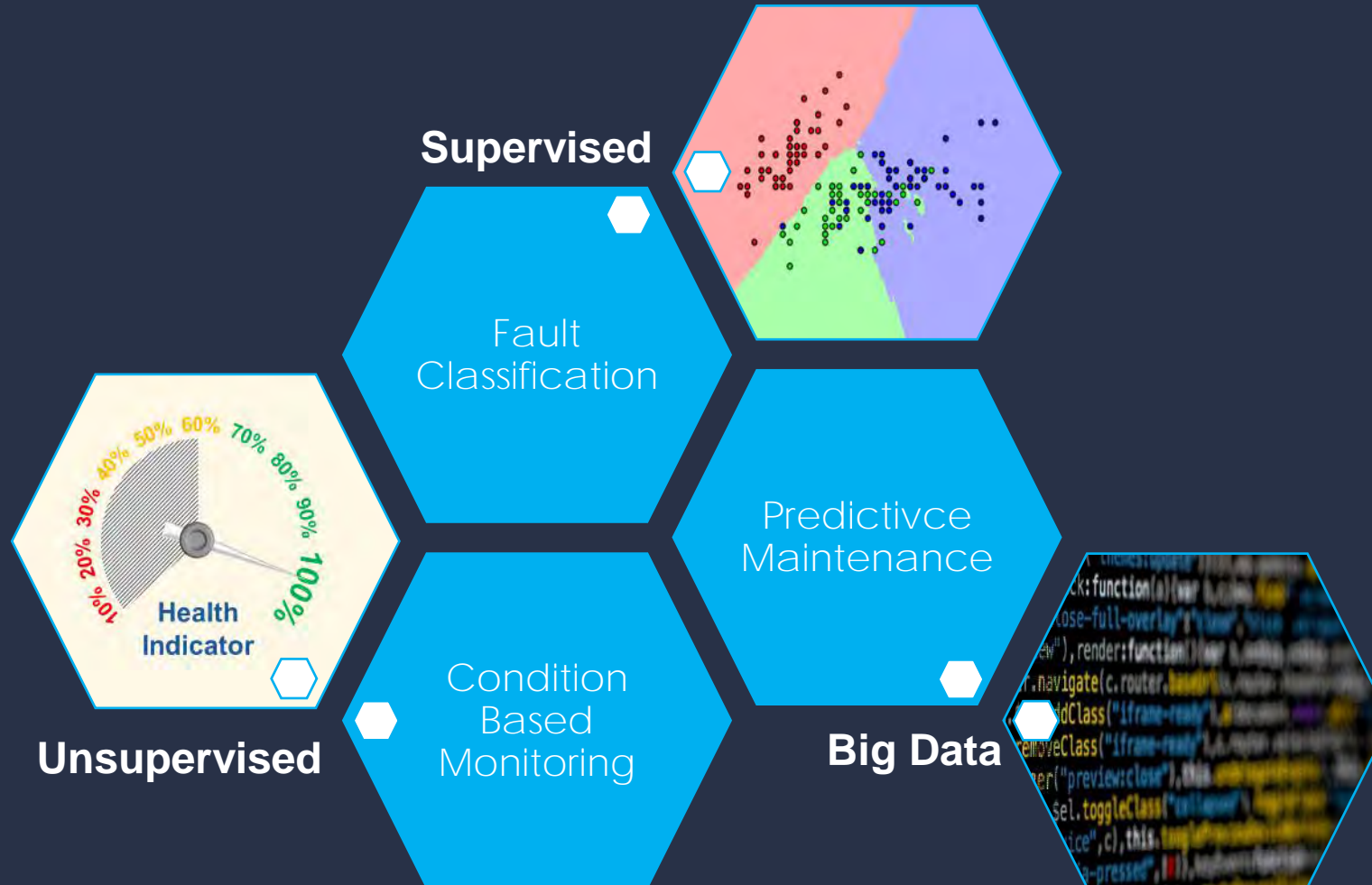
Klassifizierung

97.5%

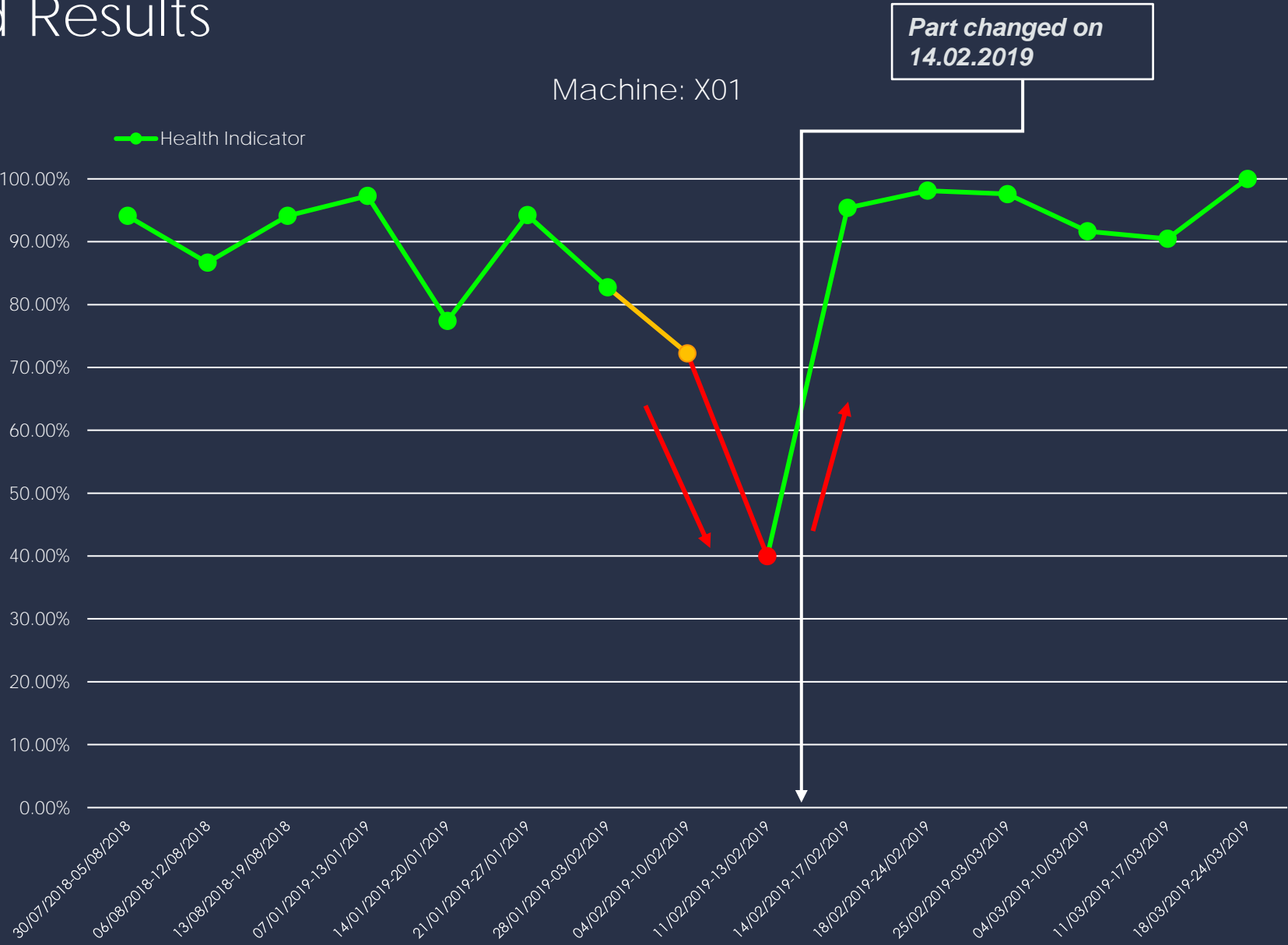


True label	Good	157	5	0	0	0	0	2	2	0	0
	T3	1	35	0	0	0	0	0	0	0	0
	T4	0	0	38	0	0	0	0	0	0	0
	T5	0	0	0	108	0	0	0	0	0	0
	T6	0	0	0	0	7	0	0	0	0	0
	T7	0	0	0	0	0	20	0	0	0	0
	T8	0	0	0	0	0	0	9	0	0	0
	T9	1	0	0	0	0	0	0	76	0	0
	T10	0	0	0	0	0	0	0	0	8	1
	T11	0	0	0	0	0	0	0	0	0	7
	Good	T3	T4	T5	T6	T7	T8	T9	T10	T11	

