

Warehouse 4.0

Businesses Have Millions to Save
in Warehouse Operations

Introduction

Artificial Intelligence and Machine Learning (ML) are transforming modern warehouse operations, helping to eliminate deep-rooted uncertainties and inefficiencies.

With granularity and methodologies that cannot be manually replicated at scale, **machine learning and artificial intelligence** is powering transparency in all facets of warehousing.

AI-driven warehouses are helping to deliver robust optimization capabilities required for **greater output, lower costs, high quality, improved productivity, and accurate capacity planning.**



Why do warehouses need AI and ML?

Artificial intelligence can substantially improve warehouse operations. Procter and Gamble, for example, uses the Internet of Things (IoT) and AI [to automate their distribution centers and warehouses](#), facilitating the delivery of about 7,000 SKUs in the process and reducing annual costs by up to \$1 Bn.

According to the Manufacturing Alliance for Productivity and Innovation or the MAPI Foundation, AI can make warehouse management more efficient.

Today, AI adoption in warehouse operations is widespread. In fact, [by 2024, industrial AI is estimated to grow by 52% vis-a-vis its 2017 market size](#).



How can AI and ML help warehouses?

Some broad areas in which **AI/ML** tech improves warehouses are:

01 Better communication

IIoT-enabled devices can vastly improve the speed and accuracy of warehouse processes. Fieldbus data communications and wireless I-O link enable each component to “talk” to each other, allowing system monitoring and control.

The components of the warehouse systems constantly generate data streams that can be analyzed using deep learning processes, helping businesses make real-time adjustments and improve their integrated warehouse management system.



02 Increased productivity

Data and Analytics can directly contribute to the increase in warehouse productivity, powering operations with real time data-driven solutions more efficient than human labor.

Data-driven solutions can operate 24X7, scanning digital tags to provide accurate inventory control. Solutions equipped with AI capabilities can ascertain the shortest possible routes to and from items, drastically reducing the time taken to move goods.



03 Streamlined appointments

In the post-Covid market, consumers expect more from organizations. If their needs are not met, clients will take their business elsewhere. This puts pressure on warehouse operations to meet the supply and demand accurately. Businesses can combine the accuracy of real-time data and the analytical power of AI/ML algorithms to make systems like warehouse appointment scheduling more efficient.

Customers can connect to their trusted shippers anytime or anywhere using integrated scheduling tools. It also enables transportation managers to respond to dynamic and volatile market demands.



04 Sustainability

Sustainability is not an occasional or one-time activity. To be truly sustainable, enterprises must monitor their eco-friendly initiatives and environmental efforts regularly. This is not a simple task and AI can help gauge ecological impact.

Intelligent systems can offer invaluable insights on improving warehouses by analyzing how they operate. AI can also help enterprises ensure that they only work with sustainable businesses by monitoring the ethical performance of their partners.

AI can help businesses track the progress of their environmental strategies. Machine-learning systems can make adjustments in real-time, reducing the risks associated with sustainability projects.



05 Data collection

Handling of data is indispensable to the efficient running of warehouses. Manual exchange of information often leads to miscommunication and errors. AI can deliver accurate real-time data anywhere and to anyone, vastly improving efficiency and boosting revenue and profits.

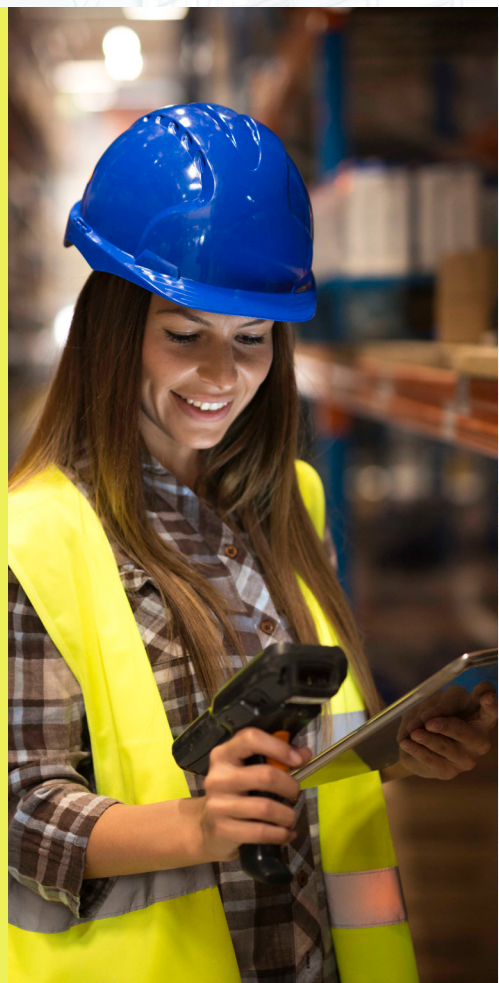
Algorithmic analysis of warehouse data can generate valuable insights, helping businesses identify patterns in their operations and formulate better strategies.



