“AI” in Ports/Terminals and Supply Chain

Transforming Efficiency, Visibility, and Resilience

Mark Yong

Agenda

Issues in Ports/teriminals and Supply Chains?

- Global **supply chains** are facing increasing complexity, volatility, and demand for sustainability.
- **Ports/terminals** are strategic hubs, yet often have bottlenecks.

1

Cost Pressure & Labor Shortages

AI automates tasks, reduces costs & workforce gaps

2

E-commerce & Just-in-Time Logistics

Improves demand forecasting and delivery efficiency.

3

Decarbonization & ESG Goals

Promotes sustainability and environmental targets.

4

Disruption Management

Provides real-time insights to handle crises like pandemics or canal blockages.

AI in Port/Terminal Operations

Autonomous Trucks (AGVs)

AGVs utilize AI algorithms to navigate warehouses and manufacturing facilities, reducing human intervention and increasing operational efficiency.

Crane Automation

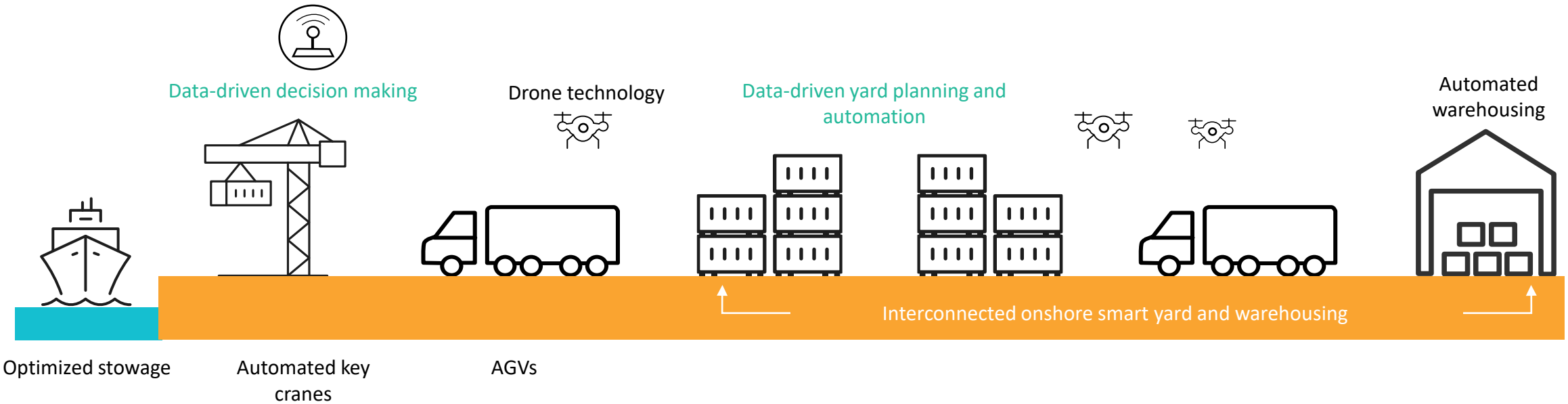
AI-driven crane systems enable precise movement and control, minimizing manual errors and improving productivity in ports and industrial settings.

Collision Avoidance via Computer Vision

Advanced computer vision techniques powered by AI detect obstacles and prevent collisions, ensuring safer environments in automated systems.

Predictive Maintenance

By combining sensor data with AI models, predictive maintenance identifies potential failures before they occur, reducing downtime and maintenance costs.



Shanghai – World's First Fully Automated Terminal

Shanghai Port's Yangshan Phase IV uses AI and automation to manage high-volume container flows with minimal human intervention.

- AI system powers:
  - Smart berth & crane scheduling
  - Automated container pickup & stacking
  - AGV fleet routing with real-time coordination
  - Predictive maintenance for equipment uptime
- Results:
  - Handles 4M+ TEUs/year with ~50% fewer on-site staff
  - 24/7 operation with near-zero delays or idle time
  - Key driver behind Shanghai becoming world's busiest port (47M TEUs in 2023)

AI in Maritime Logistics

Dynamic Route Optimization

By leveraging weather data and port congestion information, AI systems can dynamically adjust shipping routes to minimize delays and fuel consumption for more efficient logistics.

