# **Department of the Air Force/MIT AI Accelerator:**

# **Developing and Educating**

*Col Scott Ruppel 23 April 2025* 



Research was sponsored by the United States Air Force Research Laboratory and the United States Air Force Artificial Intelligence Accelerator and was accomplished under Cooperative Agreement Number FA8750-19- 2-1000. The views and conclusions contained in this document are those of the authors and should not be interpreted as representing the official policies, either expressed or implied, of the United States Air Force or the U.S. Government. The U.S. Government is authorized to reproduce and distribute reprints for Government purposes notwithstanding any copyright notation herein.



# Agenda



- DAF/MIT AI Accelerator Intro
  - The National Security Imperative
  - Organizational Overview
  - AIA Research Projects
  - AIA Impacts
- AI Education
  - Phantoms
  - Know-Apply-Lead: Portfolio and Impact





# Al Accelerator – A National Security Imperative



## **Final Report**

National Security Commission on Artificial Intelligence



## AIA partnership taps into a key national strength – talent at leading universities

"Al is expanding the window of vulnerability the United States has already entered. For the first time since World War II, America's technological predominance—the backbone of its economic and military

power—is under threat.

National Security Commission on AI, 2018

"Therefore, accelerating the adoption of [AI] presents an unprecedented opportunity to equip leaders at all levels of the Department with the data they need, and harness the full potential of the decision-making power of

our people.

Department of DoD Data Analytics and AI Adoption Strategy, 2023

"Federal investments in fundamental research have enabled the current AI opportunity.

University AI R&D is necessary but must be paired with vibrant technology transfer activities."

Bipartisan House Task Force Report on Artificial Intelligence, 2024



# **AI Accelerator Program**



### DAF AIA TEAM





Col Scott Ruppel DAF Director



Deputy Director

Maj Koley Borchard Chief Legal Counsel

Maj Megan Muniz Director of Operations

- Active-Duty Airmen/Guardians
- DAF Civilians
- Reserve Officers



## MIT AIA CORE TEAM



Prof. Daniela Rus MIT Director Lincoln Laboratory Lead



 Prof. Charles Leiserson
 Dr. Jeremy Kepner

 MIT Faculty Director
 Lincoln Laboratory Co-Lead



Dr. Christian Prothmann MIT Program Director

## JOINT PROJECT TEAMS

16 active projects that involve more than 150 MIT faculty, researchers, students, and DAF personnel to advance AI

Project teams work closely with stakeholders and engage the wider AI Ecosystem through **public challenge problems** 

AIA's education, research activities, and development of best data practices build and support DAF AI readiness









# **Al Accelerator Projects**

Illii



Foundational



# **DAF-MIT AI Accelerator Impact**



## 530+ Papers Posted Or 1200+ authors & 13,600+ c

nature machine intelligence		ARTICLES	machine int
Closed-form networks	continuous-time neural	Neural circuit policies e autonomy	nabling auditable
Received 23 Mirch 2022 Ramin Hasani 0 <sup>-11</sup> , Mathias Lechner <sup>143</sup> , Alexander Amini <sup>4</sup> , Accepted 3 October 2022 Locas Liebenwein 0 <sup>4</sup> , Aaron Ray <sup>1</sup> , Max Tschalkowski <sup>4</sup> , Genild Teschl 0 <sup>4</sup> ( Daniela Ron <sup>4</sup>		Mathias Lechner	
		Daniela Rus <sup>2</sup> and Radu Grosu <sup>© 2</sup>	
12 Novel Al		10+ N	lillion
C	hallendes	Computer-	

Challenges 1000+ participants Hou

Advancing AI Educatio AI for Senior National Leaders (100+ s Al online learning for 650,000 DAF pers

nline citations	Neural Models for Magnetic Navigation	Space Domain Awareness	Air Guardian Autonomy	Conversational AI	
abling auditable where Aniel' Thems A Henrings ?: iIIIion uter-Aniel' Thems A Henrings ?:	C-17 Integration & Demonstration Partnered with AMC, AFIT, AFRL to demonstrate Magnetic Navigation on a C-17 during AMC'S MOBILITY GUARDIAN.	ML Informed Maneuver Detection         Optimized algorithm for maneuver detection fielded at National Space Defense Center to flag satellite movements         Defense Center to flag satellite movements	X-62 Integration & Demonstration Partnered with DARPA, AFWERX, JHU-APL, TPS and EpiSci to test Liquid Neural Networks FOR Collaborative Combat on the X-62 VISTA.	618 AOC NITMRE Implementation Partnered with the 618 AOC, 577th, and 581st SWES at Robins AFB to use Natural Language Processing for C2 trend analysis, info retrieval, and event prediction.	
on stars) sonnel		The ventories			

