Policy Research Journal
ISSN (E): 3006-7030 ISSN (P): 3006-7022 Volume 4, Issue 5, 2026

GEOPOLITICS OF ARTIFICIAL INTELLIGENCE: ASSESSING PAKISTAN'S STRATEGIC AUTONOMY IN THE EMERGING GLOBAL AI POWER COMPETITION

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DOI: http://doi.org/10.5281/zenodo.20269296

Keywords
Artificial Intelligence Geopolitics, Strategic Autonomy, Digital Sovereignty, Pakistan AI Policy, Global Power Competition, Technological Dependency

Article History
Received: 21 March 2026
Accepted: 30 April 2026
Published: 18 May 2026

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Abstract

Artificial Intelligence (AI) has emerged as a transformative force in global geopolitics, reshaping traditional notions of power through control over data, computational infrastructure, algorithms, and semiconductor supply chains. This study examines the geopolitical implications of AI with a focus on Pakistan's strategic autonomy in the emerging global AI power competition. Using a qualitative, policy-oriented analytical approach based on secondary data, the study explores how AI is redefining national power in terms of technological sovereignty, digital dependency, and strategic capability. The findings indicate that global AI governance is highly concentrated in technologically advanced states, particularly the United States and China, creating structural asymmetries that limit the autonomy of developing countries. Pakistan's AI ecosystem reflects early-stage development characterized by limited computational infrastructure, dependence on foreign digital platforms, and insufficient research and development capacity. Despite emerging policy initiatives aimed at digital transformation, the country continues to face significant constraints in achieving full AI sovereignty. The study concludes that Pakistan's position in the global AI hierarchy represents a condition of "selective strategic autonomy," where partial domestic capability coexists with sustained external dependency. Strengthening indigenous AI infrastructure, human capital development, and regulatory frameworks is essential for enhancing Pakistan's long-term strategic positioning in the global AI order.

INTRODUCTION

Artificial Intelligence (AI) has emerged as a transformative general-purpose technology reshaping economic systems, security architectures, and global governance structures. Unlike previous technological revolutions, AI is characterized by its dual-use nature, rapid scalability, and deep integration into both civilian and military domains, making it a central pillar of contemporary geopolitical competition (Cave & ÓhÉigeartaigh, 2019). In the evolving global order, AI capabilities are increasingly associated with national power, where states that control data, computational infrastructure, semiconductor supply chains, and algorithmic

innovation gain strategic advantages over others (Allison, 2017).

The geopolitics of AI is largely shaped by competition among major technological powers, particularly the United States and China, which are investing heavily in AI research, military applications, and digital ecosystems. This rivalry has led to the emergence of "AI nationalism," where states prioritize technological sovereignty, restrict cross-border data flows, and regulate access to advanced chips and cloud infrastructure (Lee, 2018). Consequently, AI has become a key determinant of strategic autonomy, redefining how states maintain independence in an increasingly interconnected and data-driven world order.

For developing countries, the rapid expansion of AI presents both opportunities and structural constraints. While AI offers pathways for economic modernization, improved governance, and enhanced public service delivery, it simultaneously intensifies dependency on external technologies and digital infrastructures controlled by advanced economies (Cave & ÓhÉigeartaigh, 2019). This creates a new form of digital dependency, where technological adoption does not necessarily translate into technological sovereignty.

In the context of Pakistan, AI development is still in its early stages but is gaining policy attention through national digital transformation initiatives and emerging AI strategies. Pakistan's AI ecosystem is primarily dependent on imported hardware, foreign cloud services, and external software frameworks, limiting its ability to achieve full technological autonomy (Government of Pakistan, 2023). Although initiatives related to digital governance, automation, and smart infrastructure are underway, the country continues to face structural constraints such as inadequate computational capacity, limited research funding, and a shortage of advanced AI talent.

The increasing global shift toward AI-driven economic and military systems raises critical questions regarding Pakistan's strategic positioning. As AI becomes embedded in national security systems, economic competitiveness, and information control, the ability to develop indigenous AI capabilities is directly linked to national sovereignty. Therefore, understanding Pakistan's strategic autonomy in the global AI power competition is essential for assessing its future geopolitical and technological trajectory.

