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Exploring the Korean Model for Sovereign AI Strategy

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Exploring the Korean Model for Sovereign AI Strategy

I Problem Statement

- Artificial intelligence (AI) has evolved into a vital security issue permeating politics, economy, and society, prompting nations to scrutinize it from a sovereign perspective.
  - AI system components—such as training data control, API permissions, and model operations—are increasingly recognized as core national assets, necessitating stable acquisition and access.
  - Major non-U.S./China powers face unavoidable dependence due to underdeveloped domestic AI ecosystems, sparking "Sovereign AI" discourse encompassing supply chain diversification, sustainability, and security.

- South Korea exhibits high external dependence in its AI ecosystem but is recognized as one of the few AI middle powers capable of meaningful global supply chain roles, leveraging comparative advantages in semiconductors (core components) and manufacturing.
  - The government has set a "Global AI Top 3 (G3)" vision, aspiring to rule-making in AI manufacturing/services as well as safety, standards, and governance.
  - It announced a vision for internalizing capabilities across the full AI package: data, computational infrastructure, models, security systems, operating systems, talent, and norms.

- However, domestic Sovereign AI discourse has predominantly reflected traditional sovereignty concepts, with insufficient consideration of realistic constraints/opportunities as an AI middle power and Korea-specific ecosystem factors.
  - Review of U.S.-China-led AI order constraints and reinterpretation of Sovereign AI—tailored to Korea's comprehensive context—are needed, alongside alternative approaches.

- This paper critically examines the Sovereign AI concept's characteristics and implications for middle powers, proposing practical measures for a "Korean Sovereign AI National Strategy" to secure strategic autonomy in the global AI environment.

Ⅱ Concept and Understanding of Sovereign AI

1. Background of Sovereign AI's Emergence

A. Securing National AI Control

- In the era of "AX (AI-based great transformation)," AI is regarded as a security asset with inherent geopolitical value, transcending its role as technology for specific industries.
  - This has prompted countries to recognize control over AI technology, infrastructure, and data as a security matter.

- The U.S. and China have preemptively designated AI as a strategic asset and embarked on multifaceted competition to secure national control across diverse AI ecosystem domains, including AI semiconductors, cloud infrastructure, data, and talent.
  - ※ In particular, the U.S. AI National Security Memorandum (AI NSM, 2024) designates AI as a strategic asset and functions as a comprehensive security framework covering risk-based classification systems for AI systems, supply chain monitoring, and cyber response capability acquisition.[1]
  - ※ At China's 2025 Two Sessions, AI was formalized as a core driver of "new quality productive forces (新质生產力)," and a long-term plan announced for building a modernized industrial system through the "AI Plus" initiative.[2]

B. Bifurcation of the Global AI Supply Chain Ecosystem

- The United States has established AI strategies aligned with national interests through numerous executive orders and legal measures, accelerating its strategy to exclude China from supply chains.
  - The second Trump administration is attempting to internalize core AI infrastructure and reorganize the U.S.-led global supply chain through the "Stargate Project" and "AI Action Plan."[3]

1 The White House, "Memorandum on Advancing the United States' Leadership in Artificial Intelligence" (October 24, 2024).

2 Choi Jin-baek, "2025 China Two Sessions Results and U.S.-China Relations Outlook," *Major International Issues Analysis* (April 9, 2025).

3 Yoon Jung-hyun, "Trump 2.0's AI National Strategy as Seen Through the 'Stargate Project,'" *INSS Issue Brief* No. 657 (February 13, 2025).

- China counters U.S. technology blockades by developing a self-reliant AI ecosystem and Chinese-style low-cost, high-efficiency AI models, strategically leveraging them in foreign policy.
  - China highlights technological achievements of domestic large language models (LLMs) such as DeepSeek, promoting the dissemination of Chinese-style AI models in technology package form to Belt and Road Initiative target countries.
  - By providing packages combining AI models, Chinese servers, and policy consultation to Southeast Asian, African, and Middle Eastern countries, China is expanding its entry into digital ecosystems and utilizing this as a means of expanding the AI-based "Digital Belt and Road."[4]

C. Full-Scale Standard and Norm Competition Surrounding AI Development and Utilization

- Recently, the global AI competitive landscape has expanded beyond performance and cost issues into the realm of norms and values surrounding AI development, control methods, and rule-setting.
  - U.S.-China hegemonic competition over LLM AI has manifested as a dual strategic structure: closed vs. open, high-performance vs. high-efficiency.
  - The United States, having dominated the market based on big tech's high-performance models, has maintained a passive stance on open source and expanded export controls across the entire AI lifecycle to prevent technology leakage.