Anomaly Detection Systems

AI algorithms analyze shipping patterns to identify anomalies such as security threats, mechanical failures, or operational inefficiencies, ensuring smooth sailing processes.

Fuel Efficiency Prediction

Through machine learning models, AI predicts fuel consumption based on various factors like ship load, speed, and environmental conditions, reducing costs and emissions.

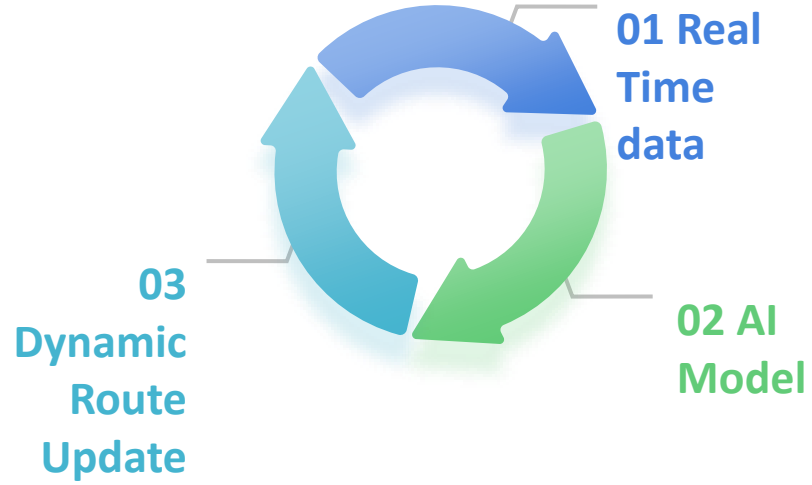
Autonomous Ship Navigation

Early-stage AI applications in autonomous navigation aim to enhance safety and efficiency by automating ship control and decision-making processes at sea.

AI for Route Optimization - ONE

Smarter Routes with AI: ONE + Google Cloud

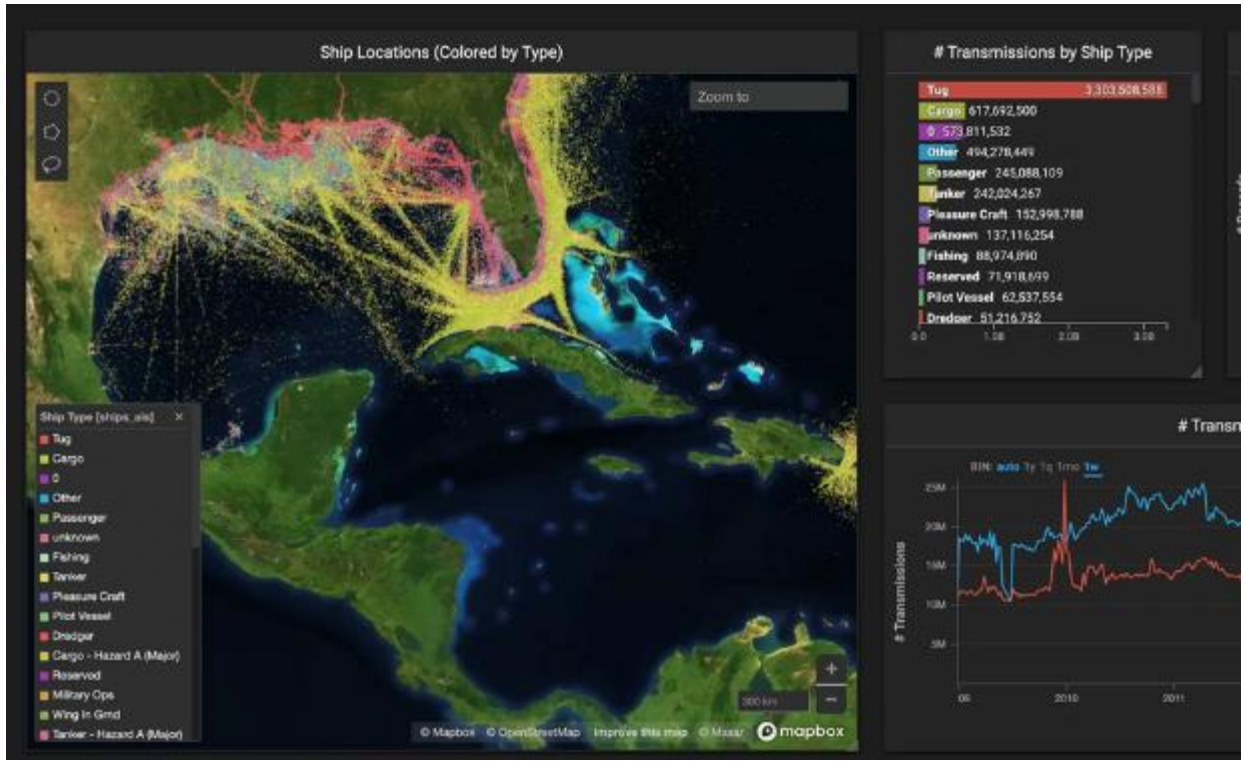
- ONE uses AI to optimize vessel routes based on live weather & port congestion.
- Platform suggests better ETAs, avoids delays, and reduces fuel usage.
- Deployed across global fleet, improving schedule reliability.



