Webinar: AI & Automation in Container and Intermodal Asset Management

COA CONTAINER OWNERS ASSOCIATION

Presenter: Martin Schoeler, CEO FLETEC

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Webinar: AI & Automation in Container and Intermodal Asset Management

Martin Schöler, CEO of FLETEC, was heading global maintenance and repair operations for various shipping lines , Hamburg Süd and Maersk were he first started to apply AI technology and process automation. In the different roles he is monitoring the industry on adapting innovation since years and happy to share a neutral industry perspective in this presentation

Agenda

- **Why is AI important?**
- AI technology overview – other industry examples
- AI application in our industry – status quo and outlook
- Enabling and supporting AI growth
- The journey to use AI

Why is AI important?

AI is a gamechanger. AI systems learn from today's data and are able to adapt learnings to new situations, and handle complex, unpredictable scenarios. This is different from old rule-based systems strictly following predefined rules but struggling with variability. AI is much more flexible and scalable.
AI is perfect to **automate repetitive tasks** to make work more efficient. **Experts can focus on exception handling** using algorithm insights to decide faster and more accurate. So AI **supports us on labor shortage and maintaining company expertise.**

Why is AI important?

Key Questions

- What is possible with modern AI?
- How do I add AI to my services?
- Will AI provide us real value?

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- **AI technology overview – other industry examples**
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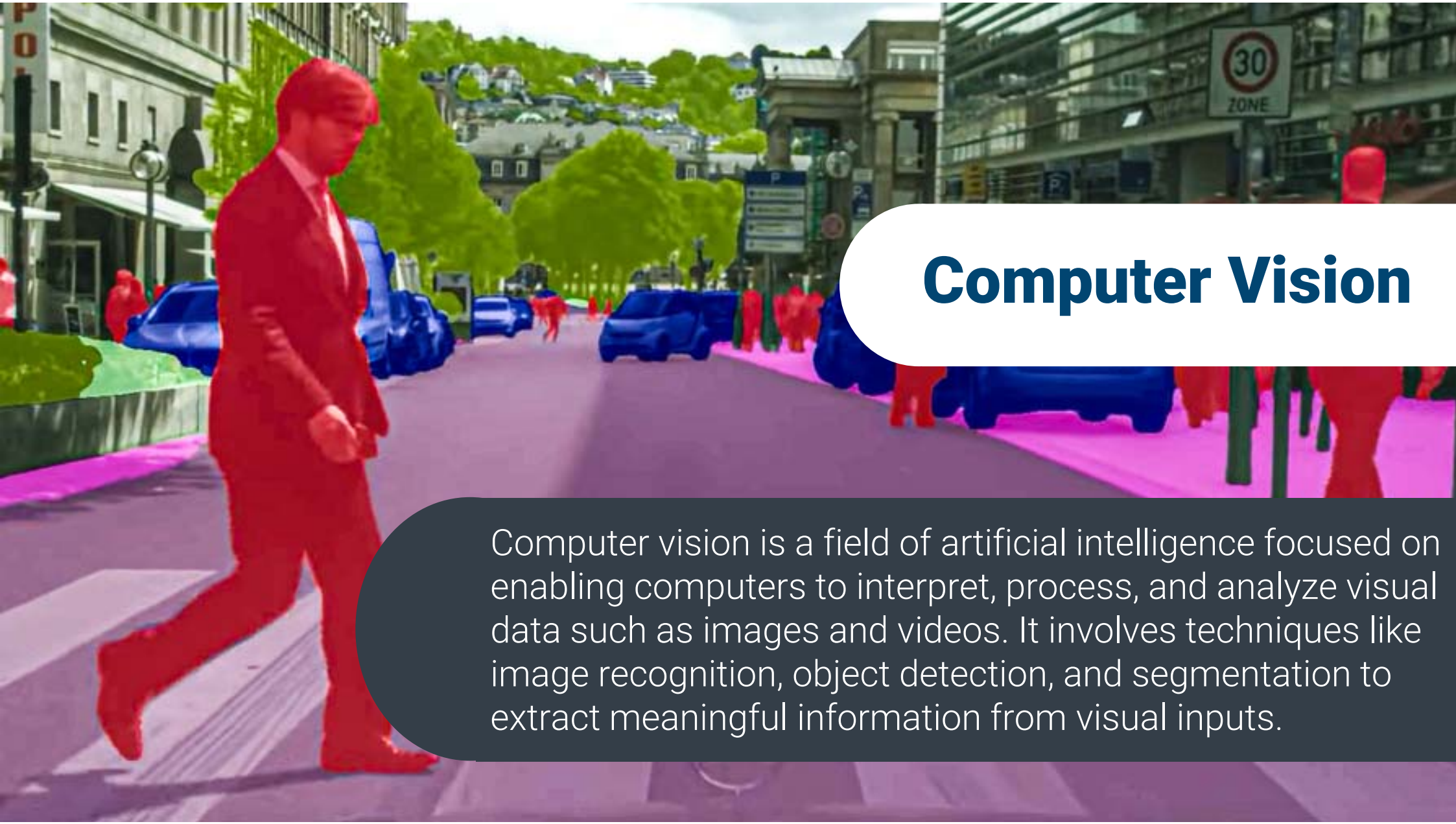
- Supporting AI growth
- Journey to use AI

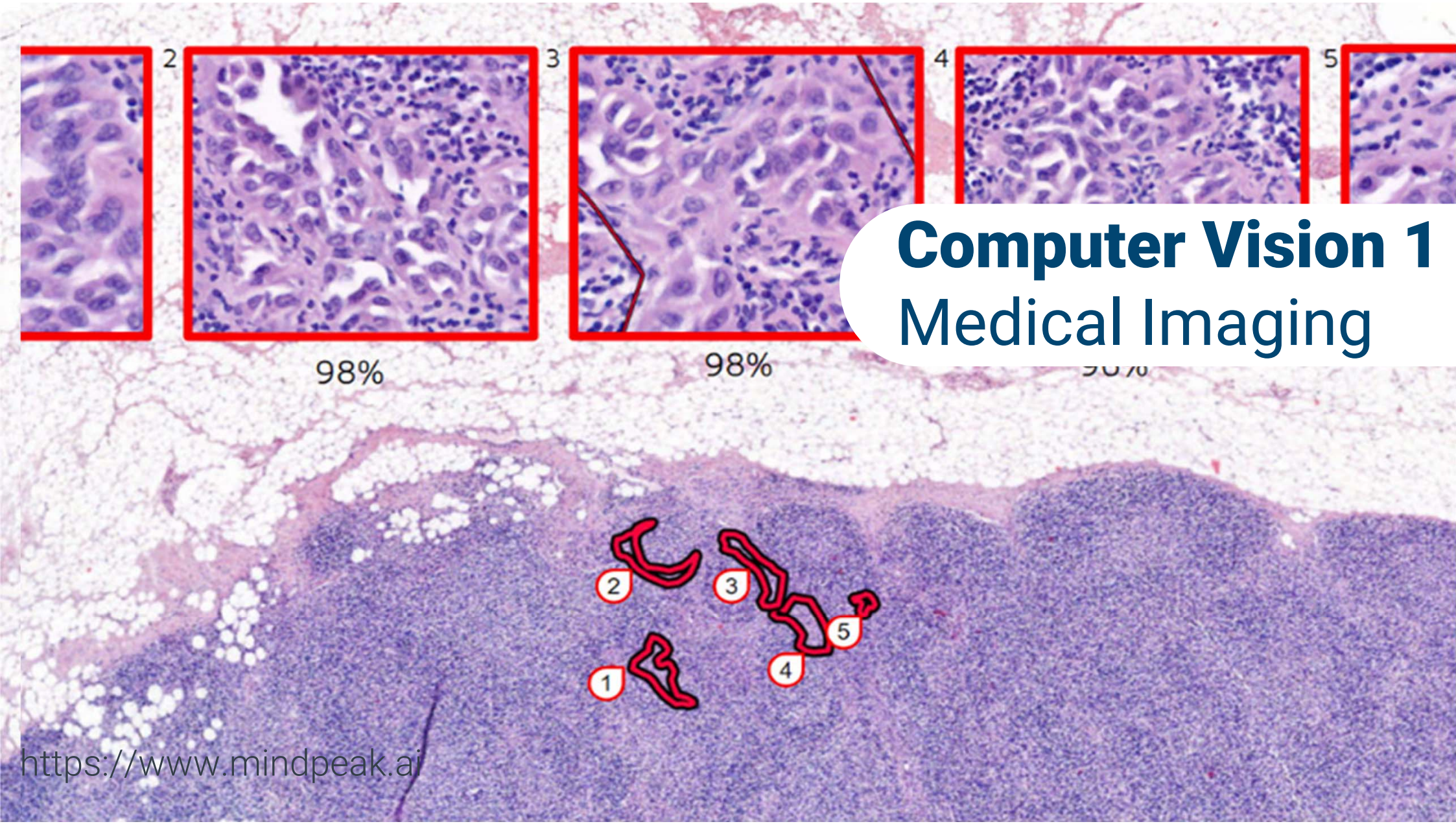
AI technology overview

There are many different AI technologies available with different training methods that fit to different use cases.
In the end this creates a quite complicated AI map full of different options.
In this presentation we concentrate on the most relevant technologies for our industry or that may become relevant for our industry soon.



Computer Vision

Computer vision is a field of artificial intelligence focused on enabling computers to interpret, process, and analyze visual data such as images and videos. It involves techniques like image recognition, object detection, and segmentation to extract meaningful information from visual inputs.



