

How Machines learn to see

Computer Vision

Intelligent analysis of image data

Artificial intelligence (AI) is considered one of the key technologies of the 21st century. The possible applications are diverse and range from the optimization of logistics routes and natural language processing to the autonomous control of machines. One promising application of AI is Computer Vision, the simulation of biological vision using imaging sensors and intelligent algorithms.

Thanks to intensive scientific efforts, the rapid progress in the performance of computing electronics and the constantly increasing availability of data, it is now possible to implement reliable and practical systems in connection with computer vision at a manageable cost.

A computer vision system is comparable to a biological vision system. The biological eyes are represented by suitable imaging sensors, such as cameras, infrared sensors, LiDAR sensors or ultrasonic sensors. This information is interpreted and evaluated by corresponding AI architectures in a similar way to the biological brain. This makes it possible to classify images, segment image areas or correctly detect objects in image data.



Computer vision replicates biological seeing

Digital eyes in maritime logistics

In the maritime sector, Computer Vision open new possibilities and create innovative approaches for solving complex challenges. Computer Vision makes it possible to analyze and interpret large volumes of visual data in real time. This forms the basis for further decisions and optimized processes.

Projects at the Fraunhofer Center for Maritime Logistics and Services (CML) show how this technology can be used successfully in various areas of the maritime industry.

COOKIE

In the COOKIE project, Fraunhofer CML and Hamburger Container- und Chassis-Repair GmbH (HCCR) investigated the use of AI in empty container handling. The image-based damagedetection of empty containers using computer vision proved particularly promising. AI models were trained and validated with real-life images, resulting in the development of various models for damage detection. Even with limited image data, high detection rates were achieved in the detection of dents.

With improved imaging sensors, higher detection rates and the recording of further container features are foreseeable in the future. The findings thus form the basis for future innovations and further developments in the field of automated container inspection.



The COOKIE system detects dents in shipping containers



The autonomous robotic system in the DTAC project identifies barcodes

Pin-Handling-mR

In the Pin-Handling-mR research project, the Fraunhofer CML is working with Hamburger Hafen und Logistik AG (HHLA) to develop an autonomous robotic system for handling hinged pins on container wagons. The aim is to optimize the manual, cost-intensive, error-prone and potentially dangerous processes through automation. A central component of the robotic system is a detection model that recognizes the positions and angles of the pins using computer vision.

By integrating this technology with suitable sensors, data processing and actuators, a complete system is created that raises automation in port logistics to a new level thanks to its innovative flexibility.



Analysis of pin positions on container wagons



Capturing the pallet geometry with the robotic system

DTAC

As part of the Digital Test Area Air Cargo (DTAC) project, several Fraunhofer Institutes are researching digitalization and automation solutions in air freight. The Fraunhofer CML is focusing on the use of autonomous robotic applications for the identification of large warehouse pallets. Here, the pallets own barcodes are localized and read using Computer Vision after sufficient movement of the sensor platform. This process enables efficient and reliable recognition and forwarding of pallet data to the central control center system, allowing subsequent transport orders to be taken over by autonomous vehicles. The developments from this project also offer great transfer potential for use in other logistics areas, including port logistics.

The digital eyes recognize new potential

Computer Vision, the combination of artificial intelligence and image data, is the key to new technological potential along the maritime supply chain.

The project results underline the potential and illustrate possible applications. The following aspects are particularly noteworthy:

Key to new applications

Computer Vision acts as a driver for innovative applications in the logistics sector. For example, automated warehouse management, condition monitoring or location systems can be realized by integrating suitable sensors, target-oriented software and corresponding hardware. These new applications contribute to the further optimization of logistics processes and the development of new business opportunities.

Increasing process accuracy

By using advanced sensors and AI models, even the smallest features can be identified or features that are imperceptible to the human sense of sight can be analyzed. This forms the basis for precise analysis and evaluation of processes and products.

Improving safety

Computer Vision enables continuous monitoring and analysis of warehouse and transport processes. This enables potential sources of danger to be identified at an early stage and appropriate corrective measures to be taken. This ultimately increases the safety of the processes.

Time and cost savings

The automation of processes using computer vision leads to a considerable reduction in time and costs. This increases efficiency within the entire logistics chain and enables optimized use of resources.

Your development partner along the maritime supply chain

The Fraunhofer Center for Maritime Logistics and Services CML is an experienced development and research partner in the field of intelligent systems along the maritime logistics chain and beyond. Great potential is currently attributed to computer vision. We develop customized solutions for our partners that are tailored to the specific needs and requirements of the maritime industry.

Our interdisciplinary team of engineers, scientists and other industry-related experts works closely with our customers to ensure that our solutions are practical and effective.

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