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Chairmen Guthrie and Hudson, Ranking Members Pallone and Matsui, and members of the Subcommittee, thank you for holding this important hearing and inviting me to appear before you today.

My name is Asad Ramzanali, and I'm the Director of Artificial Intelligence and Technology Policy at the Vanderbilt Policy Accelerator (VPA), a center at Vanderbilt University. I have fifteen years of experience working in the technology industry and in technology policy, including serving in the White House Office of Science and Technology Policy (OSTP). Prior to that role, I was a staffer here on Capitol Hill, both in the Senate and for a member of this Subcommittee. I started my career in Silicon Valley – first on the corporate strategy team at Intuit, then managing the Financial Solutions Lab, which invested in early-stage startups.

Summary

Well before chatbots, AI was in our lives, often playing a behind-the-scenes role in many of the daily interactions people have online. For the purposes of policy analysis, it is useful to think of AI as a technological stack with four layers: (1) business- and consumer-facing applications built on (2) AI models developed and accessed using (3) cloud computing data centers that use (4) high-performance AI-specialized chips. The data centers that host cloud computing require fiber-optic network connectivity, substantial energy, and cooling infrastructure (e.g., water).

American leadership in AI is critical to our geopolitical competition with the People's Republic of China (PRC). While many see this competition narrowly by focusing only on today's AI capabilities, to sustain long-term American leadership, we must have a strategy that centers on our historic technological advantages: substantial public investment in research and development (R&D), supporting startups, enabling all Americans to benefit from technology, and mitigating the societal harms of technology. Interesting AI R&D is emerging today that can improve efficiency for many areas of the Subcommittee's focus, such as spectrum sharing, next-generation 9-1-1, and radio access networks (RAN).

While AI is powerful, our country has a long history of using tried-and-tested policy tools to address the problems presented by powerful technologies. Today, many uses of AI cause or

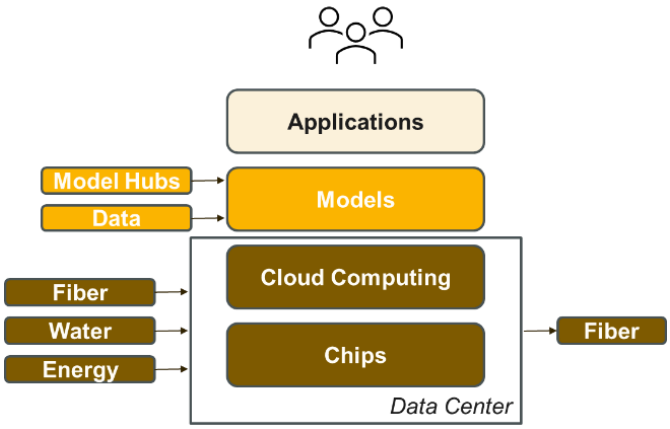
accelerate real-world harms, which sometimes violate existing laws and sometimes require new regulations. This is an area where states are making important progress. More will be needed by states and by Congress to mitigate harms to consumers and competition.

This Committee has been central to the American tradition of enabling important new industries based on powerful technologies to flourish while mitigating real-world harms through thoughtful bipartisan legislation. During the Second Industrial Revolution, it was this Committee that protected farmers and small businesses from real abuses by the powerful technology of that era, railroads. Congress should continue that tradition by encouraging the enforcement of current federal and state laws that may apply to AI, allowing states to remain the laboratories of democracy, and enacting new laws where gaps exist.

I. AI is Best Understood as a Technological Stack

Today's interactive chatbots that generate text, images, audio, video, and software code, along with those that promise 'agents,' have grabbed everyone's attention since the release of ChatGPT in 2022. However, AI has long been in our lives. AI enables voice assistants, mobile phone face-unlock, GPS driving directions, search engines, social media feeds, online shopping, targeted ads, bank fraud alerts, and spam email filters.[1] AI is also being used or has been used in ineffective, biased, or troubling ways in criminal justice and law enforcement,[2] especially involving facial recognition;[3] medicine;[4] financial services;[5] search engines;[6] social media feeds and ads;[7] surveillance;[8] robocalls;[9] and more.

I have found it helpful to break AI into its component parts, as depicted in the accompanying figure. AI is commonly described as a technological stack,[10] where the top layer represents an application that consumers or businesses use, and the bottom layers represent the physical infrastructure necessary to develop and use AI. The data centers that house the physical layers of the stack require high-capacity fiber connectivity for transferring data in from businesses and out to users. Businesses and consumers are only able to access the applications if they have access to high-speed internet, which has long been a key priority of this Subcommittee.



