June 10, 2019

Elham Tabassi
National Institute of Standards and Technology
100 Bureau Drive, Stop 200
Gaithersburg, MD 20899

Dear Ms. Tabassi,

This response reflects the views of Amazon.com, Inc. and Amazon Web Services Inc. (AWS). Amazon has been investing deeply in Artificial Intelligence (AI) for over 20 years. AI technologies like Machine Learning (ML) are core to our customer experience — from foundational shopping features like product recommendations, and path optimization and predictive shipping in our fulfillment centers, to Alexa voice service, our drone-based initiative Prime Air, and our new retail experience Amazon Go. AI technologies also drive many of our internal systems, including important work in fraud detection and security. Similarly, AWS's AI services, such as Amazon Lex, Polly, and Amazon Rekognition, provide our customers with ML capabilities as fully managed services that are easily accessible to interested developers. AWS SageMaker makes the creation and deployment of ML models far easier for the growing number of data scientists. The problems we solve with AI are real customer problems – ones that exist today or ones that we want to overcome as we look to the future and innovate on customers' behalf.

AI technologies are contributing to economic growth and have the potential to improve the world around us. We believe we must work closely with governments and researchers to ensure these positive benefits are realized. Based on our extensive experience with AI technologies across a broad base of customer use cases spanning the private and public sectors, we offer the following recommendations:

- Produce a voluntary standards framework that reflects best practices in AI development and adoption, while avoiding duplication of existing NIST and international standards that might be applicable to AI.
- Focus on shaping standards that ensure U.S. leadership at the global level.
- Develop modern benchmarks for AI technologies as a means to help advance and ensure trustworthiness of the technology.
- Follow a risk-based approach assessing use cases and "types" of AI in order to prioritize benchmarking efforts.

1) Produce a voluntary standards framework that reflects best practices in AI development and adoption.

The breadth of AI applications contributes to what will be a significant challenge in NIST's efforts to develop AI standards: the business models, use cases, and "types" of AI are vast and diverse. Given such complexities, we believe it is best to have a standards framework that is both voluntary and customizable to ensure its usefulness is sustainable as AI innovations grow and develop. For instance, rather than stipulating technical standards, such a framework should delineate best practices for developing, testing, and deploying AI technologies. NIST is a well-established leader in creating such frameworks. NIST should replicate and build upon the success of the Cybersecurity Framework, which is also serving as the foundation for the Privacy Framework, to provide voluntary tools for AI developers and customers to better identify, assess, manage, and communicate the trustworthiness and benefits of AI technologies.

To maximize the utility of the voluntary framework, we encourage NIST to create a framework that is not duplicative of existing IT standards. NIST has already developed (and is continuing to develop) voluntary standards that already directly or indirectly affect AI and are helping ensure trustworthiness of the technology. For instance, NIST's SP 800-53 (Rev. 4), Appendix J provides a set of privacy controls to help organizations protect personally identifiable information. These privacy controls are based on the Fair Information Practice Principles of accountability, audit, and risk management; data quality and integrity; data minimization and retention; individual participation and redress; security, transparency; and use limitation. Amazon and AWS look to such standards in the development and provision of their products and services -- including AI and ML products and services.

2) Focus on shaping standards that ensure U.S. leadership at the global level.

We also believe AI can indeed uphold, protect, and further American values and competitiveness. However, for that vision to be realized, it is critical that the U.S. lead on the development of AI standards at the global level. It is also essential that global standards not be shaped and used to disadvantage the U.S.'s interests and technology.