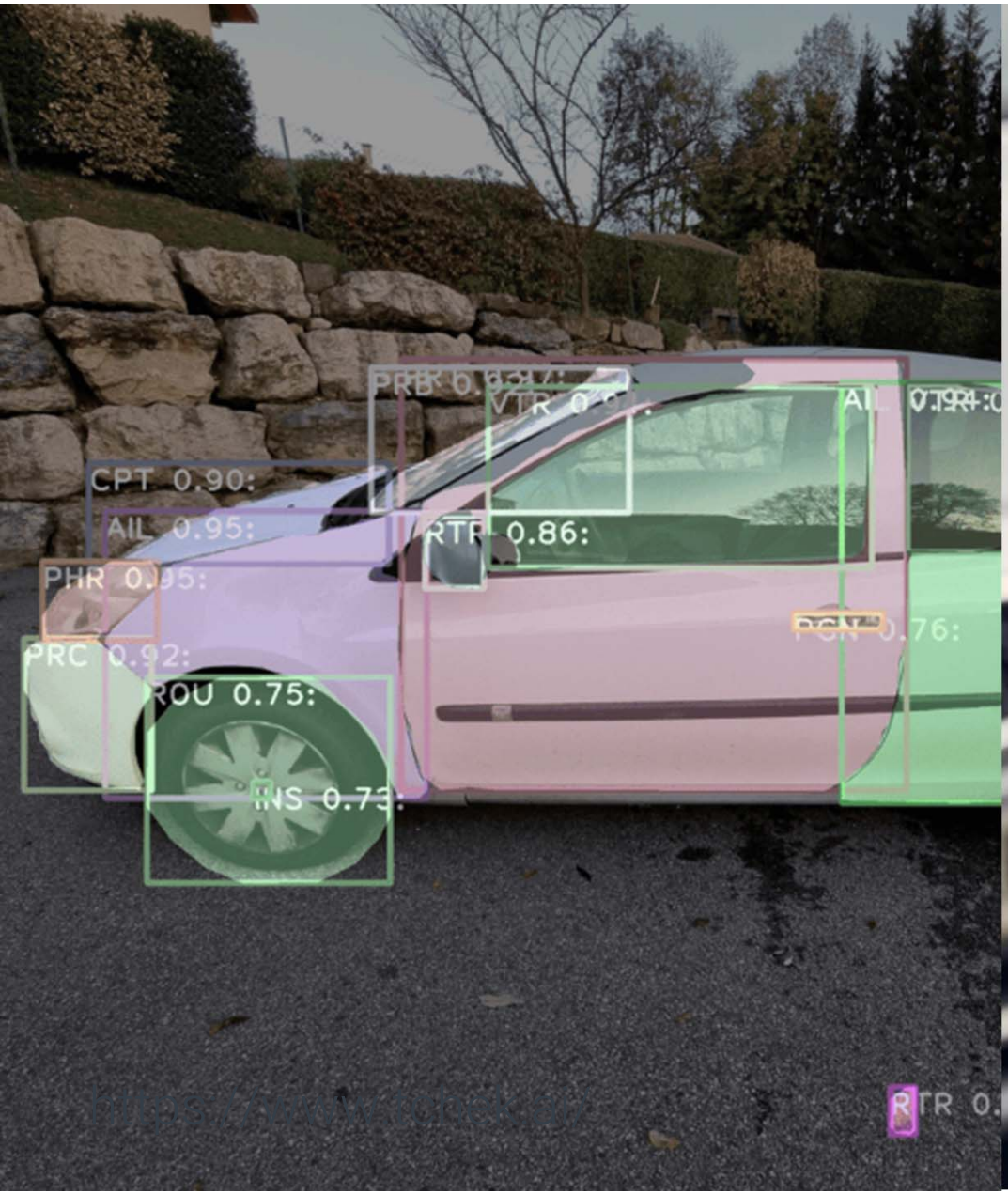
Computer Vision 1
Medical Imaging

Computer Vision 1

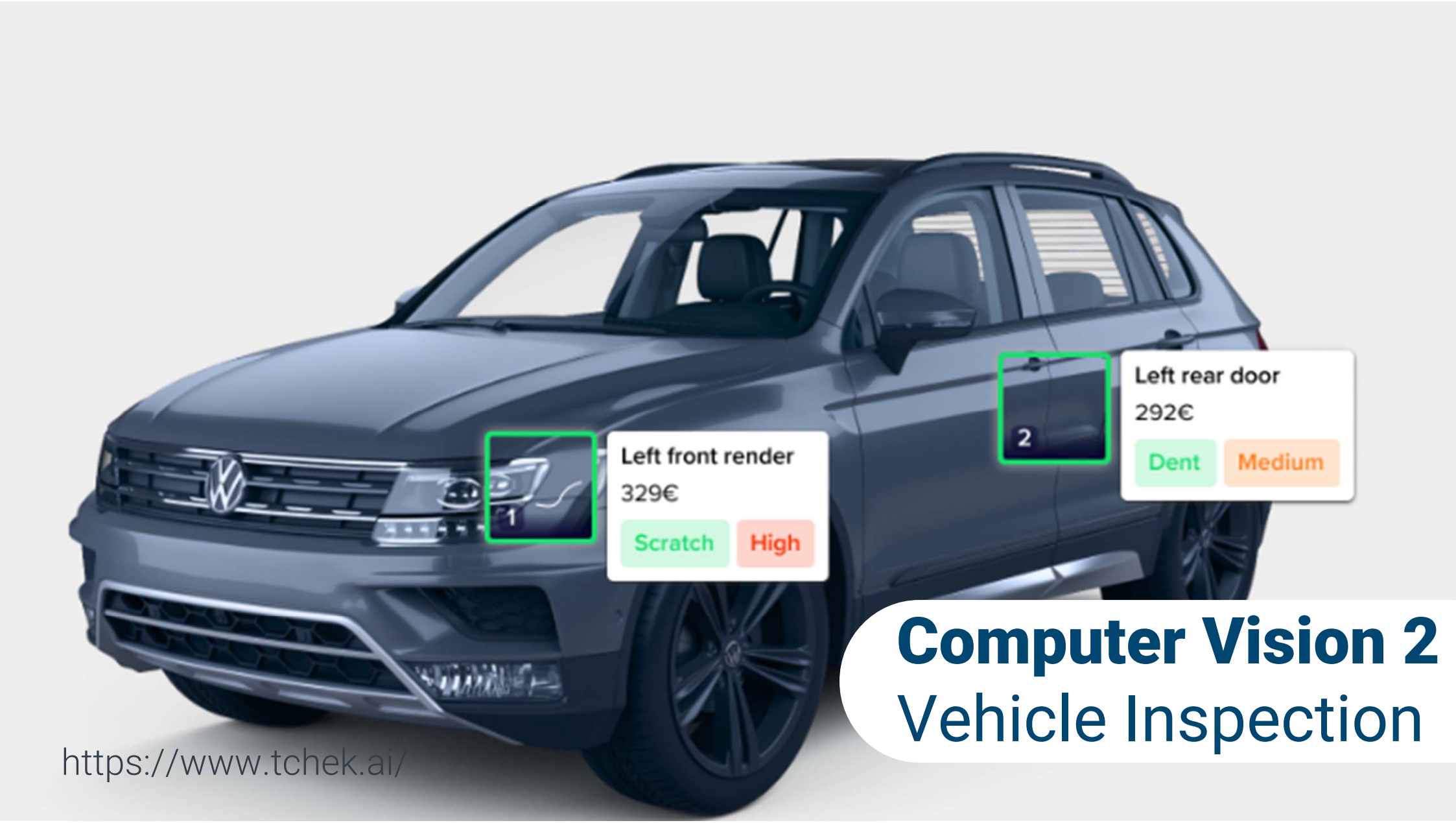
A business case similar to our challenges is medical imaging: Detecting diseases like cancer from X-rays or MRIs. Why is computer vision successful there?

The infrastructure is highly stable, photo creation processes and photo quality are consistent, extensive training data is available after huge efforts and investments have been made to create data curated by medical experts. There was a reason: the demand for medical image analysis grows rapidly but number of cancer experts remains the same with growing workload per specialist. AI tools frees specialists from repetitive tasks and allows to focus on tasks where human expertise is vital. Sounds pretty similar to the problems in our industry. AI is a support not a competitor.

http



Computer Vision 2
Vehicle Inspection



Computer Vision 2
Vehicle Inspection

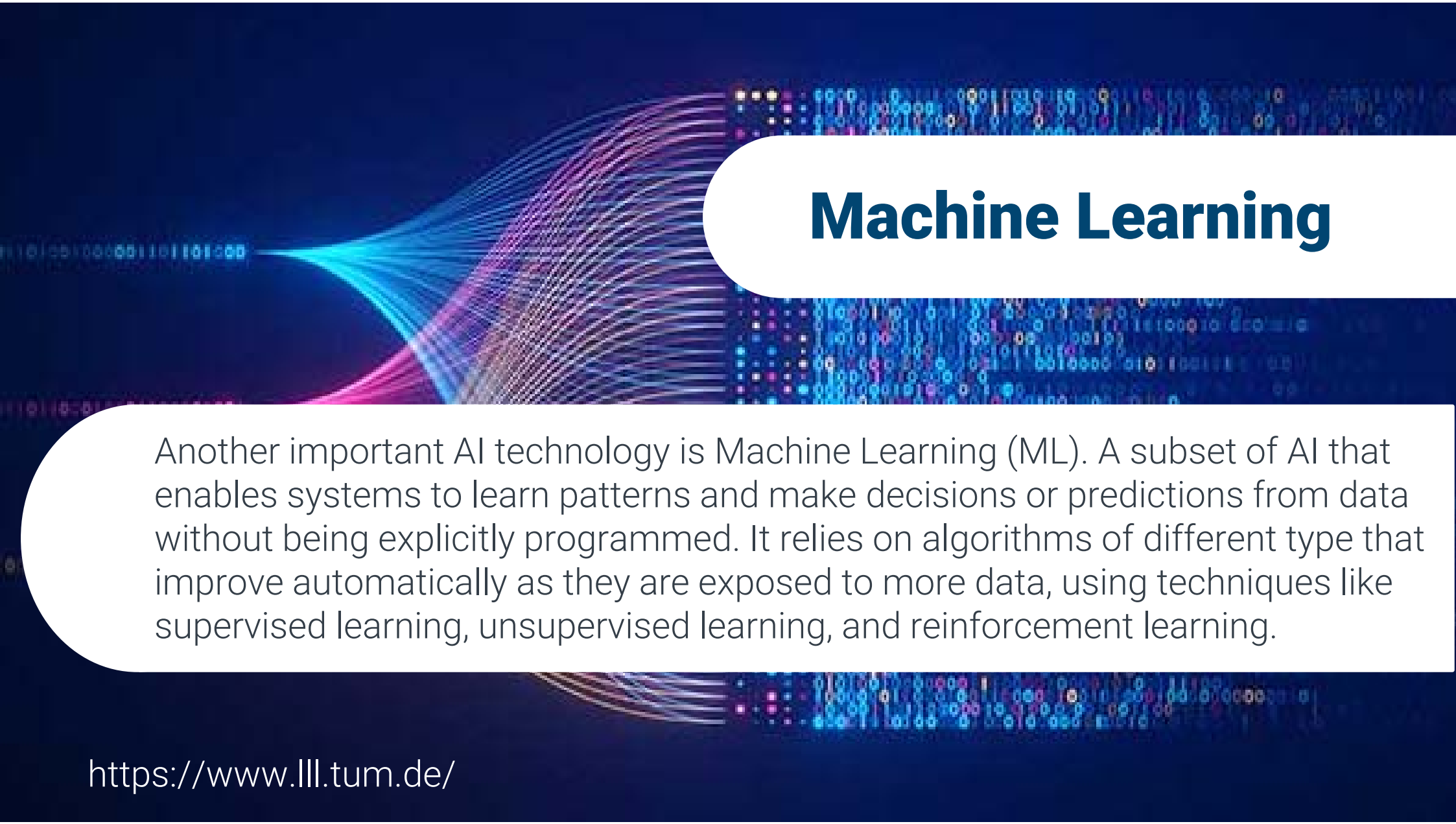
https://www.tchek.ai/

Another sample: rental car sector has high demand for vehicles inspections.

