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Research on the Path of AI Empowering Industrial Transformation and Upgrading in Underdeveloped Western Regions: A Case Study of Wuzhou

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Abstract: At the moment, artificial intelligence is driving economic and social transformation with a very deep and significant impact, becoming a key area for countries and regions to achieve the development of the high ground. As a city in the western region, Wuzhou has two pressures: transforming and upgrading traditional industries, and improving urban competiveness. According to the actual conditions of Wuzhou, this study does a systematic analysis of the strategic value, foundational conditions, and current practices of building typical AI application scenarios. Wuzhou has some advantages in characteristic industrial scenarios and network infrastructure, but it has a lot of shortcomings in policy precision, computing infrastructure, core technology supply, and talent reserves. Existing applications have features like fragmentation, superficiality, top-heaviness, and external dependencies. So, this paper suggests a systematic approach to countermeasures. It includes improving the policy system, focusing on characteristic industries to create benchmark scenarios, strengthening computing and perception infrastructure, deepening industry-education integration to build a talent system, and cultivating a localized industrial ecosystem. These recommendations intend to offer decision-making guidance to Wuzhou, aiming to achieve a catch-up path, which involves exchanging scenarios for technology, promoting development through application, and offering insights for promoting AI applications in similar western cities.

Keywords: Artificial Intelligence. Typical Application Scenarios. New Quality Productive Forces. Industrial Transformation and Upgrading. Wuzhou.

1. Introduction

Today, the new round of scientific and technological revolution, and industrial transformation is speeding up. Artificial intelligence (AI) is a strategic technology that is shaping the future, and it is driving a lot of changes in economic and social domains with a very broad and deep scope [1-6]. Globally, many developed economies have advanced AI to the level of national strategy. The United States, European Union, Japan, Republic of Korea, and others have released AI development strategies and plans successively, investing a lot of money into basic research, core technologies breakthroughs, and industrial applications [7-12].

In China, AI development has been incorporated into the country's top-level design. General Secretary Xi Jinping has repeatedly stressed that "accelerating the development of a new generation of artificial intelligence is a strategic issue concerning whether China can seize the opportunities presented by the new round of scientific and technological revolution and industrial transformation" [13-19]. The promulgation of documents such as the Next-Generation Artificial Intelligence Development Plan and the Guiding Opinions on Accelerating Scenario Innovation to Promote High-Quality Economic Development through High-Level AI Applications marks that China's AI development has entered a critical stage characterized by large-scale application and implementation.

Wuzhou is located in eastern Guangxi, adjacent to Guangdong, and serves as a key node city in the Pearl River–West River Economic Belt, historically known as "Guangxi's gateway on the water." In recent years, under the guidance of Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era, Wuzhou has thoroughly implemented the important instructions of General Secretary Xi Jinping on Guangxi's work, actively integrated itself into the construction of the Guangdong–Hong Kong–Macao Greater Bay Area, and striven to build a modern industrial system. That said, objectively speaking, as a city in the underdeveloped western region, Wuzhou still faces a significant gap compared with developed eastern cities in terms of economic development, industrial hierarchy, and innovation capacity.

2. Intrinsic Needs for Cultivating New Quality Productive Forces and Promoting Industrial Transformation and Upgradations in Wuzhou

Creating typical AI application scenarios carries multiple strategic values for Wuzhou's leapfrog development.

(1) In the new scientific, technological, and industrial changes, seize the initiative.AI technologies now stand at a pivotal moment, transitioning from the laboratory research phase to the large-scale commercial application. Across the globe, jurisdictions are collectively working to position themselves. Who takes the lead in developing and opening application scenarios will have a more favorable position in the future competion. Although Wuzhou doesn't have a comparative advantage in frontier R&D, it does have

distinctive resource endowments and market demand in characteristic-industry application scenarios. Wuzhou has a tailored path of exchanging scenarios for technologies and promoting development through applications.

