

AI Infrastructure

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From the editor's desk



Amy Kluber, Editor-in-Chief

“Strategies need to be done in partnership [with] folks that know AI well ... and then the folks who understand the business problems really well.”

—Federal Reserve Bank of New York's Laura Kurup

When we talk about infrastructure in federal technology, many discussions center around physical infrastructure. It's typically about the servers, the hardware, software and, of course, the personnel necessary to maintaining and managing all IT operations.

But for artificial intelligence, the discussions vary just a bit. That's because you're dealing with powerful computing systems that are more than just a technical puzzle to solve. It involves developing soft

skills in the workforce and managing indirect impacts this emerging technology has on the culture of any technology organization.

Federal agencies see the power AI has in accomplishing its mission more quickly and efficiently. But getting there is a process that involves close attention to the infrastructure, or the backbones, that make up successful AI. That includes data quality, skills development and the culture shift to make it there. ✨

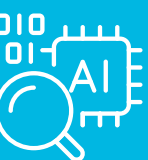


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Remember These Key Steps for Federal AI Adoption

Federal AI leaders share examples of groundwork around data management, training and culture.

BY MELISSA HARRIS

Leaders across the federal government are trying to understand and leverage artificial intelligence and emerging technologies to drive the future of work forward. But before we rush toward a future with AI, experts in the field cautioned the importance of setting the technological and cultural foundations to prepare for AI.

Various agencies are in different stages of maturity with their data, AI and other emerging technologies, making early planning, piloting, managing risk and scaling important factors in paving a thoughtful future to AI, federal leaders said during a ATARC event in September 2021. Department of Health and Human Services Chief AI Officer Oki Mek stressed that even within his agency, there are different levels of data maturity, making risk management and cost overrun mitigation top concerns for him.

“Since HHS is so large, we are at different stages of this journey of emerging technology,” Mek said. “The business owners [are] acquiring and building AI, buying AI products and services. We just want to make sure that we do it responsibly. ... We want to make sure that we have this ecosystem of support because AI, machine learning — it’s a new, innovative, transformative domain. ... The failure rate is going to be high. In even just IT projects, the failure rate is quite high. But with good, new emerging technology, it’s going to be lower.”

Mek and Navy Chief AI Officer Brett Vaughn also stressed that acquiring and preparing data to be ready for AI application is another critical piece that agencies



Photo Credit: Auris/iStock

looking to adopt AI must work on.

“Changing the way we treat data, with AI in mind, as one of those enablers is, I think, a really, really important thing,” Vaughn said.

NASA Digital Transformation Lead for AI and Machine Learning Ed McLarney added that having modernized infrastructure in place can help set the modernized groundwork that agencies often need to make AI successful. Meanwhile, embracing open-source capabilities can usher in better algorithm development and data aggregation capabilities, said Department of Energy AI and Technology Director Pamela Isom.



Pamela Isom
Director, Artificial Intelligence
and Technology Office,
Department of Energy

“There is just so much that is emerging in [the open-source] space, particularly around data aggregation and repositories of these algorithms, and then solutions that not only house algorithms, but also can help to parse the algorithms to make sure we’re getting them in the way that we need them so that we are mitigating the biases,” Isom said. “So there are technologies out there, and they’re coming through the open-source platforms.”

With the technological groundwork in place, the AI officials underscored that piloting AI projects is the next key step. McLarney shared that NASA has been developing AI prototypes and pilots for deployment systems, mission support, as well as research science engineering to create space craft and aircraft scientific instruments.

