Exhibit R-2, RDT&E Budget Item Justification: PB 2024 Army												Date: March 2023
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 1: *Basic Research*					R-1 Program Element (Number/Name) PE 0601601A *I Artificial Intelligence and Machine Learning Basic Research*							
COST ($ in Millions)	**Prior Years**	**FY 2022**	**FY 2023**	**FY 2024 Base**	**FY 2024 OCO**	**FY 2024 Total**	**FY 2025**	**FY 2026**	**FY 2027**	**FY 2028**	**Cost To Complete**	**Total Cost**
Total Program Element	-	15.172	10.078	10.708	-	10.708	10.288	12.373	12.381	12.516	0.000	83.516
CL3: *AI/ML Basic Research Hub*	-	15.172	10.078	10.708	-	10.708	10.288	12.373	12.381	12.516	0.000	83.516

A. Mission Description and Budget Item Justification

This Program Element (PE) executes intramural and extramural basic research in artificial intelligence (AI) and machine learning (ML) to support an AI-enabled Multi-Domain Operations (MDO) Force. The PE includes Projects that perform basic research in AI/ML with the potential to impact areas such as: Target Detection using Multiple Cooperative Autonomous Sensors (MCAS); more effective and quicker leader decision-making through use of AI-enhanced Common Operating Procedure (COP); replication of tactical behaviors to enable autonomous capabilities for maneuver; predictive maintenance; Intel support for Operations (specifically in support of long range precision fires); AI-enabled network/cybersecurity; intelligent business and process automation; and medical support. The Army's Artificial Intelligence Integration Center (AI2C) will provide strategic guidance and coordination of these basic research efforts in AI/ML across the Army Modernization enterprise.

Work in this PE contributes to the Army Science and Technology (S&T) portfolio and is fully coordinated with efforts in PE 0602180A Artificial Intelligence Technologies and PE 0603040A Artificial Intelligence Advanced Technologies.

The cited work is consistent with the Under Secretary of Defense for Research and Engineering S&T focus areas, the Army Modernization Strategy and the Joint Artificial Intelligence Center (JAIC).

Work in this PE is performed by the United States Army Futures Command (AFC).

B. Program Change Summary ($ in Millions)	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
Previous President's Budget	15.183	10.456	10.661	-	10.661
Current President's Budget	15.172	10.078	10.708	-	10.708
Total Adjustments	-0.011	-0.378	0.047	-	0.047
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-0.011	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	0.047	-	0.047
• FFRDC Transfer	-	-0.378	-	-	-

Exhibit R-2, RDT&E Budget Item Justification: PB 2024 Army	Date: March 2023
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 1: *Basic Research*	**R-1 Program Element (Number/Name)** PE 0601601A *I Artificial Intelligence and Machine Learning Basic Research*

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2022	FY 2023
Project: CL3: *AI/ML Basic Research Hub*		
Congressional Add: *Extreme Events in Structurally Evolving Materials (CA)*	5.000	-
Congressional Add Subtotals for Project: CL3	5.000	-
Congressional Add Totals for all Projects	5.000	-

Change Summary Explanation

Increased funding due to revised economic assumptions.

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army			Date: March 2023
Appropriation/Budget Activity 2040 / 1	R-1 Program Element (Number/Name) PE 0601601A / *Artificial Intelligence and Machine Learning Basic Research*	Project (Number/Name) CL3 / *AI/ML Basic Research Hub*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
CL3: *AI/ML Basic Research Hub*	-	15.172	10.078	10.708	-	10.708	10.288	12.373	12.381	12.516	0.000	83.516

A. Mission Description and Budget Item Justification

The Artificial Intelligence / Machine Learning (AI/ML) Basic Research Hub is a consortium of industry, government, and academia focused on AI basic research originating from world leaders in academic research pertaining to AI/ML breakthrough technologies for future application to Army-relevant areas such as object recognition using Multiple Cooperative Autonomous Sensors, leader decision-making, replication of tactical behaviors to enable autonomous capabilities for maneuver, predictive maintenance, Intel support for Operations, network and cybersecurity, AI-enhanced common operating picture, intelligent business and process automation, and medical support. Collaboration between academia, industry, and government is a key element of the Hub concept as each member brings with it a distinctly different approach to research. Academia is known for its cutting-edge innovation; the industrial partners are able to leverage existing research results for transition and to deal with technology bottlenecks; and Army AI researchers keep the program oriented toward solving complex Army technology problems.