AI for Anomaly Detection - Spire Maritime

Tracking the Unexpected: Spire Maritime

- Spire's AI flags abnormal ship behaviors:– AIS blackouts, loitering, illegal anchoring
- Used by port authorities and insurers for risk monitoring
- Key tool in tracking sanction-evading tankers

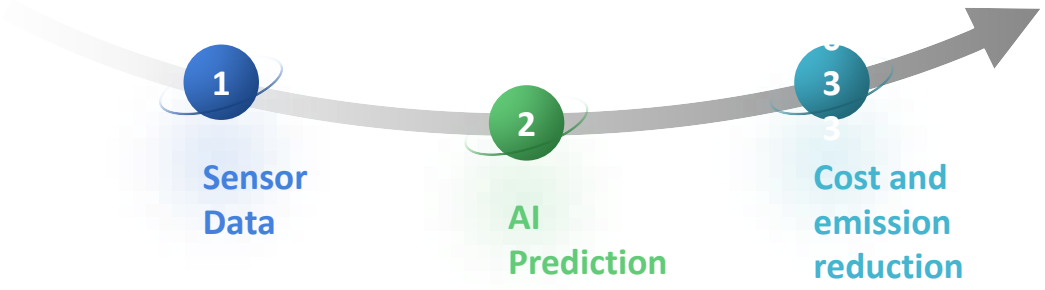


Results Monitoring 200,000+ vessels daily via satellite-AIS

AI for Fuel Efficiency - Kongsberg Digital

Fuel Savings at Scale: Kongsberg Digital

- Kongsberg's AI platform predicts fuel usage in real time
- Suggests speed, trim, engine settings for each voyage
- Operators report 5–7% fuel savings per vessel