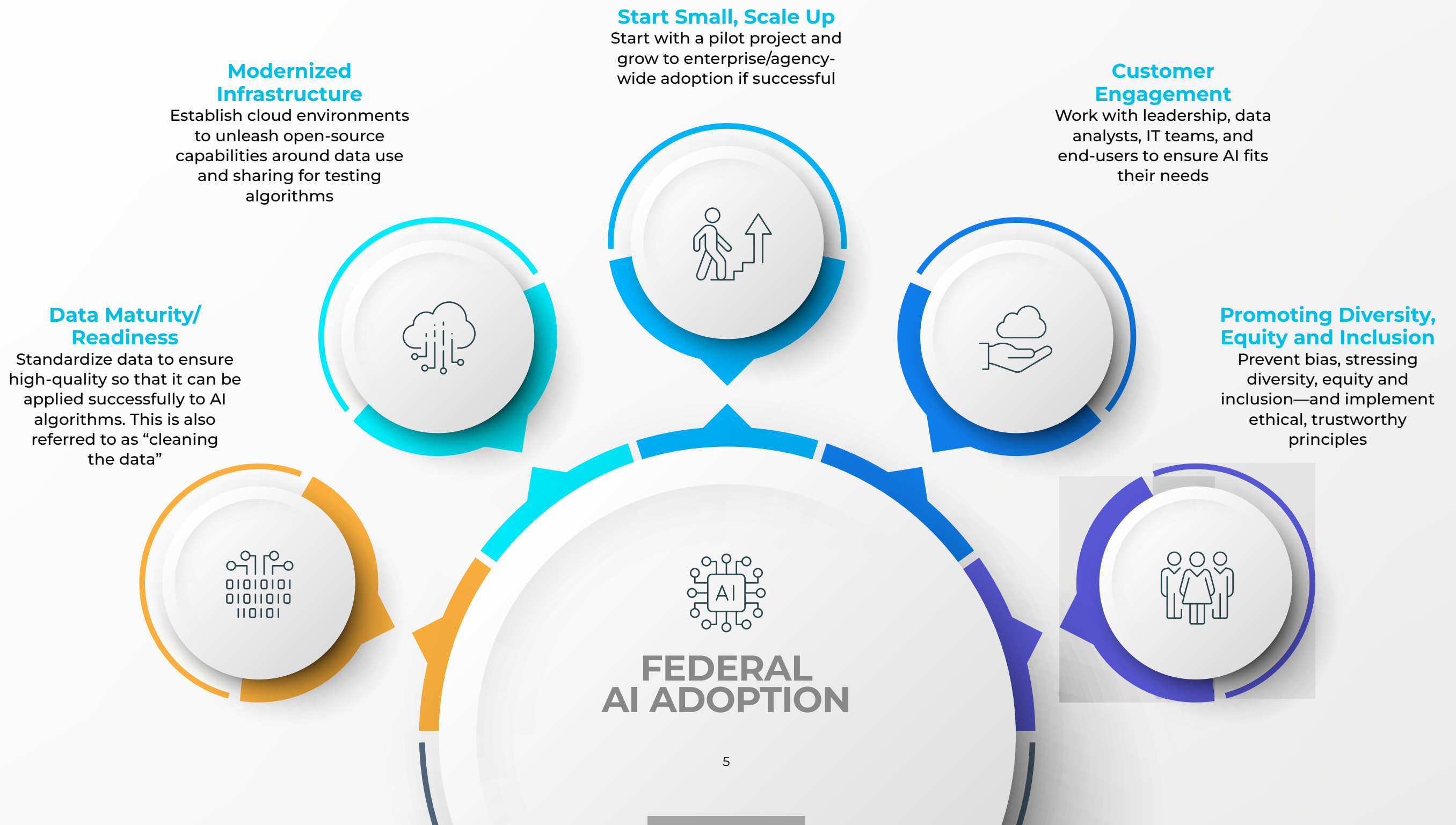
Federal Reserve Bank of New York Chief Data and Analytics Officer Laura Kurup added that the bank has matured a variety of AI pilots and is looking to scale them for operational usage.

“We’re working on moving from an era where we’ve delivered a lot of exciting pilots to making sure that those pilots are actually getting adopted into frontline activities in a way that we’ve expected,” Kurup said. “We’re looking at it as a three-legged stool — making sure that we have the focus on AI and machine learning, along with standards and policies and governance that are needed to unlock and enable some of these new use cases, along with having the technology and the tooling and data management.”

Kurup said that some of the projects the bank has been working on are called “lighthouse projects,” where her team brings in a new technological capability or technique to refine, champion and explore adoption across multiple use cases in the bank. From there, Kurup’s team clusters use cases to strengthen the capabilities’ applications to the banks’ needs.