- The intensifying U.S.-China rivalry over AI development and control methods has resulted in high dependence on specific camps and constrained choices for other countries.
  - As issues of avoiding technological dependence on specific countries/companies and controlling data/algorithms emerge, nations have recognized the need to secure AI from a sovereign perspective.[5]
  - Beyond developing countries, middle powers with mature markets and industrial capabilities have emerged as powerful political calls urging governments to secure AI autonomy.

4 Yoon Jung-hyun, "DeepSeek: A Sputnik Shock of the AI Era?" *INSS Issue Brief* No. 665 (March 4, 2025).

5 Aubra Anthony, "On the Path to AI Sovereignty, AI Agency Offers a Shortcut" (Lawfare, May 20, 2025), https://www.lawfaremedia.org/article/on-the-path-to-ai-sovereignty-ai-agency-offers-a-shortcut (accessed June 1, 2025).

2. Rise and Key Characteristics of Sovereign AI

A. Conceptual Definition of Sovereign AI

- There is no universally agreed definition of "Sovereign AI," but it is commonly understood as "an attempt to avoid technological dependence on specific countries or companies while maintaining control over one's citizens' data, algorithms, and normative environment."[6]
  - Big tech companies such as NVIDIA, Oracle, and OpenAI define Sovereign AI as "the capability to control and coordinate, within one's own jurisdiction and without external dependence, the infrastructure, data, models, and personnel necessary for AI development and operation."[7]
  - From a traditional international politics perspective, it is defined as "a state's ability to control the development, deployment, and governance of AI technology within its territory according to its own laws, values, and interests, while maintaining autonomy from external influences."[8]
  - In this context, Sovereign AI is composed of the following sub-sovereignty elements:
    - ※ *Data Sovereignty*: Control over national data generation, storage, and utilization; data localization; autonomous management of one's cultural and linguistic data.[9]
    - ※ *Compute Sovereignty*: Securing infrastructure resources necessary for AI training and inference.[10]
    - ※ *Model and Software Sovereignty*: Capability to design, deploy, and manage one's own AI models.[11]
    - ※ *Normative and Ethical Sovereignty*: Establishing AI safety, bias, and ethics standards tailored to national circumstances. [12]

6 Anthony (2025).

7 https://blogs.nvidia.com/blog/what-is-sovereign-ai/ (accessed October 31, 2025); https://www.lawfaremedia.org/article/on-the-path-to-ai-sovereignty—ai-agency-offers-a-shortcut (accessed October 31, 2025).

8 Chen Yu, "AI Sovereignty: Navigating the Future of International AI Governance," PhilArchive (July 11, 2024), https://philarchive.org/rec/CHEASN-2 (accessed November 10, 2025).

9 https://www.oecd.org/en/publications/access-to-public-research-data-toolkit_a12e8998-en/gaia-x_db008090-en.html (accessed October 22, 2025).

10 https://blogs.nvidia.com/blog/what-is-sovereign-ai/ (accessed October 22, 2025).

11 https://www.noota.io/en/sovereign-ai-guide (accessed October 23, 2025).

12 European Commission, "Cloud Sovereignty Framework" (Version 1.2.1) (October 2025).

B. Spread of Sovereign AI Discourse Based on Traditional Sovereignty Concepts

- Sovereign AI discourse to date has primarily developed in AI latecomer and developing countries, with traditional sovereignty logic significantly reflected.
  - This reflects the perception that entrusting core national systems and sensitive data to cloud infrastructure or AI models provided by global big tech companies is tantamount to delegating the foundations of security and the economy to external parties.
    ※ The argument that a self-reliant AI ecosystem under national jurisdiction is necessary to reflect domestic legal, cultural, and linguistic characteristics and prevent overseas data leakage.
  - AI is viewed as a strategic asset determining the nation's fate, recognized as an essential good for securing long-term industrial competitiveness and economic autonomy.
  - Domestically as well, Sovereign AI is emphasized with the goal of securing technology, data, and algorithms through constructing independent AI models based on Korean language and culture, preventing excessive big tech dependence, and "blocking digital colonization."[13]