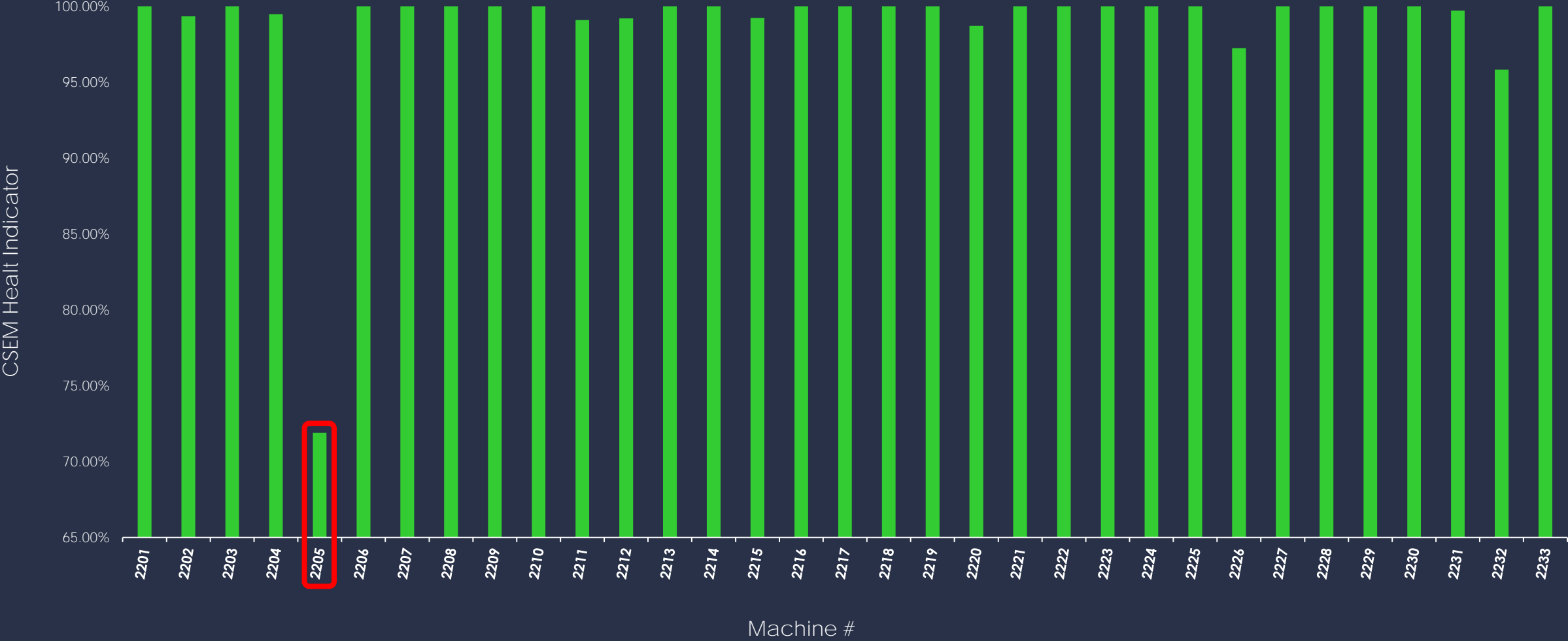
Predictive Maintenance



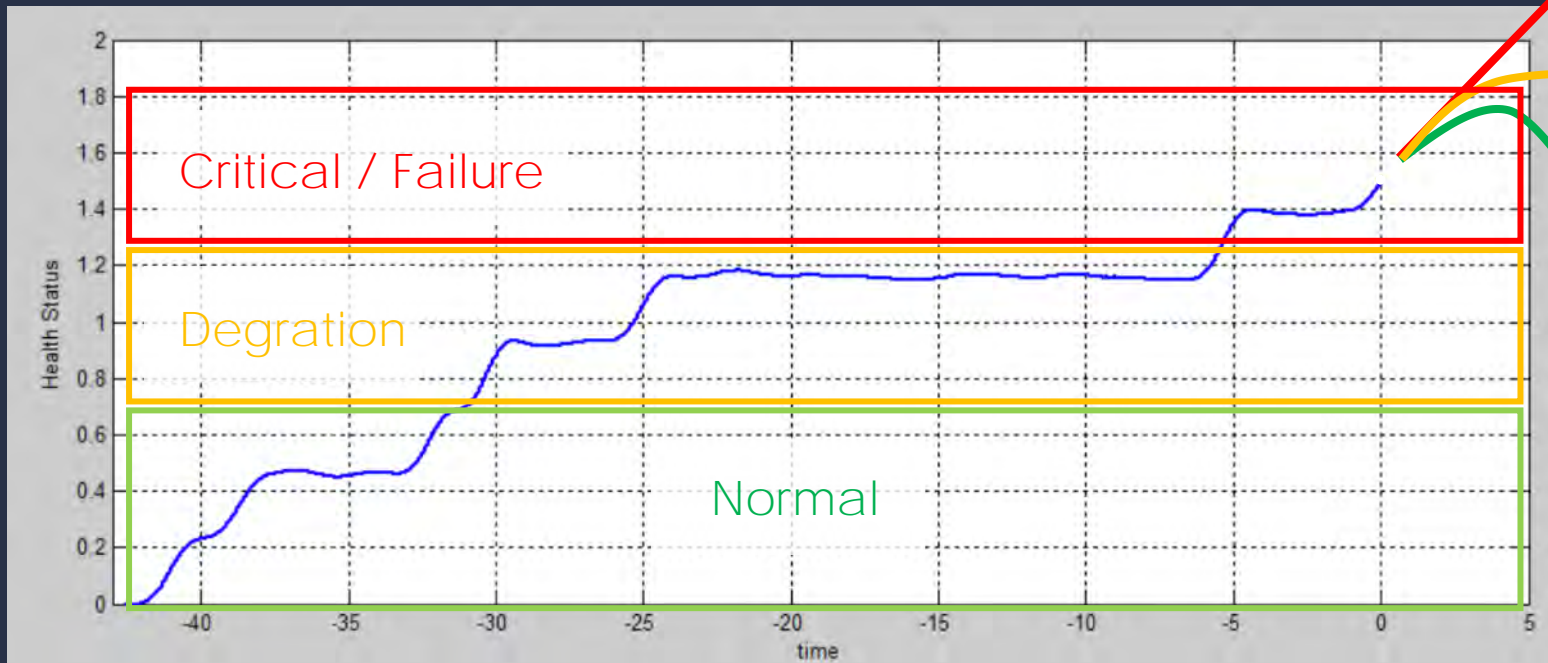
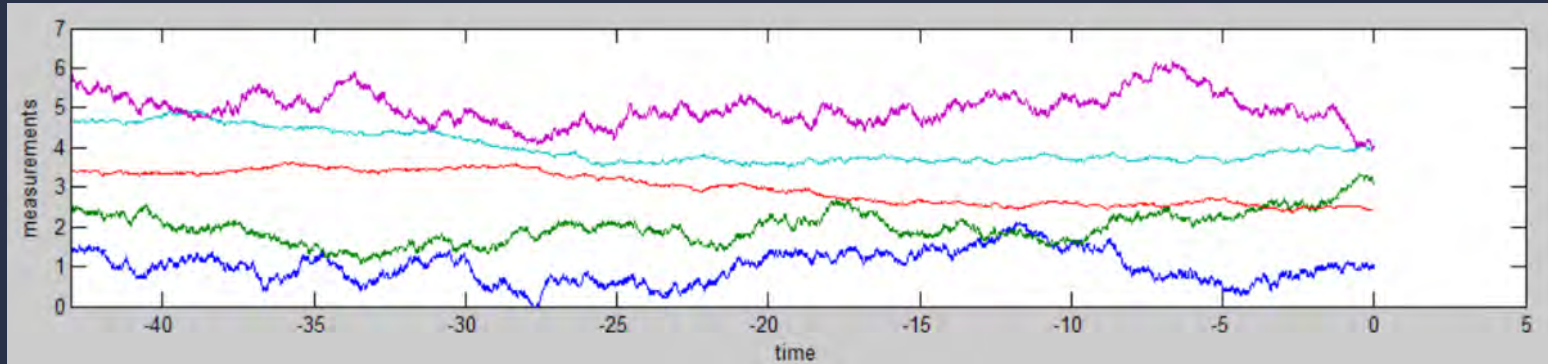
Field Results