The vehicle condition needs to be identified any time a car is returned from a last rent to replace inaccurate filled paper forms of the old times. Here computer vision is solving many different problems so that full process cycle is supported:

Image standardization and -trimming, image quality control through apps, inspection and damage analysis, vehicle condition report, automated estimation of repair cost.

This was possible after a stable infrastructure guaranteed photo quality on which models could be trained. Either through fixed camara systems at the trade in locations and/or mobile apps managing standardised taking of photos. Plus the damage criteria are very simple. What is not like brand new is a “damage”. Very good training data for each car model are available for all different viewpoints.



Machine Learning

Another important AI technology is Machine Learning (ML). A subset of AI that enables systems to learn patterns and make decisions or predictions from data without being explicitly programmed. It relies on algorithms of different type that improve automatically as they are exposed to more data, using techniques like supervised learning, unsupervised learning, and reinforcement learning.

https://www.lll.tum.de/

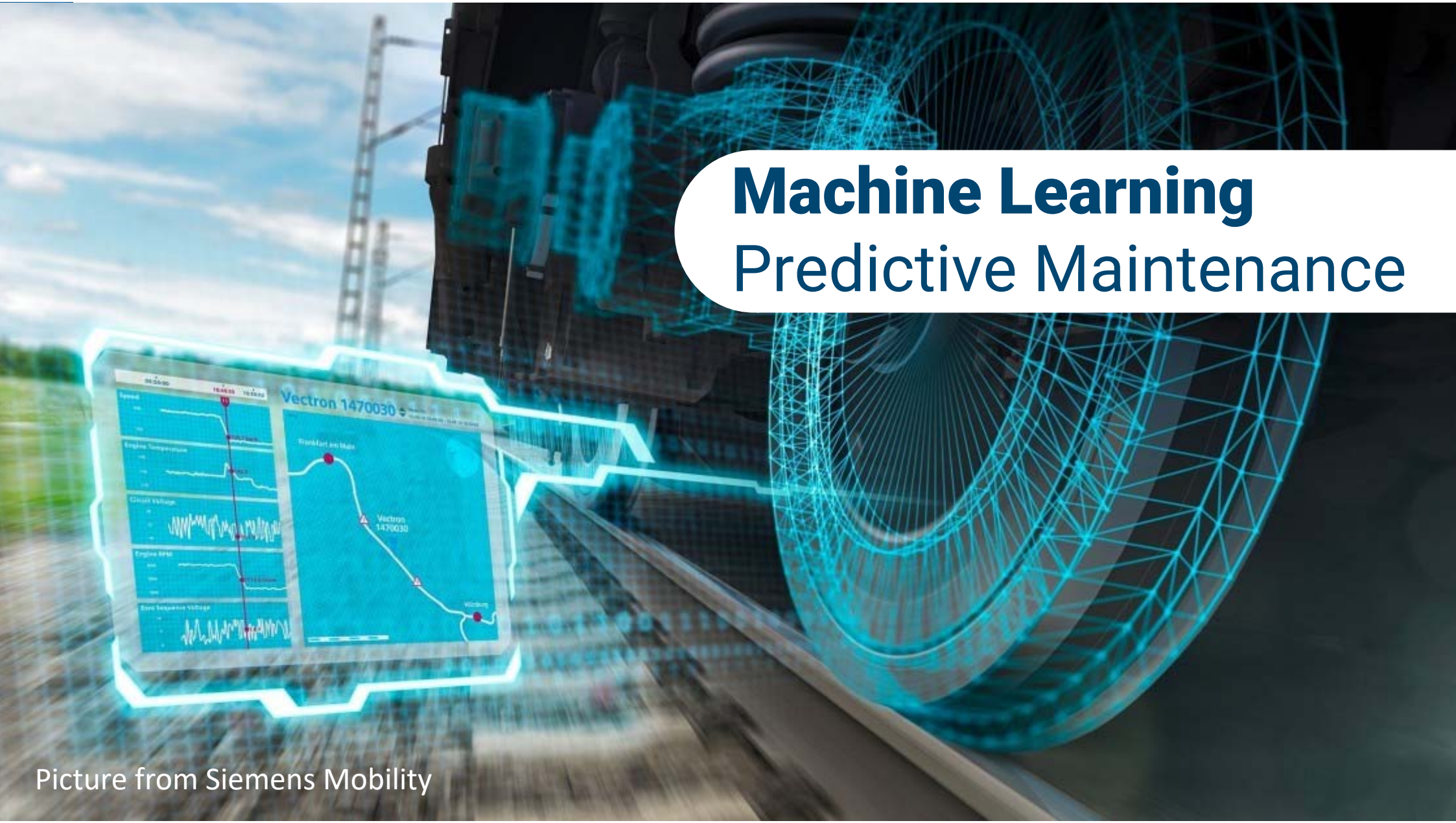
Machine Learning
Fraud detection

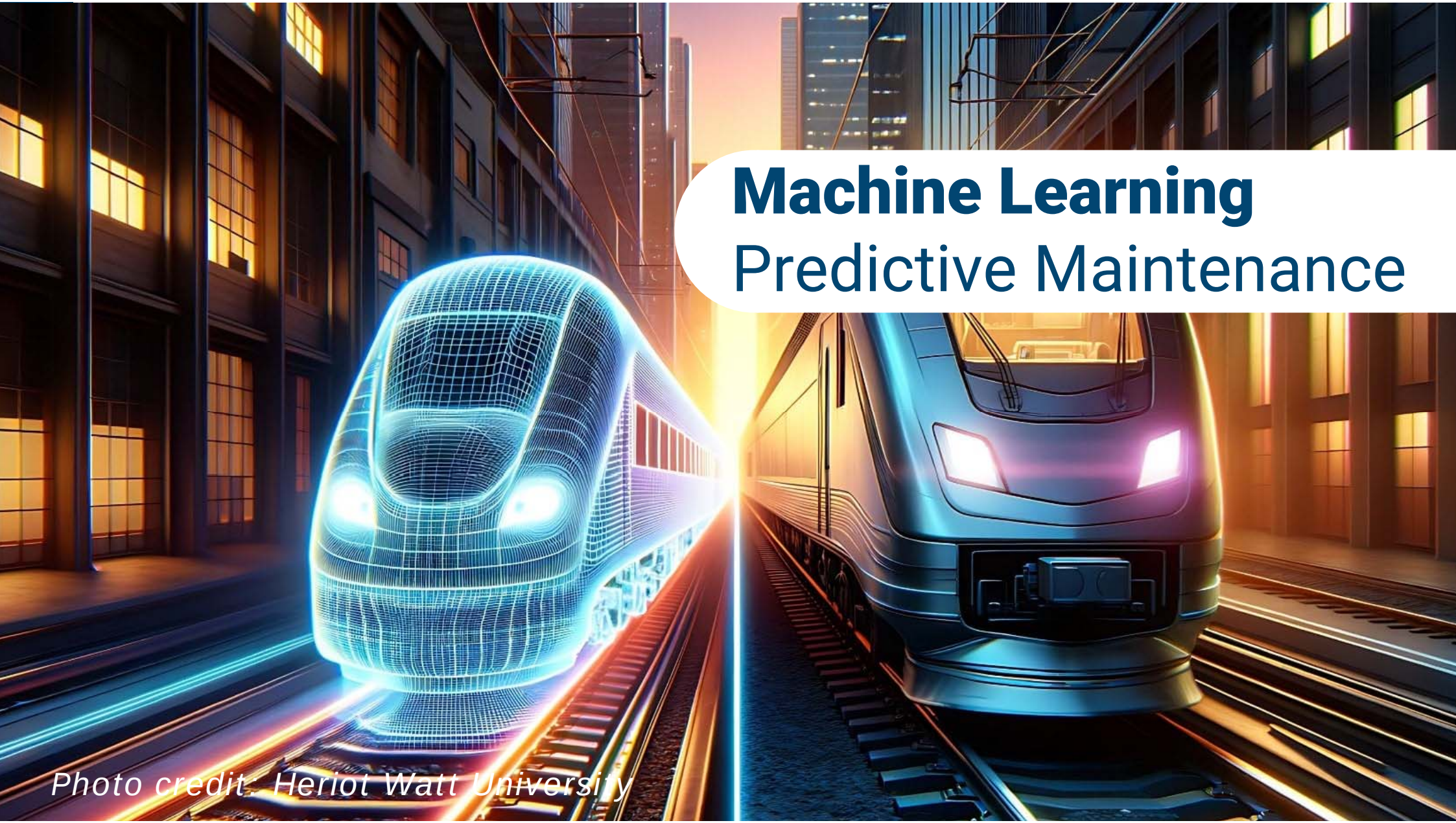
Important use cases are identification of irregularities, problems in data sets.