06 Smarter inventory management

Earlier, warehouse operators controlled and organized inventory using bar code scanners and paper trails. Today, radio frequency identification (RFID) can track products using digital tags, facilitating more accurate and precise inventory control.

RFID scanners use radio waves to transfer data, enabling them to detect and move products around the warehouse without direct line-of-sight control. Central AI processing units can be linked to RFIDs inside smart warehouses, helping to adjust the volume and speed of order processing and increasing overall productivity.



07 Cost savings due to fewer manual hours

Data-centric solutions can reduce payroll expenses, transforming warehouse management. Currently, robots assist existing operations, boosting their productivity. With continuous improvement in machine handling capabilities, AI could soon help global warehouses become fully automated.

Increasing automation is expected to enable enterprises to grow their business activities, creating more job opportunities.



08 Automated quality control (defect detection)

Warehouses monitor product defects on a micro-scale, struggling to achieve 100% accuracy in the process. If these defects are detected after client delivery or at the end of the production process, it can lead to dissatisfied customers and increased production costs.

AI-powered computer vision (CV) defect detection systems can drastically lower these costs. A CV application gathers real-time data from cameras. It analyzes these data streams using machine learning algorithms. Based on predefined quality standards, the application provides the defect percentage.

Warehouse operators use this information to trace setbacks in the production line process, making it more efficient.



09

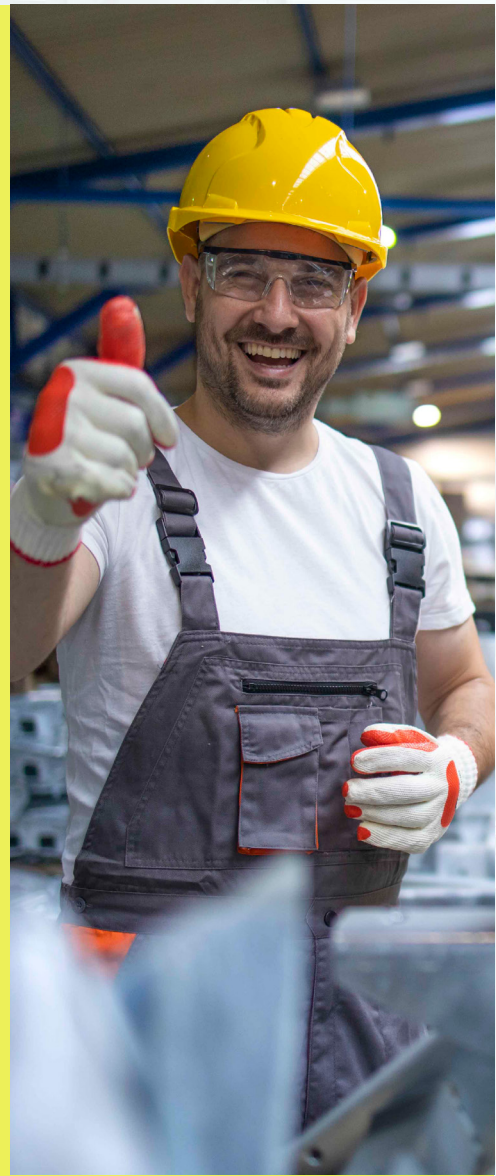
Virtual cargo monitoring and thefts detection

AI-based algorithms are trained to form models on the following sets of big data -

- Thousands of hours of actual and simulated footage related to thefts
- The period of the day most prone to crimes
- The types of items most vulnerable to theft
- The locations where most robberies occur

An intelligent system analyzes this information using deep learning algorithms. It can inform warehouse operators of potential risks and suggest alternative delivery schedules or routes to minimize the chances of theft.

Manual surveillance is prone to interruptions, errors in judgment, etc., leading to gaps in constant monitoring that unscrupulous individuals may exploit. AI security systems offer 24X7 vigilance, raising the alarm in the event of any suspicious activity.



