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Submitter Information

Organization: Northeastern University

General Comment

See attachment for Northeastern University's unabridged Response to the OSTP-NITRD-NCO RFI National Artificial Intelligence R&D Strategic Plan. Executive Summary and Recommendations for AI Investment Areas included below.

Executive Summary

Northeastern University understands the centrality of Artificial Intelligence in the future of society, national defense, human health, sustainability, and security. Through its Institute for Experiential Artificial Intelligence, its Kostas Research Institute applied research arm for national security, its first-of-its-kind partnership with Anthropic and other corporate partners, its participation in the National AI Research Resource through leadership of the National Deep Inference Fabric, and its participation in public-private co-investment in AI compute, the University is pushing the frontiers of human-AI partnership and secure and reliable AI, expanding student skills and AI-related workforce development, and driving the scale of compute operation available to university researchers. We welcome the opportunity to comment on the National Artificial Intelligence R&D strategic plan.

Recommendations for AI Investment Areas

Northeastern University recommends prioritization and investments in the following areas to ensure national leadership in artificial intelligence (AI) and advance the nation's capabilities in critical scientific and technological domains: (1) Defense, (2) Manufacturing, (3) Biotechnology and Healthcare System, (4) Discovery and Innovation, (5) Education and Training.

Attachments

May_NUresponse2RFI_NatAIRDSrPlan_2025final

Northeastern University Response to the OSTP-NITRD-NCO RFI National Artificial Intelligence R&D Strategic Plan

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Executive Summary

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Recommendations for AI Investment Areas

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1. AI to Increase Technological Supremacy in Defense

Evolving geopolitical conditions necessitate a national thrust to expand the technological capability of defense forces and industry against near-peer competitors.

Research Topics

AI investments to significantly increase the technological gap that ensures complete supremacy from strategic to operational to tactical scales are recommended in the following directions:

- AI-driven network protocols, hardware-software codesigned physical layers for secure, discreet, robust, and resilient communication systems;
- AI-enhanced heterogeneous sensors and networks for cognitive and distributed sensing, communication, and intelligence; infrastructure for AI-enabled cyber-physical interventions;
- Generative AI capabilities for deception in all domains and at all scales for defense, from cloud to edge, language to visual to physical signals.
- Geo-spatial/temporal AI analytics for heterogeneous and multimodal data in support of decision makers in all domains and at all scales;
- Enhanced human decision support through knowledge-integrated AI systems;
- AI for autonomy with minimal human oversight in all domains;
- AI-enabled capabilities to establish and maintain a strong, diversified defense industrial base across the nation in support of all forces.

Recommended Actions

In order for the Administration to drive key investments and establish strategic eminence in the AI defense domain, the following actions should be considered:

- Reinvigorate advanced AI research for defense applications by convening DOD stakeholders, academic and industry leaders to develop an ambitious roadmap that addresses key challenges related to generative AI, secure communications, human-machine teaming, and cyber-physical security.

- Re-evaluate the existing DOD AI Center of Excellence to ensure it a) meets current Department needs, b) is inclusive to academic and industry partners leading the technological and innovative investments of today, and c) provides a viable pathway for students and technology to advance the warfighting mission.
- Establish a process or procedure which ensures the military services and defense-wide programs are coordinating investments in the above-mentioned research areas specific to their mission, to best scale existing areas of expertise while avoiding redundant or duplicative efforts.
- Reignite DARPA's ability to fund high-risk research in the above-mentioned topic areas in order to find game-changing abilities specific to defense-related applications (such as AI Next).

2. AI to Achieve Overwhelming Manufacturing Dominance

Ensuring strong national economic prosperity relies crucially on increasing American manufacturing strength. AI investments in the following directions are recommended to establish manufacturing dominance in critical technology domains:

- AI-driven policy design for nationwide/industry-wide manufacturing capability and resilience optimization through multilayer (social, financial, legal, regional) network analyses;
- AI-driven innovations in semiconductor device design and manufacturing;
- AI-driven innovations in semiconductor packaging equipment design, manufacturing, and maintenance;
- AI-driven enhancements to system design and manufacturing in all engineering domains; particularly, advanced additive manufacturing from nano to macro scale;
- AI-enhanced workforce training, skill enhancement through integrated experiential virtual, augmented, and hands-on education.

Recommended Actions

- Establish "ARPA-M" to push the boundaries of advanced manufacturing with high-risk high-reward programs.
- Expand the ARM Institute ([The nation's leading collaborative in robotics and workforce innovation](#)) to other qualified nonprofit R&D organizations to achieve access to innovation and transition nationwide. Through KRI, ROUX, IER, and IEAI, and its nationwide network of campuses, NU is positioned well to be a strong national leader and a hub of cutting edge R&D at the intersection of AI, robotics, and advanced manufacturing.
- NSF should expand its AI Institutes, Science and Technology Centers, Engineering Research Centers, and Industry University Collaborative Research Centers programs to establish manufacturing impact engines through government-industry-academia partnerships.

3. AI to Propel Healthcare Efficacy & Efficiency

Advances in biomedical technologies and healthcare system will not only contribute to individual longevity in pursuing a prosperous life, enabling technologies will significantly propel national leadership in biotechnology. Federal investments in health and AI have lagged other areas and there is a major opportunity to reshape the medical research and healthcare system through smart policies and new initiatives.