(2) Wuzhou is driving traditional-industry transformation, upgrading, and quality-efficiency enhancement. Deploying AI across various production processes, including industrial production, quality control, supply chain optimization, and related activities, can significantly reduce the cost of production, enhance the quality of products, and shorten the delivery cycle. This transition from manufacturing to intelligent manufacturing can be achieved by leveraging AI in these production processes. This substitution effect, where AI takes over repetive labor and boosts total-factor productivity, becomes a particularly important aspect in the context of rising labor costs and the gradual loss of the demographic dividend.

(3) Applying AI to urban management, traffic coordination, emergency command, and government services, this way, we can perform more detailed management and make decisions smarter, data-informed, thereby making the city more intelligent and smarter. Meanwhile, introducing AI to sectors like healthcare, education, and elderly care can effectively address the structural shortages in high-quality public services and enhance residents' sense of gain, happiness, and security.

(4) The AI industry itself is a large and vast market. Wuzhou building typical application scenarios, can attract AI enterprises and talent, stimulate related industrial chains formation and development, and maybe more importantly, distill replicable experience and models that can be exported to other cities, to shape Wuzhou's city brand influence in AI applications.

3. Analysis of Foundational Conditions for AI Development in Wuzhou

3.1. Current Status of Policy Planning and Top-Level Design

In recent years, Wuzhou has attached great importance to the development of the digital economy and the application of artificial intelligence. The city has successively issued numerous policy documents and deployment plans, providing preliminary institutional guarantees for the development of AI application scenarios.

At the national level, Wuzhou has actively aligned itself with the national AI development strategy, taking artificial intelligence as an important lever to promote industrial transformation and upgrading. At the autonomous-region level, the Guangxi Zhuang Autonomous Region issued the Guangxi AI Industry Development Plan (2023–2027), which explicitly calls for "creating a batch of typical AI application scenarios and promoting the deep integration of AI with the real economy," and lists Wuzhou as one of the key supported cities. At the municipal level, in the Outline of the 15th Five-Year Plan for National Economic and Social Development of Wuzhou and the Long-Range Objectives Through the Year 2035, Wuzhou dedicates a major chapter to the construction of "Digital Wuzhou," proposing to "accelerate the application of new technologies such as artificial intelligence, big data, and cloud computing in industrial development, urban governance, and public services." Furthermore, Wuzhou has formulated the Wuzhou Digital Economy Development Plan (2023–2027), which outlines concrete measures to develop the AI industry and build application scenarios.

However, from the perspective of policy-system completeness, Wuzhou currently lacks a dedicated special plan and implementation rules specifically targeting the construction of AI application scenarios. Existing policies remain mostly at the macro-guidance level, lacking specific implementation measures and supporting mechanisms. Compared with advanced cities such as Shenzhen and Hangzhou, Wuzhou still lags considerably in policy innovation intensity, capital investment strength, and the depth of inter-departmental coordination.

3.2. Related Industrial Foundation and Data Resource Endowment

Wuzhou possesses a relatively rich industrial base and unique data resources, providing ample space for the development of AI application scenarios.

In the industrial sector, Wuzhou has formed five pillar industries—recycled resources, high-end metal new materials, building materials and environmental protection, food and pharmaceuticals, and electronic information—alongside two characteristic industries: Liupao tea and synthetic gems. Among these, the Wuzhou Circular Economy Industrial Park is among the first batch of national "urban mineral" demonstration bases, processing over 3 million tons of waste materials annually, covering categories such as scrap metal, waste plastics, and waste electrical and electronic products, generating substantial demand for intelligent sorting, inspection, and management. Wuzhou is also the largest synthetic gemstone processing base and trading hub in China, producing over 6 billion synthetic gems per year, accounting for more than 80% of the nation's output. There is considerable room for intelligent transformation in gem cutting, polishing, grading, and inspection. Liupao tea industry is a unique and beneficial industry in Wuzhou. In 2025, the city's Liupao tea production reached a level of 35,000 tons, and the total output value was exceeded by RMB 20 billion. From the tea garden cultivation to processing and marketing, the entire chain has potential for AI applications.