10 Warehouse staff scheduling

It is difficult to accurately predict warehouse workloads, leading to challenges in staff scheduling. Using optimization techniques and machine learning algorithms, warehouse managers can develop models to predict the required number of staff for different time shifts.

This will prevent unnecessary overtime costs and help allocate resources efficiently, eliminating the shortcomings associated with overstaffing or understaffing.



11 Warehouse safety with edge AI (automated pickups and drops)

Logistics managers are automating their warehouses using robotic devices that can operate without manual intervention to tackle skill-shortage and seasonal workforce needs. The most common use cases include autonomous mobile robots, order picking machines guided by RFID or laser technology, and automatic storage and retrieval systems (AS/RS).

AI systems can guide machines around a warehouse space, identify an item within the inventory, pick it up and place it in a delivery vehicle or storage location without human intervention, reducing physical risks associated with the activity and turnaround time.



12 Demand and supply optimization

Most businesses use supply chain management (SCM) and supply chain planning (SCP) systems to balance supply and demand. AI offers data-driven demand predictions that can significantly help warehouses in the FMCG and perishable goods industries where products have a short shelf life.

AI applications use machine learning algorithms to identify patterns and forecast demand. They can predict the everyday need for products and make long-term assessments. Furthermore, they can also identify the reasons behind increased demand and create easy-to-understand digital simulations.



13 Automated task planning

Using intelligent business process automation, also known as hyper automation, and AI, warehouses can automate a host of back-office tasks.

AI systems can schedule transportation, track packages in the warehouse, and organize pipelines for cargo. It can also assign and manage employees across workstations.

RPA tools can help auto-generate reports that help managers align with everyone within the company. RPA solutions can also analyze the contents of reports and email them to the correct stakeholders.



14 Warehouse layout

Optimal space planning often plagues warehouse managers. They can create predictive tools using optimization techniques and machine learning algorithms that can help use the available warehouse space more efficiently.

Optimizing warehouse efficiency can substantially improve the overall profitability of operations, especially in warehouses that deal in bulk items. AI can help identify which items are purchased most frequently. Warehouse managers can use this information to place goods in easy-to-access locations, creating a more efficient and faster pick. AI can also help operators identify which items are often purchased together so that they can be placed together, reducing retrieval turnaround times.



15

Warehouse network management

Warehouses can improve their location optimization efforts using advanced location analytics. They can forecast demand from various regions with the help of analytical models developed using location analytics.

Advanced location analytics can also provide vital insights to optimize the placement and use of existing stocks and reduce the chances of goods shortage.



How Gramener has helped global firms achieve smarter warehouses



Intelligent Appointment Scheduler – A solution that saved \$300,000 in potential detention charges in just one quarter

United States Cold Storage (USCS), one of the biggest providers of public refrigerated warehousing (PRW) and associated logistics services in the US, wanted an evolved data-driven solution that would allow it to schedule carrier appointments with great accuracy.

Using Gramex, our low-code platform, we built an Intelligent Appointment scheduler (IAS), a data-driven solution that has transformed carrier appointment scheduling at USCS.

The solution currently schedules around 650 appointments across 26 USCS facilities per day. IAS has helped USCS plan for the specific needs of every carrier effectively and reduce turn times by up to 15 percent. It has also saved more than \$300,000 in potential detention charges in just one quarter.

Smart task solution that led to effort savings

Warehouses assign work based on warehouse rules and the supervisor's experience. USCS wanted an intelligent solution based on efficiencies achieved across work allocations.

Gramener developed a solution that achieved optimal work allocation recommendations by

- Categorizing tasks
- Categorizing staff
- Simulating staff allocations

The result was an enhanced allocation of work to the available staff, leading to effort savings.

Conclusion

AI and machine learning has the potential to better every stage of warehouse operations, from planning, to inventory management, to dispatch.



AI-driven smart task solutions help warehouses plan efficiently and build business resilience. They recommend and schedule appointments, and optimize load distribution using demand and capacity forecasting. They also categorize tasks, and simulate and recommend work allocations, resulting in turn-time savings. Automated scheduling increases labor productivity, helping warehouses allocate the right task to the right person.

Industry 4.0 solutions help modern warehouses achieve sustainability objectives. To transform warehouse operations using data-driven solutions, company leaders must focus on the quality and cleanliness of the data collected. They also have to ensure that the right stakeholders are involved when the data assignments are being rolled out or executed.



Let's Connect

Learn more about Gramener's nextgen
AI solutions for a smarter warehouse

[BOOK A CALL](#)

Copyright © Gramener Inc. All Rights Reserved.