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General Comment

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Attachments

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Subject: Response to RFI – Prioritized AI Research Areas & Advancement Strategies

Date: May 27, 2025

To: Networking and Information Technology Research and Development (NITRD) National Coordination Office (NCO)

From: Project Linchpin // POC

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1. Introduction

Project Linchpin is dedicated to ensuring the delivery of safe and trusted AI capabilities. This response outlines key research needs and development challenges in AI that the Federal government should prioritize over the next 3 to 5 years, along with innovative mechanisms for research partnerships with industry and academia. Additionally, we highlight current efforts by PEO IEW&S Project Linchpin and the resource constraints that hinder our ability to sustain and expand these initiatives.

2. Research Needs in AI

Next-Generation AI Hardware

As AI continues to evolve, the demand for more powerful and efficient hardware becomes critical. To improve the accuracy and performance of AI models, robust hardware capable of handling large datasets is essential. Advancing supercomputers with the latest GPUs and exploring other processing units such as TPUs and NPUs is crucial. TPUs, optimized for TensorFlow, and NPUs, excelling in matrix multiplication, are not widely adopted due to their limited versatility outside the AI domain. Researching and developing portable yet powerful solutions for edge deployment can significantly enhance AI utilization, especially for edge users lacking access to supercomputers or GPUs.

AI Systems and Workforce Productivity

AI has the potential to enhance the efficiency of the American workforce by addressing unique workflow pain points through integrated AI solutions. Examples include curated documentation generation, document risk assessment, and situational summaries based on multiple long

documents. Cataloging these problems to identify overlaps and develop relevant solutions is necessary.

AI Standards, Security, and Reliability

Developing standards for AI is crucial for streamlining the AI development process and enhancing the security of the AI/MLOps pipeline. Standardization makes elements more structured and traceable, reducing vulnerabilities and improving reliability and compatibility.

AI for National Security and Critical Infrastructure

AI research for national security and critical infrastructure is vital for ensuring the safety and resilience of our nation. Integrating AI into surveillance, threat detection, and response systems can enhance our capabilities to protect critical assets and respond to emerging threats effectively.

Infrastructure Support for AI Research and Development Community

Supporting the AI research and development community with robust infrastructure is essential for fostering innovation and progress. This includes providing access to advanced computing resources, secure data storage, and collaborative platforms that enable researchers to share knowledge and accelerate advancements in AI.

AI Gym: A Testbed for Industry AI Solutions

To keep pace with the rapid advancements in AI technology, it is imperative that the government invests in environments to assess and validate industry AI solutions. An “AI Gym” would serve as a dedicated testbed where various AI models and applications can be rigorously tested, benchmarked, and refined. This capability would provide a controlled environment for evaluating the performance, security, and reliability of AI innovations, ensuring they meet the stringent requirements of national security and other critical applications. By funding such an initiative, we can foster a collaborative ecosystem that accelerates the development and deployment of cutting-edge AI technologies.

Multi-modal models

Conducting more research into models that process and interpret images and text simultaneously, enabling tasks such as image captioning, visual question answering, and multimodal content generation.

Sustainable AI

There is a need to reduce the environmental impact of AI, including energy consumption and carbon footprint. Conduct research focusing on the development of energy-efficient algorithms and hardware, and optimizing AI workflows for sustainability.

3. Development Challenges in AI

Technical Challenges

- **Hardware Limitations:** Developing portable yet powerful hardware solutions for edge deployment to overcome limitations in deploying large, high-performing models.
- **Security Vulnerabilities:** Addressing vulnerabilities such as data poisoning, adversarial attacks, and model inversion to ensure the security of AI systems.
- **AI Hallucination Identification:** Ability to identify when AI models generate outputs that are not grounded in the input data or reality, potentially leading to incorrect or misleading information. Creating new mechanisms to ensure the reliability and accuracy of AI-generated intelligence, situational awareness, and decision-making support.

Operational Challenges

- **Integration with Existing Systems:** Ensuring compatibility and seamless operation when integrating AI with existing national security and critical infrastructure systems.
- **Real-Time Decision Making:** Developing AI systems capable of making reliable real-time decisions in dynamic and high-risk environments.

Strategic Challenges

- **Ethical and Legal Considerations:** Addressing ethical and legal questions related to AI use in national security, such as privacy concerns and potential misuse.
- **Resource Accessibility:** Ensuring equitable access to computational resources and datasets for researchers, especially those in smaller institutions or startups. Those resources should be cost effective to encourage participation from small businesses and provide a development/test bed infrastructure to allow for development of trusted AI capabilities.
- **Test & Evaluation:** Many companies have T&E criteria but are very focused on performance. An example of more tailored T&E would be for GENAI, which contains methods to quantify risks models, technical procedures and controls to mitigate risks; as well as methods to test model performance against specific deployment configurations

4. Current Efforts by PEO IEW&S Project Linchpin

- **AI Model Development:** We have initiated the development of advanced AI models for threat detection and situational awareness, integrating cutting-edge machine learning techniques.
- **Collaborative Research:** Engaging with academic institutions and industry partners to explore innovative AI applications and address critical challenges in national security.
- **Infrastructure Enhancement:** Upgrading our computational infrastructure to support large-scale AI research and development, including the deployment of high-performance computing resources.

Resource Constraints

- **Funding Limitations:** Despite our ongoing efforts, we face significant funding constraints that limit our ability to scale up AI research and development activities. These constraints hinder our ability to develop an AI ecosystem that can widely benefit the Army, restrict the number of use cases we can handle beyond initial intake, and slow down the creation and updating of standards in this rapidly evolving field.
- **Talent Acquisition:** Attracting and retaining top AI talent is challenging due to competitive salaries offered by the private sector, impacting our ability to maintain a skilled workforce.
- **Computational Resources:** Our current computational resources are insufficient to meet the growing demands of AI research, limiting our ability to process large datasets and train complex models effectively. Although we have supercomputers at varying clearance levels, they are not optimized for AI development. This forces us to rely heavily on cloud computing, which, while flexible, is significantly more expensive in the long term compared to investing in on-premises AI-optimized supercomputers.
- **Data Accessibility:** Limited access to diverse and high-quality datasets restricts our ability to develop robust AI solutions, particularly for edge deployment scenarios. There's also a lack of infrastructure to allow secure access to varying classification levels for developmental purposes, which Project Linchpin is attempting to mitigate with the development of the AI ecosystem.

5. Ideas for Novel Mechanisms for Research Partnerships

Collaboration Models

- **Public-Private Partnerships:** Establishing partnerships between government agencies, industry, and academia to leverage collective expertise and resources.
- **Consortia and Alliances:** Forming consortia and alliances to address specific AI research challenges and promote knowledge sharing.
- **Facilitate Temporary Security Clearances:** Allowing promising small businesses to obtain temporary security clearance to access some of the relevant operational data that for model training.

Intellectual Property Management

- **Shared IP Agreements:** Developing shared intellectual property agreements to facilitate collaboration while protecting proprietary technologies.
- **Open Innovation Platforms:** Creating open innovation platforms to enable researchers to contribute to and benefit from collective advancements in AI.

5. Conclusion

In summary, addressing the research needs and development challenges in AI is crucial for advancing the field and ensuring its effective integration into various sectors. Project Linchpin is committed to collaborating with the Federal government to advance AI research and development. We look forward to further discussions and opportunities for collaboration to achieve these goals.