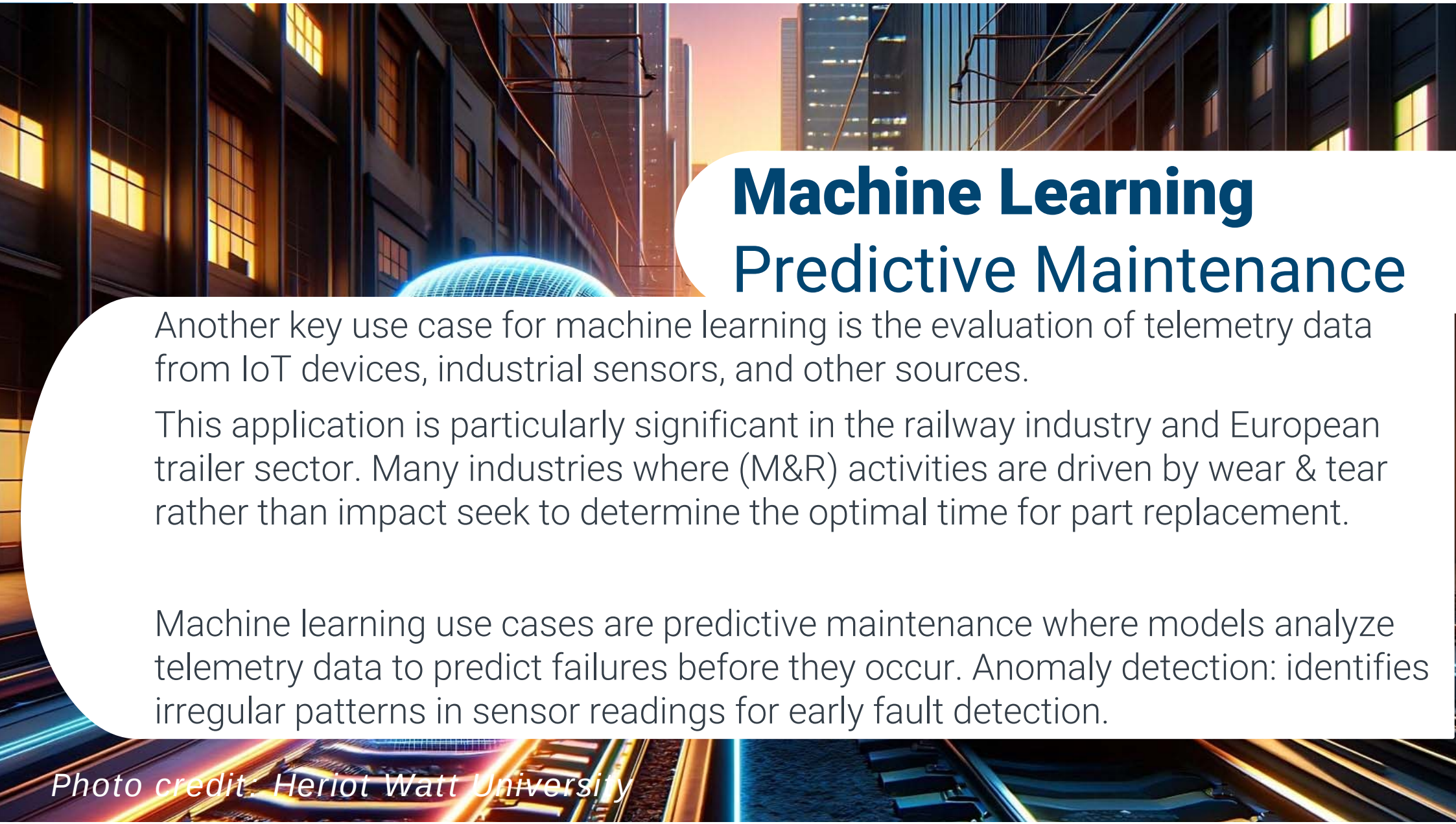
- Credit rating: risk detection in new credit requests based on models trained on past credit histories.
- Fraud Detection: identifying fraudulent transactions in financial systems.
- Quotation evaluation: identifying overpricing in quotations.

So, these are similar processes like controlling repair estimates in our industry.

https://www.linkedin.com/pulse/machine-learning-credit-card-fraud-detection-lu%C3%ADs-fernando-torres/


Machine Learning
Predictive Maintenance
Vectron 1470030
Vectron
1470030
Picture from Siemens Mobility


Machine Learning
Predictive Maintenance
Photo credit: Heriot Watt University



Machine Learning
Predictive Maintenance

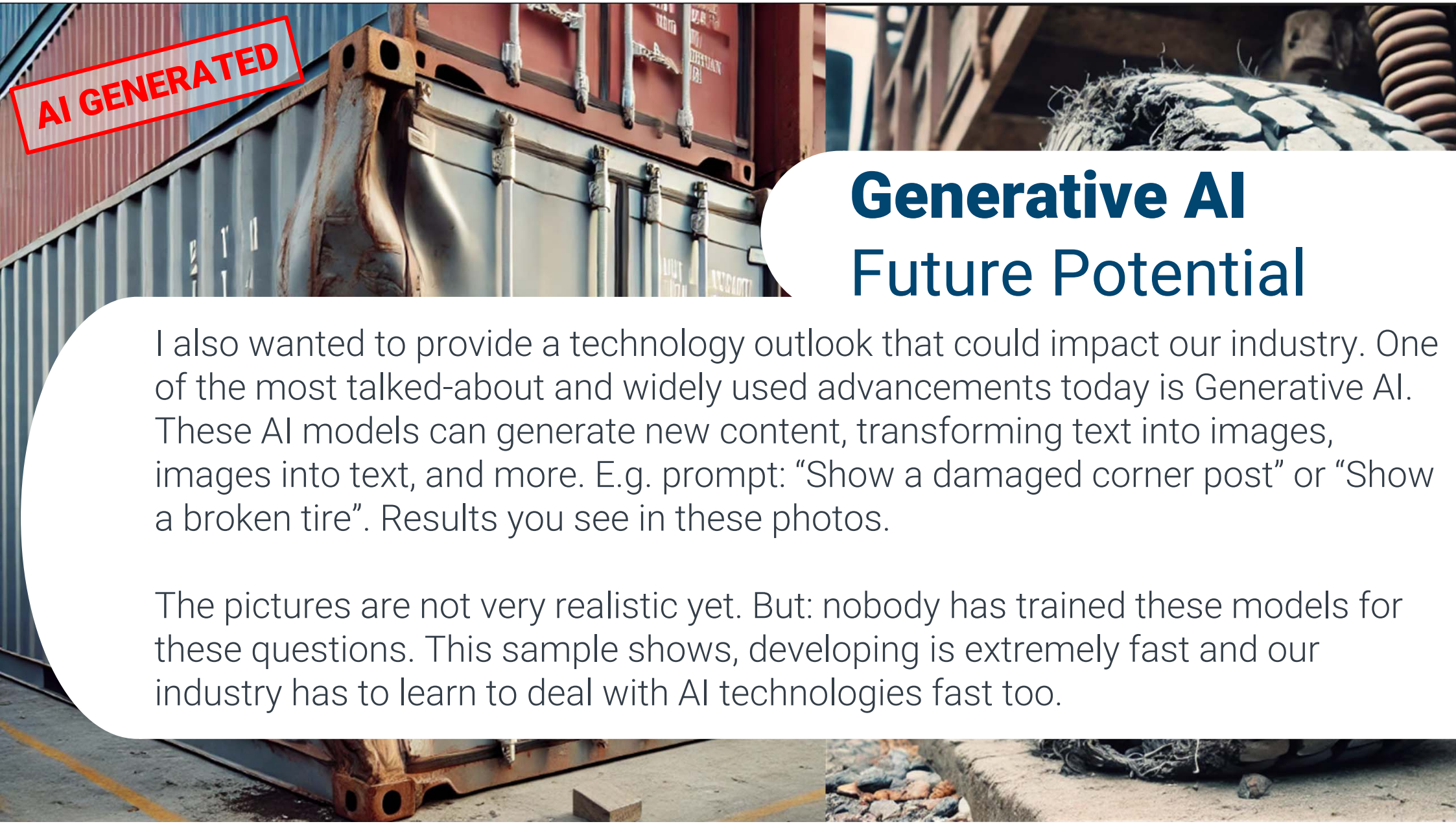
Another key use case for machine learning is the evaluation of telemetry data from IoT devices, industrial sensors, and other sources.

This application is particularly significant in the railway industry and European trailer sector. Many industries where (M&R) activities are driven by wear & tear rather than impact seek to determine the optimal time for part replacement.

Machine learning use cases are predictive maintenance where models analyze telemetry data to predict failures before they occur. Anomaly detection: identifies irregular patterns in sensor readings for early fault detection.

Photo credit: Heriot Watt University

Generative AI
Future Potential



Generative AI
Future Potential

I also wanted to provide a technology outlook that could impact our industry. One of the most talked-about and widely used advancements today is Generative AI. These AI models can generate new content, transforming text into images, images into text, and more. E.g. prompt: “Show a damaged corner post” or “Show a broken tire”. Results you see in these photos.

The pictures are not very realistic yet. But: nobody has trained these models for these questions. This sample shows, developing is extremely fast and our industry has to learn to deal with AI technologies fast too.

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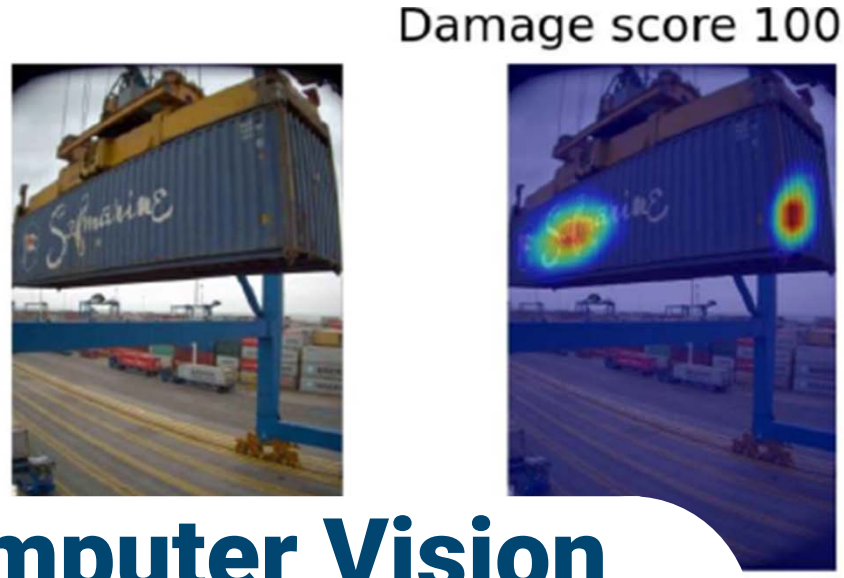
Computer Vision