Research Topics

AI investments to overhaul the healthcare system to achieve significant efficiencies and efficacy at all levels, investments are recommended in the following directions:

- AI-enabled digital twins at all relevant computational scales and data modalities for a multitude of domains from drug discovery to personalized preventative/diagnostic/prognostic treatment design to harmonized biomolecular and medical intervention execution;

- AI-assisted protein function, enzymatic activity, biomarker, and multi-omics for advances in biotechnology, synthetic biology, biomaterials, and variant effect discovery advances.
- AI for preventative health and home health care could greatly decrease medical expenses and keep people out of clinical care. For example, Northeastern participates in the NSF-funded AI Institute for Collaborative Assistance and Responsive Interaction for Networked Groups ([AI-CARING](#)), which is developing next generation personalized AI systems to protect the health of aging adults living at home.
- Investments in AI for biomedical research or human health applications would benefit from advances in privacy-protecting AI that can meet health privacy regulations. New techniques are needed to enable utilization of vast amounts of health and clinical data without jeopardizing individual health records.

Recommended Actions

Agencies such as the National Institutes of Health, the Advanced Research Projects Agency for Health (ARPA-H), and the National Science Foundation have key roles to play in advancing AI for health applications. Northeastern recommends the following:

- NIH should explore partnerships with NSF to enable further AI Research Institutes in new health topic areas. These could address NIH priorities such as population health and leverage connections between biomedical and computer science researchers while engaging major participation from industry. For example, the AI-CARING institute has sponsorship from Amazon and Google and pulls in partnerships with Toyota, NVIDIA, and Hello Robot. There are currently very few health focused NSF AI Research Institutes and NIH partnership would help push forward the frontiers of health innovation.
- The new NIH Office of Research Innovation, Validation, and Application (ORIA) should seek to create new models for AI-enabled research and expanded infrastructure to support these models. ORIA should ensure that new entrants with expertise in AI, data science, and computer science are able to access this funding who can bring a variety of approaches beyond traditional biomedical research.
- High-risk, high-reward research is essential to find game-changing abilities. ARPA-H should continue to fund AI-related topics and programs.

4. AI as an Engine for Discovery & Innovation Leadership

Innovations that will ensure technological supremacy in defense, achieving dominance in manufacturing, increasing healthcare efficiency and efficacy critically depend on sustained discovery of new fundamental governing principles for complex physical, chemical, biological systems in contexts and at scales never-before studied.

Research Topics

Scientific discovery and technological innovation require a combination of subject matter expertise and experimentation. To this end, AI investments in the following areas are of particular importance:

- Human-AI collaborative systems for scientific hypothesis generation, experimental design, knowledge-graph exploration through natural language dialogue and multi-sensory interaction;
- AI-scientists/engineers that can discover/generate multi-scale/multi-physics models based on knowledge graphs and experimental data with minimal human supervision and direction;
- Cyber-physical and computational scientist/engineer-in-the-loop experiment/design environments for rapid discovery and innovation.
- AI for science and reliability at different scales – explainable models and systems where you need to have confidence in the answer. NSF has invested in the National Deep Inference Fabric at Northeastern that is helping researchers answer these questions by providing a providing ground to study neural networks.

Recommended Actions

Investments in national computational and cyber-physical infrastructures to enable AI-assisted-scientist-in-the-loop experiments that significantly improve the efficiency of the scientific discovery process, and AI-assisted-engineer-in-the-loop system design processes that drastically accelerate the rate of technological innovation are poised to become engines of discovery and innovation that propel the nation further its scientific and technological leadership.

- The Administration should consider how to scale the National AI Research Resource Pilot to provide a clear infrastructure for science and the study of AI. Industry donations alone will not enable the NAIRR and the current pilot is very small, limiting its impact. NSF should pursue a mix of investing in new specific machines that excel in AI for science needs as well as mechanisms to incentivize the contribution of private resources. For example regional efforts such as the Massachusetts High Performance Computing Center and Empire AI are being built for their own region's use, but with the right incentives could contribute some of their time to the NAIRR and national priorities. The key is to create a robust overlay system that enables easy use by researchers.
- The NIST AI Safety Institute and its associated research consortium should be retooled to enable better data sharing and collaboration among government, industry, and academia. The consortium could be a forum for experimentation, testing, and standards development. To date it has been underutilized and could be greatly expanded in its activities and impact.

5. Preparing Students and Workers for an AI World

As important AI advances are to our national security and technological supremacy, it will be critical to ensure both our next generation and current workforce is prepared for the AI revolution. Northeastern University's President Joseph Aoun has been a global leader sounding the alarm that we need to act urgently to rethink postsecondary and lifelong learning in his 2017 book, "Robot-Proof: Higher Education in the Age of Artificial Intelligence." Recognizing that many of the jobs of today will be obsolete with AI advances means we must train students to have human skills and the creativity to compliment and exceed in an AI-powered world through technological, data, and human literacies. AI will also be an important tool and resource for educators in the creation of new learning modalities serving lifelong learners.

Recommended Actions

- Building upon the youth-focused goals outlined in the April 2025 Executive Order, *Advancing Artificial Intelligence Education for American Youth*, there should be a convening of leaders in academia, industry, and government to discuss and develop a national strategy to prepare the postsecondary sector and workforce trainers to rethink and identify best practices for the future of higher education and lifelong learning.
- Coordinate the Departments of Commerce and Labor, along with the National Science Foundation, in identifying AI-related skills of national importance and the creation of nationally recognized AI-related curriculum and educational tools, as a resource for educators in the postsecondary and workforce training sectors.
- Support research on the use of AI tools in the education settings, from pre-K to upskilling credentialing, to ensure best practices and the efficient and effective use of resources.
- Expand the use of co-op and other workforce mechanisms to encourage new models for training workers in AI skills.