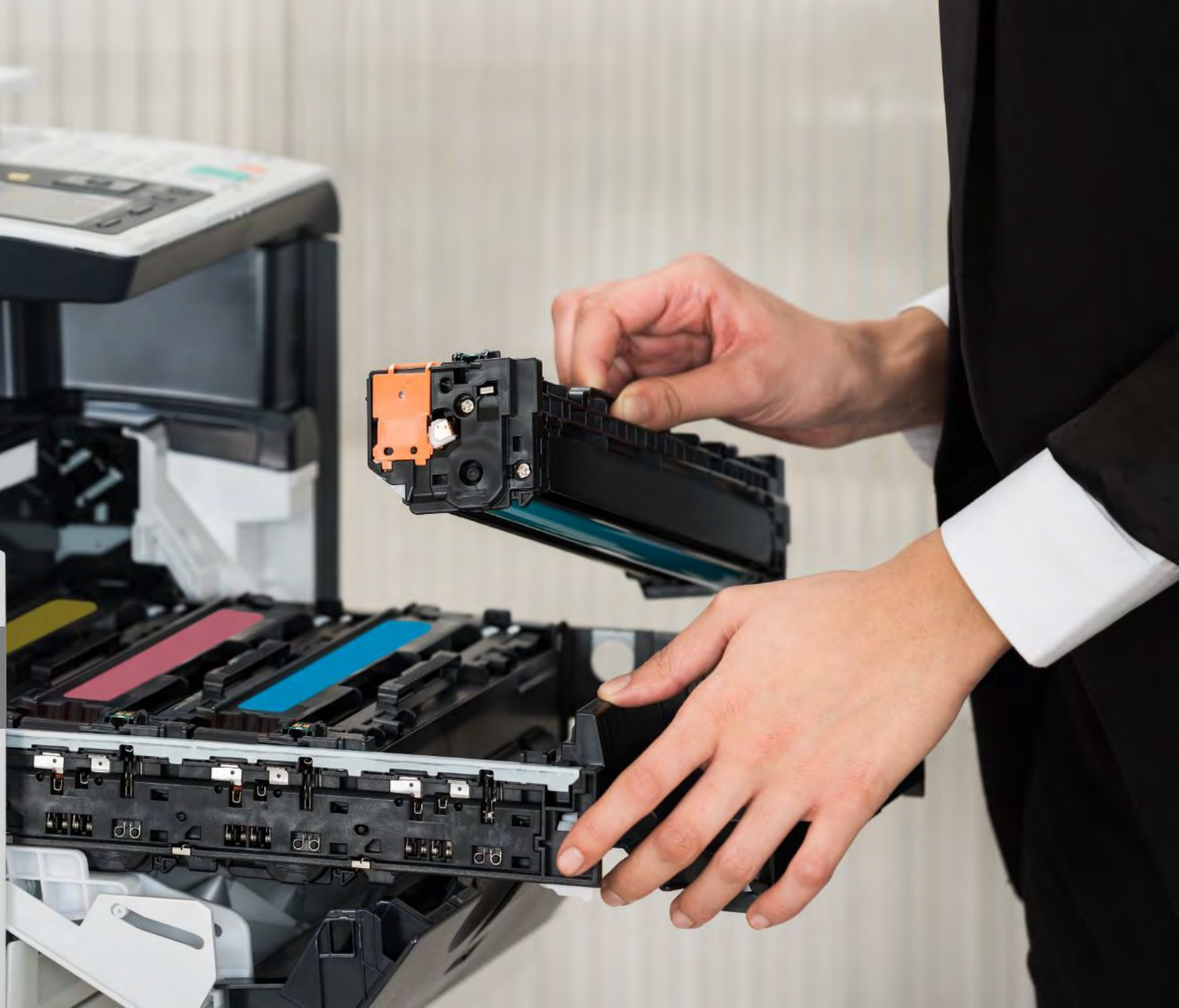
Field Results



Predictive Maintenance



Die Toner Falle



Käfigbrücherkennung >>





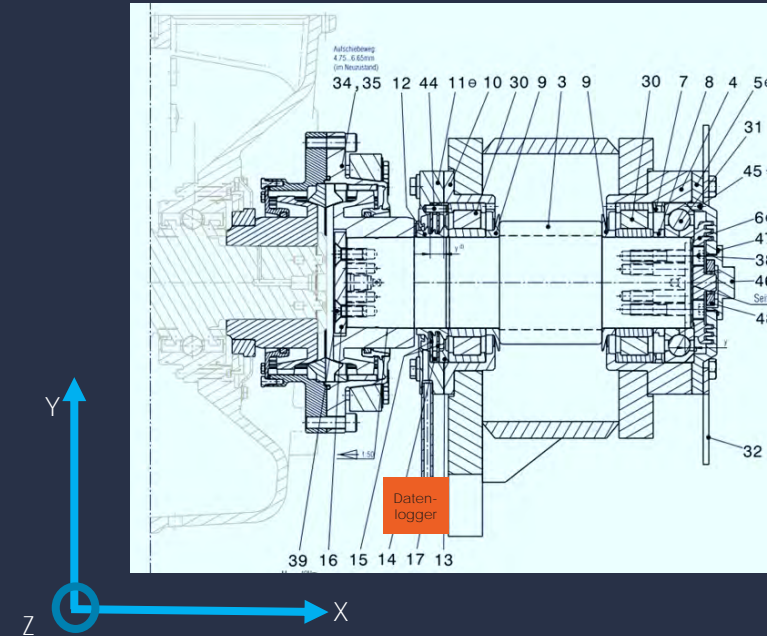
R1

SAFETY
WARNING
This machine is designed for use by trained personnel only. Do not attempt to operate this machine unless you have been properly trained and authorized to do so. Failure to follow these instructions may result in serious injury or death.

SAFETY
WARNING
This machine is designed for use by trained personnel only. Do not attempt to operate this machine unless you have been properly trained and authorized to do so. Failure to follow these instructions may result in serious injury or death.

SAFETY
WARNING
This machine is designed for use by trained personnel only. Do not attempt to operate this machine unless you have been properly trained and authorized to do so. Failure to follow these instructions may result in serious injury or death.

Datenakquise



Acc. Type	Range	Sampling Rate	Bandwidth	Noise	Resolution
Piezo-electric	$\pm 500g$	20,000 Hz	0 to 2,000 Hz	$< 0.4 \text{ gRMS}$	0.0015 g
Digital Capacitive	$\pm 40g$	4,000 Hz	0 to 300 Hz	$< 0.01 \text{ gRMS}$	0.00008 g

Datenerfassungsprotokoll

Datenerfassungsprotokoll												
Zuordnung							Technischer Zustand					
ID	Datum	Uhrzeit	Zugtyp	Lager-Typ	Kilometerstand Antrieb	Seriennummer Getriebe	Kaltstart / Warmstart	Zurückgelegte Strecke seit letztem Ölwechsel [km]	Beurteilung sachverständige/r Techniker/in	Kommentare	Optische Überprüfung Öl [0-5]	Zahnradverschleiß [N]

