Defense Systems Information Analysis Center

DSIAC TECHNICAL INQUIRY (TI) RESPONSE REPORT

Artificial Intelligence in DoD Business Mission Areas

Report Number:
DSIAC-2020-1279
Completed April 2020

DSIAC is a Department of Defense Information Analysis Center

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DSIAC is sponsored by the Defense Technical Information Center, with policy oversight provided by the Office of the Under Secretary of Defense for Research and Engineering. DSIAC is operated by the SURVICE Engineering Company.

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. REPORT DATE *(DD-MM-YYYY)*	**2. REPORT TYPE**	**3. DATES COVERED** *(From - To)*
20-04-2020	Technical Research Report	

4. TITLE AND SUBTITLE

Artificial Intelligence in DoD Business Mission Areas

5a. CONTRACT NUMBER
FA8075-14-D-0001

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER

6. AUTHOR(S)

Taylor H. Knight

5d. PROJECT NUMBER

5e. TASK NUMBER

5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

Defense Systems Information Analysis Center (DSIAC)
SURVICE Engineering Company
4695 Millennium Drive
Belcamp, MD 21017-1505

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)

Defense Technical Information Center (DTIC)
8725 John J. Kingman Rd.
Ft. Belvoir, VA 22060-6218

10. SPONSOR/MONITOR'S ACRONYM(S)

11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION / AVAILABILITY STATEMENT

Distribution Statement A. Approved for public release: distribution unlimited.

13. SUPPLEMENTARY NOTES

14. ABSTRACT
The Defense Systems Information Analysis Center (DSIAC) was asked for a literature review of U.S. Department of Defense (DoD) publications that describe the employment or attempted employment of artificial intelligence (AI) or machine learning relevant to business mission areas (BMAs). DSIAC searched open-source documents and the Defense Technical Information Center's repository for relevant documents and complied them into this report. There is a high priority across the DoD to employ AI across a variety of areas. Multiple branches have been experimenting with a variety of AI to aid in their BMAs. These areas include acquisition, logistics, human resources, installations energy and environment, training and readiness, and financial management. Although many of these programs are in their early stages, the DoD has an urgent need to hire data scientists and experts in AI and related fields to best utilize AI resources.

15. SUBJECT TERMS
artificial intelligence, business mission areas

16. SECURITY CLASSIFICATION OF: U			**17. LIMITATION OF ABSTRACT**	**18. NUMBER OF PAGES**	**19a. NAME OF RESPONSIBLE PERSON**
a. REPORT	**b. ABSTRACT**	**c. THIS PAGE**			Ted Welsh, DSIAC Director
U	U	U	UU	10	**19b. TELEPHONE NUMBER** *(include area code)* 443-360-4600

Standard Form 298 (Rev. 8-98)
Prescribed by ANSI Std. Z39.18

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The Defense Systems Information Analysis Center (DSIAC) is a DoD IAC sponsored by DTIC to provide expertise in nine technical focus areas: weapons systems; survivability and vulnerability; reliability, maintainability, quality, supportability, and interoperability; advanced materials; military sensing; autonomous systems; energetics; directed energy; and non-lethal weapons. DSIAC is operated by SURVICE Engineering Company under contract FA8075-14-D-0001.

A chief service of the DoD IACs is free technical inquiry (TI) research, limited to 4 research hours per inquiry. This TI response report summarizes the research findings of one such inquiry jointly conducted by DSIAC.

ABSTRACT

The Defense Systems Information Analysis Center (DSIAC) was asked for a literature review of U.S. Department of Defense (DoD) publications that describe the employment or attempted employment of artificial intelligence (AI) or machine learning relevant to business mission areas (BMAs). DSIAC searched open-source documents and the Defense Technical Information Center's repository for relevant documents and complied them into this report. There is a high priority across the DoD to employ AI across a variety of areas. Multiple branches have been experimenting with a variety of AI to aid in their BMAs. These areas include acquisition, logistics, human resources, installations energy and environment, training and readiness, and financial management. Although many of these programs are in their early stages, the DoD has an urgent need to hire data scientists and experts in AI and related fields to best utilize AI resources.