Like any model, this depiction is overly simplified. Many important inputs to AI are not illustrated, including a robust R&D ecosystem, an educated and capable workforce, a competitive marketplace, internet access, intellectual and creative content, a robust rule of law, and even a California state ban on noncompete agreements that enables startup formation.

This stack framework helps illustrate that each layer presents its own policy issues, which often have known policy solutions. For example, breaking down the chips layer into design and

fabrication (i.e., manufacturing), along with assembly, testing, and advanced packaging, revealed that semiconductor manufacturing was becoming highly concentrated in a precarious geography (i.e., Taiwan), leading Congress to use industrial policy tools and pass the bipartisan CHIPS Act.[11]

II. America Must Maintain its Lead

American global leadership has long depended on maintaining a technological advantage, and this remains true today for AI in our geopolitical competition with the PRC.[12] Some view American leadership in narrowly in the context of today's AI, recommending increasingly large-scale versions of today's AI models, which means building ever more energy-consuming data centers, often with the aid of government support. However, I urge you to pay attention to the larger picture for maintaining American leadership in AI, which requires (A) investment in R&D, (B) supporting startups, and (C) enabling all Americans to benefit from AI.

A. Investment in R&D

Today's private sector advances in AI build on a history of R&D funded by American taxpayers. From the 1960s onward, federal agencies funded R&D[13] in what now serves as the foundation for modern AI. This research became useful as the three inputs to AI became increasingly available: computer processing power (i.e., compute), digitized data, and advanced algorithms.[14] Government R&D funding also played key roles in other technologies critical to AI, including advanced semiconductor technologies, GPS, the internet, and smartphones.[15]

Unfortunately, the U.S. is now decreasing overall federal R&D funding, with AI R&D funding being far from where it needs to be, while at the same time the PRC is increasing its investments. Last year, the PRC announced a 10% increase in public funding for R&D[16] while the U.S. decreased non-defense federal R&D by the same amount.[17] This year, science agencies and the universities they fund are experiencing even more damaging cuts, and the proposals for next year are more severe.[18] For AI R&D specifically, in fiscal year 2024, the federal government invested $3 billion in AI R&D,[19] though some recommend an order of magnitude more.[20]

In addition to the amount of spending, *how* the federal government invests in R&D matters. Some parts of AI R&D show early promise but are fundamentally aimed at public missions, beyond market incentives. For example, last June, OSTP hosted AI Aspirations, a conference to show several big visions for how AI can be used toward public missions, such as rapid development of therapeutics, development and delivery of individualized education, and enabling more accurate and granular weather predictions.[21]

Publicly funded, shared resources for compute and data can significantly accelerate AI R&D. Part of what makes AI R&D difficult outside of a few well-capitalized companies is the cost of developing and using large AI models. Even the largest American universities lack the resources to make the investments necessary for AI research demands.[22] A solution for this problem is the National AI Research Resource (NAIRR),[23] which is operating as a small-scale pilot at the National Science Foundation and is an example of a trend of countries investing in public AI.[24]

Beyond investing in research, we need to attract and foster the best and brightest to research and develop AI in the U.S. This means growing talent domestically by strengthening universities and recruiting and retaining the best minds from across the world. Today's generative AI is based on the transformer model (the 'T' in GPT), first introduced in a technical paper in 2017.[25] The eight researchers who authored the paper were working in the U.S. for an American company, but six were born outside the U.S. and the other two are children of immigrants.[26] A recent analysis shows that 60% of the top AI startups in the U.S. have at least one immigrant founder,[27] with 70% of those founders originally coming to the U.S. on student visas.[28] Recent immigration actions risk hurting AI R&D supremacy and causing a "brain drain" of scientists.[29]

In the domain of this Subcommittee, the telecommunications sector is seeing interesting and important uses of AI that deserve attention. While these may not be ready for full-scale deployment, the following are some of the areas worthy of the Subcommittee's attention:

- **Spectrum –** Modern life depends upon spectrum, and ways to make more efficient use of the fundamentally limited public resource are important. AI systems trained on unstructured radiofrequency data are showing early promise for being able to detect interference more quickly, potentially enabling more effective dynamic spectrum sharing. In the context of national security, these systems may be able to better detect spectrum jamming.[30] As part of its Public Wireless Supply Chain Innovation Fund, which this Subcommittee helped establish in a bipartisan fashion, the NTIA recently awarded a grant for research into this area.[31]

