



AI in the Warehouse

Smarter Operations with Physical,
Explainable, and Holistic Intelligence

Why Warehouses Need AI Now

E-commerce expectations are rising, labor shortages persist, and traditional warehouse operations are under strain. Warehouses must move faster, operate smarter, and do more with less without compromising accuracy or flexibility.

Artificial intelligence (AI) is the engine behind modern, efficient, and adaptive warehouses. In smart warehouses, AI should be used not only to control robots but to optimize entire warehouse fulfillment ecosystems.

This eBook explores the challenges that make AI necessary, the three characteristics of AI transforming fulfillment today, and the measurable benefits warehouses are seeing in the real world.

The Warehouse Challenges Driving the Need for AI

The pressure on warehouses today is relentless. Whether you're fulfilling direct-to-consumer orders, managing multi-channel demand, or supporting a large retail footprint, operational complexity is growing.

To stay competitive, warehouses must overcome systemic inefficiencies and gain real-time control over every corner of the fulfillment process.

Here are some of the top challenges driving the need for smarter, AI-powered solutions.





1. Rising Throughput Expectations

Customers expect fast, accurate delivery, often within 24 hours. This puts massive pressure on fulfillment centers to increase throughput, meet tight shipping service level agreements (SLAs), and scale during peak periods without delays or disruptions.

2. Labor Shortages and Turnover

Hiring and retaining skilled warehouse associates is a growing challenge. Turnover remains high, and labor markets are tight. Warehouses must find ways to optimize how labor is deployed and reduce fatigue without sacrificing productivity.

3. Operational Bottlenecks

High-traffic zones, inefficient workflows, and unbalanced workloads can grind productivity to a halt. Many warehouses lack the tools to proactively identify and resolve these issues before they affect order fulfillment.

4. Limited Visibility into Operations

Real-time decision-making is difficult when managers don't have access to actionable data. Without insights into order flow, labor utilization, or robot activity, it's nearly impossible to operate at peak performance.

5. Rigid, Inflexible Systems

Many legacy automation systems are hard to scale or adapt to changing demands. Warehouses need intelligent systems that can flex and evolve with the business without requiring costly reconfiguration.

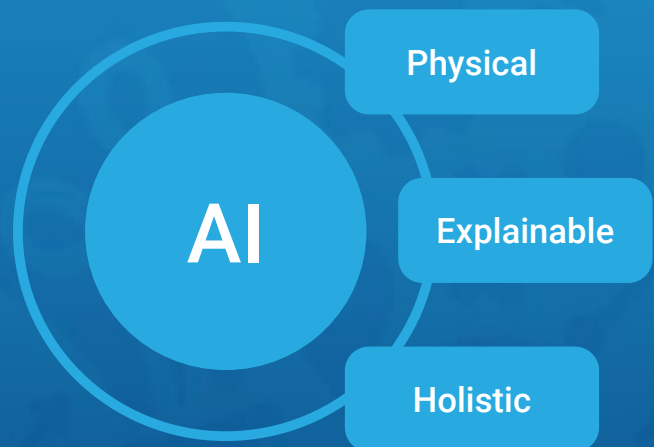
Solving these challenges requires more than better hardware or faster robots. It takes intelligence in the form of systems that can analyze, predict, adapt, and optimize on the fly.

That's where AI comes in.

The Three Characteristics of AI Powering Smarter Warehouse Fulfillment

Not all AI is created equal.

At Locus Robotics, we use a layered, integrated approach to artificial intelligence that combines three distinct but complementary characteristics of AI: Physical, Explainable, and Holistic. Together, they transform how warehouses operate and turn data into action, movement into efficiency, and complexity into control.



Let's take a closer look at each.



Physical AI: Embodied Intelligence

Physical AI is the foundational layer. It's what gives Locus AI its embodiment and allows our robots to perceive and respond to their environment, making them safe, autonomous, and efficient collaborators on the warehouse floor.