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1.0 TI Request

1.1 INQUIRY

What artificial intelligence (AI) has been employed or attempted to be employed for U.S. Department of Defense (DoD) Business Mission Areas (BMAs)?

1.2 DESCRIPTION

The Defense Systems Information Analysis Center (DSIAC) performed a literature review of DoD publications that describe the employment or attempted employment of AI or machine learning relevant to Business Mission Areas (BMAs). DSIAC searched open-source documents and the Defense Technical Information Center's repository for relevant documents and complied them into this report.

2.0 TI Response

As the rise of AI continues, the DoD is continuously looking for ways to employ AI in their BMAs. These areas include acquisition, logistics, human resources, installations energy and environment, training and readiness, and financial readiness.

The DoD established the Joint Artificial Intelligence Center (JAIC) in 2018 to guide the DoD's AI Strategy, released in response to the White House Executive Order on Maintaining American Leadership in AI. Multiple systems are being tried and tested for use across the DoD and its BMAs.

2.1 ACQUISITION

2.1.1 United States Air Force (USAF)

The USAF is utilizing IBM's Watson to assist with acquisition [1]. They asked contractors to develop an AI-based system to help government employees and potential contractors navigate the acquisition process. The transparency and ease of use should make it easier for small businesses to bid on government contracts.

The USAF is also hoping to address the challenge of making contracting more accessible to internal and external customers by providing an intuitive and critical thinking system that understands the complexities of requirements and flexibility within the DoD contracting statutes, regulations, practices, and policies. The new system would be a benefit to program managers and contracting personnel, specifically for automated processes that support

warfighting requirements, systems engineering, and risk management. The technology would also provide contracting officers the ability to swiftly answer difficult questions, allowing more time to effectively focus on creating agreements and other components of acquisitions. A small business innovative research solicitation for the system is divided into three phases: (1) developing a design that utilizes cognitive computing to provide users with answers to natural language questions about the contracting system, (2) evaluating the system, and (3) developing a ready-for-deployment application, along with several expansion support requirements. Applied Research Acoustics, LLC in Washington, DC, and KaScott Engineering in Lawrence, KS, were awarded the contract to create a natural language query system that leverages commercial sector advances in cognitive computing algorithms to provide users insights into defense contracting [2].

2.1.2 U.S. Army

The Army partnered with Sandia National Laboratories to create a system called the Capability Portfolio Analysis Tool (CPAT), which used sophisticated optimization software with useful visualization products to compare alternative investment strategies. They used CPAT to decide whether to invest in the ground combat vehicle to replace the Bradley Fighting Vehicle or invest in modernization of existing systems. Comparing the options, CPAT used 40 business rules, 70,000 constraints, 8,000 integer variables, and 2,000 binary variables. CPAT ultimately provided the Army with a solution that generated more combat power than the Army's previous plan, even after factoring in a 25% budget cut. This resulted in the Army extending its use to other major programs [1].

2.2 LOGISTICS

2.2.1 Aircraft Maintenance

The USAF is starting to use AI for predictive aircraft maintenance by testing an AI-enabled approach that tailors maintenance schedules to the needs of individual aircrafts [3]. This approach is currently used by the F-35's Autonomic Logistics Information System and extracts real-time data into a predictive algorithm to determine when technicians need to inspect the aircraft or replace parts.

2.2.2 Logistics Support Activity (LOGSA)

The Army's LOGSA has contracted IBM's Watson to develop tailored maintenance schedules for the Stryker fleet based on information pulled from the 17 sensors installed on each vehicle. LOGSA started a project in 2017 to use Watson to analyze shipping flows for repair parts distribution, attempting to determine the most time- and cost-efficient means to deliver supplies [3].

