

The application framework of artificial intelligence in the field of open data

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Abstract

With the rapid development of information technology in China, the open data movement is flourishing, and artificial intelligence technology is playing an increasingly important role in the field of open data. With the rapid development of information technology in China, the open data movement is flourishing, and artificial intelligence technology is playing an increasingly important role in the field of open data. The deep integration of artificial intelligence technology and open data has brought unprecedented opportunities and challenges to various fields. The field of open data, analyze in detail its application scenarios, content, and presentation forms, and explore how the two can work together to provide better public services for the public, provide better governance solutions for social progress, create more favorable conditions for economic development, and better empower technological innovation. Through multi domain analysis, sort out application patterns, content, and forms, summarize problems, and propose strategies. Through multi domain analysis, sort out application patterns, content, and forms, summarize problems, and propose strategies. Currently, the application framework constructed by the integration of artificial intelligence and open data has demonstrated effectiveness in multiple fields, but it still faces many serious challenges. However, by implementing a series of response strategies such as strengthening data governance and optimizing algorithms, obstacles can be effectively overcome, and the enormous advantages and However, by implementing a series of response strategies such as strengthening data governance and optimizing algorithms, obstacles can be effectively overcome, and the enormous advantages and value generated by the synergy between the two can be continuously stimulated. Comprehensively sorting out applications, providing guidance for technology integration and ecological optimization, and promoting the process of digital transformation.

Keywords

Artificial Intelligence; Open Data; Public Governance; Public Decision-Making; Innovate

1. Scenarios for Artificial Intelligence in Open Data

1.1. Government governance and public service

Digital information is an important factor in current production and life, and a fundamental condition for change in public governance. The diversity of production factors, the diversity of public product demand and the differentiation of public services in modern society have become the main reasons for the governance gap derived from public governance. The problem of decentralization and fragmentation of public space in the digital era is becoming more and more prominent, and the massive amount of public information is spreading widely because of the lack of necessary screening and verification, which is not a small nuisance to public governance[1]. With the continuous development of the information age, the release of public information by the government and related departments as well as the public's demand for public information is increasing, which requires the public sector to release accurate, complete and timely public information to the public, this time with the help of artificial intelligence, such as Chat GPT, through the powerful data processing capabilities of artificial intelligence and data integration capabilities, changing the previous public information in the dissemination process. Through the strong data processing ability and data integration ability of artificial intelligence, it changes the possibility of discontinuity in the process of dissemination, makes the dissemination of public information more accessible, weakens the problem of different information processing ability among public sectors, thus improving the efficiency of the public sector and the public's satisfaction with the government governance.

Personalized smart government services also need artificial intelligence such as Chat GPT and other large language modeling tools to consolidate the "digital base", from "passive service" to "active service". From "passive service" to "active service", from "people looking for service" to "service looking for people", this will be a public governance role swap. The government can engage in two-way communication and interaction with the public, and identify blockages in public governance more intuitively, agilely and accurately. Realizing two-way interoperability between the demand side and the supply side of public services, further promoting the transformation of the supply of public service products from a static, one-way mode to a dynamic, interactive mode, fostering trust and transparency in governance, and advancing the ability of citizens to actively participate in the decision-making process[1]. Two-way interaction allows users to receive timely feedback and to participate in the process of improving public services, with a focus on public data security and privacy protection.

1.2. Educational process

In terms of education management, education management departments and schools can analyze a large amount of education data through AI, so as to understand the learning status of students, the teaching quality of teachers, and the management efficiency of schools, etc., and provide a scientific basis for education deci-

sion-making. For example, adjusting the major setting and curriculum system based on students' learning data and employment data; and formulating teacher training and development plans based on teachers' teaching assessment data.

In terms of resource allocation, the use of educational resources is monitored and analyzed with the help of artificial intelligence technology to achieve rational allocation of resources. For example, according to the number, distribution and learning needs of students, teaching equipment, library materials and other resources are reasonably allocated; according to the teaching tasks and professional expertise of teachers, teaching posts and teaching tasks are reasonably arranged to improve the efficiency of resource utilization.

1.3. Healthcare

In healthcare, integrating open information such as medical records, genetic data, and environmental monitoring, AI models are able to predict outbreak trends of infectious diseases. In the case of influenza, for example, analysis of social media discussions about symptoms, hospital visit data, etc., early warning of the epidemic, to buy time for prevention and control, but also to mine the disease-related factors, to assist in the development of personalized prevention and treatment programs. At the same time, to build a platform for doctor-patient interaction, patients can upload their own health data, symptom changes and other information, artificial intelligence system real-time analysis, providing the basis for remote diagnosis and treatment for doctors, doctors based on the system recommendations to give personalized guidance to patients, to achieve two-way interaction of medical services, improve the experience of medical treatment, improve the efficiency of medical care, and thus reduce the public's fear of the spread of disease.