Gate process

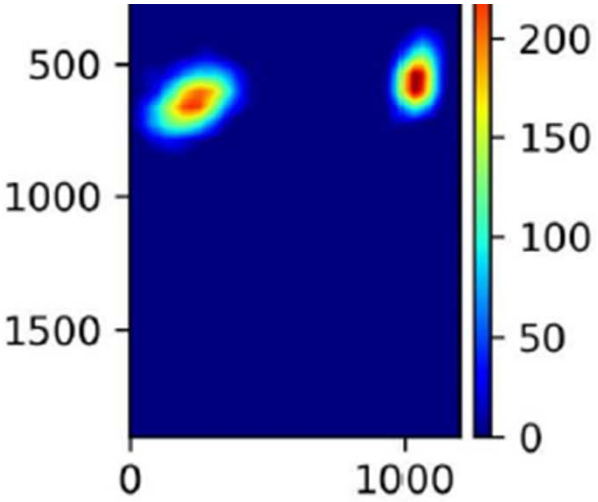
https://www.camco.be/

https://www.mavisoft.com/scantainr



Computer Vision

Gate process

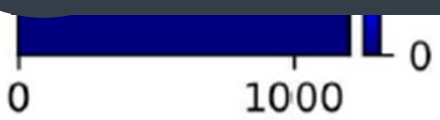


https://www.visy.fi/

https://www.mavisoft.com/scantainr

Automating gate operation started with OCR technology with fixed camera system which are now used for automatic container condition and damage detection, delivering standardized images from different viewpoints which allows training of A models. Challenges:

- what is considered “damage”? We have too many different damage criteria in use so focus is on identification of severe damages to avoid liability and safety issues
- Standardized images only available for outside problems, lacking understructure
- Today these data not used for creating/controlling repair estimates



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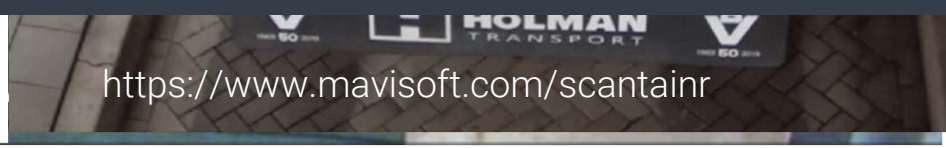


https://www.mavisoft.com/scantainr

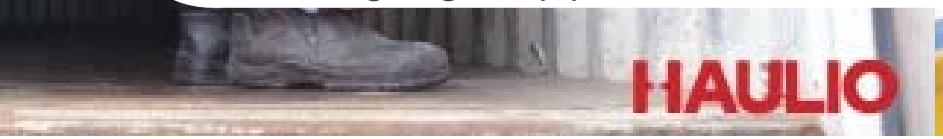
Computer Vision

M&R process

Leveraging AI and Computer Vision for the M&R process is a very different situation.

Traditional, manual container inspections with the target to write a repair estimates are time-consuming and prone to human error. Inspectors take photos of the damages by cell phones, cameras to support repair estimates that are getting controlled by the container operators. The industry has a high level of control demand, repair estimates are changed/corrected frequently.

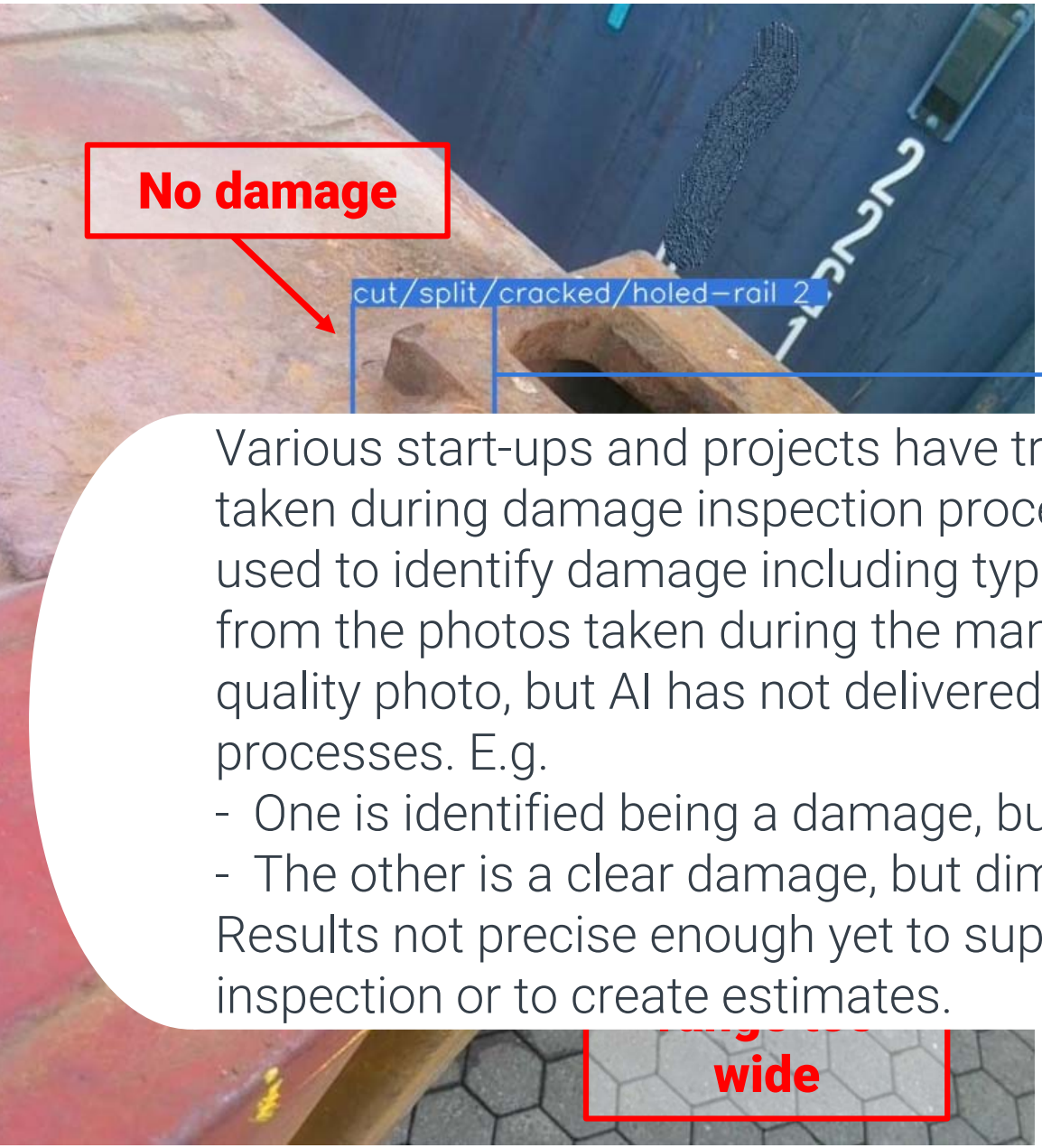
This is one of the most inefficient processes in our industry impacting equipment productivity and productivity of all stakeholders. AI shall become a game changing support, but needs better photos for training.



Computer Vision
M&R process

date	2024-10-21T07:24:12.892126Z
filename	DEMO103984020.jpg
damage	cut/split/cracked/holed-rail 2
min (cm)	3.47
max (cm)	4.77

date	2024-10-21T07:24:07.912794Z
filename	DEMO103984020.jpg
damage	cut/split/cracked/holed-rail 2
min (cm)	14.37
max (cm)	38.13



Computer Vision
M&R process

date	2024-10-21T07:24:12.892126Z
filename	DEMO103984020.jpg

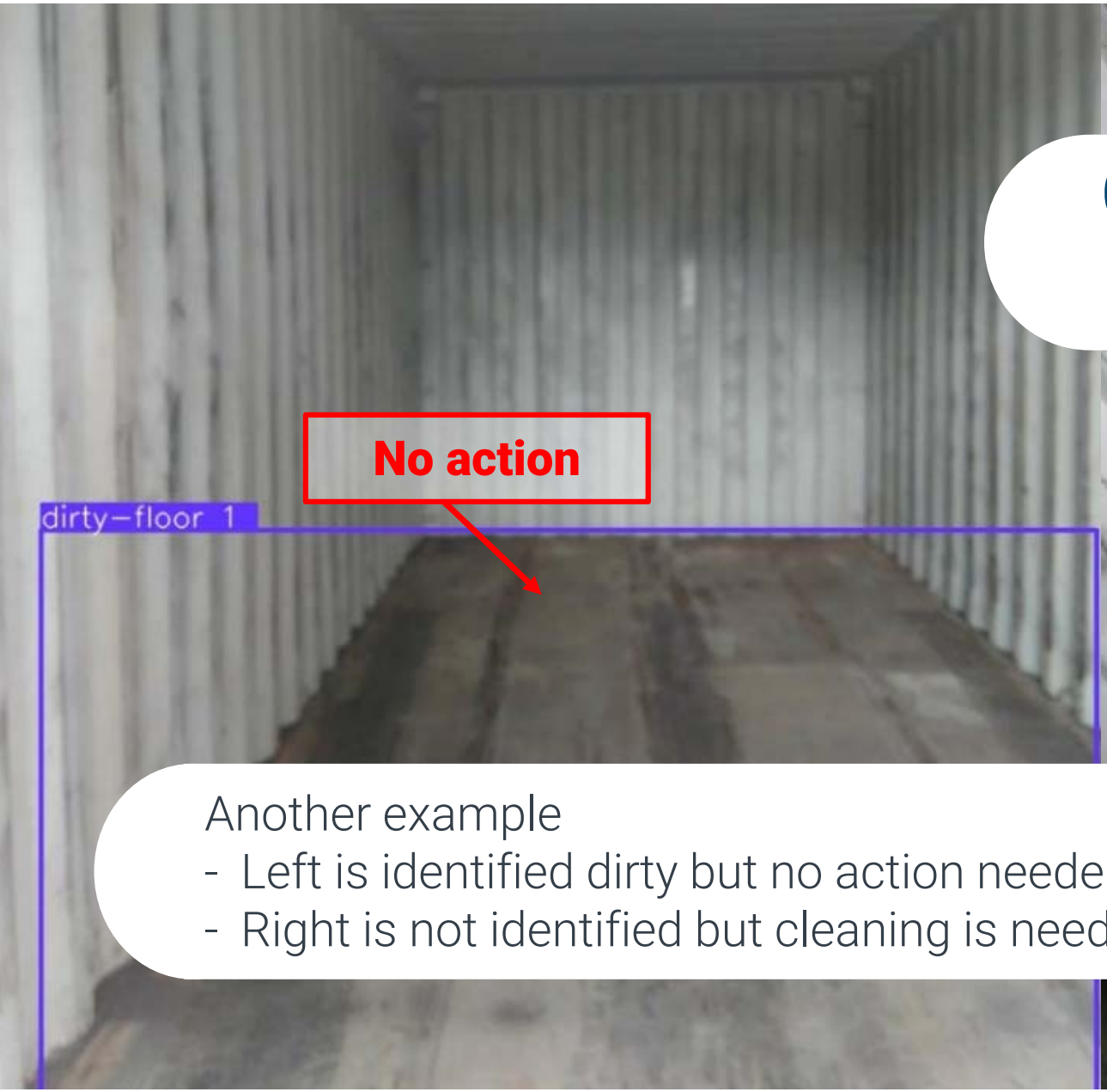
Various start-ups and projects have tried to apply computer vision for photos taken during damage inspection process. Here an example where AI has been used to identify damage including type of damage, location, damage dimensions from the photos taken during the manual inspection process. This is a good quality photo, but AI has not delivered enough accuracy to support or automate processes. E.g.