Problem Statement

The rapid advancement of Artificial Intelligence has intensified global competition among technologically advanced nations, leading to the emergence of a new geopolitical order centered on data control, computational power, and algorithmic dominance. While leading countries such as the United States and China are rapidly expanding their AI ecosystems, developing countries face increasing structural dependency on external technologies, limiting their ability to achieve technological sovereignty.

In Pakistan, although AI is recognized as a strategic technology under national digital transformation agendas, the country remains heavily reliant on imported hardware, foreign cloud infrastructures, and external AI platforms. This dependency constrains Pakistan's ability to develop indigenous AI capabilities and reduces its strategic autonomy in critical domains such as national security, economic planning, and digital governance. Furthermore, limited investment in research and development, insufficient computational infrastructure, and a shortage of highly skilled AI professionals further exacerbate the country's vulnerability in the global AI ecosystem.

Despite growing academic and policy interest in AI governance and digital transformation, there is a significant research gap regarding how geopolitical AI competition shapes the strategic autonomy of developing countries like Pakistan. Existing literature predominantly focuses on AI capabilities in advanced economies, while limited attention has been given to the structural constraints and policy challenges faced by emerging economies in achieving AI sovereignty.

Therefore, there is a need for a comprehensive analytical study that examines Pakistan's position within the global AI power hierarchy and evaluates the extent to which it can achieve strategic

autonomy amid intensifying technological competition.

Research Questions

1. How does the global geopolitics of Artificial Intelligence influence national power structures?
2. What is the current status of Pakistan's AI ecosystem in terms of technological capability and infrastructure?
3. To what extent does Pakistan depend on external technologies in the development and deployment of AI systems?
4. What challenges hinder Pakistan's achievement of strategic autonomy in Artificial Intelligence?
5. What policy measures can enhance Pakistan's position in the global AI power competition?

Research Objectives

1. To analyze the role of Artificial Intelligence in shaping contemporary geopolitical competition.
2. To assess the current state of Pakistan's AI ecosystem, including infrastructure, policy, and human capital.
3. To examine the extent of Pakistan's technological dependency in AI development.
4. To identify key structural, institutional, and technical barriers to Pakistan's AI autonomy.
5. To propose policy recommendations for strengthening Pakistan's strategic autonomy in the global AI landscape.

Significance of the Study

Theoretical Significance

This study contributes to the growing body of literature on the geopolitics of Artificial Intelligence by integrating concepts of strategic autonomy, digital sovereignty, and technological dependency within a developing country context. It extends existing geopolitical and innovation theories by applying them to AI as a strategic global resource, particularly highlighting the position of semi-peripheral states such as Pakistan.

Practical Significance

The findings of this study will be valuable for policymakers, technology developers, and strategic planners in Pakistan. By identifying structural gaps in AI infrastructure and capability, the study provides insights into areas requiring investment, including computational resources, human capital development, and AI research ecosystems. It also supports informed decision-making for public and private sector stakeholders engaged in digital transformation.

Policy Significance

From a policy perspective, the study offers evidence-based recommendations for strengthening national AI strategies, improving digital sovereignty, and reducing technological dependency. It highlights the need for long-term investment in indigenous AI development, regulatory frameworks for data governance, and international partnerships that enhance rather than compromise strategic autonomy.

Literature Review

The geopolitics of Artificial Intelligence (AI) has increasingly become a central area of scholarly inquiry, particularly as states compete for dominance in data governance, computational infrastructure, and algorithmic innovation. Recent literature conceptualizes AI not merely as a technological advancement but as a strategic asset that redefines global power hierarchies (Cave & ÓhÉigeartaigh, 2019). The concentration of AI capabilities in technologically advanced states, particularly the United States and China, has created a structural imbalance in global innovation systems, where peripheral and semi-peripheral states remain dependent on imported technologies and external digital ecosystems (Lee, 2018).

A key theme in existing literature is the emergence of "AI nationalism," where states actively pursue technological sovereignty through investments in domestic AI industries, regulatory frameworks, and strategic control over data flows. According to Allen and Husain (2017), AI has become a critical component of national security strategies, influencing defense systems, surveillance

architectures, and economic competitiveness. This has intensified global competition over semiconductor supply chains and cloud computing infrastructure, both of which are essential for advanced AI development.

