DEFENSE LOGISTICS AGENCY

THE NATION'S COMBAT LOGISTICS SUPPORT AGENCY

DLA's Artificial Intelligence / Machine Learning Strategy

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WARFIGHTER FIRST

Agenda

- Weapon System Sustainment R&D Overview
- Artificial Intelligence / Machine Learning (AI / ML) Overview
- DLA's AI / ML Journey
- AI / ML Implementation Status
- AI / ML Challenges
- Potential AI / ML Opportunities
- How Industry Can Help
- How to Engage DLA

Weapon System Sustainment R&D

Strategic Focus

- Support DLA business functional units through applied research and development of advanced technologies to improve business processes and operational methods.
- Leverage the application of leading edge logistics “out-of-the box” concepts using disruptive technology business tools in providing global logistics support. Support DLA’s technological transformation effort

Research & Development Thrusts

Incorporate emerging technologies (Machine Learning, Blockchain, Augmented Reality) across DLA core business processes

Identify and mitigate risks across the supply chain

Leverage commercial best practices

Weapon System Sustainment R&D

The Challenge

The WSS program leverages advanced technologies to shape acquisition, planning, and supply chain security across the DLA supply chain network. The challenge is to balance the need to sustain legacy systems to maintain the supply chain and continue support to the business functional areas while transitioning to new technologies to improve .

AI / ML Overview

- **Artificial Intelligence** (AI) is machine behavior and function that exhibits the intelligence and behavior of humans.

- **Machine Learning** (ML) is the branch of artificial intelligence that enables computers to learn from patterns and improve the accuracy of conclusions over time.

DLA Strategic Plan Objective 1.4

Anticipate and position solutions for Warfighter requirements by combining big data, **predictive analytics**, automation, **artificial intelligence**, sustained supply chain visibility and continuous communication.

Through employment of trend analysis and **predictive algorithms**, DLA is able to consistently predict and position the right logistics solution on time, every time.

DLA's AI Journey

Oct. 2017

WSS Strategic Assessment researched AI / ML as an emerging technology

FY18 NDAA Identified AI / ML as a Priority

Joint Artificial Intelligence Committee Formed

June 2018

DLA AI Working Group Identified many potential opportunities

FY18

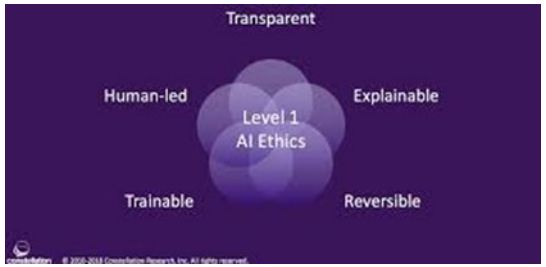
WSS AI Project Roadmap developed

AI Groundwork study initiated

FY19

WSS R&D Projects

- AI Groundwork
- Demand Forecasting
- Lead Time Estimation
- Parts Forecast Using Service Maintenance Records and Condition Based Maintenance Data
- Metadata Management



AI / ML Research Initiative Status

- Researching AI / ML applications for DLA processes is a multi-year effort.
- DLA's Project Roadmap has AI / ML research efforts planned through FY25.
- Enabling strategies in development:
  - Training and knowledge management strategy
  - Policy recommendations for data exchange, governance, etc.
  - Stable infrastructure development strategy
  - Standardized AI code libraries
  - Cloud environment

AI / ML Research Initiative Updates

- There are five active or recently completed AI / ML R&D research projects as initial efforts:
  - **AI Groundwork Study:** Provided recommendations for strategies and infrastructure in order to prepare for future AI / ML efforts.
  - **Demand Forecasting Using DLA Data:** Leverage AI / ML to improve accuracy of demand forecasting using internal DLA data.
  - **Demand Forecasting Using Service Maintenance Data:** Build a minimum viable product that provides a parts forecast using Service maintenance records and condition-based maintenance data.
  - **Lead Time Estimation:** Leverage AI / ML to improve administrative and production lead time estimation accuracy rates.
  - **Metadata Management:** Evaluate and pilot commercially available data management tools.