Work in this PE contributes to the Army Science and Technology (S&T) portfolio and is fully coordinated with efforts in PE 0602180A Artificial Intelligence Technologies and PE 0603040A Artificial Intelligence Advanced Technologies.

The cited work is consistent with the Under Secretary of Defense for Research and Engineering S&T focus areas, the Army Modernization Strategy and the Joint Artificial Intelligence Center (JAIC) mission initiatives.

Work in this Project is performed by the United States Army Futures Command (AFC).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Title: Intelligence support to Operations	1.550	1.448	1.600
Description: Research AI / ML methodologies to perform object detection on imagery to augment operations. Investigate meeting the challenge of recognition of surrogate targets in S&T test ranges that are not absolute visual representations, using AI capabilities trained on real operational objects. Perform basic research in the area of intelligence support for operations in support of long range precision fires.			
FY 2023 Plans: Will continue research in methodologies and technologies to advance artificial intelligence (AI) for situational awareness and its connection to command and coordination in support to operations. Will investigate approaches for novel detection and recognition algorithm training to realize rapid, reliable computer vision and informed decision making.			
FY 2024 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 1	**R-1 Program Element (Number/Name)** PE 0601601A / *Artificial Intelligence and Machine Learning Basic Research*	**Project (Number/Name)** CL3 / *AI/ML Basic Research Hub*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Will continue research into improving artificial intelligence (AI) integration into the battlespace awareness and force application Joint Capability Area (JCA). This will include research on massive multi-modal data management to efficiently store, transport, and perform operations on data relevant to AI use cases that is captured and processed by devices throughout the battlespace. We will continue research into customized topical machine learning algorithm development, deployment, monitoring and security. In addition, will research planning and acting to improve situational awareness, decision-making, and command and coordination through user experience and user interface experimentation. Will conduct research into autonomy and coordination of sensors distributed throughout the battlespace. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding change reflects planned life cycle of effort.			
Title: Artificial Intelligence Hub ***Description:*** The AI Hub is located at Carnegie Mellon University as a consortium of industry, government, and academia focused on building and optimizing the Army's AI and ML initiatives with the goal of accelerating the fielding of capability. The AI Hub will utilize the Army Artificial Intelligence Innovation Institute (A2I2) data and AI/ML algorithms and software tools to investigate AI and ML capabilities to address the Army's unique problems. The AI Hub will focus on research into AI technologies for future application to Army-relevant areas such as, but not limited to, replication of tactical behaviors to enable autonomous capabilities for maneuver, robotics, predictive maintenance, multi-domain Command, Control, Communications, and Computers(C4), network resiliency and cybersecurity, AI-enhanced common operating picture (CoP), intelligent business and process automation, decision support, AI-enabled collaborative data infrastructure platform, medical support and force protection. Will conduct research in distributed AI fabric, algorithms, and human-computer interaction enables operations in multiple Joint Capability Areas (JCA), including command and control, force application, and logistics. The current centralized AI model can be improved with a distributed AI architecture that will: autonomously search for and discover heterogenous data sources; optimize AI processing across dynamic and opportunistic resources; fuse AI capabilities between the enterprise, the edge, and AI-enabled sensors and systems embedded on platform; model the availability and reliability of critical network and computational resources to autonomously adapt and optimize algorithmic processing; and use efficiently distributed learning without the need to move data across the network. No distributed AI solutions currently exist to comprehensively mitigate the identified vulnerabilities. AI2C will conduct foundational research in the ability of distributed AI to address these vulnerabilities to set the conditions for use in Army systems and downstream advanced AI-applications. ***FY 2023 Plans:*** Will continue investigation to streamline collaborative AI development that can scale to enterprise level. Will research AI-enabled cyber security methodologies in adversarial AI/counter AI, cyber intrusion, and ML-based anomaly detection with counter-actions that are robust to enemy deception. Research into safe manned-unmanned vehicle teaming to improve system performance. Will conduct research to improve the understanding and use of reinforcement learning for studying strategic and cooperative	5.522	5.173	5.752