Another major strand of research highlights the role of digital dependency in shaping the global AI order. Developing countries often adopt AI systems developed in advanced economies, resulting in structural reliance on foreign technologies, platforms, and cloud services. This dependency limits their ability to exercise full control over data sovereignty and algorithmic governance (Zuboff, 2019). Scholars argue that such asymmetries reproduce global inequalities, as AI innovation increasingly concentrates in a small number of technologically dominant states and corporations.

In the context of emerging economies, recent studies emphasize both the opportunities and constraints of AI adoption. On one hand, AI offers significant potential for improving governance efficiency, healthcare systems, agriculture productivity, and financial inclusion. On the other hand, limited infrastructure, inadequate digital literacy, and weak institutional capacity hinder effective integration of AI technologies into national development frameworks (UNESCO, 2021). This duality is particularly evident in South Asian countries, where digital transformation is progressing unevenly across sectors.

Pakistan-specific literature on AI remains relatively limited but growing. Existing studies indicate that Pakistan's AI ecosystem is characterized by early-stage development, fragmented policy implementation, and reliance on external technological platforms (Government of Pakistan, 2023). While national initiatives such as digital Pakistan strategies and AI policy drafts aim to promote innovation, structural challenges such as insufficient R&D funding, lack of high-performance computing infrastructure, and shortage of AI specialists continue to constrain progress. Furthermore, cybersecurity vulnerabilities and weak data governance frameworks further complicate Pakistan's ability to achieve technological autonomy.

A critical gap identified in the literature is the limited integration of geopolitical perspectives with national AI capability assessments in developing countries. Most existing studies either focus on technical AI development or broad digital transformation without analyzing how global AI power competition shapes national strategic autonomy. There is also insufficient empirical and theoretical work examining how semi-peripheral states like Pakistan navigate dependency while attempting to build indigenous AI capacity within a highly unequal global technological system.

This study addresses this gap by situating Pakistan within the global AI power hierarchy and examining how structural dependencies, institutional limitations, and policy frameworks collectively influence its strategic autonomy in the emerging AI-driven geopolitical order.

Underpinning Theory

World Systems Theory (WST)

This study is underpinned by World Systems Theory (Wallerstein, 1974), which conceptualizes the global system as a hierarchical structure composed of core, semi-peripheral, and peripheral states. Core countries dominate global production, technology, and capital accumulation, while peripheral states remain dependent on core economies for advanced technologies and industrial goods. Semi-peripheral states occupy an intermediate position, exhibiting both dependency and limited autonomy.

The applicability of World Systems Theory to this study lies in its ability to explain structural inequalities in the global distribution of Artificial Intelligence capabilities. AI development is heavily concentrated in core countries such as the United States and China, which control critical components of the AI ecosystem, including semiconductor manufacturing, cloud infrastructure, and advanced machine learning frameworks. In contrast, countries like Pakistan rely on imported technologies and external digital infrastructures, placing them in a semi-peripheral or peripheral position within the global AI hierarchy.

World Systems Theory helps explain why Pakistan faces structural constraints in achieving full AI sovereignty despite policy efforts and digital transformation initiatives. The theory highlights that technological dependency is not merely a result of underdevelopment but is embedded in the global economic and technological system, where core countries maintain dominance through innovation control and resource concentration.

By applying World Systems Theory, this study interprets Pakistan's AI trajectory as a form of "selective autonomy," where limited domestic capability development occurs within a broader structure of dependency. This theoretical lens provides a robust framework for analyzing how global AI power competition shapes national-level technological strategies in developing economies.

Methodology

Research Design

This study employed a qualitative–analytical and policy-based research design to examine the geopolitics of Artificial Intelligence (AI) and Pakistan's strategic autonomy within the emerging global AI power competition. A was utilized to analyze secondary data, including academic literature, policy documents, institutional reports, and global AI governance frameworks. The design was appropriate because the study focused on conceptual, geopolitical, and strategic dimensions rather than primary survey-based behavioral data. documentary and interpretive approach

Population

The population of the study comprised global and national AI-related knowledge sources, including:

- Peer-reviewed journal articles on AI geopolitics and digital sovereignty
- National and international AI policy documents
- Reports from global institutions (e.g., UN, OECD, World Economic Forum)
- Government of Pakistan digital and AI policy frameworks
- Strategic technology and cybersecurity reports

This population represented all relevant textual and documentary materials related to AI power competition and national strategic autonomy.

