Canvasing Variations in US-South Korea Cooperation on AI and Quantum Technology

By Sanghyun Han

Introduction

The rapid development of AI technologies, exemplified by innovations like ChatGPT, has turned emerging technologies into critical instruments for states seeking to gain a competitive edge. As noted in the 2022 US National Security Strategy, "[t]echnology is central to today's geopolitical competition and to the future of our national security, economy, and democracy."[1] As a result, the notion of technology competition has become pervasive, with maintaining technological leadership now a key national objective. This competition spans both military and economic spheres, prompting governments to employ various tools—such as industrial policies—to either maintain or catch up with technological advancements. This dynamic is particularly evident in the US-China relationship, where competition over emerging technologies has become increasingly pronounced.

While technology is often seen as a tool of competition, it is equally a means of cooperation and collaboration. The complexity of global innovation ecosystems ensures that even in highly competitive fields, states must engage in partnerships and regulatory coordination to manage shared technological advances responsibly. Despite efforts by states to achieve self-sufficiency in critical technologies, the global value chain makes it virtually impossible for a single state to develop entire technological ecosystems independently. While some states strive for autarky in areas crucial to their security, full self-reliance remains impractical. This interconnectedness drives states to implement regulatory policies, such as export controls and lists of critical and emerging technologies, to limit the unintended diffusion of sensitive knowledge and research. However, the requirements for coordinating multilateral approaches highlight the challenges of any single state maintaining predominant influence over technologies, emphasizing the necessity of international cooperation in technology regulation.

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Before presenting an analysis of AI and quantum technology cooperation between the United States and South Korea, or the Republic of Korea (ROK), two key points need clarification. First, technology cooperation refers to collaborative efforts between two governments, including administrative bureaus focused on a specific technology, and cooperation involves adjusting and coordinating policies to achieve mutual objectives.[2] Therefore, technology cooperation, as defined here, emphasizes joint efforts between governments in pursuit of shared goals to develop and cultivate certain technologies. Under this approach, private sector-led cooperation or partnerships between a national government and private firms from another state are not included as a type of technology cooperation unless these initiatives are elevated or strongly endorsed by both governments. This is not to suggest that private sector-driven technology cooperation is insignificant or lacking in importance, but this distinction ensures that this article's analysis focuses on official state-level interactions and their alignment with national objectives rather than purely private-sector engagements.

Second, the data used in this article serves as a proxy indicator to measure technology competency, but it is neither comprehensive nor robust enough for a definitive analysis. These sources primarily assess technology capacities by focusing on research metrics, such as citation impact, researcher affiliations, and even LinkedIn-listed skillsets. For example, the OECD AI Policy Observatory measures AI human resources by counting LinkedIn profiles that list AI engineering and AI literacy as skills. Similarly, the Emerging Technology Observatory's Country Activity Tracker data tracks contributing authors' affiliations, using higher citation counts to avoid duplication.[3] While useful for identifying comparative technical advantages, these indicators have limitations. They often overlook critical factors like regulatory frameworks, infrastructure, human resources, and education systems, which are essential for a holistic understanding of technological capacity. Despite these limitations, the data provides valuable insights into the comparative strengths of different states in emerging technologies.

This article outlines the current landscape of technology competencies in AI and quantum technologies in the United States and South Korea while providing a brief introduction to each technology and examining trends in bilateral cooperation in these fields. While building domestic technological capabilities through policy initiatives and infrastructure offers significant potential and leverage for technology cooperation, this article focuses on bilateral cooperation rather than unilateral efforts to illustrate the landscape of technology collaboration between the United States and South Korea. In AI, the United States holds a dominant leadership position, while South Korea demonstrates strengths in certain areas, though not across the board. Cooperation in AI primarily focuses on standardization efforts, with significant involvement of the South Korean government in partnership with the US private sector, as well as private-sector-led bilateral research initiatives. In contrast, South Korea's capabilities in quantum technologies are far more limited. Nevertheless, cooperation in this domain is largely centered on research collaboration, with both governments actively participating alongside international research consortia led by the United States. The differing focuses—standardization in AI and research collaboration in quantum technologies—reflect the respective strengths and needs of the two countries in these critical fields. Emphasizing the necessity to secure competent human resources based on both states' environments, this article offers policy recommendations to enhance technology cooperation between the United States and South Korea, from expanding research collaboration to adopting multilateral approaches through existing and new initiatives.