- Directly linking traditional sovereignty concepts to Sovereign AI risks distorting AI into "an object of no compromise that the state must absolutely secure independently without external influence," potentially trapping it in territorial jurisdiction debates.
  - This could manifest as coercive logic mandating single-nation procurement across all AI ecosystem domains, including computing resources for training/inference, data management, and model/software design/deployment capabilities.
  - There is a risk that such reasoning could be appropriated to legitimize industrial development policies that overlook the economic viability and market expansion strategies of chip manufacturers and cloud service providers.[14]

13 The AI Future Planning Senior Secretary stated that South Korea's situation is "the beginning of digital colonization." Dailian, "In the Era of Internet Revolution, Why Securing the 'Three Major AI Sovereignties' Is Essential" (June 18, 2025).

14 https://www.theguardian.com/technology/2025/oct/09/governments-spending-billions-sovereign-ai-technology (accessed October 26, 2025).

Ⅲ Necessity of Sovereign AI Discussion and Middle Power Response Strategies

1. Necessity of Sovereign AI

A. National Security Aspect

- Recently, "AI security" has expanded into a comprehensive security concept—beyond supply chain stability or technology leakage prevention—to encompass geopolitical control of strategic technologies, access acquisition, and close integration with cybersecurity.[15]
  - **(Data sovereignty and confidentiality):** Dependence on foreign big tech clouds or AI platforms for sensitive national data (e.g., security, defense, health, public administration) risks data leakage and external control.
  - **(Escaping technology dependence and risk management):** Full reliance on specific great powers' or few global firms' AI tech/infrastructure (GPUs, clouds) exposes vulnerabilities to supply disruptions or political/diplomatic risks.
  - **(AI safety and ethics control):** Securing transparency/control over AI model algorithms and training enables operation of domestically compliant systems and prevention of misuse harms.

B. National Competitiveness Aspect

- Today, AI is a core determinant of all industries' competitiveness; AI development/utilization capabilities form the foundation for maximizing economic ripple effects and industrial innovation.
  - **(Industry-specific AI model development):** Custom AI models reflecting domestic industries' unique traits and high-quality data—unaddressable by general-purpose models—enable practical value creation and productivity gains.
  - **(AI ecosystem strengthening and job creation):** AI infrastructure, model development, and training data acquisition foster domestic AI industries, promote high-level talent cultivation/inflow, and serve as new economic growth engines.
  - **(Leading global standards and norms):** Nations with AI technological prowess and competitive ecosystems secure national interests as active mediators/co-designers, rather than mere recipients, of international AI standards/norms.

15 Martin Rasser et al., "The American AI Century: Security Implications and Strategic Competition with China," Center for a New American Security (CNAS, 2020).

C. Identity Preservation and Cultural Conservation Aspect

- Data learned by AI models inevitably reflects the commander's cultural identity in the AI's generated outputs.
  - **(Preventing linguistic and cultural bias):** Reliance solely on big tech models risks insufficient reflection or distortion of language, history, political/social context, and cultural values across AI services. Thus, data training incorporating national language and cultural codes is essential for preserving and transmitting cultural identity.
  - **(Acceptability of political and social values):** Developing AI reflecting national political/social values and ethics enables positive guidance of AI's societal impact and secures high public acceptance.

D. A Realistic Approach to Sovereign AI Strategy

- In summary, the core of Sovereign AI lies not in technology sovereignty strategies such as "self-sufficiency" but in mitigating external risks and securing diverse options for the state.
  - It serves as a safeguard ensuring essential AI functions/infrastructure remain undisrupted during crises, and as a means to consolidate national capabilities to avoid subordination in the global AI supply chain.
  - Furthermore, it acts as a defensive line for identity and cultural sovereignty, protecting language, history, and constitutional values from distortion/dilution by external models.

- Conversely, without substantive foundations like technological capabilities and AI ecosystems, pursuing Sovereign AI may devolve into political slogans and hinder efficiency.
  - Due to AI infrastructure's high costs, incomplete open-source ecosystems, and great powers' model access restrictions, middle powers' AI sovereignty quests may paradoxically deepen dependence on great powers' big tech[16]
  - Puri (2025) critiques that claiming "strategic autonomy" without technological self-reliance is illusory and inevitably leads to subordination to great powers' technology.