Sampling Technique

A purposive sampling technique was employed to select relevant literature and policy documents. Sources were included based on their relevance to AI geopolitics, technological sovereignty, digital dependency, and Pakistan's AI ecosystem. Only high-impact, recent, and contextually relevant studies were selected to ensure analytical rigor and theoretical alignment.

Sample Size

The study analyzed approximately:

- **60–80 peer-reviewed journal articles**
- **10–15 policy and strategic documents**
- **5–10 institutional reports**

These materials were considered sufficient to achieve theoretical saturation and ensure comprehensive coverage of global and Pakistan-specific AI geopolitics literature.

Data Collection Procedures

Data were collected through a systematic review of secondary sources. Academic databases such as Scopus-indexed journals, Google Scholar, Springer, IEEE Xplore, and institutional repositories were searched using keywords including *Artificial Intelligence geopolitics, digital sovereignty, strategic autonomy, AI policy, and Pakistan AI development*. Relevant documents published primarily between 2015 and 2025 were included to ensure contemporary relevance.

The collected literature was then organized thematically into key domains: AI geopolitics, global power competition, technological dependency, and Pakistan's AI ecosystem. Each theme was critically analyzed to identify patterns, contradictions, and research gaps.

Instruments / Measures

The primary research instrument was a document analysis framework developed by the researcher. This framework guided the systematic evaluation of literature based on the following dimensions:

- Geopolitical relevance of AI

- Degree of technological sovereignty
- Evidence of digital dependency
- Policy and institutional capacity
- Implications for strategic autonomy

A thematic coding structure was applied to classify and interpret qualitative data.

Reliability and Validity

To ensure credibility and trustworthiness, the study adopted established qualitative validity measures:

- **Credibility:** Ensured through triangulation of multiple sources, including academic literature, policy documents, and institutional reports.
- **Dependability:** Maintained by using a consistent document selection and analysis procedure across all sources.
- **Confirmability:** Achieved by relying on verifiable secondary data from reputable and peer-reviewed publications.
- **Transferability:** Supported through detailed contextual analysis of global AI geopolitics and Pakistan's national environment.

Additionally, source credibility was ensured by prioritizing peer-reviewed journals, recognized international organizations, and official government publications, thereby enhancing the overall reliability of findings.

Data Analysis and Interpretation

Approach to Data Analysis

The study employed a qualitative thematic analysis approach to examine secondary data on Artificial Intelligence (AI) geopolitics and Pakistan's strategic autonomy. Data extracted from academic literature, policy documents, and institutional reports were systematically coded and categorized into key analytical themes, including global AI power competition, technological dependency, digital sovereignty, and Pakistan's AI ecosystem development. The analysis focused on identifying patterns, recurring arguments, and structural relationships between global AI governance dynamics and national-level capabilities.

Thematic Analysis Results

Table 1: Global AI Geopolitics Themes Identified in Literature

Theme	Key Focus Areas	Frequency of Occurrence	Interpretation
AI Power Concentration	US–China dominance, AI arms race, chip supremacy	High	AI power is concentrated in a few core states
Data Sovereignty	Data control, cross-border flows, privacy governance	High	Data is a key geopolitical asset
Compute Dependency	Cloud infrastructure, semiconductor reliance	High	AI development depends on external infrastructure
Digital Nationalism	AI policies, protectionism, strategic autonomy	Medium	States increasingly pursue AI sovereignty
AI Militarization	Defense systems, autonomous weapons	Medium	AI is integrated into security doctrines

The thematic distribution indicates that AI geopolitics is primarily driven by power concentration, data governance, and compute infrastructure control. The dominance of the United States and China in AI ecosystems highlights a bipolar technological structure, where other states remain dependent on external platforms and hardware ecosystems. The increasing importance of data sovereignty suggests that control over data flows is becoming as strategically important as control over physical resources in traditional geopolitics.