AI in Autonomous Navigation - MOL & Furuno Trial

Autonomous Voyage: MOL & Furuno Trial

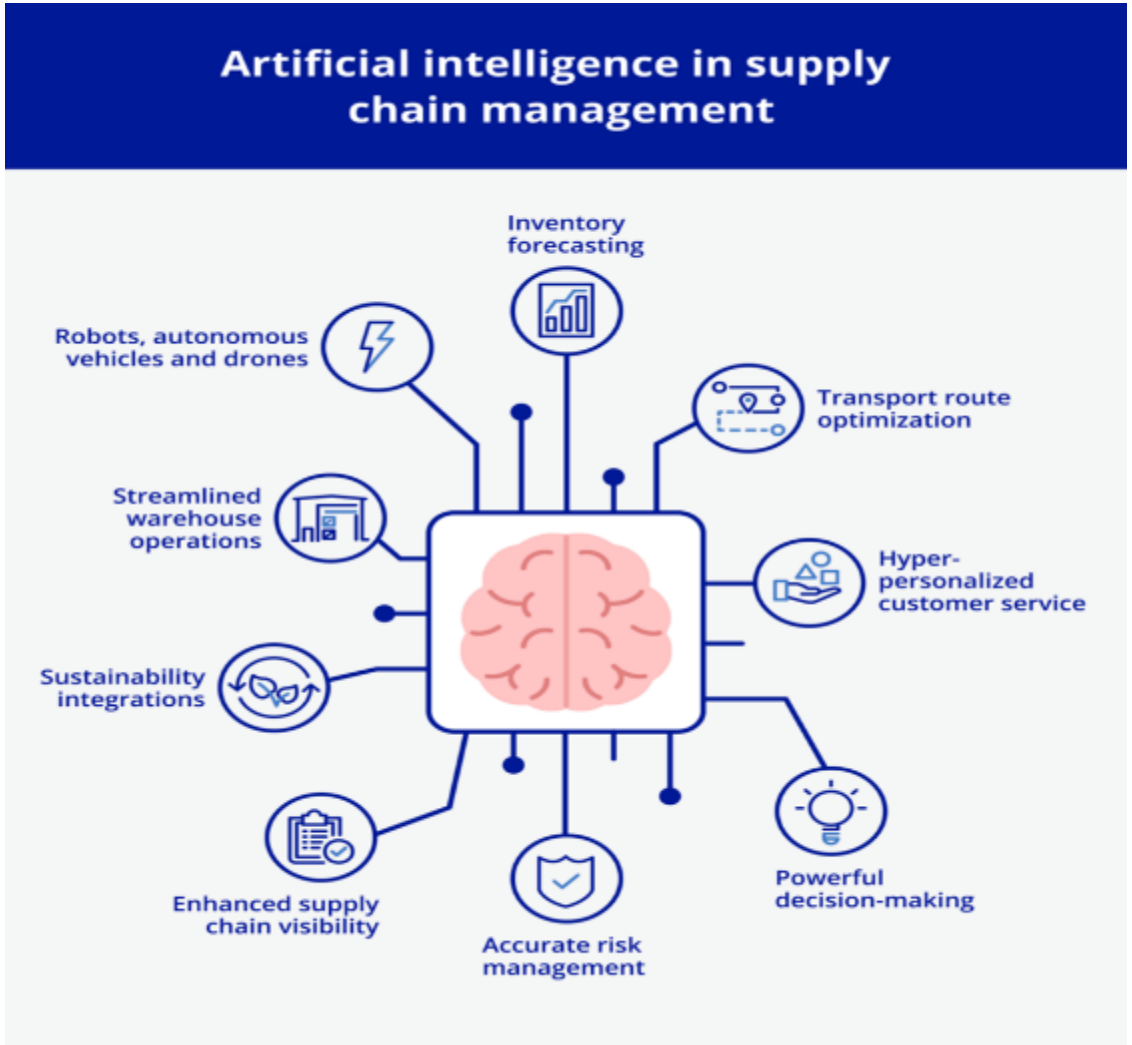
- 750 km voyage with full autonomous navigation in Japan
- AI handled routing, obstacle avoidance, docking
- Key step toward commercial AI-driven ships by 2025

01 Zero crew intervention

02 Multi-sensor AI

03 Safe port docking

AI in Logistics and Supply Chain Management



Demand Forecasting Techniques

Explore how deep learning models analyze historical data, market trends, and external factors for precise demand predictions.

Inventory Optimization Methods

Discover AI-driven insights to balance stock levels, reduce holding costs, and prevent stockouts effectively.

Supplier Risk Assessment

Understand the use of NLP to monitor financial reports, news articles, and social media for real-time supplier risk evaluation.

Shipment Delay Mitigation

Learn how AI algorithms predict potential delays by considering weather, traffic, and logistical data for proactive solutions.

Digital Twin Implementation

Examine the creation of virtual replicas of the supply chain to simulate scenarios, identify bottlenecks, and improve decision-making.