Erläuterungen

ID: fortlaufende Nummer für jeden Messung (Querschnittsmessung mit Ordinateure der abgelegten Messdaten)
Datum / Uhrzeit: Zeit des Messbeginns
Zugtyp: Adler, Vih, ...
Lager-Typ:
Kilometerstand Antrieb:
Seriennummer Getriebe:
Kaltstart / Warmstart: Wurden Aufschaltungen nach Kalt- oder Warmstart durchgeführt?
zurückgelegte Strecke seit letztem Ölwechsel [km]:
Beurteilung sachverständige/r Techniker/in: Einschätzung zum Zustand jeglicher Komponenten, die in direktem Zusammenhang mit dem Lager des Zahnrad-Motors stehen? Sind Auffälligkeiten zu beobachten?
Kommentare: Sonstige Kommentare, gute es Auffälligkeiten oder besondere Ereignisse im Betrieb?
Optische Überprüfung Öl: Beurteilung des Zustands des Öls (in Lager durch durchführende/r Techniker/in) (sehr gut: 5 - sehr schlecht: 0)
Zahnradverschleiß [N]: Zahnradverschleiß des Zahnradantriebs in %

Datenerfassungsprotokoll

Datenerfassungsprotokoll												
Zuordnung							Technischer Zustand					
ID	Datum	Uhrzeit	Zugtyp	Lager-Typ	Kilometerstand Antrieb	Seriennummer Getriebe	Kaltstart / Warmstart	Zurückgelegte Strecke seit letztem Ölwechsel [km]	Beurteilung sachverständige/r Techniker/in	Kommentare	Optische Überprüfung Öl [0-5]	Zahnradverschleiß [‰]

Erläuterungen

ID: fortlaufende Nummer für jeden Messung (Querschnittsmerkmal mit Ordinate der abgelegten Messdaten)

Datum / Uhrzeit: Zeit des Messbeginns

Zugtyp: Adler, Vih, ...