To really develop and mature sustainable AI projects and models across agencies, the AI experts said that upskilling workers and creating a culture that enables collaborative AI adoption is another boon to making AI adoption take off.

Key Steps for Federal AI Adoption



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—Pamela Isom

Mek — who is working on developing both an AI Council and community of practice within HHS — said that a lot of the skilling and learning comes from building fellowship around AI.

“We will make sure that we bring folks together and collaborate and share information, any best practices, lessons learned, any challenges or pitfalls that will help manage risks or lower the risk for a department, as well as avoid cost overrun,” Mek said. “It’s about education and training, as well as really just culture shift, culture change into more of a data, digital-centric culture.”

Developing a culture around AI isn’t just for those in IT. Once leadership has buy-in to technologies like AI and can work in partnership with AI developers and data analysts, the initial exploration of AI use cases and adoption becomes more focused and synchronized between leadership, customers and IT teams.

“Strategies need to be done in partnership — both between folks that know AI well, are familiar with the advanced data science, machine-learning techniques, how we can apply them, and then the folks who understand the business problems really well,” Kurup said. “Oftentimes the first round of use cases folks think of may not be the most interesting problems to solve and the most impactful areas where we can focus AI, so coming up with the characteristics of the type of challenge that we can solve well with AI within the agency and then looking for those in new places.” ✨

Federal AI Workforce Development Requires Skills Diversity

AI workforce experts highlight the importance of diversity and robust education development to foster a stronger AI workforce.

BY MELISSA HARRIS

Federal agencies all face the common challenge of filling positions across the IT workforce, especially in artificial intelligence. To help overcome it, AI workforce experts are looking to build a robust and diverse AI talent pipeline from across a variety of stages of education and career growth.

AI workforce professionals across academia and the Defense Department explained key strategies, considerations and practices to strengthen the federal AI workforce pipeline during the November 2021 AI Gov: National Security event. Stanford Human-Centered AI Deputy Director Michael Sellitto said that there are several areas of work across the AI field and that filling those positions requires diverse expertise.

“It’s not just one kind of skillset,” Sellitto said of AI. “You have the technical AI researchers, the developers and engineers that are building the systems. You have experts in human impact of the technology, policy experts, ethicists, social scientists, humanists who can understand enough about the technology to help understand what are the potential risks and opportunities? ... And then the users.”

Georgetown Center for Security and Emerging Technology Research Fellow Diana Gehlhaus added that the IT and AI fields overall face the challenge of educating students and young professionals that the AI field requires a variety of talents beyond the technical, making the field more open to a wider range of skills and individuals than traditionally thought.

“One challenge is informationally really helping people understand as they’re



Photo Credit: metamorworks/iStock

approaching their career and educational decision-making, all the different types of jobs that are going to be out there that are needed — the different roles and responsibilities that are involved in AI design, development and deployment and what that means and making sure that our educational infrastructure is set up in a way that we can grow, cultivate and train talent,” Gehlhaus said.

To diversify the talent pipeline, Gelhaus said it will be critical for educational institutions and organizations to reframe career pathways to highlight interconnected avenues of pursuing AI, as well as encourage and energize people



Michael Sellitto
Human-Centered AI Deputy
Director, Stanford University

to embrace the variation of careers within the AI field.

Sellitto added that increased investment in STEM education and the development of a national research cloud are two critical pieces to nurturing early interest in AI. The cloud would provide government datasets and compute capabilities for academic research, Sellitto said. This makes hands-on interest and learning more accessible to a variety of students.

“The goal here is really to try to make it easier for academic researchers across the country — not just at elite universities, but at colleges, state schools, community colleges across the country — to provide meaningful educational opportunities for students to help them develop a career in this area and to upskill and give them some interesting projects to work on,” Sellitto said.

Within the Air Force, Kessel Run is focusing on diversity in its workforce development and recruitment. Kessel Run Chief of Data Integration Maj. Andrew Armstrong said that while it has been challenging to recruit diverse employees, Kessel Run and DOD as a whole are making strides to be more inclusive.