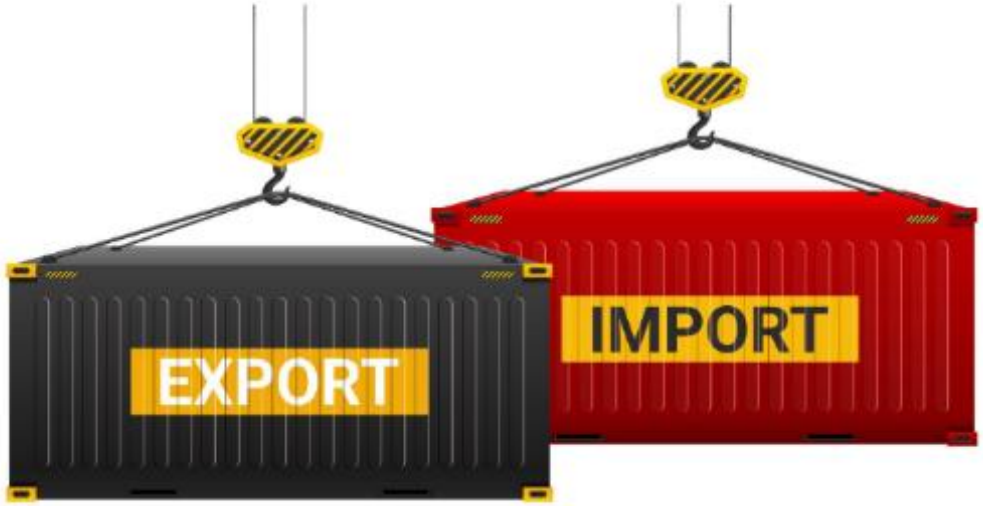
AI in Logistics Planning - MatchLog

MatchLog – AI Matching for Container Reuse in Japan, reducing wasted repositioning moves.

- AI system considers:
  - Location of import/export bookings
  - Container type, availability, and timing
  - Port schedules and trucking constraints
  - CO_2 savings from fewer empty trips

Result:

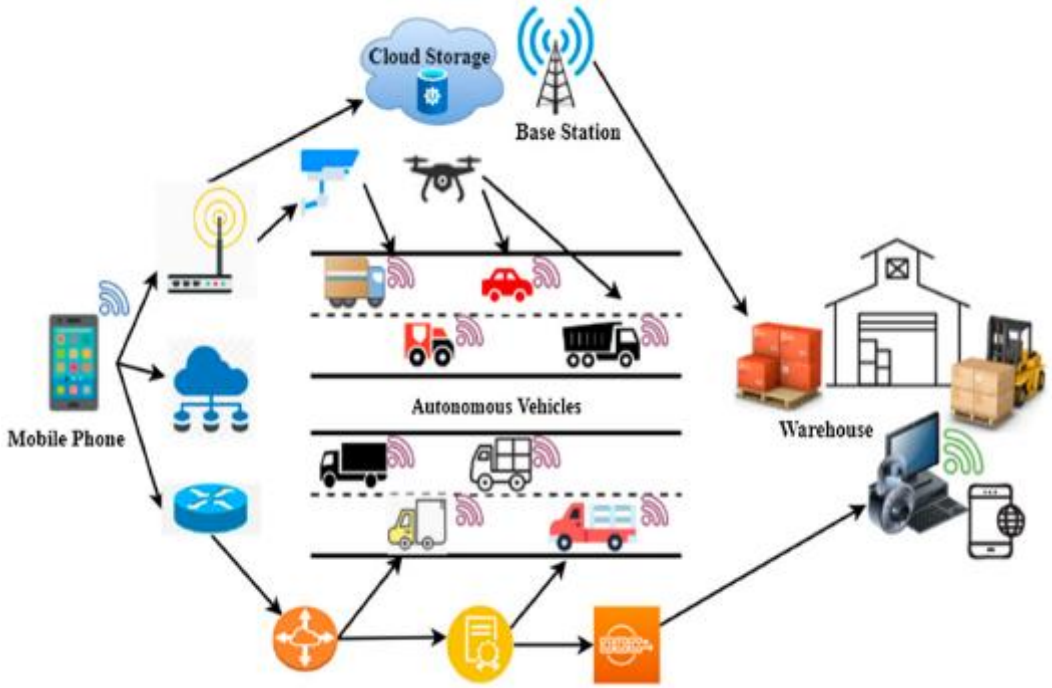
- 15–20% reduction in empty container transport
- Thousands of truck trips eliminated monthly
- Major clients include major Ocean carriers



AI in Last-Mile Logistics – JD.com

JD Logistics: AI-Driven Efficiency at Scale

- JD.com uses AI to optimize rider assignment, delivery routing, and parcel batching across its nationwide courier network.
- AI system integrates:
  - Real-time traffic
  - Delivery density
  - Rider performance & capacity
  - Customer time preferences
- AI helps dispatch over 90% of orders automatically in major cities.
- Reduces average delivery time to under 30 minutes in key zones (e.g. Beijing, Shanghai).
- Also powers autonomous delivery vehicles in select campuses and neighborhoods.