China has a large population resource and a large base of medical data resources. Along with the continuous improvement of the level of medical informatization, especially the integration and application of artificial intelligence technology and medical technology, coupled with the help of algorithms, arithmetic, big data and other core technologies, the support of national policies and the entry of a large amount of capital, China's medical big data is growing explosively. During the epidemic after 2019, services such as quantitative analysis and efficacy evaluation of intelligent new coronaviral lesions by AI medical imaging technology have provided clinicians with important references for efficient and accurate decision-making, and also accumulated a large amount of medical imaging data resources, which have provided strong support for epidemic prevention, control and treatment[2].

1.4. Scientific research and innovation

The rapid development of artificial intelligence, especially the application of deep learning, has demonstrated a strong ability to think non-linearly. On the one hand, AI can process massive amounts of data and identify patterns, trends and correla-

tions from it, providing more comprehensive and objective information for scientific research and effectively assisting scientific research decisions. On the other hand, generative artificial intelligence (AIGC), represented by GPT-like AI, can also assist researchers in data collection and content re-creation[3].

Open data from different disciplines are aggregated and artificial intelligence assists researchers in mining data connections. For example, astronomy combines optical and radio telescope observation data with theoretical models of physics, uses artificial intelligence to explore the mysteries of cosmic evolution, breaks down disciplinary boundaries and spawns new theoretical discoveries. In the process of scientific research projects, through the open scientific research collaboration platform, global researchers can communicate and share research ideas and milestones in real time, and AI analyzes and integrates these interactive information to recommend potential cooperation directions and next research priorities for the team, promoting two-way interaction in scientific research collaboration and accelerating the pace of knowledge innovation. In experimental disciplines such as materials science and biology, based on open data from past experiments, AI plans new experimental programs, determines the optimal experimental parameters, reduces the cost of trial and error, and accelerates the scientific research process. Experimenters can feedback real-time data and accidental discoveries in the experiment to the AI system during the implementation process, and the system optimizes the subsequent experimental suggestions accordingly, forming a closed loop from design to practice to feedback and optimization, realizing two-way interaction in the process of scientific research experiments, and improving the efficiency of scientific research output.

2. Artificial Intelligence in the Open Data Domain

2.1. Data collection and pre-processing

Government departments have massive amounts of structured and unstructured data within them, and AI can help break down data silos and achieve multi-source integration. On the one hand, network crawler technology can be used to obtain all the data from the office system of each public sector and the open system, and then after the design of algorithms and some data analysis tools, according to the preset rules to automatically identify and extract the key data to ensure that the data is complete and accurate. On the other hand, integrating external data, collecting public opinion information from news media, social media, etc., to understand people's reaction to policies and assist in policy optimization; or cooperating with third-party data providers to obtain commercial data, geographic information data, etc. to supplement the governmental data system and provide a more comprehensive perspective for urban planning and economic development decisions.

After collecting the data, the AI purifies the data through a variety of algorithms due to the wide range of open government data sources and the varying quality of the

data. Rule-based cleaning can deal with the problem of format inconsistency, the format of inconsistent data standardization; the use of statistical analysis to identify outliers, eliminating obviously too high or too low and no reasonable basis for outliers, to ensure that the data reflect the real situation. At the same time, the clustering algorithm in machine learning is used to calibrate the data accuracy, grouping similar data together and comparing the differences within the groups to detect potential errors. Ensure reliable data and enhance government credibility. Taking the construction of smart cities as an example, data from multiple sectors such as transportation, energy, and environmental protection converge, and the AI system coordinates data sources from all parties to collect real-time data such as traffic flow, energy consumption, and air quality monitoring, providing first-hand information for comprehensive urban management.

2.2. Fostering a data culture in government

Artificial intelligence in the field of open data also includes the governance of government data, the construction of government data governance system in the context of artificial intelligence should focus on fostering the government data culture, improving the data literacy of the staff within the government and the general public, and forming a data governance eco-culture of "speak with data, manage with data, innovate with data, and serve with data". The data governance ecological culture of "speak with data, manage with data, innovate with data, and serve with data" should be formed. Government departments need to develop a big data mindset and expertise related to data governance. Change the traditional thinking mode of empirical decision-making and human calculation, and replace it with scientific management and intelligent decision-making, focus on speaking with objective data and facts, and use big data, artificial intelligence and other advanced technologies to carry out internal government management and social governance, and use the data to enhance social and public services[4].

2.3. Knowledge discovery and decision support

With the advent of the big data era and the rapid development of artificial intelligence, big data-driven AI technology will be a powerful enabler of evidence-based government decision-making. AI algorithms can enhance the human decision-making knowledge system by crawling large-scale data resources and mining and analyzing the information behind big data, which can have a significant impact on decision-making patterns[5]. Human decision makers are also constantly learning, reflecting, questioning and revising the results of feedback from AI algorithms as they interact with them. The recursive transformation of tacit and explicit knowledge that occurs when human decision makers train the AI and the learning that occurs during the human decision maker's interactions with the AI not only enriches the human decision maker's knowledge, but the AI also emerges with new

knowledge from this iterative process of interactions, which in turn provides the decision maker with evidence for more effective decision making[6].