For instance, since joining DOD 13 years ago, Armstrong has seen the abolition of the ‘Don’t Ask Don’t Tell’ policy, creating a more welcoming environment for professionals who identify as LGBTQ+ to enter the DOD workforce. Kessel Run has also engaged in outreach to encourage more women to apply to their positions.

“When I joined, I never really expected an LGBTQ+ type of environment, and Kessel Run has an active LGBTQ+ community, which is really exciting,” Armstrong said. “It’s really cool to see that in the DOD nowadays. As far as getting a more diverse workforce, we’re really focused heavily on that. We recruit at different places like Women Who Code Boston and other kinds of places like that where we can find some of the more diverse workforce.”

Gehlhaus has also been aiding DOD in its efforts to bolster a more robust AI workforce. In one of her studies, she realized DOD to be a top employer of technical talent — much of which is hidden — and has worked with the military to identify and uplift that talent.

“It’s not just one kind of skillset,” Sellitto said of AI. “You have the technical AI researchers, the developers and engineers that are building the systems. You have experts in human impact of the technology, policy experts, ethicists, social scientists, humanists who can understand enough about the technology to help understand what are the potential risks and opportunities? ... And then the users.” —Michael Sellitto

“There’s a lot of hidden talent within the DOD, and this is in the enlisted community and in the officer community, in the reserve community,” Gehlhaus said. “Why is this talent hidden? What are some barriers for this talent to be able to use these skills that they’re acquiring — whether through DOD official training channels or their own?”

The report found there are also a number of barriers preventing the DOD workforce from entering the AI field, including a culture that largely does not

reward or provide opportunity to apply technical skills, especially for enlisted individuals.

Armstrong added that despite these barriers, Kessel Run has made some breakthroughs in recruiting individuals with unconventional backgrounds. He said that Kessel Run has onboarded people who were professional linguists to work in their AI program as programmers, program managers and designers on various product teams. ✨

Data Partnerships Essential for AI Development

Federal agencies are focusing on data interoperability and knowledge-sharing partnerships to support increasingly advanced research initiatives.

BY ADAM PATTERSON

Federal agencies are building knowledge and data-sharing partnerships as the foundation for further advancement in applied artificial intelligence capacities.

Speaking at the December 2021 AI Gov: Mastering Data event, representatives from the National Institutes of Health (NIH) and the departments of Energy (DOE) and Veterans Affairs (VA) discussed how their agencies are advancing their research projects through refining both their data-processing capacities as well as cross-organizational collaboration.

These agencies have taken a forefront role in applying AI toward their central missions, with NIH using the expanded scope of data processing to increase the sophistication of research into the pathology and treatment of various conditions — including better elucidating how to manage more severe COVID-19 infections.

“It has broadened the dimensionality of our data analysis capability, enabling a more comprehensive approach in understanding and managing diseases and conditions instead of the traditional siloed organ-specific way. And, for example,



because COVID-19 affects many organ systems, the Medical Imaging and Data Resource Center could enable clinical decision support tools to diagnose and monitor both the acute COVID or long COVID cases in a systematic way,” said Qi Duan, program director at the NIH Division of Health Informatics Technologies.

While advanced data projects have been used to support diagnostics tools, partnerships both within and across

agencies to analyze large quantities of data have also been essential for better understanding the pathologies and potential complications of a novel virus like COVID-19. This has included both clinical data-sharing partnerships, as well as sharing expertise and high-powered computing resources to partner agencies.

“Part of the thing that is very exciting about the VA is it’s a health system that is a learning health system that has nested research within it. That includes investigators who both have expertise in statistical analysis and AI, and a great deal of expertise in clinical epidemiology and clinical research, as well as how that data is recorded. Bringing those people together, having them have worked on

A portrait of David Womble, a man with short dark hair, wearing a dark suit jacket, a light blue shirt, and a patterned tie. The image is overlaid with a semi-transparent blue filter. The text is positioned in the bottom left corner of the image.

David Womble
AI Program Director,
Oak Ridge National
Laboratory

questions before, enabled us to much more rapidly address these issues in the present,” said Dr. Amy Justice, a professor of public health at Yale University and leading Veterans Affairs clinical epidemiologist. “We had already reached out and began a very close collaboration with Department of Energy investigators using high-power computing and their in-house expertise on AI, and began to develop that language so that when COVID hit, we already had a collaboration that was well in place.”