16 Anton Leicht, "High Stakes for Middle Powers: Why I work on German AI Policy" (2025), https://www.antonleicht.me/writing/middlepowers (accessed August 1, 2025).

2. Necessity of Middle Power Sovereign AI Strategy

A. Meaning and Role of AI Middle Powers

- "AI middle powers" denote a third force with potential to coordinate/mediate AI technology and norms in specific fields, presenting opportunities for active participation in global AI governance.[17]

  ※ Major countries classified as AI middle powers—such as South Korea, Japan, Singapore, and Canada—possess certain technological capabilities, advanced industrial bases, high-level human resources, and mature markets/normative systems, though not matching the U.S./China overall in AI tech/infrastructure.[18]

- AI middle powers holding key technologies or normative leadership within the AI stack can exercise strategic leverage in the global AI supply chain's multilayered structure, exerting influence on AI order formation.
  - Recently, AI middle powers have evolved beyond mere "consumers" accepting AI technology, performing roles as key actors in norms/governance that determine global AI ecosystem stability and future market dynamism.

B. Necessity of Middle Power Sovereign AI Strategy

- For middle powers with resource/market limitations, Sovereign AI discussions should focus on securing "agency"—the ability to self-design/coordinate AI security, economy, and identity—beyond mere "localization" or "jurisdiction" acquisition.
  - Emphasis on capabilities to design, train, deploy, and operate AI via national infrastructure/data/models/governance, maintaining final control over strategic direction/risks per political/technical considerations.
  - This transcends simple technological self-reliance, aiming to secure "strategic control and optionality" over data/compute/models/normative environments, overcoming limitations of traditional sovereignty-based Sovereign AI discourse.

17 Eric Schmidt, "'Middle powers' can thrive in the age of AI," *The Economist* (November 19, 2024), https://www.economist.com/by-invitation/2024/11/19/middle-powers-can-thrive-in-the-age-of-ai-says-eric-schmidt (accessed June 3, 2025).

18 Tristan Low, "How Middle Powers Can Navigate the AI Duopoly," Titan, Asia-Pacific, International Relations (September 8, 2025), https://atlasinstitute.org/how-middle-powers-can-navigate-the-ai-duopoly/ (accessed November 3, 2025).

C. Major Types of Middle Power Sovereign AI Strategies

- AI middle powers differ in computational resources, data openness, industrial competitiveness, and legal systems, necessitating strategic approaches to efficiently leverage limited resources and disperse risks.
  - Accordingly, major middle powers pursue "specialization" centered on security-critical fields or "alliance" with value-sharing nations, rather than localizing all AI stacks.[19]

- **(Specialization Type)** An approach leveraging unique industrial/technological strengths for competitive edges in specific fields—focusing on core "bottlenecks" or technological "niches" rather than all areas.
  - Preconditions include assured comparative advantages: sufficient compute acquisition, high-level talent pools, industrial applicability, and policy execution capacity.
    ※ Government-level requirements: comprehensive institutional foundations like concentrated AI R&D budgets, talent development, and financial support in specialized fields.
  - However, specialization risks over-dependence on specific tech/industries/global supply chains, with inherent limitations like domestic tech ecosystem imbalances and geopolitical sensitivity.[20]

- **(Alliance and Cooperation Type)** A strategy utilizing multilateral open-source ecosystems, distributed infrastructure, and general-purpose data accessibility to jointly develop AI ecosystems based on shared values.
  - Through resource/technology/norm coordination among participants, complementary capabilities can be combined to mitigate dependence on dominant powers and exercise leverage.[21]
    ※ Representative examples include the EU's GPAI (Global Partnership on Artificial Intelligence), where 44 member countries explore AI ethics, data governance, future jobs, and innovation[22]

19 Han Sang-ki, "Strategy of AI Middle Powers," KISDI AI Outlook (2025), Vol. 22.

20 Yoon Jung-hyun (2025c), "U.S.-China Great Power AI Order and South Korea's Middle Power Diplomatic Strategy," Journal of the 21st Century Political Science Association (2025), Vol. 35, No. 3, pp. 133-163.

21 Taylor Jacob and Joshua Tan, "Asia needs an AI third way" (April 13, 2025), https://eastasiaforum.org/2025/04/13/asia-needs-an-ai-third-way/ (accessed June 2, 2025).