Artificial Intelligence

What is AI?

Generally speaking, AI is "a set of technologies that enable computers to perform a variety of advanced functions," imitating the way a human mind thinks and makes a decision.[4] Similar to how neurons in the human brain transmit stimuli through synapses, artificial neural networks mimic this structure to transform information from input to output layers. While definitions of AI vary, they typically center on three components: data, algorithms, and computing capacity.[5] Data serves as the foundation for analysis, while algorithms, consisting of a series of defined steps, guide the machine in achieving specific objectives. Essential to this process is computing capacity, as greater and faster processing capabilities allow AI to handle more sophisticated tasks.[6] A notable example of contemporary AI is large-language models like OpenAI's ChatGPT, which generate responses to prompts based on extensive training data.

AI's ability to analyze vast amounts of data and support decision-making with accuracy makes it an adaptable and foundational technology across various fields. In this sense, AI is anticipated to bring significant transformation to society and the global community, leading to its application across various fields. Private sector entities such as Bloomberg and JP Morgan, as well as the US government, including the Department of Homeland Security, have developed or adopted AI-powered models. Notably, the Joe Biden administration has committed to integrating AI technologies into national security activities, signaling an increase in government adoption and usage.[7]

Technology Competency

Both the United States and South Korea possess significant capabilities in AI technologies, though the United States has a clear advantage. In July, the ROK Ministry of Science and ICT (MSIT) published the *Global R&D Strategic Map*, which assessed technological advancements, research output, and commercialization stages across various countries.[8] The United States was found to dominate in all AI-related disciplines while South Korea ranked fifth or sixth in four different sectors—AI infrastructure, AI modeling and decision-making, safe and trustworthy AI, and innovative AI—among 12 countries. Notably, the gap between the United States and South Korea in terms of AI capacity ranged from four to nine times, with China ranking second in all categories but still trailing significantly behind the United States. This suggests that while the United States is the undisputed leader in AI, other countries, including South Korea, occupy limited but relatively robust capacity compared to the top two players, the United States and China.

Similarly, according to the *Top-Ranked AI Nations* (TRAIN) Scorecard, published by Tufts University's Digital Planet project, South Korea ranks ninth out of 25 leading AI nations, while the United States holds the top spot, followed by China.[9] South Korea's strengths lie in data and capital drivers for AI technology, highlighting the country's ability to generate vast, complex datasets and its resources in terms of human capital, financial investments, and computational capacity. However, South Korea scores lower in areas related to rules and innovation, reflecting strong digital infrastructure but limited research output and administrative support in the form of stringent regulatory policies and privacy protections. Furthermore, data from the *Country Activity Tracker for AI* (CAT-AI) shows that US researchers collaborate most frequently with China, while South Korea ranks seventh in collaborations with the United States, whereas the United States is South Korea's top research partner in AI.[10] While both countries possess AI technology competencies, South Korea's capabilities are relatively lower than those of the United States, which is likely to influence the dynamics of their collaboration.

AI Technology Cooperation

When Washington and Seoul opened a "new chapter" of their alliance in 2021, it marked the first time that AI was recognized in a joint statement as part of emerging technologies.[11] During South Korean President Yoon Suk-yeol's first visit to Washington, DC, in 2022, AI was again mentioned in the joint statement, emphasizing the need for "public and private cooperation to protect and promote critical and emerging technologies."[12] Despite sporadic cooperation in the private sector driven by industrial demand, which will be discussed in the following section, national-level AI cooperation remains relatively late and limited.

The principle of AI cooperation was also articulated in the joint statement among the United States, South Korea, and Japan at Camp David in August 2023. The leaders recognized AI as “a transformative technology” and agreed to facilitate international governance and develop safe, secure, and trustworthy AI.[13] Publishing such a joint statement requires extensive negotiation, which suggests that AI cooperation—at least for these three countries—focuses on building international governance and ensuring safety and trust in AI. This broad direction was reiterated in the follow-up U.S.-ROK Information and Communications Technology (ICT) Policy Forum led by US Ambassador at Large for Cyberspace and Digital Policy Nathaniel Fick and ROK Vice Minister of Science and ICT Yun-Kyu Park. They reaffirmed an “inclusive approach to developing AI governance that supports the development of trustworthy AI” and highlighted the “need for global discussions on principles” to address challenges posed by emerging technologies.[14]

The inaugural U.S.-ROK Next Generation Critical and Emerging Technologies (CET) Dialogue in December 2023 included a section titled “AI and Standards,” announcing the launch of a bilateral AI working group to develop international standards, advance joint research, and foster interoperability in AI policies.[15] The dialogue also called for a rapid conclusion of the Memorandum of Understanding (MOU) between the US National Institute of Standards and Technology (NIST) and the Korean Agency for Technology and Standards (KATS), both responsible for technological standardization.