In terms of data resources, Wuzhou has a certain scale of data in government services, urban management, transportation, and healthcare. Wuzhou Big Data Development Bureau initially set up a municipal-level government data-sharing and exchange platform, this platform aggregates data from various departments. Moreover, Wuzhou is a key node on the West River shipping trunk line, and it has a lot of port logistics data and vessel navigation data. These data resources offer the essential foundation for training and optimizing AI algorithms.

3.3. Information Infrastructure Support Capability

Information Infrastructure provides a robust foundation for the development of AI application scenarios. In recent years, Wuzhou has made significant progress in developing its information infrastructure.

In terms of network infrastructure, Wuzhou has achieved continuous 5G coverage in urban areas and basic 5G coverage in townships. The penetration rates of fixed broadband households and mobile broadband users are both higher than the regional average. Wuzhou is also among the first prefecture-level cities in Guangxi to be built as a "gigabit city," providing network support for high-bandwidth, low-latency AI applications.

In terms of computing infrastructure, Wuzhou has established a municipal-level cloud computing center and a big data center, with some data storage and computing capacity. But it's important to note that Wuzhou currently does not have a dedicated AI computing center and an intelligent computing platform. The current computing resources are not enough to meet the requirements of large-scale deep learning model training and inference. Compared to cities in the region, like Nanning and Liuzhou, Wuzhou has a clear shortage in computing infrastructure.

In the realm of IoT infrastructure, Wuzhou has implemented a variety of sensors and IoT terminal devices in the fields of smart transportation, smart environmental protection, and smart security. However, the coverage is still limited, and a full-domain sensing network system hasn't been established yet.

3.4. Technology Supply and Talent Reserve Situation

Technology Supply and Talent Reserve Situation: The success or failure of AI application scenario construction depends on the supply of technology and the availability of talent. From the technology-supply standpoint, Wuzhou's local AI R&D capabilities are not very strong. Wuzhou University is the main university and research institution engaged in AI-related research in the city. However, the disciplinary development and research strength in AI are still lagging significantly behind the key universities both inside and outside the region. Local AI enterprises are scarce and small, mainly focusing on system integration and operations and maintenance services, but there are no enterprises with core algorithm R&D capabilities.

From the viewpoint of talent reserves, Wuzhou has a severe shortage of AI professionals. According to incomplete statistics, the total number of professional technical personnel involved in AI-related work in Wuzhou is less than 50. Among the high-level talent, there are particularly scarce. Wuzhou University annually produces around 30 graduates in computer science, electronic information, and related fields. However, most of them migrate to developed regions like Pearl River Delta, with less than 30% choosing to stay and work in Wuzhou. Moreover, due to constraints like salary levels and career development opportunities, Wuzhou has a significant challenge in attracting external AI talent.

4. Exploration Practices and Current Status of AI Application in Wuzhou

4.1. Preliminary Applications in Intelligent Manufacturing and Industrial Internet

In the industrial sector, a few leading enterprises in Wuzhou have started using artificial intelligence technologies for preliminary applications, and they've achieved some results.

In the Wuzhou Circular Economy Industrial Park, there are several enterprises that have introduced machine-vision-based intelligent sorting systems, which automatically identify and classify scrap metal and plastic. The sorting accuracy rate is more than 90%, and the efficiency has improved by more than three times compared to traditional manual sorting. For instance, a company that has recycled aluminum introduced an intelligent batching system during the smelting process. By analyzing the raw material composition and target product requirements, the system automatically calculates the optimal batching scheme, which reduces energy consumption, improves product quality and stability.

In the high-end metal new materials industry, a copper processing enterprise in Wuzhou has introduced a deep-learning-based surface defect detection system. Operating at high production-line speeds, this system can detect scratches, bubbles, and oxidation copper plate surfaces in real time, with detection accuracy more than 9%, which reduces the cost and error rate of manual quality inspection by a lot.