AI in Logistics Safety - Cainiao (Alibaba Group)

Cainiao deploys visual AI systems in its smart warehouses to monitor safety and operational risks in real time.

- AI system enables:
  - – Detection of unsafe behaviors (e.g., no helmet, risky proximity to robots)
  - – Real-time alerts for blocked emergency exits, fire hazards
  - – Heatmaps of high-risk zones for layout optimization
  - – Post-incident analysis using video data
- Helps prevent injuries and boosts compliance across Cainiao's 100+ logistics hubs.

Risks with AI - sailing into uncharted waters?

	Risks	Mitigation
Inaccurate Results	LLMs “hallucinate” - generate seemingly authentic content that is factually incorrect.	Find new benchmarks to test models and increase transparency regarding model architecture, training, the use of AI in a program, etc.
Cyber Attacks	AI allows threat actors to create more sophisticated malware and viruses that can infiltrate shipping systems.	Consider employing ‘ethical hackers’ into their evaluation process.
Data Privacy	AI has ethical implications due to its ability to collect users’ personally identifiable information and potentially process these details for future use.	Ensure their AI models do not violate data privacy laws and implement data protection practices.
Algorithmic Bias	Trained on heaps of data, AI models often perpetuate bias and prejudice it learns from this data.	Train their models on the intricacies of different cultures and with DEI principles in mind.

Overview of AI Technologies

Machine Learning Basics

Systems learn from data to improve performance.

Deep Learning Insights

Enables machines to interpret visual information.

Predictive Analytics Tools

Advanced ML using neural networks for complex tasks.

Computer Vision

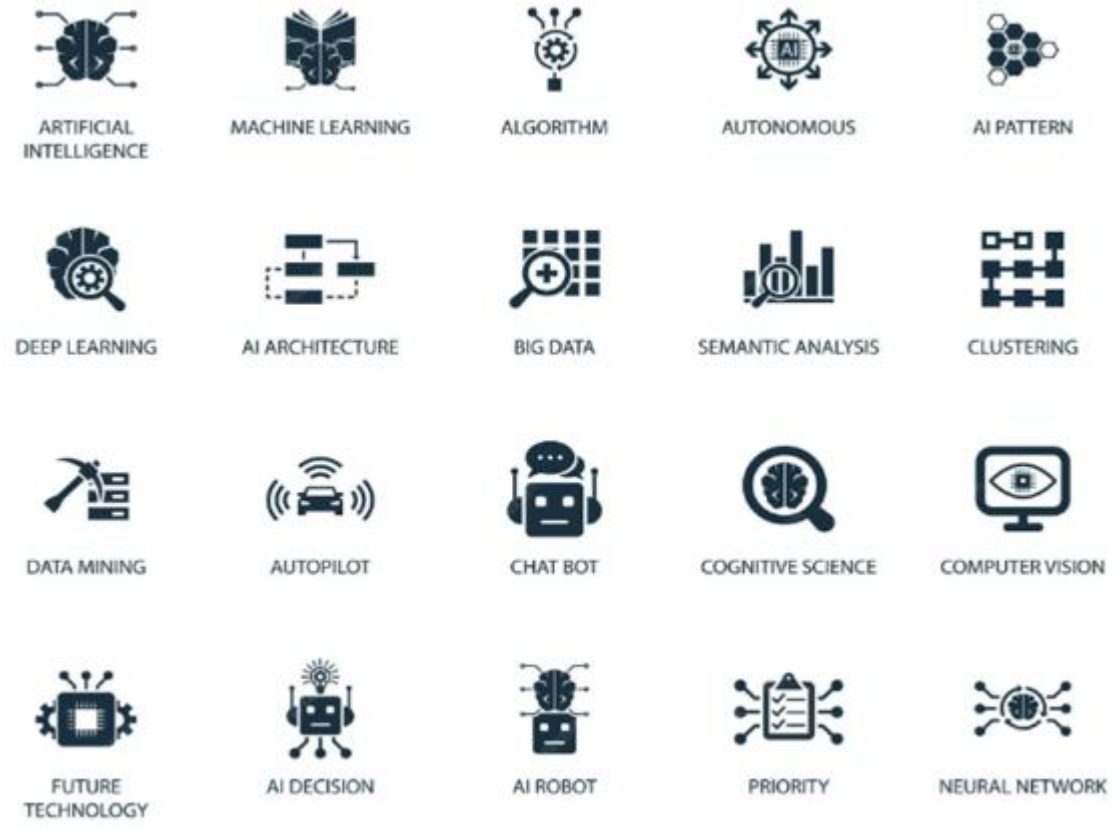
Facilitates human-computer interaction through language.