- One is identified being a damage, but it is not
- The other is a clear damage, but dimensions don't match .

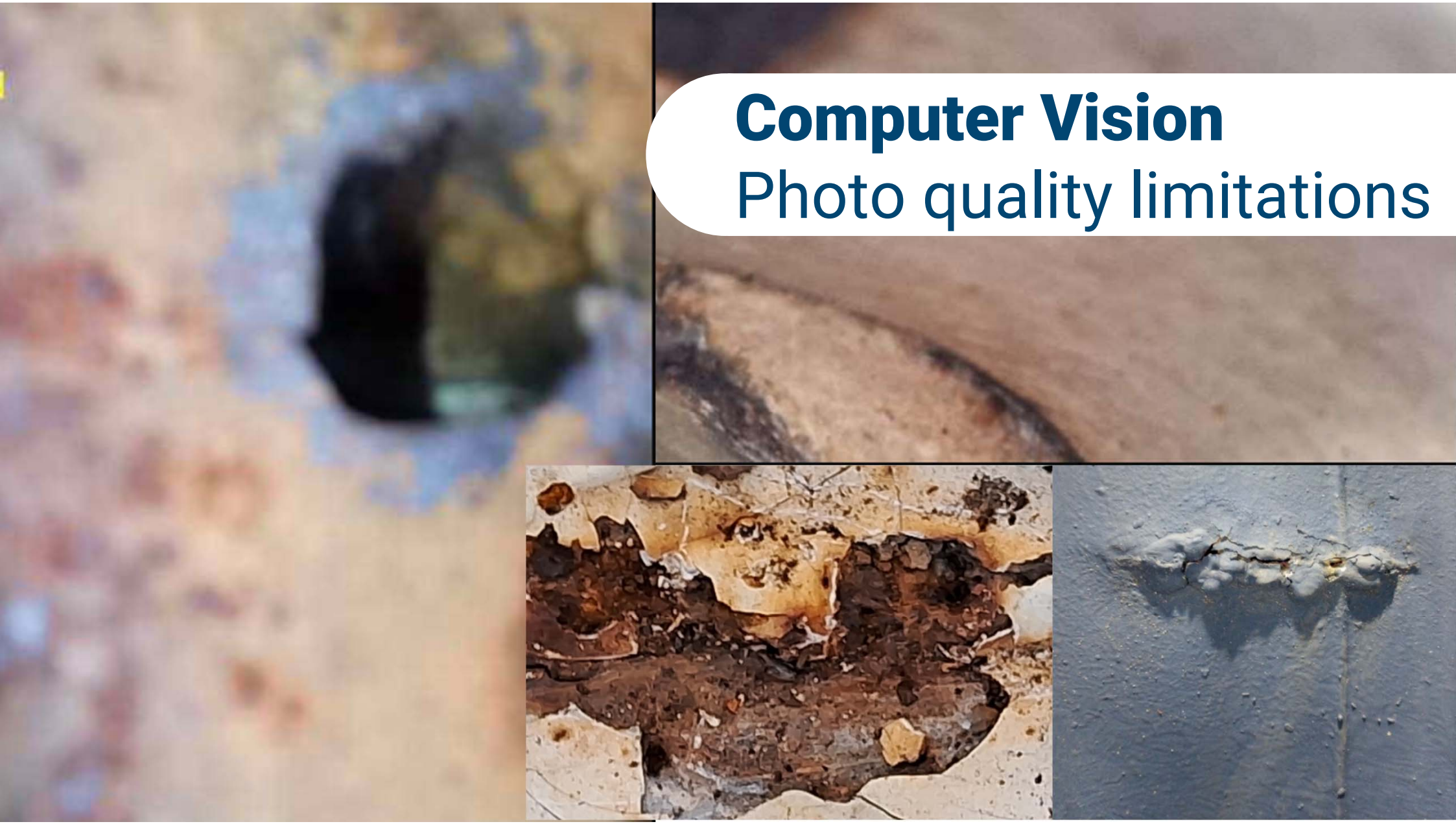
Results not precise enough yet to support or automate processes of container inspection or to create estimates.

Computer Vision
M&R process

Computer Vision
M&R process

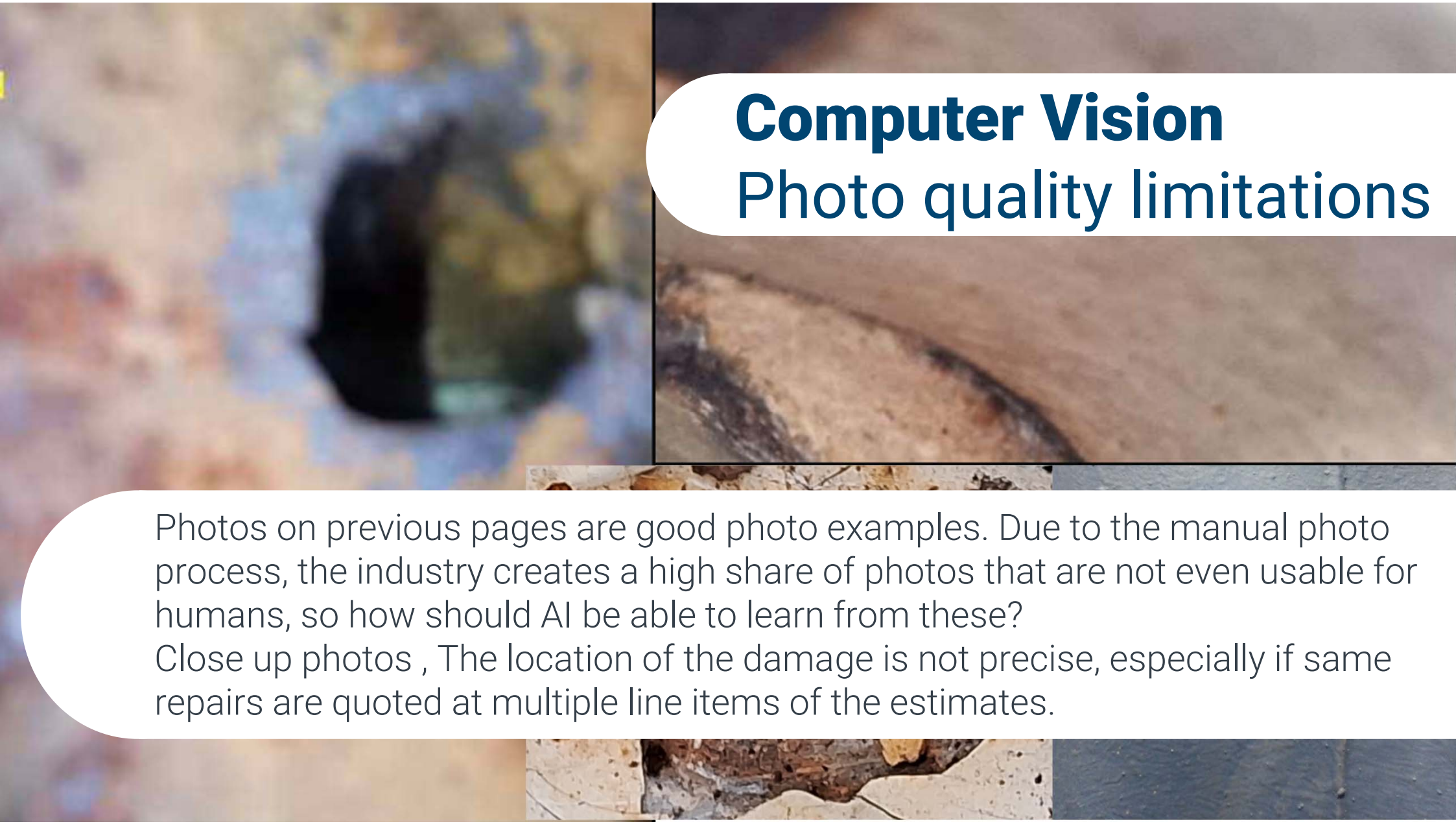


Another example
- Left is identified dirty but no action needed here
- Right is not identified but cleaning is needed here