In the Liupao tea industry, a few big tea enterprises have started exploring intelligent production. For example, the Wuzhou Tea Factory has introduced an automated fermentation control system, which employs temperature and humidity sensors, combined with intelligent algorithms, to precisely regulate the fermentation process, significantly enhancing the consistency of batch-to-batch in tea quality. Other enterprises have tried to combine near-infrared spectroscopy analysis with machine learning models to perform rapid, non-destructive testing on key indicators like moisture content and tea polyphenol content.

But it's important to note that these applications are currently in the exploratory and point-based phase. They haven't established a systematic application framework, and they mainly operate among a few large enterprises. The vast majority of small and medium-sized enterprises have a very low level of intelligentization.

4.2. Penetration into Smart City Management and Government Services

In the realm of urban management and government services, Wuzhou has made some beneficial endeavors.

In terms of smart government affairs, the Wuzhou Administrative Approval Bureau launched a reform of "one-window acceptance, integrated services." On this basis, it introduced intelligent guidance systems and self-service terminals, enabling "instant approval and instant processing" for some high-frequency matters. Wuzhou has also launched the "i-Wuzhou" App, which integrates multiple citizen-oriented services—such as social security inquiries, housing provident fund processing, and traffic violation handling—allowing residents to complete routine administrative tasks via their smartphones.

In terms of smart transportation, the Wuzhou Traffic Police Department has built an intelligent traffic signal control system that automatically adjusts traffic light timing based on real-time traffic flow, alleviating congestion on major urban arterial roads to some extent. Moreover, Wuzhou has implemented intelligent systems to monitor and manage illegal parking, and to recognize pedestrians who are running red lights on certain road segments. This enhances the refinement of traffic management.

In the realm of smart urban management, the Wuzhou Urban Management Supervision Bureau has set up a digital urban management platform. With grid-based management, video surveillance, and citizen snap-and-report methods, this platform allows for the timely discovery and quick handling of urban issues. But the system hasn't introduced AI analysis functions yet, and it mainly relies on manual inspection and reporting.

4.3. Attempts in Livelihood Sectors: Cultural Tourism, Health and Elderly Care, and Education

In the field of cultural tourism, Wuzhou Qiloucheng (Arcade Building) has introduced an intelligent tour guide system and AR interactive experience projects. Visitors can use their mobile phones to scan QR codes and get introductions to attractions and historical stories, thereby enhancing the tour's interest and interactivity. Baiyun Mountain scenic area has a smart visitor flow monitoring system, which counts visitors and tracks their distribution in real time, giving data support for scenic area management and safety assurance.

In the realm of health and elderly care, there a few community-based elderly care service centers in Wuzhou, which have introduced intelligent health monitoring devices, like smart wristbands and integrated blood pressure and blood glucose monitors. These devices can monitor elderly health status in real time and automatically upload data to a management platform, so family members and caregivers can stay informed easily. But these devices have relatively low intelligence, and they don't have early warning and intervention capabilities based on big data analysis.

In the realm of education, Wuzhou University and a number of primary and secondary schools have initiated pilot projects to construct smart campuses, introducing systems like online teaching platforms, electronic class boards, and intelligent access control. Wuzhou University has also tried AI teaching assistants in a few courses to answer questions and grade assignments. However, the scope of application is limited, and a mature model has not yet been formed.

4.4. Summary of Characteristics and Patterns of Existing Application Cases

After conducting a systematic review of AI application cases in Wuzhou, the following key points can be summarized:

(1) The feature of fragmentation is clearly evident. Existing applications are distributed across various industries and fields, but there is no interconnection and synergy, and they haven't formed a systematic application ecosystem yet.

(2) The majority of applications are shallow. Most of the applications are concerned with perceptual intelligence, like image and speech recognition. In contrast, applications at the cognitive and decision intelligence levels are rare, lacking deep learning and complex reasoning capabilities.

(3) Leading enterprises dominate the pattern. Existing applications are mainly led by a few leading enterprises, with a limited participation from small and medium-sized enterprises, giving a top-heavy structure.