AI cooperation on standardization culminated in the 2024 U.S.-Korea Standards Forum, where national standard development organizations signed an MOU to share strategies for emerging technologies and exchange knowledge.[16] Both the United States and South Korea play crucial roles in AI standard setting. The American National Standards Institute (ANSI) serves as the secretariat for the International Organization for Standardization/International Electrotechnical Commission’s Joint Technical Committee 1/Subcommittee 42 (ISO/IEC JTC 1/SC 42), the first international body to establish AI standards, while KATS hosted the most recent plenary session of SC 42 in April 2024. Additionally, SC 42 approved ISO/IEC 5259-1:2024, focusing on data quality assessment, a standard led primarily by South Korea.[17] While this particular standard may not result directly from bilateral cooperation, the active participation of both states in the subcommittee and their ongoing communication through various channels is likely to facilitate the process of standardization.

National-level technology collaboration is still in its early stages. Beyond bilateral cooperation, a notable initiative began in December 2023, when the United States, South Korea, and Japan agreed on a trilateral framework for CETs based on "mutual benefit, equality, and reciprocity."[18] This initiative was formalized in April 2024, with representatives from the three countries signing a memorandum of cooperation (MOC) involving three US national laboratories (Los Alamos, Sandia, and Lawrence Livermore).[19] According to a press briefing by MSIT, the joint steering committee will prioritize suggestions from experts in the three countries, focusing on human resource exchange, the use of national research facilities, information sharing, and joint research. While this initiative underlines the importance of joint research and development (R&D) among the three countries, details such as the specific technologies for cooperation or the approach to joint research remain unclear. The briefing also indicated that discussions are ongoing, with no concrete timeline or specific technologies decided yet.[20] Although it is premature to conclude that technology collaboration is a lower priority than AI standardization, the latter appears to be more active and well-established between the United States and South Korea.

In addition to AI standardization efforts, both countries emphasize leading international discussions and hosting forums. For instance, the United States announced the Political Declaration on Responsible Military Use of Artificial Intelligence and Autonomy, while South Korea co-hosted a series of AI summits with the United Kingdom and the Responsible Artificial Intelligence in the Military Domain (REAIM) Summit, which stems from the US-led declaration.[21] While these initiatives focus more on normative approaches than standardization, they share the common goal of fostering dialogue and cooperation among multiple states. The earlier a state participates in such discussions, the better positioned it is to influence the global agenda and shape emerging norms. By initiating international norms, both the United States and South Korea align their efforts with broader technology cooperation, prioritizing these discussions as a way to influence global standards over direct technological development.

Another form of technology cooperation is the South Korean government's support for the US private sector. The ROK Ministry of Trade, Industry and Energy (MOTIE) established the Korea AI and System IC Innovation Center in San Jose, California, in September to promote collaboration between the United States and South Korea, focusing on AI-advanced semiconductors. Five US firms are currently based in the center and receive support from MOTIE.[22] Additionally, MOTIE announced an investment of USD 505 million over five years to fund 45 projects through Global Industrial Technology Cooperation Centers (GITCC). These centers, in partnership with prominent research universities, aim to accelerate joint R&D, facilitate expert exchanges, and secure and internalize original technologies.[23]

A more advanced cooperative initiative is the Global AI Frontier Lab in New York, jointly funded by MSIT (USD 33.8 million) and NYU (USD 31.5 million). This lab is part of the broader ROK Institutions-NYU AI and Digital Partnership, which also established research collaborations with the Korea Advanced Institute of Science and Technology (KAIST). Based on a memorandum of agreement signed in May 2024, the initiative will focus on fundamental, convergent, and responsible AI research over a six-year term.[24] While the Korea AI and System IC Innovation Center provides financial and administrative support to firms, the Global AI Frontier Lab exemplifies collaborative technology development. The specifics of joint research will be determined by a selection committee, but the existing 12 joint projects between KAIST and NYU outline the nature of this collaboration.[25]