This focus on data and knowledge-sharing partnerships extends across VA as a whole. Much of this centers on tech sprints overseen by VA’s National Artificial Intelligence Institute (NAII), including an upcoming initiative to explore the application of AI in the diagnosis and management of lung cancer.

“In the next tech sprint, we will pursue an imaging technology for accelerating or improving the accuracy of lung cancer scans that are routinely performed for either screening or diagnosing lung cancer in the veteran population. For a number of reasons, lung cancer is such a heavy burden. It is a high mortality cancer that disproportionately affects our veteran population, for instance, and there are a number of mature technologies behind it. Our intent is that we would like to provision a safe environment computationally within the VA where we can invite outside collaborators to pitch solutions,” said Rafael Fricks, lead AI tech sprints coordinator at VA.

Beyond the areas of public health and health care, federal agencies have begun applying AI capacities for infrastructure resiliency programs. This has been spearheaded in large part by the Department of Energy, using high-powered computing and AI models developed in partnership with its Oak Ridge National Laboratory to gauge the strain that natural disasters and extreme weather events might have on America’s vital infrastructure. These initiatives require large quantities of data sharing between various localities and organizations, and have shown promise for addressing issues like supply chain lapse.

“The other thing that AI really opens up is the ability to look at what we call

“A lot of companies, organizations, cities and governments have the ability to look very effectively at local optimization. I can manage my own fleet, I can control my own traffic, and things like that. But at the scale of AI and with the computational power that we have today, we can really look at the whole system.”

**—David Womble, AI Program Director,
Oak Ridge National Laboratory**

the system scale. A lot of companies, organizations, cities and governments have the ability to look very effectively at local optimization. I can manage my own fleet, I can control my own traffic, and things like that. But at the scale of AI and with the computational power that we have today, we can really look at the whole system. We can look at the impact of the Port of Long Beach, on the manufacturing supply chain for some of the largest companies in the United States in ways that no single entity has the ability to do that will require a lot of sharing data,” said David Womble, AI program director at the Oak Ridge National Laboratory. ❁

HHS Releases Trustworthy AI Playbook, Website

The playbook looks to promote ethical and successful AI adoption across HHS.

BY MELISSA HARRIS

The Department of Health and Human Services has released its artificial intelligence playbook to provide high-level information about trustworthy AI and guidance for deploying AI across its typical lifecycle.

HHS published its Trustworthy AI (TAI) Playbook, alongside the launch of its AI website, nearly a year after the agency released its AI Strategy and appointed Oki Mek as its first chief AI officer. The new playbook looks to meet

requirements from OMB M-21-06 and Executive Order 13960, which call on agencies to encourage AI innovation and growth while establishing ethics and principles around the technology.

The playbook aims to guide HHS leadership to create policies around trustworthy AI and evaluate risks associated with AI investments, while also highlighting how program and project managers can incorporate it properly, work with teams before building AI solutions, oversee projects throughout their lifecycle and mitigate risks.

Rather than cementing a formal policy or standard, the playbook paints broad



strokes for AI adoption to promote White House TAI principles, centralize relevant federal and non-federal resources, and set a framework for smart adoption throughout the AI lifecycle and future use.

“HHS has a significant role to play in strengthening American leadership in artificial intelligence,” Mek said in the playbook. “As we use AI to advance the health and wellbeing of the American people, we must maintain public trust by

ensuring that our solutions are ethical, effective and secure.”

The playbook highlights six principles that the agency should apply across “all phases of an AI project. They call on HHS’s AI to be fair and impartial, transparent and explainable, responsible and accountable, robust and reliable, safe and secure, and stewards of privacy.

From those principles, the playbook looks across the AI lifecycle, from initiation and conception through deployment and operational maintenance to underscore how to apply those principles across common and critical steps for AI adoption.



Oki Mek

Chief AI Officer, HHS

The playbook provides various use cases across various stages of the lifecycle to indicate how to apply the principles in steps like designing solutions and evaluating model risk factors. These use cases include automated medical document processing, AI for medical billing fraud detection, chatbots for customer service and more.