AI Groundwork Study

- The AI Groundwork Study researched and developed the reference documents that will assist with the assessment and implementation of AI / ML solutions within DLA. Recommendations include:
  - Create AI organization within the Analytic Center of Excellence.
  - Develop AI training plan for DLA.
  - Collaborate with JAIC and OSD to establish DLA as a “pathfinder” for AI logistics support.
  - Develop playbooks for AI Model Development, AI Application Development, and AI Data & Technology to foster an end-to-end AI methodology.
  - Develop robust and automated process to provision Cloud services for AI.
  - Study is complete and recommendations are being evaluated.

Demand Forecasting Using DLA Data

- The Artificial Intelligence Demand Forecasting project will develop and test a proof of concept using AI / ML techniques to improve the accuracy of DLA's parts forecasts using historical demand data.
  - Data warehouses evaluated for data sensitivity classification.
  - Data preparation / cleansing is underway and algorithm development has begun (approximately 1B individual simulations).
  - Currently testing six different model types using up to 48.5K records from five different supply chains.

Demand Forecasting Using Service Maintenance Data

- This effort will explore the use of AI / ML applications to provide a better prediction of future demand by using historical demand data, Service condition-based maintenance data, and current/projected operational data. This will allow DLA to have parts on hand for anticipated maintenance issues, improving Warfighter readiness.
  - Exploring two potential sources of data:
    - Service Condition Based Maintenance Plus (CBM+) Data
    - DoD's Maintenance and Availability Data Warehouse (MADW)
  - Collaborating with the US Navy; in discussions with US Air Force.
  - Initially focusing on the F/A-18 Superhornet but postured to extend to most Navy aircraft.
  - Currently working with sample of 175K labor and material records.

Lead Time Estimation

- The Lead Time Estimation project will leverage the processing power of AI / ML to improve administrative and production lead time estimation accuracy rates, allowing DLA to optimize purchase timing and quantity.
  - Currently building the pipeline required to quickly process data and train and test models.
  - Using 10 years of DLA data (3 million+ records) combined with economic data from Dep't of Commerce and Federal Reserve.
  - Looking at two distinct issues:
    - How long it takes to get an item on contract (administrative lead time or ALT)
    - How long it takes to get the item once it's on contract (production lead time or PLT)
  - Factors considered include current economic conditions, DLA workload, supplier type, item cost, etc.

Metadata Management

- The Metadata Management effort is evaluating commercially available data management tools in order to support data location, collaboration, and analysis across the DLA Enterprise. We are seeking a capability that will enable analysts' ability to more quickly locate and evaluate data, improving the speed, accuracy, and relevance of analysis.
  - Issued public Request For Information on FedBizOps.com in March.
  - Evaluated responses and refined DLA requirements.
  - Issued amendment to Emergent Broad Agency Announcement soliciting white paper proposals.

AI / ML Challenges

- DLA has four major challenges for implementing AI / ML:
  - Data: Ensure easily accessible, reliable, and consolidated data.
  - Infrastructure: Rapidly changing DoD IT, including consolidation of CIO and DoD cloud migration, challenge the implementation of AI computing resources and software approvals in new environments.
  - Training: AI / ML requires advanced skills (programming languages, platforms, and mathematics). Industry competition for AI / ML talent is also a concern.
  - Governance: Managing, documenting, and deploying AI / ML capabilities along with legal and ethical controls.