Despite the early stage of AI technology and its implications for cooperation, US-South Korea AI collaboration emphasizes the development of international standards for secure and trustworthy AI, while joint practical technology development remains limited. This approach was highlighted during the first AI working group session in May, led by Acting Special Envoy for Critical and Emerging Technology Seth Center. The meeting covered key topics such as South Korea's hosting of international AI summits, AI standards, policy interoperability, and global governance.[26] While research collaboration was mentioned, the emphasis remains on standardization and multilateral engagement rather than direct joint development. Current government-led AI initiatives lack detailed bilateral research engagement, with much of the cooperation focusing on the South Korean government partnering with US universities rather than fostering comprehensive government-to-government collaboration. Further advancements in AI cooperation are anticipated, but the existing framework remains primarily focused on standardization rather than on direct technology development.

Quantum Technology

What is Quantum Technology?

Quantum technology, which encompasses the application of quantum physics principles, has diverse applications across various fields. Quantum information science, focusing on technical applications in information technology, is defined in the 2018 National Quantum Initiative Act as "the use of the laws of quantum physics for the storage, transmission, manipulation, computing, or measurement of information."[27] Additionally, quantum technology can be applied in areas such as encryption, communications, optics, sensing, and materials.

The three key areas of quantum technology are computing, sensing, and communication. Quantum computing transforms conventional binary bits, represented as 0 or 1, into quantum bits (qubits), allowing these bits to exist in superposition, which significantly enhances computational capacity and efficiency. This increased capacity enables private sectors to calculate vast combinations and possibilities. For example, manufacturers such as Volkswagen and Airbus use quantum computing to evaluate optimal chemical compositions for electric vehicle batteries or the most efficient flight paths.[28] Second, quantum sensing leverages the sensitivity of quantum states to environmental changes, enabling high-resolution and precise measurements. Atomic clocks, for instance, use quantum transitions in atoms to provide highly accurate time measurement, which is essential for applications requiring precise synchronization, such as satellite navigation and energy network management.[29] Quantum communication enables faster and more secure data transmissions. In this method, the key for decrypting data is generated by qubits, ensuring virtually unbreakable security against hacking attempts. One prominent application of this technology is quantum key distribution, which supports secure communication by leveraging the principles of quantum mechanics.[30]

In addition to economic opportunities in the private sector, quantum technology's broad range of applications has drawn significant interest from national security sectors, particularly for its potential in military and security affairs.[31] Quantum computing can enhance computational capacity, enabling militaries to optimize logistical routes and simulate complex tactical scenarios. Meanwhile, quantum communication and sensing are vital for secure data transmission and accurate environmental detection, making them essential capabilities for national security.

Technology Competency

The global landscape for quantum technology differs significantly from that of AI, with South Korea demonstrating marginal capacity in quantum technologies. According to MSIT analysis, the country ranks last in all key quantum disciplines—quantum computing, quantum communication, and quantum sensing.[32] This is in stark contrast to South Korea's stronger performance in AI technologies. Furthermore, the United Kingdom's quantum strategic document highlights that South Korea is not particularly specialized in quantum technology, as evidenced by its relatively low international patent activity in this field.[33] This limited capacity is also reflected in the Australian Strategic Policy Institute's Critical Technology Tracker (CTR), which further underscores South Korea's weak position in the global quantum technology landscape.[34]

US and Chinese leadership in quantum technology present a perplexing picture, with varying analyses offering different perspectives. Although this illustration may not be directly relevant to US-ROK cooperation in quantum technologies, the distinct environment, especially when compared to the AI field, suggests that South Korea must consider additional factors in its technology development strategy. While some sources, like the MSIT analysis, assert that the United States leads in all key areas—quantum computing, quantum telecommunications, and quantum sensors—others highlight China's rapid progress, particularly in quantum communication. Despite a significant gap in quantum computing and sensing, China is portrayed as quickly closing in on US leadership.

