Request for Information to the Update of the National Artificial Intelligence Research and Development Strategic Plan: Responses

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Feedback on “THE NATIONAL ARTIFICIAL INTELLIGENCE RESEARCH AND DEVELOPMENT STRATEGIC PLAN: 2019 UPDATE”
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Introduction
At the University of Oklahoma, we have been performing fundamental research on AI, grand challenge problem-driven AI research, and deploying AI-enabled solutions to address societal challenges. Below we suggest improvements and updates to the National Artificial Intelligence Research and Development Strategic Plan to incorporate new innovations, challenges, and needs that have emerged over the past four years for the successful research, development, and deployment of impactful AI.

Strategy 2: Develop Effective Methods for Human-AI Collaboration
One of the key, emerging areas of research that needs further advancement in creating, robust, adaptable, responsive, trustable AI solutions are advances in interactive, human-guided machine learning and AI systems. The coupling of human expertise, contextual information, and additional relevant nondigital has the promise of creating more accurate, robust, context-relevant AI solutions to solve problems in ever changing environments with contexts that have never been previously experienced (e.g., unprecedented weather, environmental, and growing conditions).

Expanding this strategy or creating a new strategy specifically focusing on trustable, transparent/understandable AI will create AI advances that are readily adopted, deployable to more situations, and enable AI to have a broader impact on our sociotechnical society.

Strategy 4: Ensure the Safety and Security of AI Systems
It is crucial to look at the interaction between adversarial settings and emerging aspects of machine learning, such as transparency and fairness. Transparency, trust, and explainability are mentioned in isolation in Section 4, but in Section 3, we see that they are blended together under "Improving fairness, transparency, and accountability by design." Research is needed to investigate tradeoffs not only among these notions but also about these notions in an adversarial setting and discuss what can be achieved by design.

Additionally, in terms of verification and validation, we must include not only malfunction, but also fairness, transparency, and their impact on the precision, recall, and deployability of these systems. Often, as we make a system more transparent or fair (by design), we inherently impose certain limitations on achieving certain goals at the end of the learning process. For example, how would/could
transparency-design and fairness-design decisions impact complex performance measures (e.g., precision, recall, upon deployment of these mechanisms?)

**Strategy 5: Develop Shared Public Datasets and Environments for AI Training and Testing** - Advanced-Data Ecosystem for Improved Adaptability and Availability under the Community Contribution

Thanks to the rapid development of data collection, there has been a dramatic increase in data sources and information availability. With the increasing amount and the variety of available datasets, expert-led data analysis faces challenges in promptly evaluating the quality of raw information sources. Specifically, we need sufficient time and domain expertise to perform data capture, curation, and analysis for potentially valuable datasets under an enormously data-rich environment.

We have seen the great potential of creating dynamic and agile data repositories through the help of the data science community and standardized data storage language/format. Under the government-led efforts, we encourage **building an open-access repository paradigm** facilitated by a collection of moderators for each area to review the datasets submissions and oversee the sharing policy. The moderators can help recategorize the datasets with different values, assign categories, or reject their upload for inappropriate information. A comprehensive list of moderators should consist of government officials, the AI community, and the corresponding experts from a variety of domains.

To further improve the exposure and the accessibility of the open-access repository. We recommend **improving the availability of open-source AI software libraries** that can easily access such a repository (both for uploading and downloading). For example, we have seen AI software, including but not limited to OpenNLP, Scikit-Learn, Weka have been gaining a significantly larger AI user community over the past years. As a result, we can provide high-level programming language-based development toolkits to bridge the gap between the above-mentioned open-source software and the open-access repository to encourage the repository’s further development.

Finally, we need to ensure that these resources are available to all and **democratize access to AI data, software, and hardware.**

**Strategy 6: Measure and Evaluate AI Technologies through Standards and Benchmarks** - Integrating the Domain Expertise and Expectations for AI standards and Benchmarks

It is important to promote the participation of both the industry and academia in measuring and evaluating AI technologies as they are the primary sources that generate and benefit from AI technologies. On examining the effectiveness of AI solutions, there is a lack of a balanced participant pool from both the AI technology developers and users, especially in ensuring diversity, equity, inclusivity, and justice. Although researchers from academia and industry R&D organizations have the motivations and incentives from directly engaging in AI solution development, other sides of the AI community, who can benefit from AI, but lack the background knowledge in this domain, are easily ignored. The practitioners carry critical domain expertise on the testbed of AI,
and their expectations can play a major role in developing AI technologies. As a result, it is crucial to broaden the education of AI to a variety of industries and encourage the AI community to **further engage in standards development for evaluating AI technologies**. Furthermore, it is even more crucial to bridge the gap between the expectation from practitioners and AI researchers to achieve a harmonious development cycle between AI technology developers and users.

**Strategy 7: Better Understand the National AI R&D Workforce Needs**

- **Strengthen the Involvement of the Research Community Throughout the Studies**

This report has identified the urgent need for additional studies on the need for AI R&D from the current and future US workforce to prepare the AI community’s future, such as the educational pathways and retraining opportunities. It is important to emphasize the accuracy of such studies by strengthening the involvement of the research community during the study and **creating national accreditation and educational standards programs**.

There is a diverse industry workforce that can become the cornerstone of AI technology development. **We need to ensure tight partnerships and industry engagement in our educational program development, review, and improvement to ensure that academia is producing AI graduates that meet industry needs.** We also need to ensure that we create AI training across all fields of study since data-driven and AI-driven technology and solutions will impact all aspects of the workplace. However, it is difficult to create a continual retraining and upskilling environment to keep the workforce current with the research frontier of AI technologies and ensure they are fully aware of the capability of the rapidly advancing AI technologies. Enhancing the research community’s involvement and strengthening the industry workforces’ understanding of AI technology will ensure that the study result accurately reflects and understands the national AI R&D workforce needs. Similar problems exist in cybersecurity and medical fields, and adapting and modifying continual training programs based on their best practices will ensure the best AI workforce. With a better understanding of the current and future AI R&D workforce needs, we can develop more tangible plans and follow-up actions to help alleviate the challenges of the US workforce.

**Conclusion**

The report provided by the select committee on the artificial intelligence of the national science and technology council offered clear and tractable expectations of the federal AI research and development. Building upon the original report, we have provided several directions to help the United States continuously serve as the world leader on the AI knowledge frontier. We believe that such efforts will further strengthen our nation’s security, economic growth, and our citizens’ life quality.