- **Next-Gen 9-1-1 –** Access to 9-1-1 is essential for public safety, and AI may be able to bolster capabilities for next-generation 9-1-1. Two interesting use cases include the use of rapid translation systems to enable support for non-English callers, and using analytics from call metadata to pinpoint potential natural disaster locations.[32]

- **RAN** – The radio access network (RAN) is part of the core wireless infrastructure that enables mobile connectivity. Some American and European companies have started integrating AI in their RAN offerings with the aim of improving performance and efficiency. Critically, Huawei and China Mobile are also making progress on this front.[33]

B. Supporting Competition from Startups

Today's tech giants were originally able to take root and grow thanks to an earlier generation of pro-competition policies[34] and are now dominating their sectors and stifling emerging competition. We too often see concentration and vertical integration across every layer of the AI tech stack. For example, three companies – Amazon, Microsoft, and Google – now control two-thirds of the cloud computing market by revenue.[35] They play roles up and down the stack: Each designs its own chips, develops AI models, and controls key applications.[36] To further complicate matters, these companies use investments, exclusivity agreements, and revenue sharing partnerships to further vertically integrate and maintain moats around their businesses.[37] To model developers, cloud companies are simultaneously their suppliers, investors, customers, and competitors. This leads to documented cases of self-preferencing, such as cloud providers

prioritizing compute for large companies in which they invest over smaller startups.[38] As I suggest later, pro-competition policies can aid in mitigating these impacts.

C. Increasing AI Access and Adoption for All Americans

Finally, AI's power and usefulness will be fundamentally limited if all Americans are not able to access applications that use AI. This Subcommittee has long led the charge for increasing access to and adoption of broadband. As mentioned earlier, AI systems are computers that connect to the world via fiber connections to the public internet, and which end-users access from their at-home or mobile internet connections. If all Americans do not have high-speed internet, we will exacerbate the digital divide. The Broadband Equity, Access, and Deployment (BEAD) and Digital Equity programs that this Subcommittee included in the bipartisan Infrastructure Investment and Jobs Act are important steps to close the digital divide, particularly in rural areas. Implementation of the former is paused, while the latter has been permanently halted.[39]

III. AI is a Normal Technology that Needs Normal Regulation

AI is powerful technology, but it is fundamentally a "normal" technology, in contrast to the utopian and dystopian science-fiction futures often debated, as computer scientists Arvind Narayanan and Sayash Kapoor write.[40] They discuss AI's normality as a description of today's technology, a prediction of its future development, and a prescription for societal responses. This simple idea is important because it shows that today's public policy problems can have normal, well-known public policy solutions.

This Committee has been central to the American tradition of enabling powerful industries to flourish while passing thoughtful bipartisan regulations to mitigate real-world harms. This is a tradition that should continue by encouraging the enforcement of current federal and state laws that may apply to AI, allowing states to remain the laboratories of democracy, and enacting new laws where gaps exist.

A. Real-World Harms to Real People

In many instances, current laws can be used to deal with AI-caused or AI-accelerated harms. As leaders of 10 federal agencies explained last year, "Existing legal authorities apply to the use of automated systems and innovative new technologies just as they apply to other practices."[41] Put more plainly, "There is no AI exemption to the laws on the books."[42] As an example of this idea, the Federal Communications Commission (FCC) ruled that the Telephone Consumer Protection Act of 1991 applies when robocalls and robotexts are generated using AI,[43] and the FCC brought an enforcement action against a company that transmitted a spoofed call using generative AI voice cloning.[44] Other federal agencies have gone after fake "robot lawyers" that bilked consumers of millions, tools generating false product reviews, an algorithmic pricing scheme that harmed millions, and more.[45] States are using existing laws too. For example, the State of Texas sued a healthcare AI company that made deceptive claims about the accuracy of its AI tool and a large insurance company using surveillance-based pricing algorithms.[46]

However, some AI-caused or AI-accelerated harms require new regulations, and states have taken the lead on this front.[47] Many commenters have lamented the hundreds of state AI bills, but it is worth noting that actual state laws do things like require basic transparency, prevent scams, and protect renters from algorithmic predatory pricing, according to dozens of state attorneys general.[48] States have also taken the lead in passing privacy laws that begin offering some protections in a world of increasing private surveillance.[49] The need for privacy protections will only increase as chatbots and other AI tools become more personalized and invasive.[50]

Finally, the harms to children from the use of screens, social media, and other addictive technologies are worsening with AI. While some question the robustness of the evidence to develop a causal link between technology use and harm to children, the former Surgeon General described it well when he said that "in an emergency, you don't have the luxury to wait for perfect information."[51] These issues are accelerating as AI is increasingly intertwined with tools kids use and as we see new applications directed to children, like companion chatbots designed by companies like Meta that have problematic histories of building tools that harm children.[52]