Mek hopes that this information the playbook provides will increase success rates of AI projects across HHS.

“As many studies have shown that about 85% of AI projects fail, the playbook helps guide the build of trustworthy AI and will help increase the success rates,” Mek said in a social media post announcing the HHS AI website and playbook. “To truly realize the benefits of AI, we must communicate, share and collaborate across the health sector. AI provides us with an immense instrument to keep the flame of intelligence glowing even brighter.”

With the playbook in place, HHS will focus on further collaboration and dialogue around AI in 2022.

These include:

- Cultivating the HHS AI community of practice
- Hosting further AI lunch and learn sessions for HHS personnel
- Standing up the HHS AI Council to execute the HHS AI strategy
- Expanding the playbook as needed to promote ethical and trustworthy AI
- Developing an AI use case inventory. 🌟

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Data Curation Vital in Applying Predictive Analytics to Patient Care

Successful AI and machine-learning capacities within health systems require a foundational attention to data quality and the broader care environment.

BY ADAM PATTERSON

To achieve the potential of predictive diagnostics through the use of artificial intelligence in health care systems, organizations must focus on data quality and curation.

Jonathan Weiner, co-director of the Johns Hopkins Center for Population Health IT, noted the importance of building machine-learning capacities atop the input of well-structured data for private and federal health care networks.

“High quality data in, high quality data out,” Weiner said. “Eighty-five percent of the issues in applying data to improving quality of care rest on effective data management and curation.”

While AI/ML capacities have shown demonstrable promise in areas such as predictive diagnostics, one of the most substantial challenges in applying patient information within these fields rests on finding means of standardizing health data, a quandary Weiner recognized is compounded by the fact that “most electronic health records are something like 50 to 60% free text.”

The push toward EHR standardization remains an ongoing project across all American health care networks, with Weiner saying “there is no health care



organization in the world that has completely solved the problem of EHR standardization.”

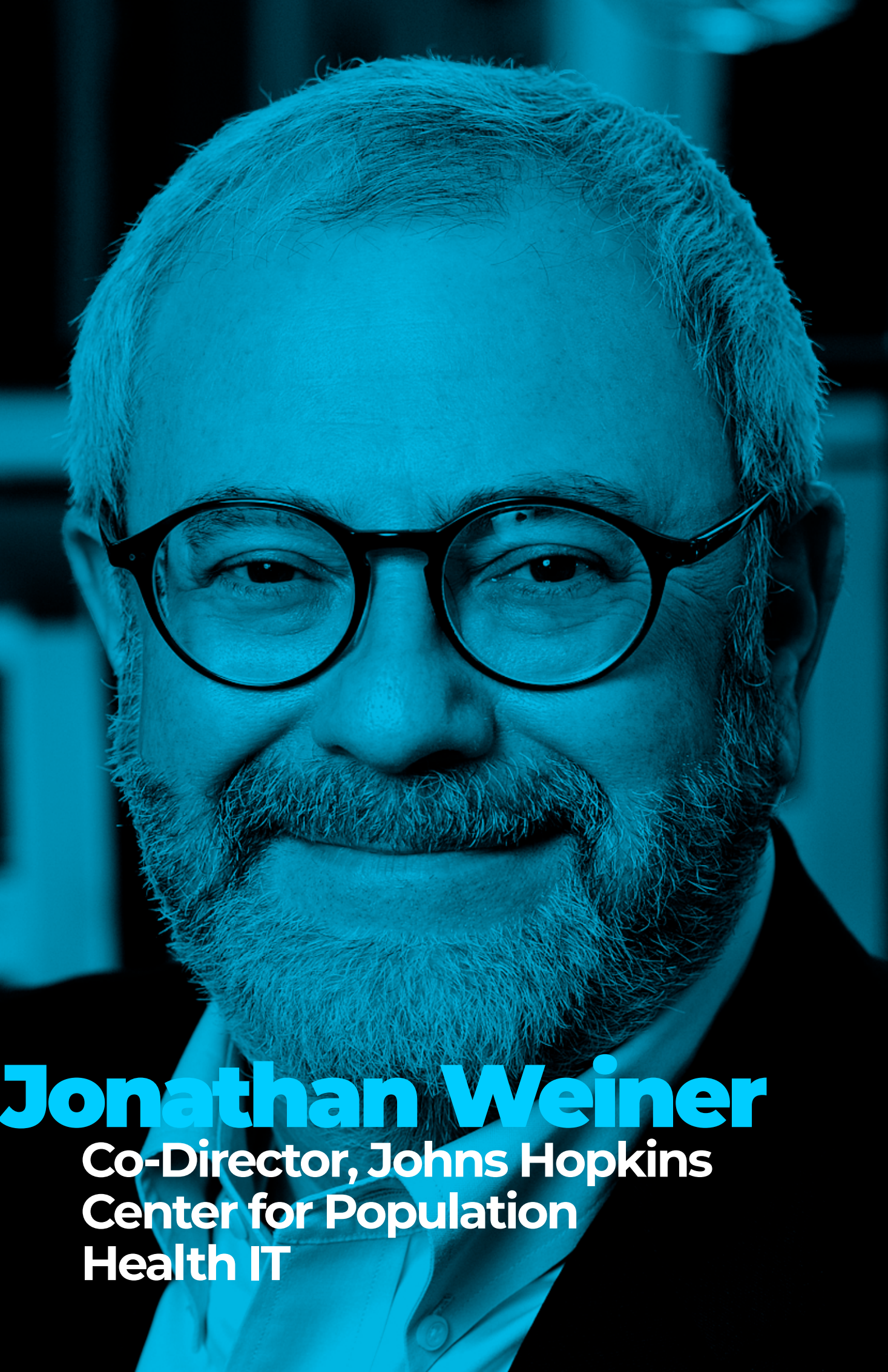
The application of machine-learning capacities to data standardization also requires the analytic methods and data sets used in their development be fundamentally sound.