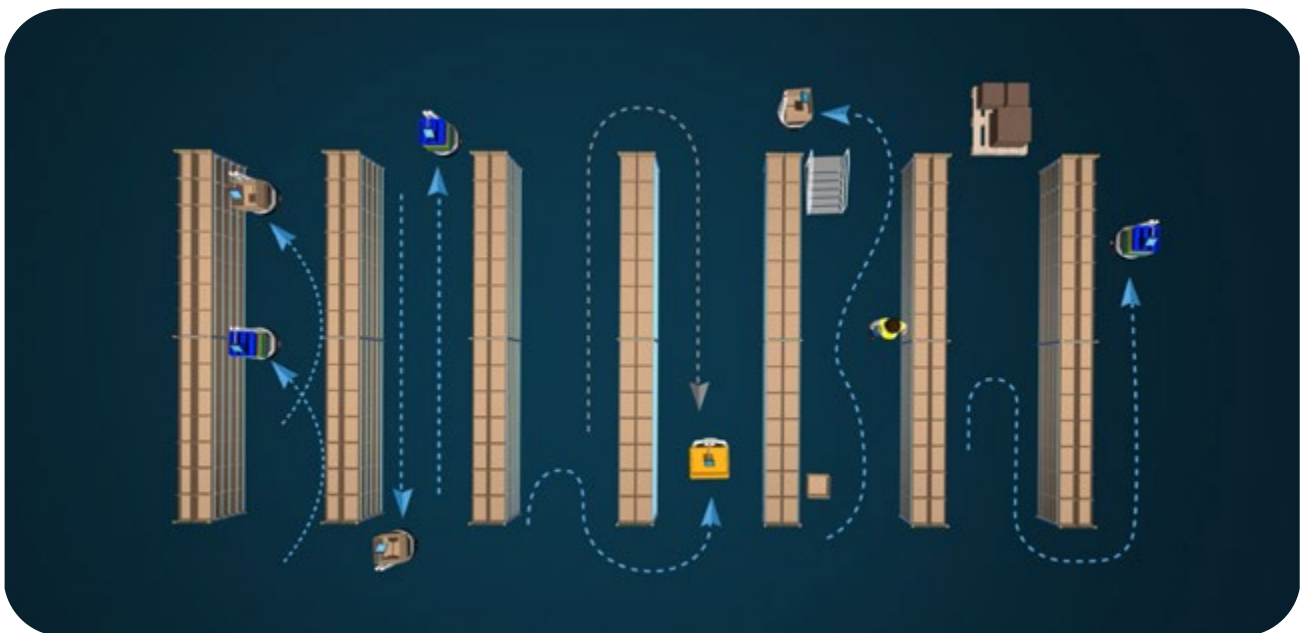
Core Capabilities

- Computer Vision for obstacle detection, localization, and holistic understanding of our robots' environment
- Intelligent path planning based on live warehouse maps
- Continuous route optimization in dynamic environments
- Real-time localization and navigation in brownfield or unstructured spaces

Real-World Impact

With Physical AI, Locus Robots navigate intelligently, avoid collisions, and interact seamlessly with human associates. They take the most efficient routes, adjust to traffic conditions, and maintain high accuracy in every task from navigation to tote placement.

Physical AI ensures that every movement inside the warehouse is purposeful, precise, and productive to reduce errors and keep fulfillment moving smoothly, even in unstructured and dynamic environments.



Explainable AI: Insight with Clarity

AI is most effective when people can trust it, and that's where Explainable AI comes in. This layer provides visibility into how and why decisions are made, empowering warehouse managers with actionable insights instead of black-box outputs.