(4) There is a lot of dependence on external technology. Enterprises outside the region offer technical solutions for most applications, whereas local technical service capabilities are lacking, causing difficulties in subsequent maintenance and upgrades.

5. Conclusions and Policy Recommendations

Conclusions and Policy Recommendations This study does a systematic analysis of the construction of typical AI application scenarios in Wuzhou from four dimensions: historical context, strategic value, foundational conditions, and practical exploration. The following main conclusions are drawn:

(1) The construction of typical AI application scenarios is a strategic point for Wuzhou to achieve rapid development. In the accelerated technological revolution and industrial transformation, although Wuzhou doesn't have technological R&D advantages, it has unique resource endowments for characteristic industrial application scenarios. Pursuing a differentiated path of "exchanging scenarios for technologies, promoting development through applications" is a realistic choice for Wuzhou to seize development opportunities, drive the transformation and upgrading of traditional industries, enhance urban governance capacity, and cultivate new economic growth points.

(2) Wuzhou possesses foundational conditions for developing AI applications, but its shortcomings remain prominent. A policy framework has been preliminarily established, but special-purpose plans and implementation rules are lacking. Industrial scenarios are abundant, and data resources have taken initial shape, but the construction of computing infrastructure and IoT sensing systems lags. Network conditions have reached the "gigabit city" standard, yet local technology R&D capabilities are weak, and the total talent pool is insufficient, with severe outflow, which has become the biggest bottleneck.

(3) Wuzhou has achieved initial results in AI applications, but overall remains at a preliminary stage. Some leading enterprises have already gained successful experience in intelligent sorting, defect detection, and process optimization. Applications such as smart government affairs and smart transportation are gradually being rolled out. However, existing applications exhibit characteristics of "fragmentation, shallowness, top-heaviness, and external dependency." A systematic application ecosystem has not yet been formed, the level of intelligentization among SMEs is extremely low, and applications in cognitive and decision intelligence are severely lacking.

The deep-seated contradictions constraining Wuzhou's AI development include: disconnect between top-level design and grassroots implementation, resulting in a structural mismatch between policy supply and industrial demand; misalignment between technology supply and scenario needs, with high adaptation costs for external solutions; short-term performance orientation causing applications to remain at the level of shallow perceptual intelligence; and a vicious cycle in talent attraction, cultivation, utilization, and retention, coupled with a lack of high-quality industrial platforms to host talent.

Policy recommendations:

(1) Improve the policy system and strengthen top-level design. Promptly introduce a special plan for the construction of AI application scenarios, establish cross-departmental coordination mechanisms, set up dedicated funds, adopt approaches such as "rewards instead of subsidies" and equity investment to guide social capital participation, and incorporate relevant work into performance assessment.

(2) Focus on characteristic industries and create benchmark scenarios. Concentrate resources on building benchmarks in the three advantageous industries of recycled resources, Liupao tea, and synthetic gems. Construct an intelligent demonstration site for urban minerals, a Liupao tea industry leader, and a synthetic gem intelligent manufacturing demonstration area, which is driving the intelligent upgrading of the entire industrial chain from the point to the surface.

(3) Consolidate the infrastructure and address the

shortcomings in computing power and sensing. Plan and construct a Wuzhou AI computing center to offer inclusive computing capabilities; speed up the construction of IoT sensing systems, focusing on the coverage of key industrial parks and urban management areas; encourage the orderly opening of public data to stimulate the value of data elements.

(4) Strengthen industry-education integration and establish a talent system. Leverage Wuzhou University to jointly establish industrial colleges with universities and enterprises from the Greater Bay Area, carrying out order-based cultivation; implement flexible talent introduction policies, improve supporting services for talent, and create a favorable environment for innovation and entrepreneurship.

(5) Encourage local IT enterprises to transition toward AI services, establish supply-demand matching platforms, support small enterprises in adopting lightweight SaaS models to access AI applications, and create an innovation ecosystem that promotes collaboration among large, medium, and small enterprises.