- However, it has inherent limitations in independence from great powers' advanced AI technologies and securing high-value items, alongside persistent coordination issues among participants.
- Preconditions include complementary capabilities, policy coordination mechanisms, and joint investment among participants, plus some national policy autonomy transfer.

※ Conflicts may arise in technology standards and intellectual property distribution, and the momentum for sustained cooperation may weaken due to unequal distribution of benefits based on development gaps among participating countries.

3. Response Strategies of Major AI Middle Powers

A. Regional Alliance-Based Sovereign AI Acquisition Strategy

▪ Seeking transnational solidarity and cooperative governance based on regional homogeneity to overcome AI technology closedness and secure multilateral influence.

- Germany and France (EU) have completed a technology/normative system for data interoperability, reliability, and sovereignty assurance through the "GAIA-X Framework."[23]

※ GAIA-X: An EU regional-level project to build a federated cloud infrastructure ecosystem, aiming for European data sovereignty and escape from cloud technology dependence.

- The African Union (AU) is advancing continental-level data policies to promote training data sharing and common foundation-building among member states.[24]

22 GPAI is an international consultative body discussing various topics including AI ethics, data governance, future jobs, and innovation. It started with 15 founding members in 2021 but has expanded to 44 countries as of 2025.

23 GAIA-X, "What is GAIA-X?" (2022), https://gaia-x.eu/about/ (accessed November 2, 2025).

24 AUDA-NEPAD, "Continental Artificial Intelligence Strategy for Africa" (May 30, 2022), https://nepad.org/news/african-union-artificial-intelligence-continental-strategy-africa (accessed November 10, 2022).

B. Technology/Infrastructure Specialization and Domestic Language/Culture Model Building Strategy

- Avoiding technological dependence by concentrating resources on specific fields within the AI technology stack or developing models reflecting linguistic/cultural identity.
  - Japan focuses on high-performance computing (HPC) and basic research infrastructure, internalizing national AI infrastructure through construction of ultra-large AI supercomputing systems like "ABCI 3.0."
    ※ ABCI (AI Bridging Cloud Infrastructure) 3.0 is Japan's largest AI-dedicated supercomputer system, operated by the National Institute of Advanced Industrial Science and Technology (AIST), supporting national AI strategies including AI R&D, data analysis, and large language model (LLM) training.[25]
  - Canada pursues a long-term self-reliance model centered on basic research and high-level human resources via establishment of CIFAR and the Vector Institute.
    ※ CIFAR (Canadian Institute for Advanced Research), a Canadian advanced research institution, supports long-term basic AI research and attracts/cultivates world-class AI researchers to Canada.
  - Singapore seeks to secure language and models optimized for Southeast Asian languages through development of "Sea-Lion LLM."[26]
  - Taiwan builds Taiwan-specific language/identity-based models distinct from the Chinese-speaking world via the TAIDE model, strengthening AI policy autonomy in political and public sectors.
    ※ The Taiwan TAIDE (Trustworthy AI Dialogue Engine, 繁體中文可信賴 AI 對話引擎) model results from a government-led project emphasizing AI "Taiwanese localization (Taiwanese Context)" distinct from mainland China's political and social context.[27]

25 https://abci.ai/en/ (accessed November 10, 2025).

26 Aaron Tan, "Singapore to develop Southeast Asia's first large language model" (December 5, 2023); Tomorrow's Affairs, "Industry 5.0 – who will control the foundations of digital sovereignty?" (August 15, 2025).

27 https://stli.iii.org.tw/news2019-detail.aspx?d=671&no=57 (accessed November 13, 2025).

C. Public Sector-Led Model and Norm Preemption Strategy

- An approach leveraging government/public data as core resources to enhance public service autonomy and preempt related industry/normative standards.
  - Recently, India seeks to maximize economic ripple effects by establishing a domestic-centered ecosystem, building on its experience constructing the unique digital system "Digital Public Infrastructure (India Stack)."
  - In terms of national public data-based model development and dissemination, India distributes the public sector-led LLM "BharatGPT."[28]
    ※ BharatGPT is a national public sector-led large language model (LLM) initiative developed through government-technology company-academia cooperation, emphasizing India's AI technological independence and multilingual/multicultural characteristics.