In contrast, the CTR data suggests that China has already surpassed the United States in post-quantum cryptography, quantum communication, and quantum sensors, using research paper citations to measure progress. This dataset, which tracks both yearly and cumulative research outputs, reveals that the United States originally held dominance in these areas, but China has gained ground, especially in quantum communication and sensors. The Australian government further documents that China now leads in quantum research, commercialization, and international collaboration.[35] On the other hand, analyses by the Information Technology and Innovation Foundation and the Center for Strategic and International Studies counter these claims, asserting that the United States still maintains an edge in specific areas such as quantum computing. These reports emphasize that China's advancements are heavily driven by state-led investment and government funding, which have played a crucial role in propelling its quantum technology innovation. This divergence in assessments underscores the ongoing competition between the United States and China, each excelling in different aspects of quantum technology.[36]

Quantum Technology Cooperation

Compared to AI cooperation, quantum technology collaboration between Washington and Seoul focuses more on joint R&D. Recognized in the May 2022 joint statement, quantum technology is the only area explicitly highlighted in the subsequent meeting between Alondra Nelson, head of the US Office of Science and Technology Policy (OSTP), and Jong-ho Lee, ROK Minister of Science and ICT.[37]

Subsequent joint research initiatives include the establishment of the Korea-US Quantum Technology Cooperation Center in Washington, DC. This center serves as a research platform connecting research and commercialization efforts in both countries, organized into six principal research clusters with funding of approximately USD 4.5 million in 2022.[38] Additionally, South Korea joined the Entanglement Exchange, an initiative aimed at facilitating international quantum technology cooperation by creating "a portal for highlighting international exchange opportunities for students, postdocs, and researchers in quantum information science."[39] Initiatives such as establishing research centers and gaining memberships expand South Korea's research infrastructure into the United States, serving as a foundation for promoting research and human resource exchanges.

The joint statement between the US OSTP and ROK MSIT in April 2023 highlights the unique trajectory of quantum technology cooperation. Recognizing quantum information science and technology (QIST), the statement enunciated that this cooperation is rooted in the bilateral Scientific and Technological Cooperation Agreement, which aims to foster technological collaboration between the two countries.[40] The joint statement provides a more solid foundation for quantum cooperation compared to other areas. While the agreement broadly defined cooperation without specific initiatives, the joint statement aims to seek "collaborative and transnational efforts in research and development are important to accelerating innovation" and "the identification of overlapping interests and opportunities for future scientific cooperation."[41] The recognition of this agreement provides a robust and formal foundation and authenticates the rhetoric in the joint statement.

In particular, the 11th joint committee meeting (JCM) on science and technology, convened under the cooperation agreement, also featured a dedicated roundtable involving researchers and government officials, emphasizing the prioritization of quantum technology in collaborative research efforts.[42] The US-South Korea quantum roundtable, hosted by the US National Science Foundation (NSF) and MSIT, emphasized both nations' commitment to advancing quantum technologies through collaborative research and researcher exchange programs. With the US delegation led by US Science Envoy Prineha Narang and the participation of private sector leaders such as IBM, both countries agreed to strengthen joint efforts by exploring new research areas and opportunities for future collaboration.[43]

Akin to AI cooperation emphasizing standard-setting, the scope of bilateral technology cooperation includes standardization and technology protection. In February 2024, South Korea assumed the chair position of the ISO/IEC Joint Technical Committee on Quantum Technologies.[44] At the U.S.-Korea Standards Forum in June 2024, certain quantum technologies were prioritized due to the nascent state of quantum standards. Specifically, US and South Korean standard development organizations identified post-quantum cryptography and quantum secure communications as strategic areas for cooperation.[45]

However, exploring joint R&D opportunities remains the primary focus and produces more tangible outcomes than other types of cooperation, such as standardization. These cooperation efforts were reinforced during the inaugural U.S.-ROK Next Generation CET Dialogue.[46] One of the three initiatives highlighted in the statement involves research collaboration between the US NIST and the Korea Research Institute of Standards and Science (KRISS) on next-generation superconducting quantum computing. This collaboration is detailed in the amendment to their existing MOU, which includes projects such as the "development of advanced precision RF measurement technologies" and "qubit readout and control for scalable low-latency qubit feedback." The commitment to joint research was further supported during a July 2024 meeting between the US NSF Director and the ROK Minister of Science and ICT, where Minister Lee proposed new joint research initiatives in quantum and biological technologies.[47]