Lager-Typ:

Kilometerstand Antrieb:

Seriennummer Getriebe:

Kaltstart / Warmstart: Wurden Aufschaltungen nach Kalt- oder Warmstart durchgeführt?

Zurückgelegte Strecke seit letztem Ölwechsel [km]:

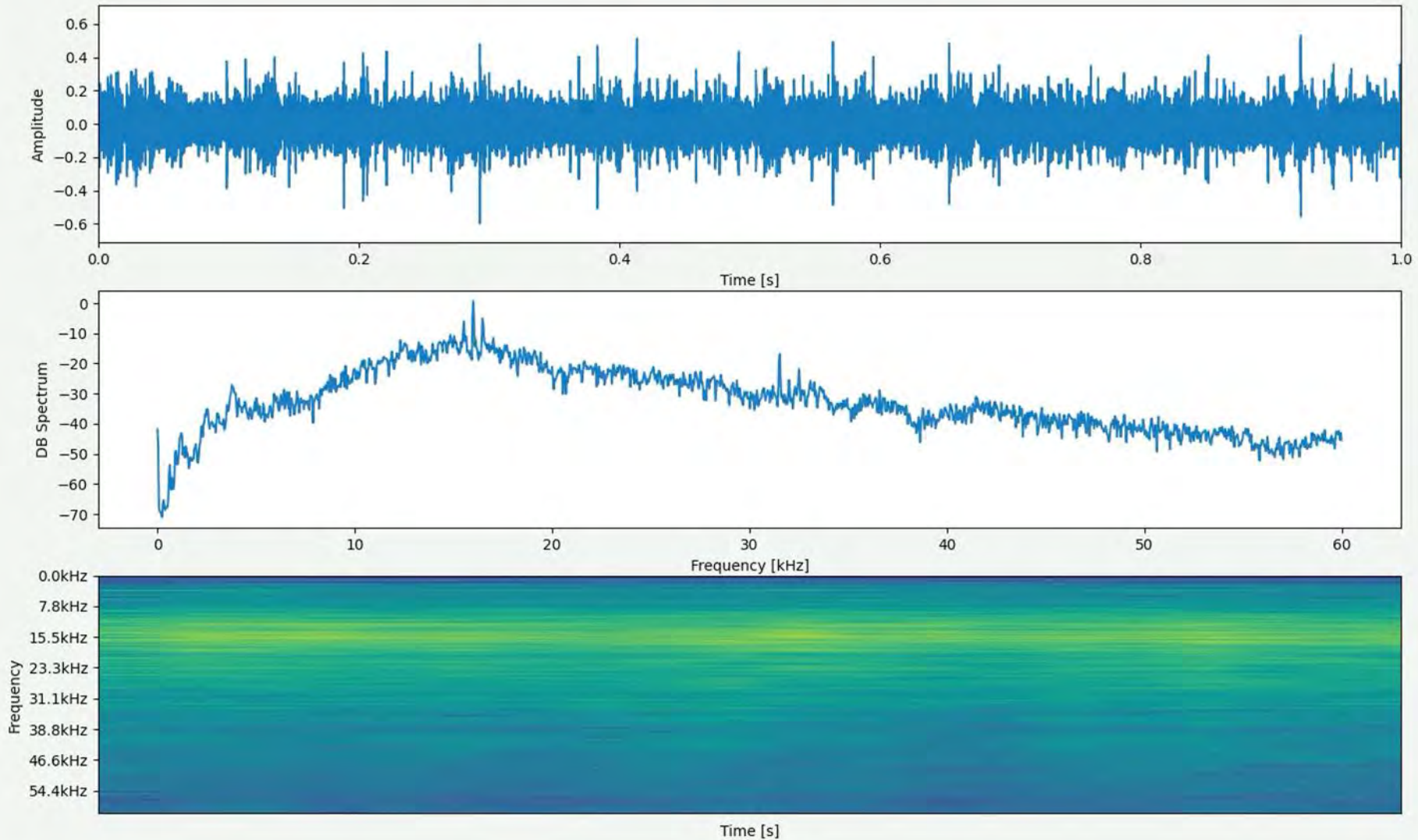
Beurteilung sachverständige/r Techniker/in: Einschätzung zum Zustand jeglicher Komponenten, die in direkter Zusammenhang mit dem Lager des Zahnradantriebs stehen? Sind Auffälligkeiten zu beobachten?

Kommentare: Sonstige Kommentare, gute es Auffälligkeiten oder besondere Ereignisse im Betrieb?

Optische Überprüfung Öl: Beurteilung des Zustands des Öls (in Lager durch durchführende/r Techniker/in) (sehr gut: 5 - sehr schlecht: 0)

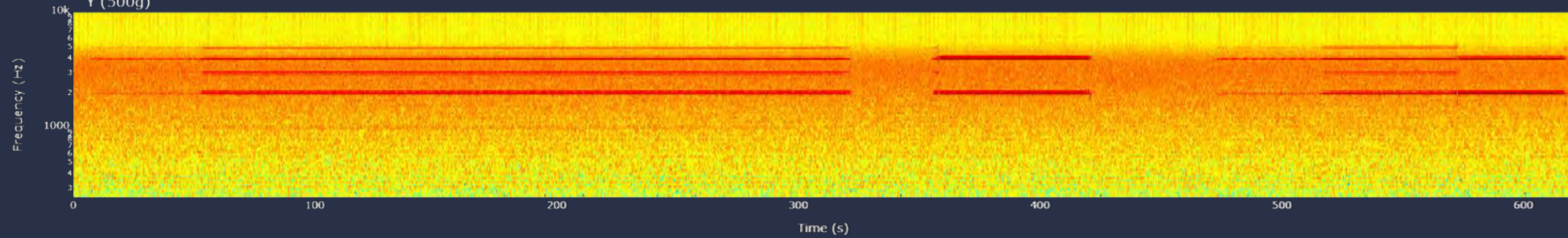
Zahnradverschleiß [‰]: Zahnradverschleiß des Zahnradantriebs in ‰