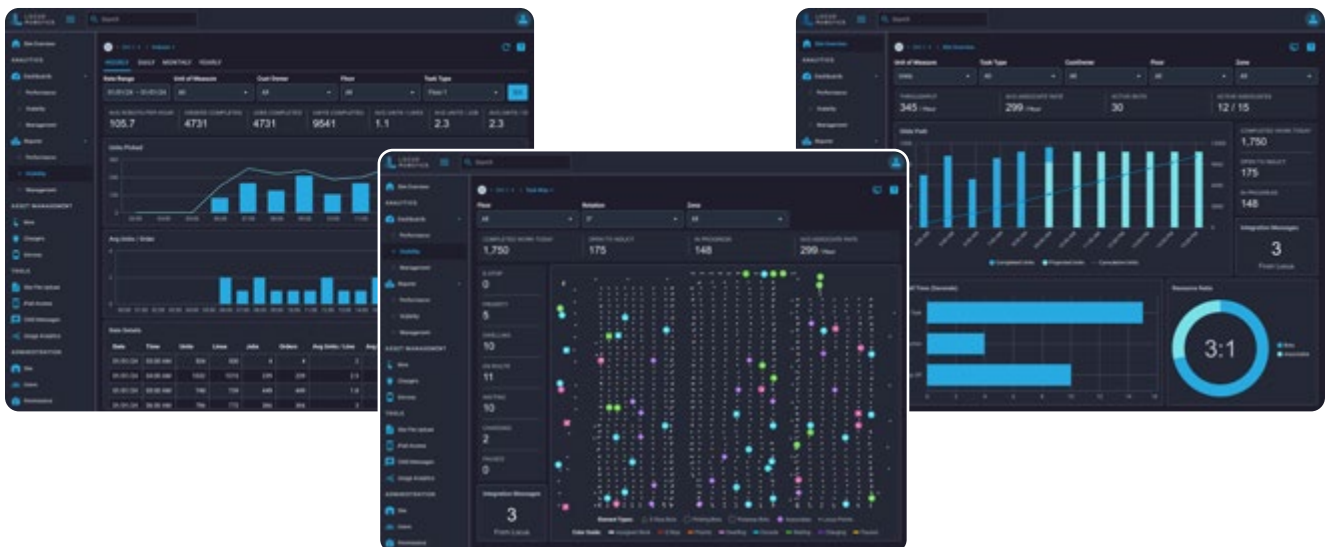
Core Capabilities

- Predictive analytics based on historical and real-time data
- Real-time dashboards to visualize performance and order flow
- Transparent logic behind task assignments and workflow decisions
- Support for operational adjustments based on live insights

Real-World Impact

Explainable AI enables managers to make confident, data-driven decisions. Whether it's optimizing labor allocation, anticipating a slowdown, or identifying a performance issue, the insights are clear, timely, and actionable.

By giving managers transparency and control, Explainable AI bridges the gap between machine intelligence and human decision-making to create a warehouse that's both smart and self-aware.



Holistic AI: Orchestrating the Entire Ecosystem

Holistic AI is the strategic intelligence that coordinates every part of the warehouse, from people and robots to zones and orders. It manages individual tasks and ensures the whole system runs in harmony.

