Bolstering U.S. AI Superiority

Targeted Investments for National Defense and Global Competitiveness

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In recent years, the competition between the U.S. and China to dominate artificial intelligence (AI) has captured the attention of policymakers, business leaders, and security experts. Much of the debate focuses on government spending because China's government investment has surged dramatically. Following last fall's Senate AI Insight Forum series, Senate Majority Leader Chuck Schumer stated at the roll-out of his proposed $32 billion AI roadmap that if China is "going to invest $50 billion, and we're going to invest in nothing, they'll inevitably get ahead of us."[1] However, this perspective can be misleading because it often overlooks the significant role of the U.S. private sector, which outpaces China in R&D funding. For example, from 2013 to 2022, Chinese startups raised $523 billion in venture capital, with $82 billion specifically allocated to AI, while U.S. startups secured over $1 trillion, with $213 billion directed to AI.[2] While increasing government spending indiscriminately won't necessarily strengthen U.S. AI leadership, strategic and well-targeted public investments, in collaboration with the private sector, can.

To maximize impact, Congress should view AI investment through the lens of the AI triad—data, algorithms, and compute.[3] These are the critical components that underpin AI innovation, and addressing gaps in each area will require nuanced government investments that go beyond R&D alone. In this context, realistic and strategic investments made by the U.S. Congress in its 119th session, starting in January, could significantly bolster American leadership in AI.

Data: Creating a National AI-Ready Data Architecture

Data is the lifeblood of AI systems, yet access to high-quality, labeled, and AI-ready data remains a major challenge. While the private sector holds vast amounts of valuable data, much of it is siloed and inaccessible, especially in industries where there are few incentives for data sharing. Government action is critical to overcome these barriers and create national data-sharing frameworks that support AI innovation, particularly in sectors where market forces alone won't suffice.

One important initiative Congress could consider is the establishment of a National AI Data Infrastructure Fund. This could provide grants and subsidies to industries like healthcare, agriculture, and energy, incentivizing the creation and sharing of labeled datasets. For instance, in public health, federal investments could support the aggregation of patient data, in compliance with privacy laws, to improve AI-driven healthcare solutions. According to estimates by the Brookings Institution, creating an AI-ready data architecture on a national scale could require initial investments of around $1-2 billion over five years, with ongoing costs to maintain and update datasets.[4] This infrastructure would be invaluable for areas like climate research, where more accessible and high-quality data could accelerate solutions for mitigating climate change.

Moreover, Congress could take a lead in forming public-private partnerships to standardize data collection and labeling procedures, ensuring that datasets are interoperable and useful across different sectors. This would not only foster innovation but also create a level playing field for smaller AI startups that currently lack access to the data resources of tech giants like Google and Microsoft.

Algorithms: Testing and Evaluation for National Defense and Government-Specific Models

In the context of national defense, the development and testing of AI algorithms present unique challenges. Military applications often require specialized AI systems that operate in high-risk environments where failure is not an option. Consequently, rigorous testing and evaluation of these systems, particularly when used in autonomous or semi-autonomous operations, is vital. Unlike commercial AI models designed for broad consumer use, AI systems intended for defense often lack a commercial market and therefore depend heavily on government investment.

Congress should prioritize funding for AI testing and evaluation centers specifically dedicated to military systems. These centers could simulate battlefield conditions to rigorously test autonomous drones, surveillance systems, and other AI-driven military applications. Such facilities could also ensure that these AI systems meet stringent safety, security, and ethical standards before being deployed. Congress should conduct a study to determine the cost of developing comprehensive AI testing and validation infrastructure for defense systems and swiftly authorize and appropriate the funding.

Additionally, there is a need for AI models tailored specifically to the military and government sectors, where commercial off-the-shelf solutions may not be sufficient. For instance, AI systems designed to detect cyber threats, analyze satellite imagery, or enhance logistics in combat zones must address unique operational constraints, such as limited data connectivity, real-time decision-making, and integration with legacy systems. These models may not generate immediate commercial returns, yet they are critical to national security.

To address this, Congress could allocate funds to develop government-specific AI models in collaboration with defense contractors and national labs. The Department of Energy's Frontiers in Artificial Intelligence for Science, Security and Technology (FASST) initiative is an ideal first step. The goal of the FASST initiative is to leverage all seventeen of DOE's national laboratories to deliver key assets to advance national security, attract and build a talented workforce, harness AI for scientific discovery, and conduct government-specific R&D where there is a lack of commercial interests.[5] Current bipartisan legislation would authorize $2.4 billion annually for five years for the FASST initiative.

AI talent is key to maintaining leadership in the algorithm leg of the AI triad. Many of the brightest minds in AI and machine learning come from international backgrounds. However, current U.S. immigration policies make it difficult for highly skilled professionals to obtain visas and permanent residency, forcing many to seek opportunities elsewhere. Reforming high-skilled immigration programs, such as expanding the H-1B visa cap or offering new visa categories specific to AI researchers and engineers, would enable the U.S. to retain top talent.

Compute: Energy-Efficient Data Centers and Secure AI Hardware

The computational power needed for AI continues to grow exponentially, with large-scale models requiring vast amounts of energy and advanced infrastructure to operate. According to a report by OpenAI, the compute required for state-of-the-art AI models has increased by a factor of 300,000 over the past decade.[6] This rising demand for compute power poses challenges in terms of both cost and energy consumption, areas where the government can play a key role.

Federal investment could incentivize the development of AI-optimized, energy-efficient data centers. By offering tax incentives or direct grants for the construction of green data centers that use renewable energy and efficient cooling technologies, Congress could help mitigate the environmental impact of AI development. These next-generation

data centers would lower the cost of AI computation and reduce the carbon footprint of AI research. The cost of building such facilities is significant; estimates for the construction of a large-scale data center range from $400 to $700 million.

Another critical area for investment is on-chip governance. AI hardware, especially specialized chips like graphics processing units (GPUs) and tensor processing units (TPUs), plays a pivotal role in AI computation.[7] However, ensuring the security and resilience of this hardware is vital to national security. Malicious actors could exploit vulnerabilities in AI chips for cyberattacks, espionage, or manipulation. Congress should allocate funding for R&D into secure AI hardware. This would include developing tamper-resistant chips and creating governance frameworks for ensuring that AI hardware is both safe and reliable.

Conclusion

The U.S. can reclaim its leadership in AI, but this will require more than just increased government spending. A strategic, targeted approach, centered on the AI triad of data, algorithms, and compute, is necessary to ensure that the U.S. remains at the forefront of AI innovation. In the 119th Congress, key investments in national data architectures, algorithmic testing, and energy-efficient AI infrastructure could provide the U.S. with a competitive edge in the global AI race. Targeted and precise investments, rather than a large lump sum for generic R&D funding, are realistic and impactful commitments that Congress can make to bolster U.S. leadership.

Moreover, these investments will ensure that AI development aligns with democratic values, prioritizing transparency, fairness, and security. By leveraging public-private partnerships and focusing on strategic areas where government intervention is most needed, the U.S. can build an AI ecosystem that is innovative, equitable, and globally competitive.

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