Potential AI / ML Project Opportunities (FY20 - FY24)

- ✓ **Backorder Prediction:** AI / ML solution could identify factors that drive backorders, allowing DLA to shift to a predictive approach and thereby enable preventative action

- ✓ **Diminishing Manufacturing Sources and Material Shortages Mechanical Forecasts**: Improved ability to manage material risks and identify solutions to future material shortage issues

- ✓ **Returned Parts Identification**: Reduce the reliance on specific human expertise and ultimately reduce overall manual workload while increasing DLA's ability to reconcile its inventory and fill customer demand

- ✓ **Proactive Supply Chain Risk Management**: Identify risk factors that could lead to supply chain disruption, allowing proactive mitigation efforts

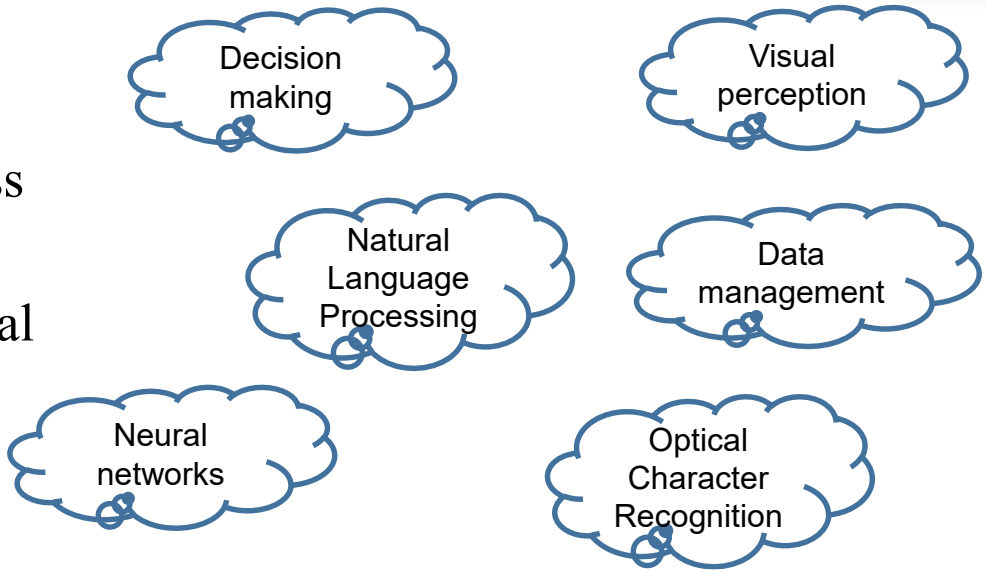
- ✓ **Vendor/Distributor Vulnerability Assessment**: Identify and develop plans to mitigate vendor vulnerabilities due to natural disaster, civil disturbance, terrorism, or other causes

Potential AI / ML Project Opportunities (FY20 - FY24)

- ✓ **Automated War Game Support Activities**: Use AI / ML Red Cell player to improve the ability to plan for potential future supply chain scenarios
- ✓ **Contract Close-Outs**: Standardize and automate contract close-out procedures
- ✓ **Fraud, Waste and Abuse**: Detect fraud, waste and abuse and proactively predict situations that may lead to fraud, waste and abuse
- ✓ **Long Term Contract Item Selection Using AI**: Select items that will be the best candidates for long term contracts
- ✓ **Readiness Drivers**: Predict readiness drivers to enhance planning and procurement actions
- ✓ **Contract Quality Control Program**: Evaluate contracts to ensure standardized terms, legal compliance, best economic value, etc.

How Industry Can Help

- DLA is looking for new and innovative ways to incorporate artificial intelligence into business processes.
- Industry can help identify artificial intelligence opportunities.



Emergent Technologies: BAA-0001-17 open until 22 June 2021
https://www.fbo.gov/spg/DLA/J3/DSCP-PB/BAA-0001-17/listing.html

Metadata Management: Responses shall focus on data location, collaboration, and analytical tools capable of connecting data from a variety of sources across the DLA Enterprise.	**Artificial Intelligence:** Responses shall focus on AI / ML applications to aid in planning, acquisition, and technical quality processes across the DLA Enterprise.

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