Vorverarbeitung Signale

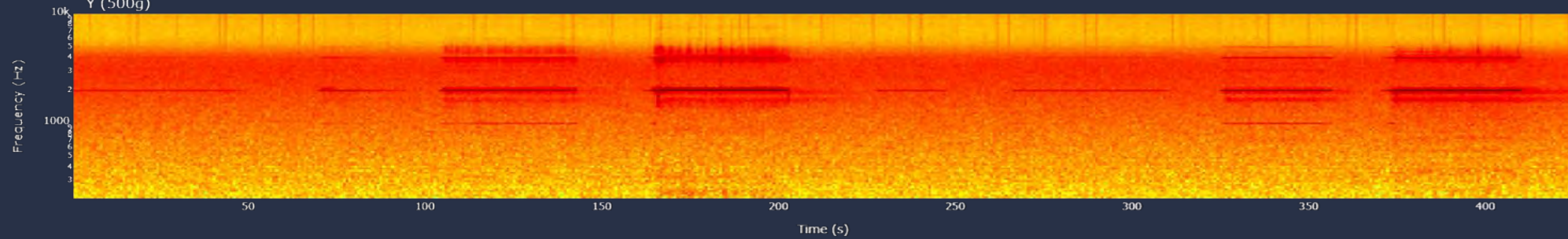


Datensatz - Spektrogramme

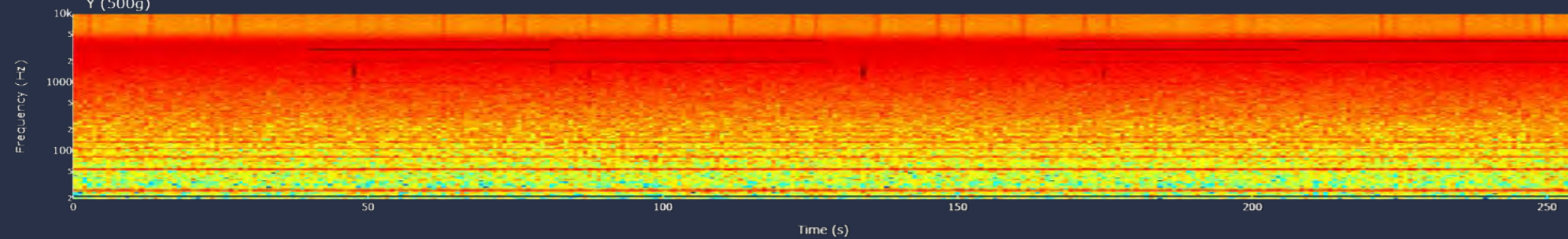
ID: 2, Oil [1-5]: 5, cogwheel degrad.: 7.0%
keine auffälligkeiten
Y (500g)



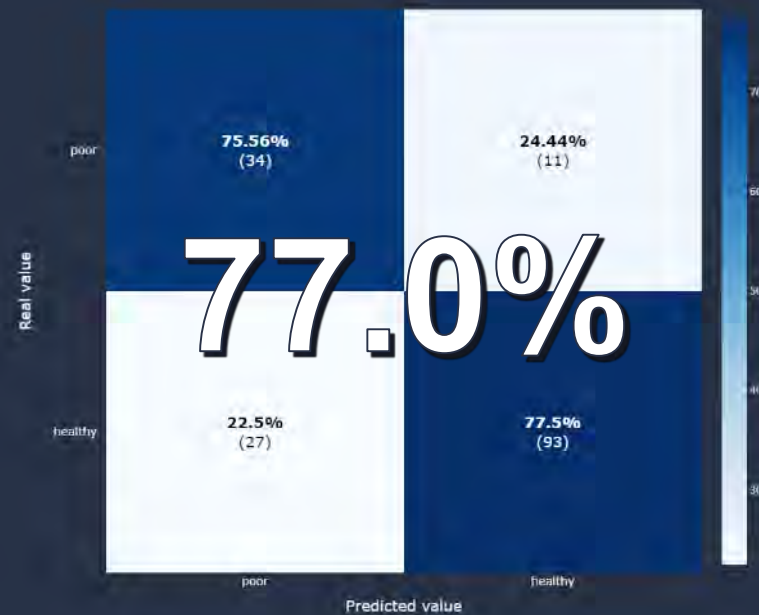
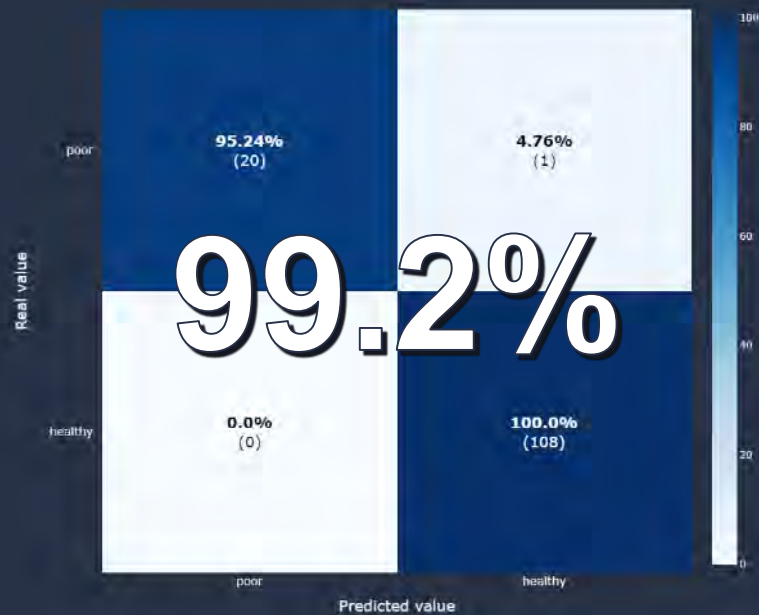
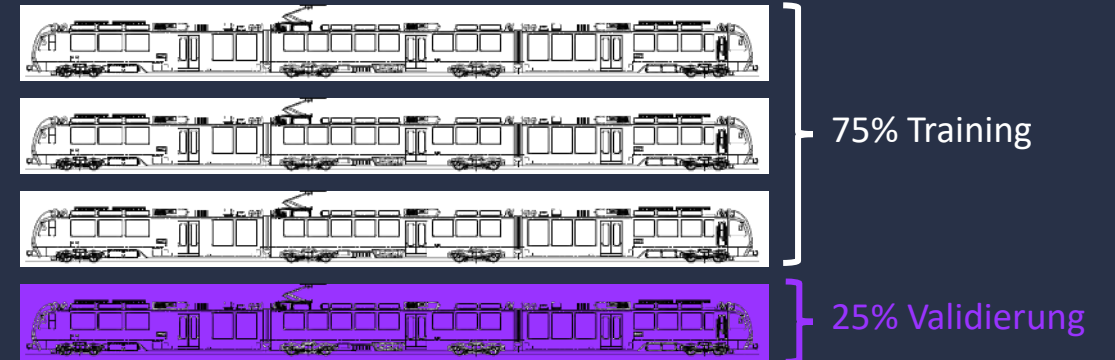
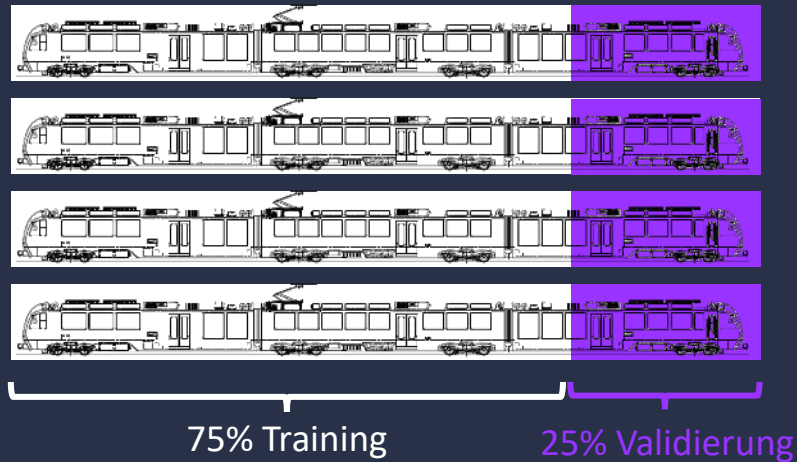
ID: 1, Oil [1-5]: 1, cogwheel degrad.: 74.0%
starke kratzgeräusche Welle 1
Y (500g)