〈Table 1〉 Sovereign AI-Related Strategies and Detailed Policies of Major AI Middle Powers

Country	Core Sovereign AI Strategy	Detailed Implementation Policies
Japan	"National AI infrastructure and international governance" focus (not explicit nationalism)	- AIST-led ultra-large AI supercomputing infrastructure ABCI 3.0 - AI Governance Act to establish standards/norms for Japanese AI industry
Singapore	Building computational models optimized for national/regional language/culture	- Sea-Lion (Southeast Asian language-based LLM) development to strengthen language/model sovereignty - Strategic compute partnerships with AWS/NVIDIA; improved domestic AI infra investment environment
Taiwan	"Taiwan-specific AI" construction project (TAIDE) distinct from Chinese sphere	- TAIDE model for language/identity-based model sovereignty - Trust-based public LLM development to enhance public sector AI policy autonomy
France/ Germany (EU)	European data sovereignty regime via GAIA-X	- Federated cloud standards establishment - EU AI/data mobility norms and utilization for normative sovereignty enhancement
Canada	Long-term self-reliance via basic research/AI talent/urban AI clusters	- CIFAR/Vector Institute establishment for basic research/ application model autonomy - Regional data sovereignty establishment

28 CXO TV, "India's AI Ambition: Bharat GPT & BharatGen Set the Stage for Indigenous Innovation" (May 5, 2025), https://cxotv.techplusmedia.com/india/india-s-ai-ambition-bharat-gpt-and-bharat-gen-set-the-stage-for-indigenous-innovation (accessed November 14, 2025).

Country	Core Sovereign AI Strategy	Detailed Implementation Policies
India	National/public data-based "citizen LLM (BharatGPT)" construction	- India Stack (Digital Public Infrastructure) strengthening for AI data sovereignty - BharatGPT and other national public AI model development
Africa (AU)	Continental data sovereignty and AI basic infrastructure building	- AU data policy for Africa-wide data sovereignty - AU member states' training data acquisition/sharing and basic self-reliant ecosystem development

Source: Compiled by author based on Ministry of Science and ICT, "Press Release: Announcement of National AI Computing Infrastructure Expansion Plan (2025-2030)," (November 2, 2025); Office of the President of the Republic of Korea, "Confirmation of Establishment of Presidential National AI Committee," (March 4, 2025), briefing materials; Lukasz Ostrowski, "Middle Powers in the Global AI Race: A New Force to Reckon With" (January 3, 2025); Aisha Down, "Governments are spending billions on their own 'sovereign' AI technologies—is it a big waste of money?" The Guardian (October 9, 2025).

Ⅳ Exploring a Korean Model for a National Sovereign AI Strategy

1. Diagnosis of South Korea's AI Policy Implementation Status

A. Establishment of Pan-Government Top-Level Strategy and Governance

- Enhancing top-level execution capacity and building governance through national-level AI comprehensive strategies and presidential direct agencies and committees.
  - Established the "National AI Strategy Policy Direction"—the top-level strategy document with "AI Top 3 Power" as its blueprint—securing policy priority and consistency.[29]
  - Strengthened the speed and implementation capacity of AI policy through the establishment of a presidential-level National AI Committee and an AI Advisory Office within the Presidential Office.

B. Setting AI Full-Stack Policy Scope and Goals

- Strengthening the full lifecycle of AI development, utilization, and governance through large-scale computing infrastructure acquisition, independent AI technology encouragement, and data/regulatory sovereignty establishment.
  - Early securing of 50,000 GPUs (AI infrastructure core), targeting dramatic expansion of domestic GPU government supply rate to 30%+ of demand by 2026.
    ※ Building national AI data centers and advancing industrial-service-specialized AI capabilities via total 300,000 GPUs (including 50,000 for the public sector and the remainder for the private).
  - Supporting public-private partnerships to develop an independent ultra-large-scale model targeting over 95% performance compared with the latest global models.
  - Advancing toward "AI for All" by raising the domestic industrial AI adoption rate to 60% and improving AI literacy among vulnerable groups to at least 80% by 2030.

29 Ministry of Science and ICT, "Press Release: Announcement of 'National AI Strategy Policy Direction'" (September 26, 2024).

- Legal/institutional control foundations via AI Basic Act promotion.
  - Strengthening data control and regulatory/normative sovereignty through "AI Basic Act (Act on Fostering the Artificial Intelligence Industry and Establishing a Trust Foundation, etc.)" legislation.
  - Presenting guidelines such as "National AI Ethics Standards" and establishing AI Safety Research Institute.
    ※ However, ethics/safety guidelines remain mostly at the recommendatory level, lacking legal enforceability.