Global standards bodies and other governments are increasingly engaged in creating technical standards and defining ethics around AI. For example, International Standards Organization's (ISO) ISO/IEC JTC 1/SC 42 is the first international standards committee focused on all stakeholders in AI. The committee's efforts consist of working groups that address concepts and terminology, computational approaches, trustworthiness, and use cases and applications. We need to ensure that the U.S. is highly engaged in shaping global standards for AI, so development of AI reflects and furthers the U.S.'s values. Failing to do so risks putting U.S. technology providers at a strategic disadvantage, as global standards could be shaped to favor the AI technologies of other countries, including those countries whose values are not aligned with the U.S. Unfortunately, countries that may not be aligned with United States' values are increasingly active and highly engaged in shaping global standards for AI. Therefore, as a leading, well-reputed standards and technology organization, we strongly support greater NIST

involvement (and U.S. involvement overall) in international standards bodies, such as the ISO, Institute of Electrical and Electronics Engineers, Worldwide Web Consortium, and other global multi-stakeholder organizations. NIST leadership will be essential to harmonizing and shaping global AI standards, and ensuring U.S. competitiveness.

In NIST's capacity as a global leader, we further recommend development of open global standards for AI technologies that reflect a multi-stakeholder approach. Standards development should incorporate the view of, at minimum, technical experts, cross-domain experts, and policymakers. We are proponents of frameworks and best practices that support innovation and do not lock-in incumbent technologies and practices. For instance, AWS's services are designed such that developers can build on top of existing products and services to support customers' evolving needs. Similarly, we work with partners in voice technology to develop integrated digital assistants that can carry out tasks across different dimensions of daily life, wherever most convenient. Amazon's Alexa and Microsoft's Cortana are able to collaborate to provide customers easy to access features like Office 365 email through Alexa. We support a thriving partner environment to expand the menu of choices and stretch the limits of the "art of the possible" for our customers as we work alongside other innovators and service providers. Governments can impede AI adoption and the technology's transformational potential with incompatible or conflicting standards or governance models.

We recognize the scope and complexity of the challenge to shaping global standards. In keeping with Organisation for Economic Co-operation and Development's (OECD's) recently released recommendations on AI, which were endorsed by the U.S. Government, we encourage NIST to coordinate with U.S. industry and other U.S.-based stakeholders in global standards bodies to define and drive towards a shared vision for global standards on AI. We stand ready to help NIST in this effort.

3) Modernize benchmarking and testing methodologies to stay in pace with rapid innovation.

We believe that benchmarking (i.e., comparing the performance of systems) and testing are important to advancing the state-of-the-art in AI and ensuring AI technologies are trustworthy and safe. Benchmarking and testing methodologies are a proven way to address design issues in software, and the need for such methodologies are equally applicable here. As such, we fully support and encourage NIST to develop modern benchmarks and testing tools for AI technologies.

It is essential that NIST remains a world-leader in benchmarking as AI technologies become more advanced and the use cases more diverse. Being a world leader in benchmarking AI technologies will require NIST to leverage modern commercial cloud infrastructure for testing, as the commercial cloud is increasingly the proven infrastructure upon which AI is optimized to operate.

Amazon and AWS have always been, and will remain, supportive and committed to investing in the development of standardized testing methodologies, including those that seek to improve accuracy and mitigate bias in AI, such as facial recognition technologies. As such, we encourage

and support the development of benchmarking methodologies for AI by NIST, including in conjunction with other independent and trusted research organizations and standards bodies, such as academic institutions and the ISO.

4) Follow a risk-based approach assessing use cases and "types" of AI in order to prioritize benchmarking efforts.

Another critical consideration is that certain AI use cases carry more weight in that they have the potential to materially impact human lives than other use cases. Algorithms and data-driven decision making techniques are not new, and there is a wide spectrum of use, context, and types of datasets for algorithms, including those that merit greater regulatory intervention. For instance, the potential impacts for an AI system used for medical diagnoses are far greater than an AI system designed to filter-out spam from inboxes. We therefore recommend that NIST prioritize its benchmarking efforts using a risk-based approach. By surveying and assessing the risks of various AI technology use cases, NIST can best align its resources and efforts to develop benchmarks and tests that ultimately advance the trustworthiness of AI.

We appreciate the opportunity to respond to this RFI. Advancing AI technologies while building trust and confidence in these technologies is essential, and we look forward to every opportunity to partner with NIST on these efforts.

Sincerely,

Steven Block
Director, U.S. Federal Policy
Amazon Web Services