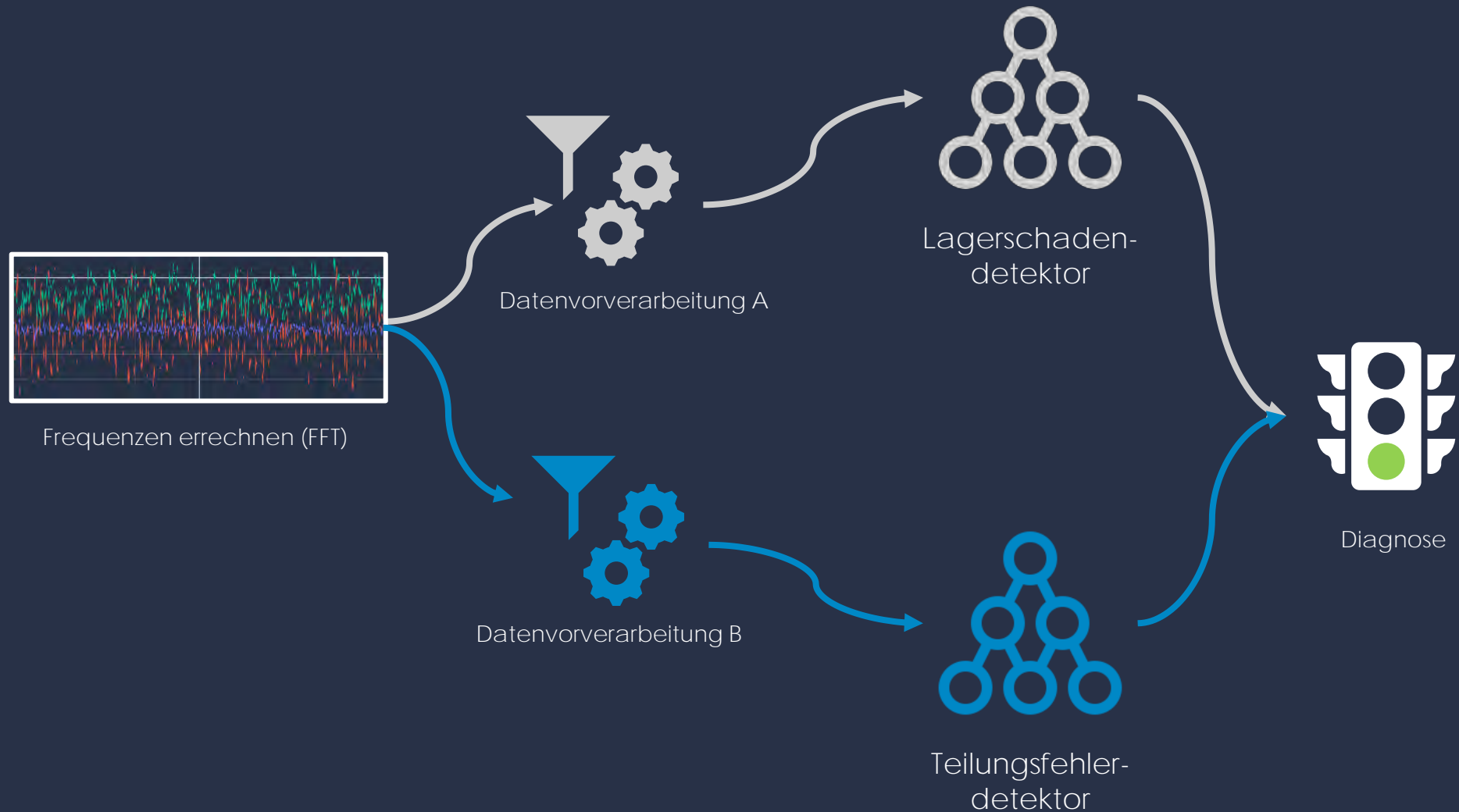
ID: 49, Oil [1-5]: 4, cogwheel degrad.: 50.0%
Stufe 2 Klopfen hörbar
Y (500g)