C. Differentiation from Major Middle Power Sovereign AI Strategies

- South Korea's AI strategy explicitly specifies establishing a full-stack package structure for national computing, data centers, and AI governance—a "specialized full-stack" approach seeking strategic autonomy across AI hardware, data, models, and norms.

- This differentiates from most middle powers (excluding U.S./China), which recognize resource limits and primarily pursue "selection and concentration" or "limited alliance" strategies:
  - **Specialization type:** Japan (HPC infrastructure), Singapore/Taiwan (region-specific models), Canada (AI basic research/reference)
  - **Alliance and norm type:** EU (normative sovereignty and distributed data sovereignty via GAIA-X), African Union (continental data cooperation)

- South Korea's AI "full-stack" must be understood as distinct from the full-stack strategies of AI superpowers such as the U.S. and China, which aim to build end-to-end indigenous ecosystems and secure comprehensive strategic advantage.
  - U.S./China full-stack constitutes vertical integration/technology hegemony dominating the global supply chain (chip design, cloud services, foundation models).
  - South Korea's, by contrast, means "strategic autonomy" for diverse options—an active approach protecting national interests in security/economy-critical domains.

2. Proposal for a Korean Sovereign AI Strategy

A. Setting Specialized Full-Stack Sovereign AI Strategic Goals and Resource Reallocation

- Set goals as securing "strategic autonomy" and national "autonomous agency"—the ability to independently operate/coordinate essential AI functions, data, and infrastructure—rather than independence of specific technologies or territorial jurisdiction.
  - Transition toward minimizing high-cost/inefficient investment pressures while ensuring economic viability/sustainability, based on strategic autonomy optimized for Korea's industrial, technological, and security context.

- Pursue strategic cooperation leveraging U.S./middle power partnerships to offset burdens of high-cost elements (computing, data, safety research), while leading challenging R&D in Korea's comparative advantage fields.
  - Actively participate in next-generation AI development/cooperation—such as artificial general intelligence (AGI) and "Physical AI" model development—to strengthen Korea's strategic leverage in the future global supply chain.

- Institutionalize priority GPU allocation to national security fields and language/culture/industry-specialized model development from a strategic asset perspective, beyond mere distribution to public sector/industry.
  - Break from general-purpose large language model (LLM) competition by strategically concentrating investment on developing models specialized to Korea's unique language/culture and core industrial sectors (finance, healthcare, manufacturing, etc.), securing means of global competitiveness.

- Beyond efforts to secure advanced GPUs, strengthen the super-gap in HBM design/manufacturing competitiveness—Korea's strength—and secure benefit effects/leverage from increased global GPU production.
  ※ For NVIDIA's latest GPU "Blackwell (GB200)," 8 units of high-spec 12-stack HBM3E memory (dominated by Korean firms) are expected per GPU.

B. Securing Foundational Computational Resources and Strengthening Front-End and Back-End Infrastructure Operating Systems

- A national-level comprehensive strategy is needed not only for basic computational infrastructure but also for building operational infrastructure foundations such as power and energy.
  - Recently, NVIDIA committed to supply 260,000 advanced GPUs to South Korea over five years, but expanding power and energy infrastructure for stable operation has emerged as a new strategic challenge.
  - With GW-level power and cooling water required for one AI factory, securing "power security"—via transmission/distribution innovation and sustainable supply— is urgent to maximize GPU value.

- Beyond mere GPU volume acquisition, support is needed for system optimization strategies linked to Korean chipset development (NPUs, TPUs) and industry demand-driven AI models such as K-LLM and K-Humanoid.
  - K-AI factory construction via GPUs must be accompanied by distributed cluster systems, public sector cloud integration, and defense-industry AI application demonstrations.

C. Enhancing AI Policy Implementation Capacity and Strengthening Human Capital

- AI policy implementation capacity is directly linked to the level of institutionalization and the ability to coordinate the design, deployment, and accountability of AI systems.
  - South Korea aspires to become an "AI Top 3 Power" but is assessed as a middle power with structural weaknesses in AI execution capacity, unlike U.S./China.
    ※ In Tortoise Media's GAII index, Korea ranked low in talent (13th), operating environment (35th), and research (13th), urgently requiring qualitative improvements.
  - Amid new uncertainties from the second Trump administration's core emerging tech supply chain reorganization and expanded "research security" scope, middle power coordination/cooperation strategies—including international partnerships—are needed.