NLP Techniques

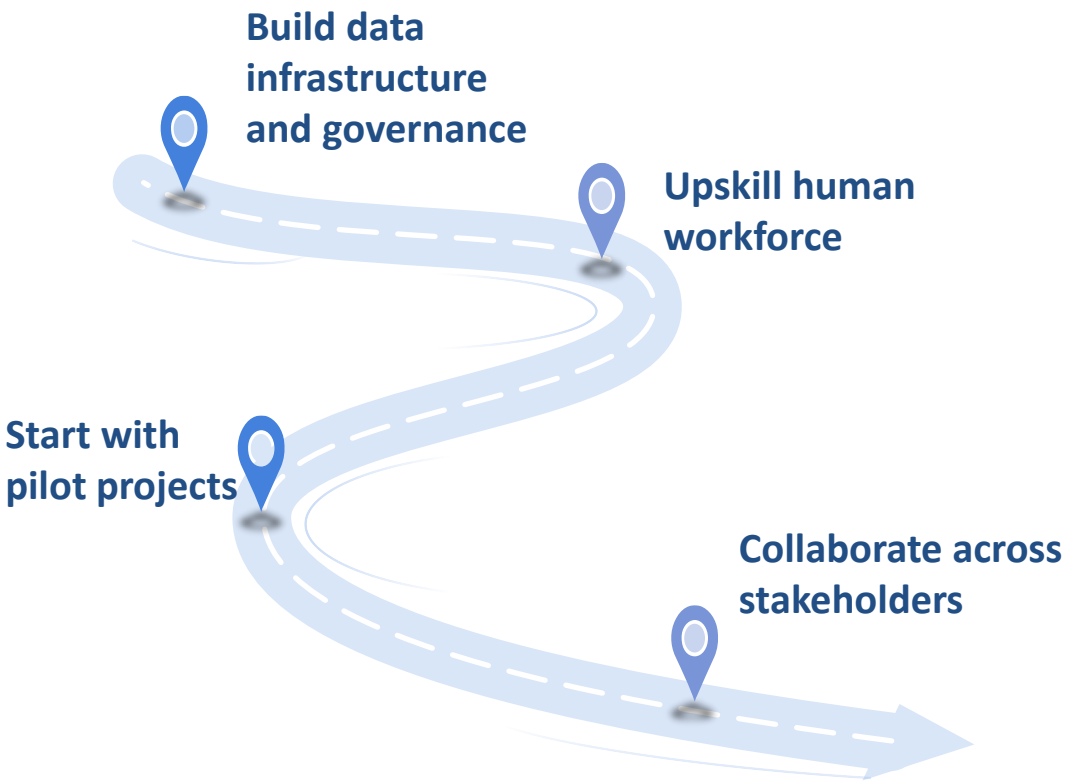
Forecasts future trends using historical data.

Reinforcement Learning for autonomous logistics

Optimizes decision-making in dynamic environments.