Computer Vision

Photo quality limitations

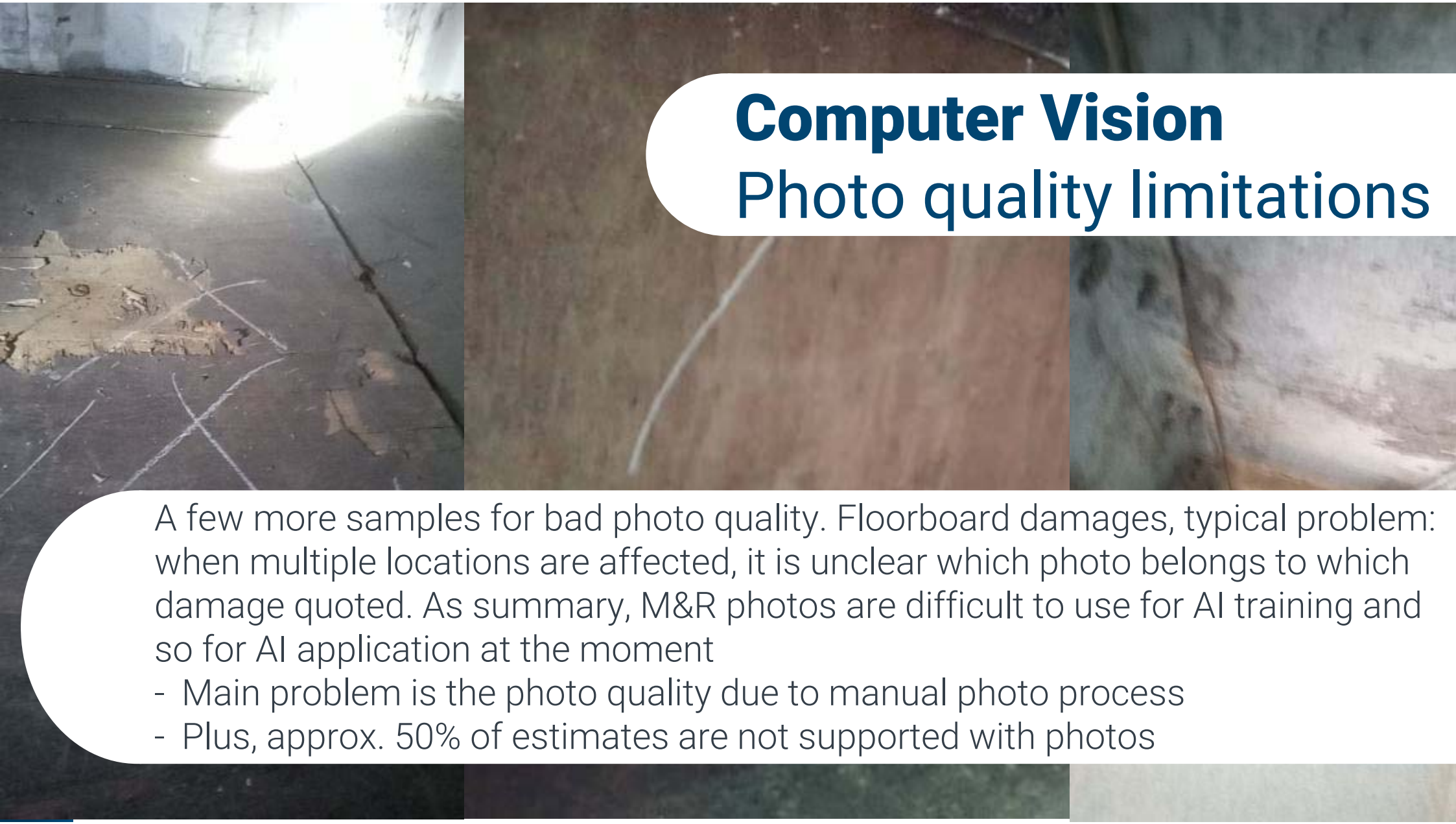


Computer Vision
Photo quality limitations

Photos on previous pages are good photo examples. Due to the manual photo process, the industry creates a high share of photos that are not even usable for humans, so how should AI be able to learn from these?
Close up photos , The location of the damage is not precise, especially if same repairs are quoted at multiple line items of the estimates.

Computer Vision

Photo quality limitations

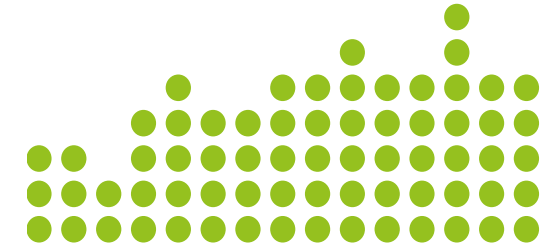


Computer Vision
Photo quality limitations

A few more samples for bad photo quality. Floorboard damages, typical problem: when multiple locations are affected, it is unclear which photo belongs to which damage quoted. As summary, M&R photos are difficult to use for AI training and so for AI application at the moment

- Main problem is the photo quality due to manual photo process
- Plus, approx. 50% of estimates are not supported with photos

Machine Learning
Risk Detection

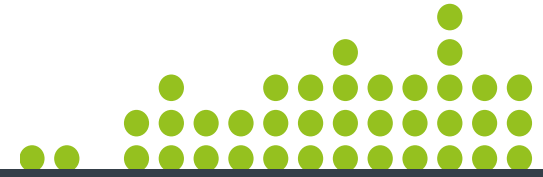


GREEN = Fast approval

- Immediate approval of green=correct estimates without cost risk
- Improve approval and equipment turn times
- Support depot efficiency

RED = Control needed

- RED rating = control required
- Technical experts focus on incorrect, too expensive estimates keeping cost and quality under control



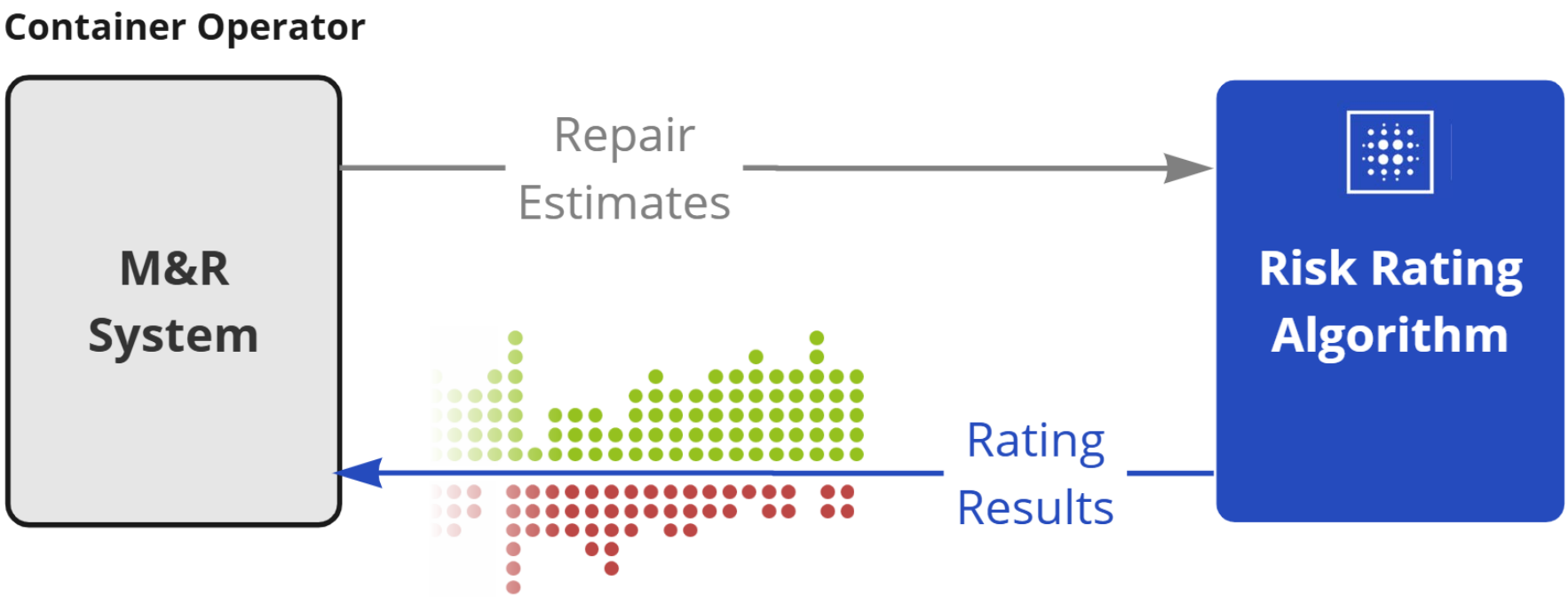
This solution to support the M&R process is identifying risks in the CEDEX M&R data same as applied for fraud detection. With Machine Learning it is possible to identify if an estimate is correct or incorrect. Rating result delivered to user as GREEN for correct estimates, RED for estimates perhaps not and better to be controlled by a technical expert.

This information significantly reduces manual workload without risk of missing out on cost control and accelerating equipment productivity. We see:

- Fast approvals without cost risk which improves equipment turn times
- Fast decision supports depot efficiency
- Workload is focussed on critical items
- Technical expertise can shine and creates higher value
- Visualization of cooperation quality between container owner and workshops

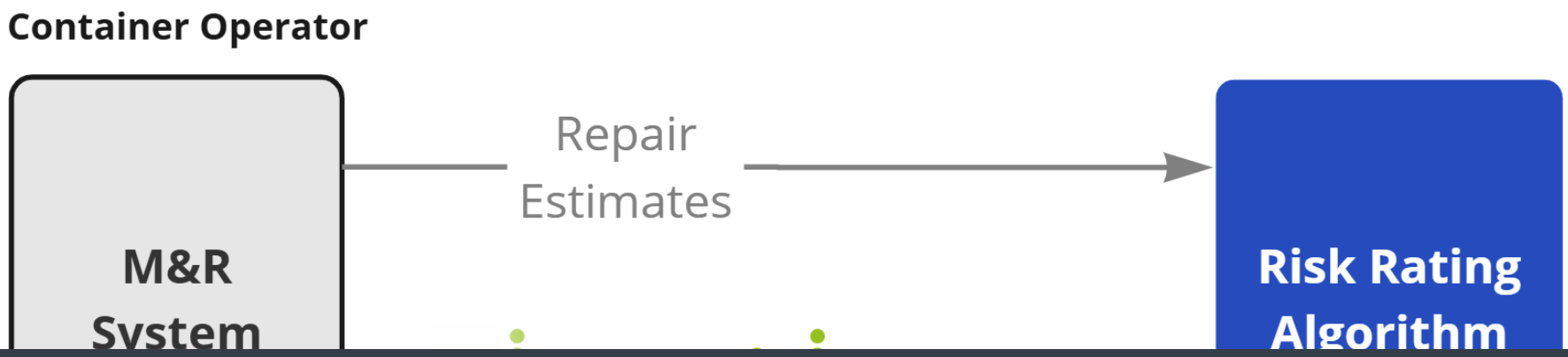
This technology is in use for several years and has proofed to deliver significant value.