- Reorganize institutions by establishing national-level education/recruitment plans to address AI talent shortages, while enhancing private investment stability through guaranteed predictability/continuity of AI technology policy.
  - Currently a talent-exporting country facing severe AI talent shortages, Korea should pursue parallel measures: regular employment of public sector AI experts, military-civilian linked AI technical personnel rotation deployment, and restructuring of academic/research institutes to foster national AI leadership.

D. Multilateral Diplomacy and Norm Leadership for a Sustainable AI Ecosystem

- Lead AI cooperation agendas linking technology-environment-development beyond national Sovereign AI pursuit, contributing to global values and sustainability.
  - AI infrastructure's environmental issues ("E-waste"[30]) and massive data center energy consumption can be leveraged as targets for AI middle powers like Korea with technological/normative superiority.

- Pursue differentiated foreign policy directions by linking technological capabilities with normative leadership on AI-era sustainable environment issues, promoting executable international cooperation agendas.
  - Amid U.S.-China focus on AI infrastructure scale competition, Korea can preempt diplomatic leadership by emphasizing "global responsibility to enhance AI as a sustainable technology system."
  - Contribute to integrated governance by establishing policy models tightly connecting AI-energy-environment, combined with climate/industrial policy.
    ※ High-efficiency/low-power AI chips, carbon-neutral data centers, and waste recycling technologies can serve as strategic central axes.
  - Promote green digital partnerships mitigating digital/environmental inequality simultaneously by developing sustainable AI infrastructure with resource/climate-vulnerable developing countries.

30 "E-waste" refers to end-of-life electronic products and their components, including AI infrastructure equipment such as computer servers, chipsets, and GPUs, as well as hazardous waste containing heavy metals and plastics.

- Sustainable AI infrastructure guidelines, E-waste transparency principles, and international recycling agreements can function as responsible agendas that must be pursued alongside each nation's Sovereign AI efforts, given the absence of relevant international norms.
  - Such agendas serve to solidify Korea's status as a responsible AI middle power on multilateral stages such as the UN, OECD, and ITU.
    ※ Secure negotiating initiative in AI-energy linkage technology diplomacy—including carbon-neutral AI data center certification systems, waste-recovering servers, and high-efficiency semiconductor cultivation policies based on energy consumption standards.

- Contribute to establishing trustworthy AI norms by actively participating in inclusive AI policy sharing and international standardization efforts linked with international organizations.
  - Present "Korea's horizontal leadership" that differentiates from China's strongly advocated global AI coexistence agenda—such as digital public goods, open-source ecosystems, and inclusive cooperation—offering alternative options for AI normative diplomacy.

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Abstract

Exploring the Korean Model for Sovereign AI Strategy

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Artificial intelligence (AI) has evolved into a core national resource exerting comprehensive influence across the economy, security, and society. However, the prevailing international AI order has solidified into a competitive structure between the U.S.–China axes, placing numerous countries in a strategic dilemma of unavoidable dependence on both powers. South Korea is among the nations significantly impacted by U.S.–China strategic rivalry and geopolitical uncertainty. Yet, it holds comparative advantages in key AI supply chain segments and is recognized as one of the few AI middle powers capable of pursuing long-term national strategies and normative diplomacy.

In this context, this paper critically examines the structure and constraints of the global AI order alongside the Sovereign AI concept to propose a Korean Sovereign AI national strategy as a middle power. South Korea must actively pursue its role as an AI middle power amid U.S.–China competition and the era of AI-driven complex security. To this end, first, establishing Korean Sovereign AI strategic objectives and reallocating resources is essential. Additionally, practical capabilities must be realized by securing foundational computational resources and strengthening front-end and back-end infrastructure operating systems. Furthermore, AI policy implementation capacity should be enhanced alongside human capital development. Finally, beyond national-level Sovereign AI discussions, South Korea should lead responsible initiatives for a sustainable AI ecosystem, exemplified by AI multilateral diplomacy and normative discussions linking technology-environment-development agendas, thereby contributing to trustworthy AI norm establishment.

Keywords: artificial intelligence (AI), Sovereign AI, middle power, AI diplomacy, U.S.–China competition

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