Quantum technology cooperation—similar to AI cooperation—involves initiatives beyond the state level, including third-party states and private sectors. Universities in South Korea (Yonsei University and Seoul National University), Japan (Keio University and the University of Tokyo), and the United States (University of Chicago) have formed a partnership, supported by IBM, to provide training in quantum computing for approximately 40,000 students over the next decade.[48] The trilateral education and training initiative, which aims to "train a quantum workforce and strengthen [their] collective competitiveness," was also recognized at the trilateral meeting between the three countries' national security advisors in January 2024.[49] In addition, the United States recently established the Quantum Development Group, led by Deputy Secretary of State Kurt Campbell, with eight participating countries, including South Korea, to foster "coordinated approaches" and facilitate R&D collaboration in quantum technologies.[50]

Despite active multilateral and private-sector-led initiatives, bilateral cooperation in quantum technologies between the United States and South Korea focuses predominantly on tangible research projects. This is distinct from AI cooperation, which prioritizes standardization, governance, and the establishment of international norms. Quantum technology collaboration, on the other hand, is rooted in the foundational Scientific and Technological Cooperation Agreement, a formalized framework that enables long-term joint research initiatives. This presents a contradiction to AI cooperation in that both states prioritize the creation of new knowledge and capabilities through hands-on scientific collaboration. At the same time, this practical focus reflects the fact that quantum technologies are still in the early stages of commercialization and require significant R&D to mature. Therefore, bilateral quantum cooperation is centered on pooling resources, expertise, and infrastructure to push the boundaries of quantum research rather than on governance or standardization efforts that dominate AI discussions. This cooperative research-driven approach helps both countries build capacity in quantum technologies.

Policy Recommendations

Beyond the formality of technology cooperation, cooperation also must prioritize human researchers, as they are the driving force behind technological innovation and advancement. Securing highly skilled researchers and providing education to cultivate future talent is critical, and cooperation between the United States and South Korea is no exception in this context. For instance, in the field of quantum computing, with the top 25 percent of most cited papers, the largest number of highly cited researchers begin their education in China (22.6 percent), but a significant portion ends up employed in the United States (31.2 percent). Similarly, in machine learning, most researchers start their education in China (22.5 percent), yet the United States again leads in attracting top talent, employing 25.3 percent of researchers.[51]

This trend, consistent across various subfields of AI and quantum technologies, highlights the United States' ability to attract both domestic and international researchers, whereas China is less competitive in retaining top talent. Meanwhile, South Korea has been relatively successful in retaining researchers trained domestically, although the overall number is small, and there is minimal inflow from other countries. This analysis suggests that both the United States and South Korea can enhance their research environments by building on their respective strengths—whether it be the United States' ability to attract global talent or South Korea's effective cultivation of homegrown researchers.

Acknowledging the significant disparity in technology competencies between Washington and Seoul, which makes genuine reciprocal cooperation challenging, this article provides policy recommendations for advancing AI and quantum technology cooperation.[52] First, regarding AI, the two countries should engage actively in initiatives and processes of the Global Partnership on Artificial Intelligence (GPAI) to foster the development of secure and reliable AI systems. In addition to leveraging existing international summits and collaborating through these venues, both countries are founding members of the GPAI. Initially established as an independent international organization, GPAI has since been incorporated under the OECD's umbrella, broadening its influence and collaborative scope. As a "unique initiative for global multi-stakeholder cooperation on AI," GPAI is committed to promoting trustworthy, human-centric AI while addressing the challenges and transformative impact of the technology.[53] Given that China and Russia are not members of GPAI (as of November 2024), US and South Korean participation is crucial for shaping global AI norms and ensuring that both countries influence the ethical, technical, and policy frameworks that govern the development and use of AI technologies.

Second, both states should actively participate in and lead dialogues, workshops, and conferences within the ISO/IEC JTC 1/SC 42, the primary forum for discussing AI technical standards. Given that the United States serves as the secretariat, the two countries' leadership is crucial to ensure that their approaches to AI development are reflected in universal standards. While serving as the secretariat may not directly enhance cooperation due to its neutral role, its responsibilities, such as circulating agendas and organizing meetings, can play a crucial role in facilitating cooperation on standards. Although the adoption of these standards is voluntary, they serve as foundational principles for guiding the development of AI technologies globally. As complementary leaders in AI, the United States and South Korea should collaborate to align their efforts, ensuring a unified approach to technical and ethical standards.