Machine Learning
Risk Detection



https://fletec.io

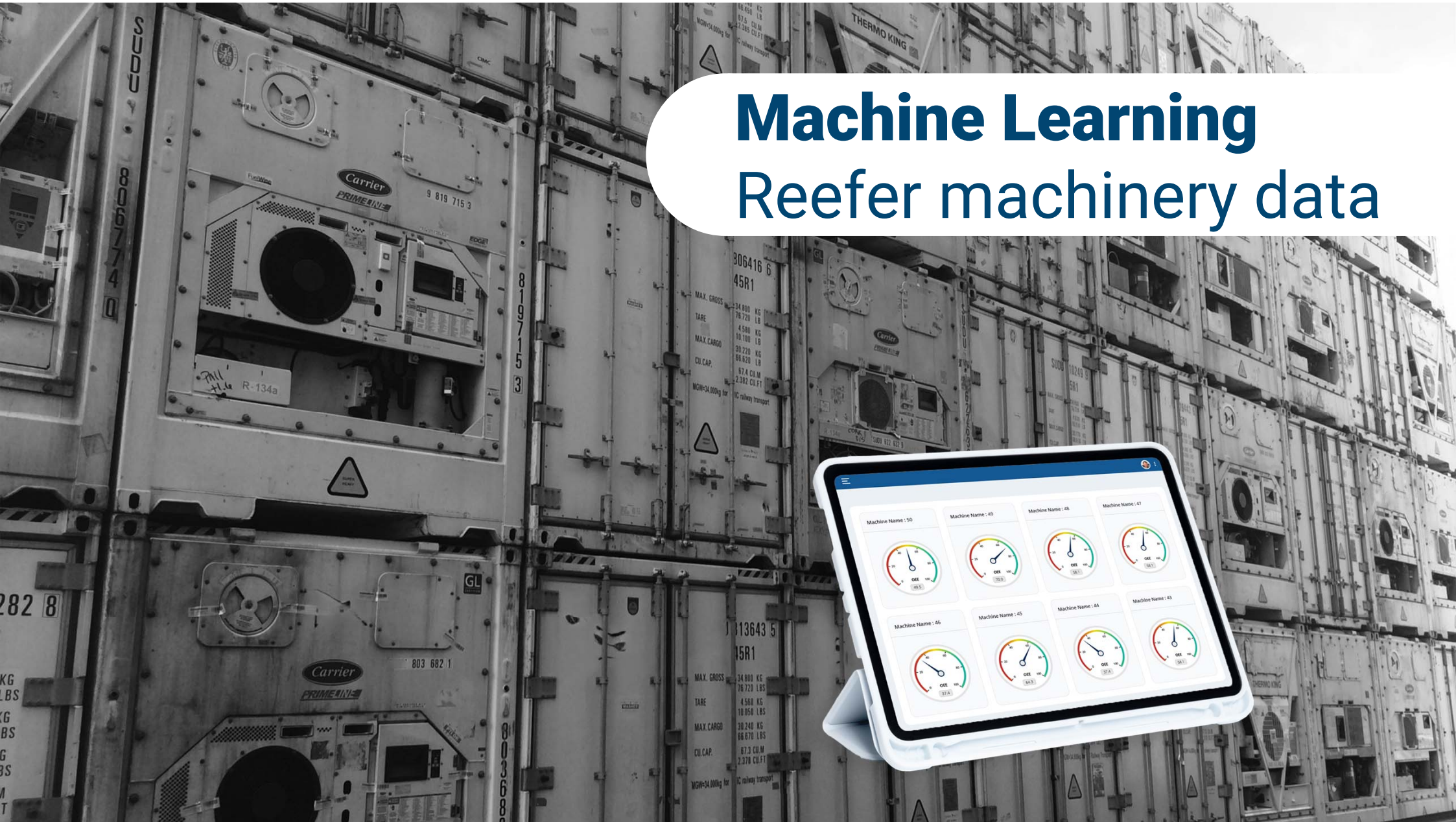
Machine Learning
Risk Detection

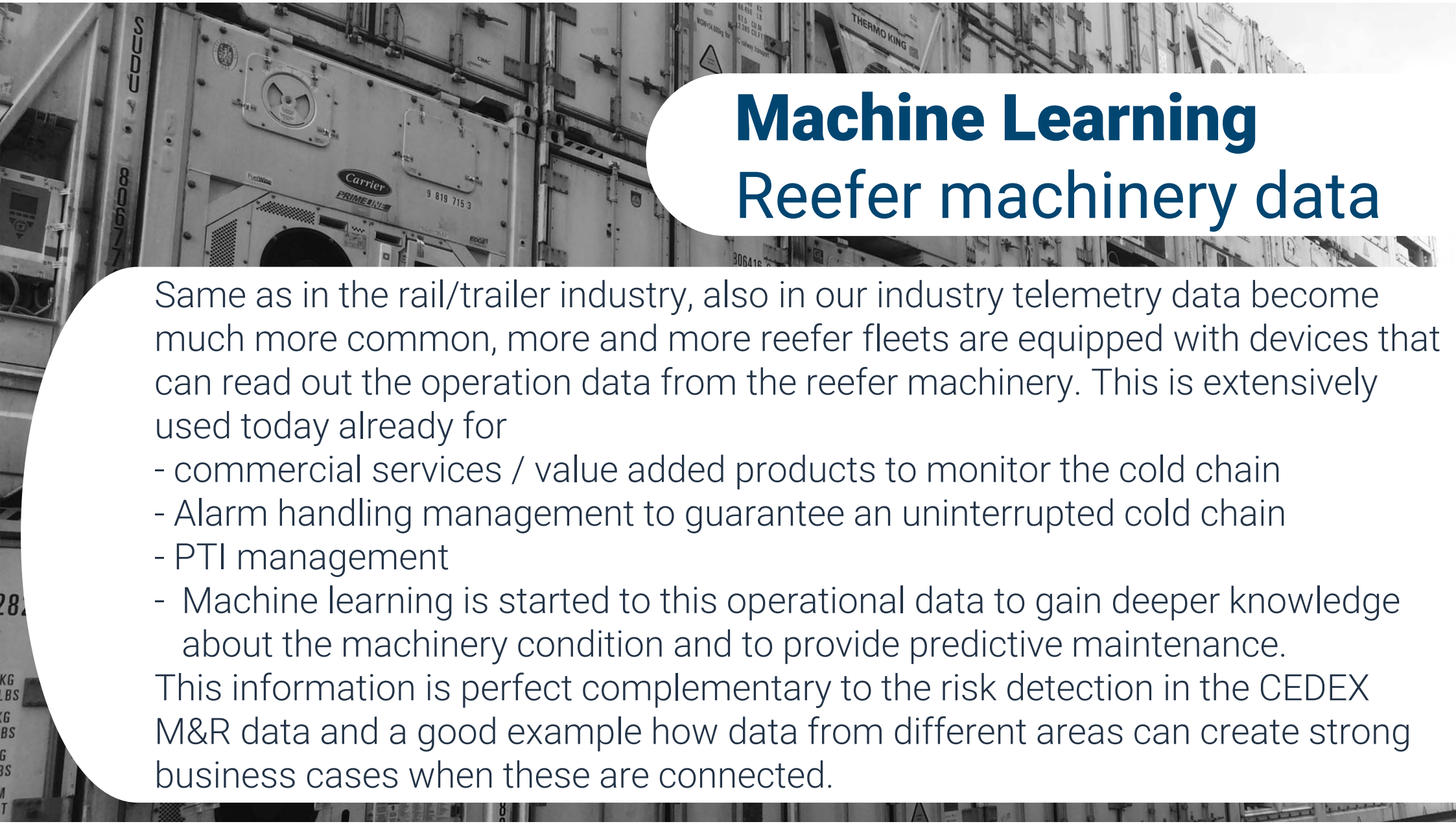


Risk Rating is available as a SaaS solution and can be called very easily via API, e-mail or manual upload of estimate data. Rating results are immediately available a can be used used to structure approval and control work.
This is the same process as used in credit scoring, banking systems, etc.

Machine Learning

Reefer machinery data





Machine Learning
Reefer machinery data

Same as in the rail/trailer industry, also in our industry telemetry data become much more common, more and more reefer fleets are equipped with devices that can read out the operation data from the reefer machinery. This is extensively used today already for

- commercial services / value added products to monitor the cold chain
- Alarm handling management to guarantee an uninterrupted cold chain
- PTI management
- Machine learning is started to this operational data to gain deeper knowledge about the machinery condition and to provide predictive maintenance.

This information is perfect complementary to the risk detection in the CEDEX M&R data and a good example how data from different areas can create strong business cases when these are connected.

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- **Supporting AI growth**
- Journey to use AI

Supporting AI growth

Making data available – APIs and intermediate solutions

AI thrives on data, and all stakeholders must connect their systems by todays standard which are Application Programming Interfaces (API). APIs enable data exchange between vendors, shipping lines, and AI-driven algorithms supporting real-time risk assessment and rapid actions on operational tasks.

This will also enable the connection of data from different areas to support further AI value: e.g. repair data, container movement data, commodity, telemetry data will improve predictions significantly.

Supporting AI growth

Standardise communication - CEDEX Container Syntax, standard API formats

The cleaner and more standardized the data the better AI can learn. CEDEX Container Syntax initiative by COA and IICL is the widest used systems and the most recommended system to be used for AI growth. At the moment we see many CEDEX dialects being used by vendors and stakeholders which should be minimized.

An API standard format should be established to minimize implementation effort. FLETEC offers help to develop this for the industry.

Supporting AI growth

Enhancing image quality for better damage detection

High-quality images are essential for AI-powered damage detection. Vendors must improve and standardize the photo process and should provide critical metadata—such as container numbers and damage locations with the photos to ensure accurate and automatic evaluations.

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Journey to use AI

Innovative atmosphere – Attract and enable innovation

An AI journey needs innovation welcoming atmosphere, attracting or enabling innovation.
Go and seek out new ideas, technologies, and talent from external sources. Set up incubators and accelerator programs to search for promising startups, support their growth, and connect them with established corporations.
Establish a forward-thinking culture that encourages fresh ideas, provide teams with the necessary time and resources to experiment. When employees feel empowered to explore new concepts, and external innovators find a welcoming environment, true breakthroughs emerge.
Such foundation ensures that both internally developed and externally sourced innovations have the opportunity to grow, scale, and drive long-term success.

Journey to use AI

Test innovation - Proof of Concept (POC) , Pilots

This is typically the next phase when external AI solutions show promising potential.
AI solutions are then tested in real-world scenarios. This is done via Proof of Concept (POC) and pilot projects, where the technology is deployed on a smaller scale within the business.
These controlled trials help assess functionality, measure benefits, and identify areas for improvement before committing to full-scale implementation. By minimizing risk and gathering insights, organizations ensure that only the most effective AI solutions move forward.

Journey to use AI

Make vs buy decision

Within the AI Journey, companies normally come to a point when they decide whether to develop AI solutions in-house or purchase them from external providers.

For this decision it often comes down to comparison of speed and knowledge— building in-house is very time-consuming as AI knowledge is normally not available in the necessary expertise and depth – but builds knowledge in a totally new field.

Buying allows much faster implementation as players have solutions available already and are fully dedicated and focused on developing products and technology – solutions and advantages are available much earlier.

Journey to use AI

IT Integration

When AI solutions have been tested and qualified, such solutions must be seamlessly integrated into existing IT systems. This requires close collaboration between operations and IT teams to ensure smooth data flow and compatibility so that full benefit of AI can be activated.

A challenge typically is to provide data from legacy systems via modern APIs to business partners.

Journey to use AI

Full deployment and cultural change

Rolling out AI across an entire organization is not just a technical challenge—it's a cultural shift. Employees must adapt to new ways of working, and leadership must drive change management efforts to ensure the success of the new technologies

Essential to take your employees with you on your journey and alley their fears.

FLETEC

Contact:
Martin Schöler, CEO,
Info@fletec.io