Examples of Transition Activities/Opportunities



## **Phantom Fellowship**

Democratizing Data: An Intelligent Querying System for Marine Corps Data



Abstract—This research presents the development and im-plementation of a text-or-Netroiter Q beny Language (NGL) system tailore for Marine Corps ingotise, capital and the system tailor of the structure and availability of logistics the power capabilities of Marine Corps ingotise, capital users can intuitively interval with Marine Corps state through natural language querics with Alion graphics processing unit (Graph States). Alion graphics processing unit (Graph States) and deploying the model on spectra state through and relations through the posterion of the processing unit (Graph States). Alion graphics processing unit (Graph States) and the posterion model on the posterion capital for local or edge spectra states and through the model on spectra states and through the posterion through the posterion on the processing unit (Graph States). Alion graphics processing unit (Graph States), representative datasets and governance, Aling and prepost combined program equipations. We charge and capital integration, and workfore develops the text-to-SQL integration, and workfore develops, text-to-SQL system that enables users to effectively "that" with Marine Corps that and the corps of the forectively "that" with Marine Corps that and the text-to-SQL system that enables users to effectively "that" with Marine Corps that and the system that forectively "that" with Marine Corps that and the text on text on the text on the text on the text on the text on the

### I. INTRODUCTION

The Marine Corps recognizes the imperative of achieving an asymmetric advantage over its adversaries in the digi-tal domain [1]. Its recently published Artificial Intelligence (AI) Strategy acknowledges and emphasizes the transformational power of data and emerging technologies to accelerate decision-making and operational effectiveness. These advancements enable Marines to fight smarter and close kill chains faster and more reliably than the adversary [1]. AI is one of the technologies identified as having the ability to significantly improve the way Marines train, plan, and fight.

Although there are opportunities for AI application across all warfighting functions, logistics represents an area ripe for

Research was sponsored by the Department of the Air Force Artificial Intelligence Accelerator and was accompliable inder Cooperative Agreement document at robote of the authors and should not be interpreted as representing the official policies, either expressed or implied, of the Department of the Air Force or the U.S. Government: The U.S. Government standards reproduce and dustibute reprints for Government purposes notwithstanding any corpyright notation berzen.

Kevin Nam, PhD

MIT Lincoln Laboratory

Lexington, Massachusetts

kevin.nam@ll.mit.edu

enables users to effectively "chat" with Marine Corps data in an intuitive fashion. To do so, we curated a bespoke dataset with which we fine-tuned an open-source LLM specifically for converting natural language text to SOL queries related to Marine Corps supply and maintenance data. Generated SQL queries were automatically executed against a database and returned to the user showcasing that with our system, anyone, regardless of technical ability, has the power to take advantage of the wealth of data available in the MDR to make data-driven decisions. • What We Demonstrated: Our work demonstrates the ability to effectively and efficiently fine-tune an LLM in a resource-constrained environment. With only a single NVIDIA A100 graphics processing unit (GPU), we highlight the feasibility of implementing an LLM-based solution locally, or in a simulated edge environment. • What We Learned: A high-quality dataset that is representative of the complexity and diversity of realworld prompts plays a significant role in impacting model performance. Developing this kind of dataset that





Al Accelerator

[3] BMS KCA – Battle Management System Killchain Automation Team

## Creating AI Literate Airmen by Facilitating Operational Solutions



7



## **Know-Apply-Lead Portfolio and Impact**





# 3-year Summary: Highlighted Project Accomplishments



## AI Education Research: Know-Apply-Lead

## AI EDUCATION IMPACT

- Bespoke AI learning journeys defined and evaluated for key DoD role archetypes with new measures.
- Innovative online course developed on Human-AI Collaboration. General availability.
- Two Innovative, in-person workshops developed and evaluated: Horizon Scenarios + Learning Machines: Computation, Ethics and Policy. Very well received.
- Engaged over 1500 airmen, DoD personnel and NATO allies learners over 3.7 M of minutes (62K hours) of Al education.

### **PUBLICATIONS + AWARDS**

- 9 publications in peer-reviewed conferences in engineering education (7 completed, 2 in progress).
- Toolbox of innovative instruments and measures for assessing AI Leadership, Ethical and Technical knowledge.
- MIT News Article (link)
- 2023 DAF-MIT AIA Directors Award

## **TRANSITION IMPACT**

MIT Horizon AI education **Cloud One integration complete** with Chief Digital and Artificial Intelligence Office (CDAO) **to serve the entire DoD** 





# Concluding Thoughts...



- As an organizational model DAF/MIT AIA benefits from:
  - Access to campus, LL as transition partner
  - Close alignment to users, growing network permanent party & Phantoms
  - Vibrant ecosystem on campus, across DoD
- Educational Opportunities Abound
  - DAF must determine what AI education is needed
  - Al impact on education rethinking "knowledge"



<sup>&</sup>quot;Wings Through Time" Robert Emerson Bell