The state AI law moratorium recently passed by the House would wipe away guardrails protecting real people from real harms, not to mention its unintended consequences.[53] If passed, the provision would strip millions of Americans of rights promised to them by state lawmakers. Notably, eight out of ten voters opposed this measure in a poll conducted last week.[54]

B. Harm to Competition

Market concentration and anticompetitive behaviors across layers of the AI stack are impeding competition from startups, and again we have known solutions and tools to address these problems. The House Antitrust Subcommittee investigated the concentration of digital markets,[55] and passed six bipartisan pro-competition bills that remedy issues it uncovered.[56] Recently, Garry Tan, who leads the startup accelerator Y Combinator, testified before the Senate Antitrust Subcommittee supporting three of these policies: (1) mandating access to application programming interfaces (APIs), (2) requiring interoperability, and (3) restricting self-preferencing.[57] Beyond these, Ganesh Sitaraman, my colleague at VPA, and Tejas Narechania published a useful inventory of pro-competition AI policies Congress should consider.[58]

C. This Committee has a Storied, Bipartisan History of Regulating Powerful Technologies

One instructive parallel for thinking about AI is looking back at the Second Industrial Revolution of the late 19th and early 20th Century. That era had its own tech stack: coal at the bottom (analogous to chips), followed by railroads (analogous to cloud computing), industrial plants (analogous to AI models), and mass manufactured goods (analogous to applications). Railroads were a powerful technology that fundamentally changed the American geography, industry, and society. This tech stack presented policy problems that Congress solved through bipartisan laws.

After decades of government support – in the form of land, funding, and even reduced liability standards – railroads expanded across the U.S. in the mid-1800s. In 1867, farmers, small business owners, and others organized as part of the Grange movement and effectively advocated

for states to pass laws that prohibited the pricing discrimination that was rampant (e.g., railroads charging more for short-haul shipments than long-haul ones). After courts struck down state laws, Congress outlawed pricing discrimination and other anticompetitive practices, based on state laws in 1887. It created the Interstate Commerce Commission (ICC) as the first major independent regulatory commission, which became the template for the FCC, FTC, and others.[59]

The problems later included vertical integration. By 1900, six railroad companies had captured 90% of the anthracite coal market.[60] In 1906, Congress passed the Hepburn Act, which further empowered the ICC and required rail companies to divest their coal holdings,[61] followed by laws prohibiting rail companies from owning steamboat companies in 1912[62] and trucking companies in 1940[63]. Like today's AI companies, railroad companies comprised a powerful industry led by powerful barons who had strong negative reactions to regulations. Ultimately, Congress re-established democratic governance over the industry and enabled fair competition, equitable pricing and terms for farmers and small businesses, diverse and plentiful goods for consumers, and a rebalancing of power in America.

The parallels between the history of railroads and today's tech and AI industry are manifold: an industry grows based on government funding, powerful technology changes many aspects of society, legal liability is softened, and state regulation passes before federal. The next step in the journey, applied to our current situation, is Congress passing bipartisan AI regulations.

Critically, it was not just Congress generally that regulated railroads. As you all know, this Committee was created in 1795 and is the oldest continuous Committee in the House of Representatives.[64] It was specifically this Committee that drafted, debated, and passed bipartisan legislation to regulate the railroads, and later telegraph, radio, telephone, and so many other industries based on powerful technologies. The Hepburn Act is named for Col. William P. Hepburn, a Republican representing Iowa's Eighth Congressional District in the U.S. House of Representatives from 1881 to 1887 and again from 1893 to 1909, who drafted the legislation when he served on this Committee.[65]

The lesson from this story is simple: This Committee has a long history of bipartisan, sector-specific laws to mitigate harms and restore fairness.

IV. Conclusion

I urge Congress to take actions to bolster American leadership in AI based on proven tools that have given the U.S. a technological advantage historically: (1) substantial public investment in R&D, (2) supporting startups, (3) enabling all Americans to benefit from technology, and (4) mitigating the harms of AI. Harms are best mitigated through the great American tradition of regulated capitalism, in which this Committee plays a leading role. Congress should (1) encourage the enforcement of current federal and state laws that may apply to AI companies, (2) allow states to continue their role as the laboratories of democracy, and (3) enact new laws where gaps exist.

I once again thank this Subcommittee for holding this important hearing and inviting me to testify, and I look forward to your questions.

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