Datensplitting



Zweifache Klassifizierung



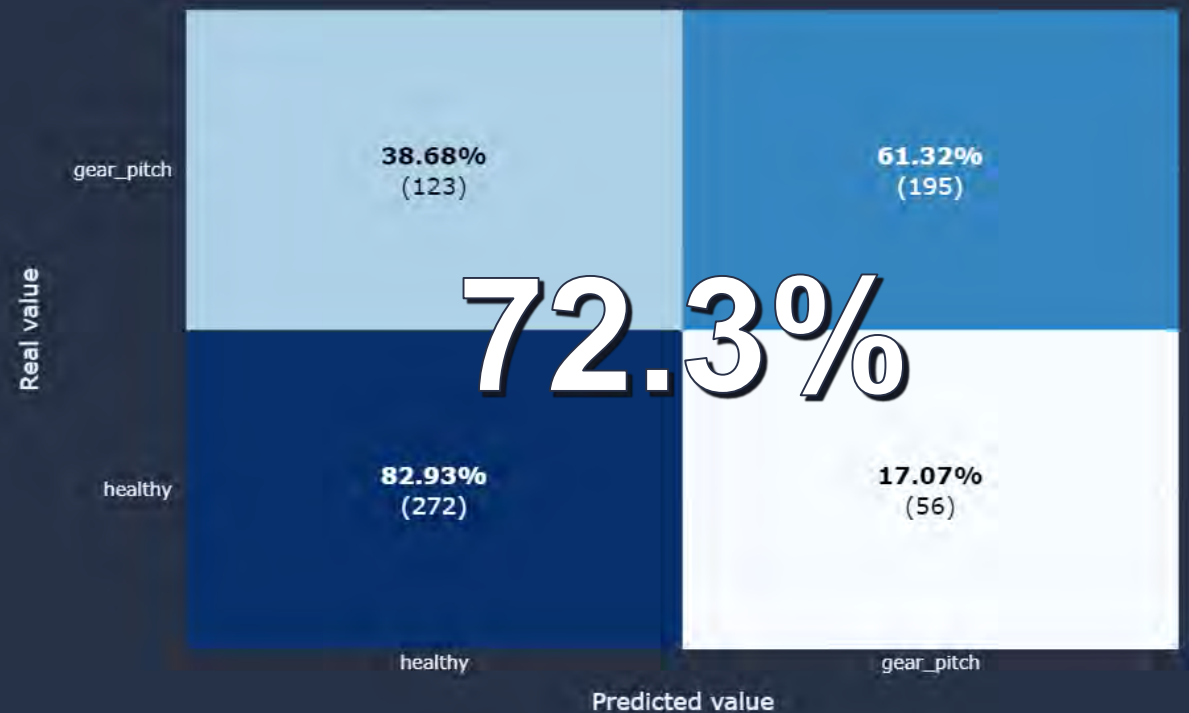
Resultate nach Optimierung



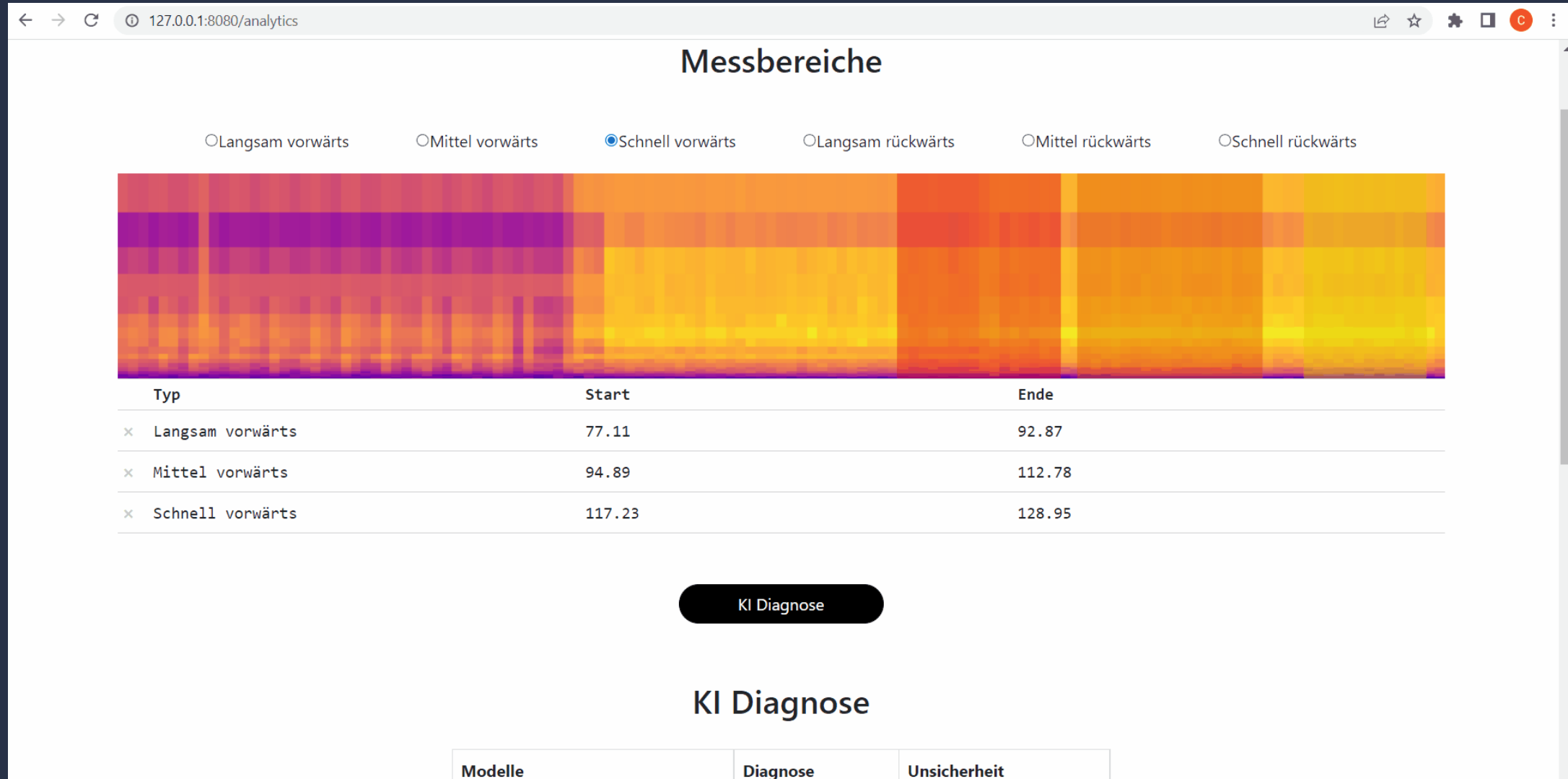
Lagerkäfigschaden



Teilungsfehler



Analytik App



5 Punkte Plan



1. Sensoren
2. Daten
3. Experten Wissen
4. Algorithmik
5. Business Case





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