Key Recommendations



FlatWorld Associates

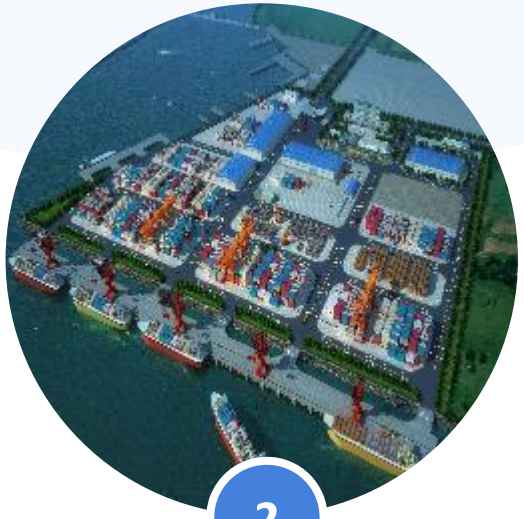
We provide end-to-end logistics, supply chain management consultancy

We support businesses across Pan Asia, the Middle East, Africa and other global markets with bespoke solutions, backed by 30+ years of expertise in addressing unique client challenges. Our network includes trusted local partners in key regions (such as the USA, UK, Middle East, Southeast Asia, and Australasia), complemented by seasoned industry advisors for specialized guidance.

1

Market studies & Financial appraisal

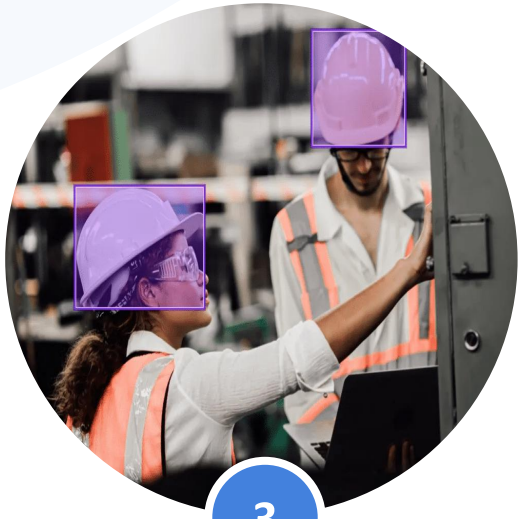
Is Asset A worth investing ?



2

Design / Optimization of Critical Infrastructure

Drawing nice pictures that make economical sense & safe



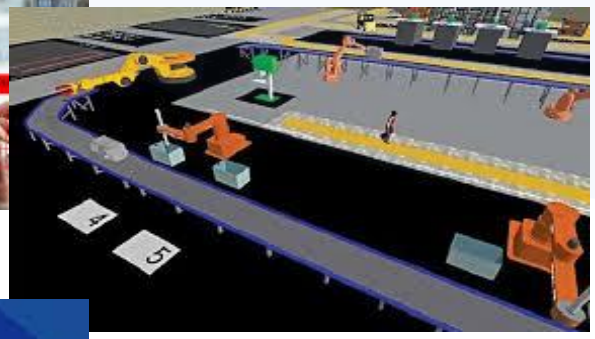
3

Digital/AI Strategy/Advisory

Is your organization equipped to leverage technology?

Services - Digital/AI Strategy

With a strong digital experience, sector knowledge, use of digital tools, and technical expertise in engineering, artificial intelligence and data science, we can help you identify and execute with the highest impact. We not only guide your digital strategy but can assist with implementation.



1. **Vendor Selection (RFPs, evaluations, Due diligence), Onboarding and integration**
   Support in vendor evaluation, due diligence, onboarding and system integration.

2. **How to leverage Industrial/Visual AI to improve Health and Safety in the workplace.**
   Use AI and computer vision to monitor safety risks and improve workplace conditions.

3. **Big Data / AI / Simulation Platforms for Operations Intelligence**
   Leverage digital platforms that use data and simulation to support smarter decision-making.

4. **Cybersecurity** – ensure business continuity by applying various technologies, policies and practices against cyber attacks.

Services - Optimization of Supply Chain

With deep expertise in logistics systems, industrial engineering, and infrastructure strategy, we support public and private sector clients in improving end-to-end supply chain performance. Our services span from long-term infrastructure planning to day-to-day operational enhancements, ensuring resilience, efficiency, and adaptability in evolving markets.

1. **Critical Infrastructure Planning and Design**
   Feasibility studies, master plans, detailed designs, and financial assessments for logistics infrastructure.

2. **Supply Chain Facilities Planning**
   Plan and design warehouses, factories, supply bases, and retail outlets for better performance.

3. **Supply Chain Operations Review and Optimization**
   Plan and design warehouses, factories, supply bases, and retail outlets for better performance.

Thank you!/Terima Kasih!

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