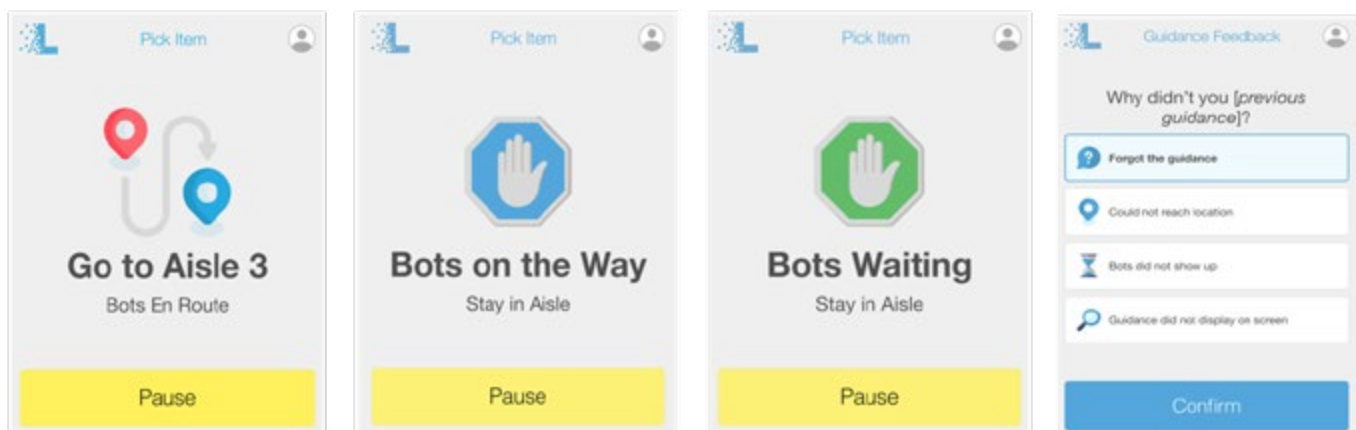
Core Capabilities

- Dynamic task allocation based on SKU priority, proximity, and deadlines
- System Directed Labor to integrate human associates into optimized workflows
- Workload balancing across zones and teams
- Real-time congestion management and traffic rerouting

Real-World Impact

With holistic AI, the warehouse becomes a self-optimizing environment, and bottlenecks are prevented before they happen. Resources are always in the right place at the right time and every element — human and robotic — is aligned to maximize throughput.

Holistic AI turns the warehouse into an intelligent ecosystem that responds dynamically to demand, scales effortlessly, and ensures every process is working toward the same goal: fast, accurate, efficient fulfillment.



The Benefits of AI-Powered Fulfillment

AI helps warehouses automate tasks and also achieve new levels of performance, agility, and resilience across the warehouse. AI that is Physical, Explainable, and Holistic makes a warehouse smarter and stronger.



Here's what customers gain from implementing Locus Robotics' AI-driven solutions.



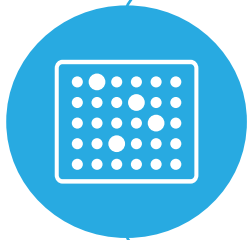
Increased Productivity

Dynamic task allocation and system-directed workflows help warehouses increase throughput by 2–3x without needing to hire additional labor.



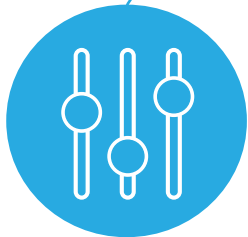
Lower Operational Costs

AI-optimized path planning reduces travel time and labor fatigue, maximizing efficiency and reducing wasted motion.



Smarter, Faster Decisions

Real-time dashboards and predictive analytics enable managers to make informed decisions that solve problems before they escalate.



Seamless Scalability

Locus AI adapts as your business grows, integrating into existing systems and expanding without disruption or costly redesigns.



Human-Robot Harmony

Locus AI facilitates smooth collaboration between human associates and robots, improving safety, accuracy, and satisfaction on the warehouse floor.

With AI, warehouses are able to reduce costs and boost throughput to create more agile, collaborative environments, Locus Robotics' AI unlocks the full potential of modern fulfillment operations.

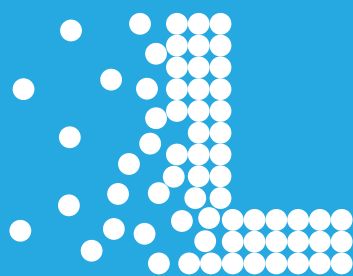
Building the Intelligent Warehouse

The warehouse of the future is here, and it's powered by Artificial Intelligence. Locus Robotics develops AI that is Physical, Explainable, and Holistic AI to deliver solutions that are not only smart but scalable, adaptable, and most importantly proven.

Whether you're navigating peak season, expanding to new sites, or just trying to meet growing demand, AI gives you the tools to do it all faster, better, and with confidence.

Ready to put AI to work in your warehouse?

To learn more about how Locus Robotics can transform your warehouse operations, visit www.locusrobotics.com.



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