This study is mainly qualitative. Future research might do quantitative evaluations and comparative studies across cities, and continuously track AI development in Wuzhou. This would provide a replicable Wuzhou sample for digital transformation in similar cities.

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References

[1] Xiang, B. W., & Zhang, D. (2026). The generation mechanism and advanced strategies of new human capital empowered by higher education. *Journal of Higher Education Management*, *20*(2), 103–112.

[2] Huang, S. J., & Du, Y. Y. (2026). AI for science for good: cultivating a sound and orderly development ecosystem. *Journal of Dalian University of Technology (Social Sciences)*, *47*(2), 122–128.

[3] Li, T. Y., & Wu, J. Y. (2026). Mechanisms and modes in AI for science (AI4S) research: a perspective from knowledge production modes. *Studies in Science of Science*, *44*(2), 235–244.

[4] He, Z. H., & Lu, X. (2026). Artificial intelligence for science: enhancing the application value of research outcomes. *Studies in Science of Science*, *44*(4), 701–712.

[5] Wang, F. (2025). Artificial intelligence leading the paradigm shift of scientific research. *Red Flag Manuscript*, (10), 45–48.

[6] Hekkert, M., Janssen, M., Wesseling, J., & van de Ven, G. (2020). Mission-oriented innovation systems. *Environmental Innovation and Societal Transitions*, *34*, 76–79. https://doi.org/10.1016/j.eist.2020.04.002

[7] Wang, C., Zhang, C. H., & Yao, H. L. (2023). Mission-oriented innovation policy: framework, theory and practice. *Studies in Science of Science*, *41*(1), 30–37.

[8] Ren, X. N., & Guo, S. F. (2025). The development of mission-oriented innovation policy and its research directions in the context of China. *Science and Technology Management Research*, *45*(2), 41–52.

[9] Li, P., & Cai, Y. Z. (2014). Each major science and technology plan in New China and construction of national innovation system: analysis of the transformation from the perspective of innovation system theory. *Seeking Truth*, *41*(5), 45–55.

[10] Xu, W., Yang, Z. T., & Wang, N. N. (2020). Development trajectory and strategic path of scientific and technological innovation in China: based on the perspective of national innovation system theory. *China University Science & Technology*, (9), 8–12.

[11] Yuan, Y. (2025, December 3). Can the Genesis Mission create a new era of artificial intelligence in the United States? *China Youth Daily*, p. 4.

[12] Kattel, R., & Mazzucato, M. (2018). Mission-oriented innovation policy and dynamic capabilities in the public sector. *Industrial and Corporate Change*, *27*(5), 787–801. https://doi.org/10.1093/icc/dty021

[13] Chen, K. H., Wen, X., & Liu, X. Y. (2025). The research on paradigm shift of scientific research driven by digital intelligence. *Science of Science and Management of S. & T.*, *46*(8), 54–68.

[14] Wu, N. Z., Chen, E. L., & Wu, Y. (2024). Organized teaching and research: orderly evolution of teacher training in an artificial intelligence environment. *E-Education Research*, *45*(1), 122–128.

[15] Xiang, B. W., & Zhao, J. F. (2024). Accelerated transformation and diversified development: the action path and practical logic of ExcellenceES in France. *University Education Science*, (4), 76–87.

[16] Crawford, J., Cox, P., & Rees, D. (2021). Speeding up to keep up: exploring the use of AI in the research process. *AI & Society*, *37*(4), 1439–1457. https://doi.org/10.1007/s00146-021-01268-y

[17] Li, L., & Liu, M. D. (2024). AI for science as a scientific research paradigm revolution: situation and future. *Exploration and Free Views*, (10), 143–151.

[18] Wang, F. Y., & Miao, Q. H. (2023). Novel paradigm for AI-driven scientific research: from AI4S to intelligent science. *Bulletin of Chinese Academy of Sciences*, *38*(4), 536–540.

[19] Tang, Y. J. (2025). Productivity paradox of artificial intelligence development and its solutions. *Academics*, (8), 62-69.