Lastly, both governments should aim for more robust governmental cooperation or elevate private-sector-led collaborations to a national level. AI cooperation between the United States and South Korea has been largely driven by private sector initiatives or by the South Korean government partnering with US companies, such as the above mentioned cases of the Korea AI and System IC Innovation Center, GITCC, or Global AI Frontier Lab. Expanding these efforts to government-level collaborations would help strengthen joint R&D programs, supporting the commercialization and practical implementation of AI technologies. Deeper cooperation would not only accelerate technological advancements but also bolster joint initiatives for AI standardization.

For quantum technologies, where both states are already engaged in collaborative research, there is potential to expand cooperation on a broader scale with like-minded partners. The Quantum Economic Development Consortium (QED-C), established under the US National Quantum Initiative Act, serves as a multi-stakeholder platform that brings together the private and public sectors. Initiatives like the Quantum Development Group, which was launched by the US Department of State, and the Entanglement Exchange, which facilitates exchanges of international researchers in quantum technologies, are instrumental in fostering deeper cooperation. Both the United States and South Korea can leverage these frameworks to enhance their collaborative efforts, broadening the scope of joint research and innovation in quantum technologies while ensuring alignment with global quantum technology developments. Expanding these partnerships will not only accelerate technological advancements but also position both nations as key players in the evolving global quantum landscape.

South Korea can also expand cooperation in quantum technologies to multilateral platforms. Following individual bilateral dialogues on emerging technologies between the United States and both South Korea and India, the three countries initiated a trilateral technology dialogue centered on complementary agendas and technical capabilities.[54] Following the launch of the Korea-US Quantum Technology Cooperation Center in Washington, DC, South Korea has chosen Brussels as the location for its second Quantum Technology Cooperation Center, focusing on partnerships with European countries.[55] With five ongoing joint projects involving Switzerland, the Netherlands, Germany, Israel, and the United Kingdom, South Korea can coordinate its research initiatives across Washington and Brussels in a manner similar to the trilateral dialogue on emerging technologies with the United States and India. This strategic alignment will facilitate the exploration and development of further opportunities in quantum research, strengthening South Korea's role in the global quantum technology ecosystem.

Conclusion

This article elucidates how Washington and Seoul cooperate on AI and quantum technologies, both recognized as critical emerging technologies essential to their national interests. Here, technology cooperation is denoted as government-to-government efforts aimed at cultivating and developing technologies, focusing on national strategies and interests rather than the profit-driven motives of the private sector. In AI, US-South Korea cooperation emphasizes the establishment of standards over direct joint research, aligning with the common framework of data, algorithms, and computing capacity. South Korea, with demonstrated competency in AI as evidenced by various data sources, prioritizes standardization as a strategic approach alongside the United States. In contrast, South Korea's capabilities in quantum technologies are limited, with the United States and China regarded as global leaders. Bilateral cooperation in this domain focuses on joint R&D through national research institutes and participation in multilateral or international research initiatives. These efforts are supported by formal agreements on science and technology cooperation between the two nations, providing a stable and long-term foundation for collaboration in quantum technology.

The US-ROK alliance originated from the security threat posed by North Korea during the Korean War and is rooted in the Mutual Defense Treaty of 1953. However, the alliance has evolved alongside shifts in the geopolitical landscape. North Korea's development and testing of nuclear weapons, the rise of China and its challenge to US global leadership, and the ongoing war in Ukraine have all influenced the focus of the alliance. Additionally, the signing of the Korea-US Free Trade Agreement (KORUS FTA) in 2007 has strengthened economic ties, positioning the United States and South Korea among each other's top trading partners.

While security threats to South Korea remain significant, the US-ROK alliance has evolved into a broader framework that extends beyond security and economic matters to include technological cooperation based on shared norms and principles. Ideological solidarity, underpinned by democratic values and support for a market economy, has contributed to the alliance's resilience.[56] The progression of the US-ROK alliance in this direction is both natural and beneficial, as the development of advanced and sophisticated technologies is increasingly beyond the capacity of any single state alone. Autarkic policies in technological development are unlikely to succeed in the current global landscape. Fostering technological growth requires cooperation between like-minded states and collaboration with various stakeholders. As AI and quantum technologies are critical areas of focus for many countries, advancing technology cooperation is the next step for the US-ROK alliance.

Endnotes

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