2.3 HUMAN RESOURCES

2.3.1 Resumix

Beginning in the mid-1990s, the DoD, National Aeronautics and Space Administration, and other agencies used a system called Resumix to scan resumes for knowledge, skills, and abilities needed for a vacant job [4]. Technology at the time did not exist to allow the system to be successful. The DoD did not find a wide market, and the system was discontinued.

2.3.2 Employee Monitoring

The Defense Security Service (DSS) Office believes a new AI-enabled pilot program will be helpful in evaluating which employees to trust [5]. The program seeks to sift and apply massive amounts of data on people who hold or are seeking security clearances. The goal is to detect those who have betrayed their trust and predict which ones might. The program involves collecting an individual's digital footprint, or cyberactivity, and then matching it with other data the DoD has on the person. A full snapshot of the person is hoped to be created during this process. Machine-learning algorithms are being used to derive insights.

The pilot will also provide a person's Standard Form 86 information and other data not related to cyberactivity. This will join data from what is called continuous evaluation—a current effort to monitor life events related to clearance holders. This includes getting married or divorced, accumulating a lot of debt, tax returns, arrests, and sudden foreign travel. The goal is to allow the system to sense impending insider crime by detecting "micro changes" in a person's behavior. The overarching goal is to have the system reveal changes in mode, outlook, or behavior of an employee before punishment becomes necessary.

2.3.3 Army Talent Alignment Program (ATAP)

The Army has been tweaking its personnel management systems as part of its People Strategy, released in October 2019, which outlines how they plan to acquire, train, and keep their talent [6]. The Army recently assigned about 15,000 officers using an automated program as part of the ATAP, which seeks to better match unit needs with officers' skills. This was the first time the board selection was conducted by combining ATAP with an automated job application portal, the Assignment Interactive Model 2.0. With AIM 2.0, officers can view all open positions and list their preferences and skills, while unit commanders can use it to have more interactive input with applicants to figure out who is best for the assignment. Army officials noted a 35% improvement in market participation, and more than half of officers and units received their top choice, where the unit and officer matched. The Army hopes that future iterations of the system will help define and curb nepotism and commanders hiring predominantly within their comfort zone.

2.4 INSTALLATIONS ENERGY AND ENVIRONMENT

The Army plans to use smart technology to help defend against the increasing complexity of security threats to military installations [7]. Ten technologies are currently being explored to innovate installations, including automated assessments of systems with limited manpower and monitoring utilities for anomalies in energy consumption. They are also looking to track fault detection, install smart thermostats, create autonomous vehicles, and explore frictionless entry. The Army Corps of Engineers is considering its Virtual Test Bed Installation, which involves AI that will analyze data of military installation facilities.

2.5 TRAINING AND READINESS

The Defense Acquisition University (DAU) is looking to move to an adaptive learning environment that responds in real time to student needs based on AI analytics measuring performance and activity. This will hopefully accelerate learning and reduce overall training time. The DAU will evaluate proposed solutions, with the intent to award one or more Other Transaction Authorities for prototype projects through the Training and Readiness Accelerator. Past AI experiments have included a 13-week adaptive, AI-powered learning pilot to test whether students can learn more efficiently, retain learning longer, and find value from an AI-enabled learning experience.

In December 2019, the Air Force launched an adaptive learning pilot, issuing tablets to 110 trainees with the 321st Training Squadron at Joint Base San Antonio-Lackland, TX, instead of hard-copy textbooks currently used for basic training. The solution includes Cerego's online adaptive learning platform and Microsoft Surface Pro tablets [8].

2.6 FINANCIAL READINESS

The head of the Pentagon's new AI capability believes AI could play a key role in helping the DoD shore up its accounting and make a clean audit more than just a dream [9]. The DoD's JAIC says the department has plenty of manual processes, like financial accounting, that could benefit from AI to drive greater back-office efficiencies by augmenting manual, human work. The JAIC has had very early discussions with the Pentagon's Chief Management Officer and Chief Data Officer to predict what the department's widespread adoption of robotic process automation might look like. The issues of deciding the scope of AI financial auditing are being explored. But the biggest challenge is obtaining the personnel who would not only understand it but embrace it.

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