“When analytics are good, adding machine learning on top of that will give you a modest benefit,” he said. “But if you don’t have clean or well-curated data and

just throw machine learning at it without those other steps, you’ll have a mess.”

Using machine-learning capacities to standardize data without these essential inputs results in a fundamentally ineffective process. “Only if you apply higher-order machine learning with a team that has already used those other necessary techniques will you start to see serious benefits,” Weiner said.

In terms of broader structural development necessary to streamline the delivery of health care, Weiner said the incorporation of AI and machine-learning techniques is merely one element of any comprehensive modernization program that can be used to improve health care delivery, rather than a process that



Jonathan Weiner
Co-Director, Johns Hopkins
Center for Population
Health IT

wholesale replaces the necessary human inputs.

“The essential purpose of any automating function is to save human input for tasks it would be best used for,” he said. “Most of the time when people say, ‘AI is better,’ what they mean is, ‘I can diagnose patients better, identify veterans who have poor continuity better.’ I have not found many studies where AI or machine learning is a significant improvement simply on its own.”

AI and machine-learning techniques are, therefore, best understood as an accessory to health care modernization and continuity of care. “ML and AI have to be taken within the broader data application and human-machine interface,” Weiner said.

He said this approach has been validated by research and analysis he has overseen at the Johns Hopkins Center for Population Health IT, with the ultimate value of digital modernization measured by its ability to provide improvements commensurate with changes in the broader health care environment.

“We need to remember that medical care has to be integrated within the broader health environment, including the social environment and the mental health sphere. Integrating medical records is one thing, but there are a whole array of human considerations that have to be incorporated as well,” he said. ✨

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HEALTHCAST

How AI, Data Are Boosting FDA's Regulatory Processes

The agency is working to improve workflows and ultimately ensure safety of the drugs and treatments it regulates.

Featuring: Arunan Skandarajah, FDA Presidential Innovation Fellow



The Food and Drug Administration is ramping up technology adoption, and prioritizing AI and data strategies to ensure safety of new interventions and medical devices, improve workflows and ultimately deliver on its public health mission. Arunan Skandarajah, an FDA Presidential Innovation Fellow who believes in the power of equitable digital tools, discusses how he is innovating FDA's regulatory processes to drive greater efficiencies.. 🌸

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