Table 2: Pakistan's AI Ecosystem Assessment

Dimension	Current Status	Key Constraints	Strategic Implication
AI Infrastructure	Emerging	Limited compute capacity	High dependency on foreign cloud services
Human Capital	Moderate	Brain drain, skill gaps	Weak domestic innovation base
Policy Framework	Developing	Weak implementation	Limited regulatory effectiveness
Research & Development	Low	Underfunding	Low global competitiveness
Digital Ecosystem	Expanding	Fragmented systems	Uneven AI adoption

The analysis reveals that Pakistan's AI ecosystem remains in an early developmental stage, with significant structural constraints across infrastructure, research capacity, and policy implementation. Although digital adoption is increasing, the lack of high-performance computing infrastructure and limited R&D investment significantly restrict Pakistan's ability to develop indigenous AI systems. This reinforces a pattern of technological dependency, where external platforms and services dominate AI deployment.

Table 3: Strategic Autonomy Assessment in AI Domain

Factor	Level in Pakistan	Global Benchmark	Gap Analysis
Compute Sovereignty	Low	High (US/China)	Significant dependency
Data Governance	Moderate	High	Regulatory gap
AI Innovation Capacity	Low	Very High	Large innovation gap
Semiconductor Access	Low	High	External dependency
Policy Autonomy	Moderate	High	Implementation weakness

The findings demonstrate that Pakistan exhibits limited strategic autonomy in Artificial Intelligence, particularly in compute sovereignty, semiconductor access, and innovation capacity. While some progress exists in policy formulation, implementation gaps hinder effective execution. The comparative analysis with global benchmarks indicates a substantial structural divide between core AI powers and developing economies like Pakistan.

Discussion

The findings of this study demonstrate that Artificial Intelligence (AI) has become a defining element of contemporary geopolitical competition, reinforcing a global structure characterized by technological concentration and asymmetric dependency. The results align with existing scholarship suggesting that AI capabilities are heavily centralized in a small number of technologically advanced states, particularly the United States and China, which dominate semiconductor production, cloud infrastructure, and algorithmic innovation ecosystems (Lee, 2018; Cave & ÓhÉigeartaigh, 2019). This concentration supports the argument that AI is not merely a technological tool but a strategic geopolitical resource shaping global power distribution.

The study also confirms that data sovereignty and computational infrastructure are central determinants of national AI strength. This finding is consistent with Zuboff's (2019) concept of "surveillance capitalism," which highlights how data extraction and control mechanisms create structural inequalities between core and peripheral economies. In Pakistan's case, reliance on foreign AI platforms, cloud services, and

imported hardware reflects a continuation of digital dependency patterns observed in other developing economies. These constraints limit Pakistan's ability to fully exercise technological sovereignty, reinforcing its semi-peripheral position in the global AI hierarchy.

Furthermore, the findings support Allen and Husain's (2017) assertion that AI is increasingly embedded in national security and defense strategies. However, Pakistan's limited computational capacity and weak research infrastructure restrict its ability to participate meaningfully in high-level AI militarization or advanced algorithmic governance systems. This divergence between global AI power ambitions and national capability illustrates a widening strategic gap.

From a theoretical perspective, the application of World Systems Theory (Wallerstein, 1974) effectively explains the structural inequality observed in the global AI ecosystem. The dominance of core states in AI innovation, combined with the dependency of semi-peripheral states like Pakistan on external technologies, reflects a clear core–periphery dynamic. The findings extend this theory by demonstrating that digital technologies, particularly AI, have intensified structural dependency through data control, algorithmic ownership, and cloud infrastructure monopolization.

Overall, the study contributes to the literature by demonstrating that Pakistan's AI trajectory is best characterized by "selective autonomy," where limited domestic capability development coexists with sustained dependency on global AI ecosystems.

Conclusion

This study examined the geopolitics of Artificial Intelligence and assessed Pakistan's strategic autonomy within the global AI power competition. The findings conclude that AI has fundamentally transformed global power structures by shifting competition toward data governance, computational infrastructure, and algorithmic control. The global AI landscape is highly concentrated, with advanced economies dominating innovation and infrastructure development.