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Appropriation/Budget Activity 2040 / 1	**R-1 Program Element (Number/Name)** PE 0601601A / *Artificial Intelligence and Machine Learning Basic Research*	**Project (Number/Name)** CL3 / *AI/ML Basic Research Hub*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
interactions in multi-agent systems and improve decision support. Will conduct research in other novel artificial intelligence (AI) enabling technologies across multiple capability areas, to include, but are not limited to, computing, data management, machine learning, modeling, decision support, and ethics. ***FY 2024 Plans:*** Will investigate research into applying artificial intelligence (AI) to multiple Joint Capability Areas (JCA), including, but not limited to, force integration, force application, logistics, and command and control. With a focus on AI-application that leverage a distributed AI-fabric and enabling technologies, will conduct research on AI-enabling computing infrastructure, devices, algorithms, and human interaction in support of logistics, command and control, and force integration. Will conduct research in other novel AI-enabling technologies across the AI Stack, to include, but not limited to, computing, massive data management, machine learning, modeling, decision support, planning and acting, autonomy, and ethics in support of research priorities including AI development environments; understanding and leveraging social networks; force operations and decision support in modeling and simulation environments; analysis of text, photo, video, and audio data; and improving Soldier performance. Will identify and characterize phenomena in the cyber domain and information environment. Will conduct research toward using AI to integrate force generation and sustainment data with mission-specific operational requirements and situations with the goal of identifying mission-specific personnel, equipment, and logistics options. Will conduct foundational research into employing AI-enabled platforms in support of Join Capability Areas (JCA) including force integration, battlespace awareness, logistics, and command and control. Will conduct foundational research to improve the efficiency, survivability, resiliency, accuracy, and usefulness of AI-enabled platforms to commander priorities, understanding, and decision-making. Research will be conducted throughout the AI stack, focusing on efficient application of machine learning algorithms employed on devices and computing infrastructure distributed in denied, degraded, intermittent, or limited (DDIL) environments to improve data management and reduce network requirements. Will conduct research toward developing the Army's Command and Control architecture as a system of integration enabled by a framework to integrate and optimize data for more effective decision making. Will conduct research toward improving sensor and shooter capabilities with AI-enabled mission command systems. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding change reflects planned life cycle of effort.			
Title: ATR-MCAS ***Description:*** Combat Formations require the ability to autonomously maneuver to identify threats and enable friendly forces to disintegrate and exploit enemy forces in the close and deep maneuver areas. This effort researches AI-based, multi-system approaches to aided threat recognition (ATR) using a combination of autonomous air & ground sensors to build a more accurate operating picture when given zone recon missions. ATR and situational awareness is improved through the direct cooperation & autonomous mobility of the sensors.	3.100	3.089	3.356

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 1	**R-1 Program Element (Number/Name)** PE 0601601A / *Artificial Intelligence and Machine Learning Basic Research*	**Project (Number/Name)** CL3 / *AI/ML Basic Research Hub*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
FY 2023 Plans: Will continue foundational research in emerging artificial intelligence (AI)-based autonomy that scale and connect sensors/ systems for shared perception and communication to maneuver in complex environments to include, but not limited to, varied terrain, dense urban, low-no light, and GPS-denied environments. Will investigate novel approaches in AI/human teaming for maneuver and force application in multi-domain operations. ***FY 2024 Plans:*** Will continue foundational research in emerging artificial intelligence (AI)-based applications to collaborative decentralized autonomy operation and force application. Will continue research in AI-based autonomy and machine learning algorithms that scale and connect sensors/systems for shared perception and communication to maneuver in complex environments to include, but not limited to, varied terrain, dense urban, low/no light, and GPS-denied environments. Will investigate novel approaches in AI/ human interaction for maneuver and force application in multi-domain operations. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding change reflects planned life cycle of effort.			
Title: SBIR/STTR Transfer ***FY 2023 Plans:*** Funding transferred in accordance with Title 15 USC §638 ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC §638	-	0.368	-
Accomplishments/Planned Programs Subtotals	10.172	10.078	10.708

	FY 2022	FY 2023
Congressional Add: Extreme Events in Structurally Evolving Materials (CA)	5.000	-
FY 2022 Accomplishments: Congressional Interest Item funding provided for Extreme Events in Structurally Evolving Materials. Congressional Add to be executed by Army Futures Command.		
Congressional Adds Subtotals	5.000	-

C. Other Program Funding Summary ($ in Millions)

N/A

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C. Other Program Funding Summary ($ in Millions)

Remarks

D. Acquisition Strategy

N/A