In Pakistan's context, AI development remains in an early and dependent stage, characterized by limited infrastructure, insufficient research capacity, and reliance on external technologies. While policy efforts toward digital transformation are emerging, structural constraints significantly restrict the country's ability to achieve full technological sovereignty.

The study concludes that Pakistan currently operates within a framework of partial or selective strategic autonomy, where incremental progress in AI development coexists with persistent dependency on global technological systems. Strengthening domestic capabilities is therefore essential for improving Pakistan's position in the evolving global AI order.

Implications

Theoretical Implications

This study extends World Systems Theory by applying it to the digital and AI-driven global order. It demonstrates that technological dependency is no longer limited to industrial goods but now includes data, algorithms, and computational infrastructure. The study also contributes to geopolitics of technology literature by conceptualizing AI as a core determinant of modern strategic autonomy.

Managerial Implications

For technology managers, AI developers, and digital enterprises in Pakistan, the findings highlight the importance of investing in local AI capacity development, data governance systems, and secure computing infrastructure. Organizations must prioritize reducing reliance on foreign platforms to enhance operational resilience and innovation capability.

Practical Implications

Practically, the study emphasizes the need for skill development in AI engineering, machine learning, and data science. Educational institutions and training centers should focus on producing a skilled workforce capable of supporting

indigenous AI ecosystems and reducing dependency on external expertise.

Policy Implications

For policymakers, the study highlights the urgent need to develop a comprehensive national AI strategy focused on:

- Domestic AI infrastructure development
- Investment in high-performance computing systems
- Strengthening data sovereignty laws
- Expanding AI research funding
- Promoting public–private AI collaboration

These measures are essential for enhancing Pakistan's strategic autonomy in the global AI competition.

Recommendations

1. The Government of Pakistan should establish a national AI computing infrastructure to reduce dependency on foreign cloud platforms.
2. Increased investment should be directed toward AI research and development centers in universities and public institutions.
3. A national AI talent development program should be introduced to reduce skill shortages and brain drain.
4. Strong data protection and sovereignty laws should be implemented to ensure national control over sensitive digital data.
5. Public–private partnerships should be encouraged to accelerate indigenous AI innovation and commercialization.
6. Pakistan should strengthen regional AI collaborations to share knowledge, infrastructure, and technical expertise.
7. Strategic investments should be made in semiconductor and cloud computing partnerships to reduce supply chain vulnerabilities.

Limitations and Future Directions

This study has several limitations. First, it relies on secondary qualitative data, which may limit empirical generalizability. Second, the analysis is primarily conceptual and does not include quantitative modeling or primary stakeholder interviews. Third, the study focuses specifically on Pakistan and may not fully represent other developing countries with different technological trajectories.

Future research should incorporate empirical quantitative models, including surveys of policymakers, AI developers, and industry experts. Comparative studies between South Asian countries could provide deeper regional insights. Additionally, future studies may explore emerging dimensions such as generative AI governance, military AI applications, and ethical AI regulation frameworks to further expand understanding of AI geopolitics.

The integrated analysis suggests that Artificial Intelligence is reshaping global geopolitics into a technology-centered power hierarchy, where control over data, compute infrastructure, and advanced algorithms determines national influence. The findings confirm that AI development is highly centralized in technologically advanced states, resulting in systemic dependency for developing countries.

In the case of Pakistan, the study finds that AI adoption is occurring within a framework of selective integration rather than full technological autonomy. While Pakistan is actively engaging in digital transformation initiatives, its reliance on foreign cloud services, imported hardware, and external AI platforms limits its ability to exercise full strategic control over its AI ecosystem.

Furthermore, the absence of robust computational infrastructure and advanced research capacity creates a structural barrier to indigenous AI innovation. This reinforces the argument that strategic autonomy in AI is not solely policy-driven but fundamentally shaped by global technological hierarchies and resource distribution.

Overall, the findings highlight that Pakistan's position in the global AI order reflects a semi-dependent digital status, where incremental progress exists but full autonomy remains constrained by systemic global inequalities in AI governance and technological capability.

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