3. Forms of Artificial Intelligence in Open Data

3.1. Smart Applications

The public service APP integrates open data services such as transportation, medical appointments, and life payment, so that citizens can obtain services in one-stop via cell phones. For example, the real-time bus inquiry APP relies on open data on transportation to inform the arrival time of buses, thus enhancing the convenience of life. Moreover, the public can give feedback on bus service experience, line optimization suggestions, etc. within the APP, the artificial intelligence background analysis and processing, the bus operation department accordingly to improve the service, and realize the two-way interaction of the people's service.

In the enterprise-level data analysis software, to provide customized data analysis tools for enterprises, access to the market, customers and other open data, visual display of the analysis results, to assist in business operations and management, such as sales data analysis software to help enterprises grasp the market dynamics. Enterprise employees can enter market research, customer feedback and other information into the software, artificial intelligence combined with the existing data to optimize the analysis model, to provide more accurate marketing strategy for the enterprise, to reach the two-way flow of information in the enterprise operation.

3.2. Data analysis platform

In terms of research collaboration platforms, research teams share experimental data and code in the cloud and utilize the platform's built-in artificial intelligence tools to collaborate on analysis and accelerate research innovation, such as bioinformatics platforms that promote genetic data mining and advance precision medicine. Researchers in the platform to exchange research experience, put forward the problem, artificial intelligence on the exchange of content mining analysis, for the team to recommend related literature, similar research cases, to help researchers in-depth interaction and collaboration.

There is also the Government Data Insight Platform, which is used by government departments to aggregate and analyze open data in various fields, macroscopically control socio-economic operations, and present data insights with an intuitive visualization interface to provide a basis for policy formulation. At the same time, a public opinion collection board is set up so that people can express their views on policy issues of concern, and AI analyzes public opinion tendencies and assists the government in optimizing policy solutions, realizing a two-way interaction between government decision-making and people's aspirations.

3.3. Intelligent decision-making system

Artificial intelligence has a very effective boost for public decision-making, the most typical is the emergency command and decision-making system, the government emergency departments to integrate meteorological, geographic, demographic and other open data, artificial intelligence to assist in disaster early warning, rescue resource deployment decision-making, such as the earthquake quickly planning rescue routes, distribution of supplies, to ensure the timeliness of emergency response. At the same time, through the emergency communication channel to collect the location of the affected people, demand and other information, artificial intelligence analysis to guide the rescue forces to accurately put, to realize the two-way information linkage in the emergency rescue and improve the rescue effect.

4. Challenges and strategies to address them

4.1. Challenges

In terms of data quality and privacy protection, there are uneven quality of open data, the risk of misopening of some sensitive information, and the difficulty of ensuring data accuracy and integrity while protecting personal privacy and business secrets, which will lead to a crisis of trust once privacy is compromised and hinder the application of technology.

In terms of algorithmic bias and interpretability, artificial intelligence algorithms affected by the training data may produce bias, such as recruitment screening algorithms based on gender-biased historical data training, will continue to be unfair, and complex deep learning model decision-making process such as a black box, it is difficult to explain the reasonableness of the results to the user, affecting the adoption of key decisions.

In terms of technical talents, there is a lack of composite talents who understand both artificial intelligence algorithms and are familiar with open data management and domain business knowledge, which restricts the landing of technology and makes it difficult for enterprises and organizations to set up efficient R&D teams to tap the value of open data.

In terms of cross-institutional collaboration, open data sharing among different departments and enterprises often encounters barriers, inconsistent data standards, difficult coordination of benefit distribution, and ambiguous definitions of rights and responsibilities, hindering the collaborative development of large-scale cross-institutional AI applications.

4.2. Response Strategies

First, data governance should be strengthened, a strict data review mechanism should be established, the data opening process should be standardized, encryption, anonymization and other technologies should be used to protect privacy, and data security should be ensured to be available on the premise.

Second, regular audits of algorithmic fairness and the development of interpretable models, such as rule-based machine learning models or model visualization techniques, make decisions transparent and enhance user trust.

Again, colleges and vocational schools are optimizing their curricula to cultivate interdisciplinary talents, and enterprises are strengthening on-the-job training, while actively introducing high-end talents from overseas to enrich their technical strength.

Finally, to build a collaborative ecology, the government takes the lead in formulating data-sharing standards, coordinating the distribution of benefits, building a cooperation platform, and promoting in-depth cooperation between industry, academia, research and application, such as setting up an open-data innovation fund to incentivize multi-party joint research.

5. Conclusion

The fusion of artificial intelligence and open data builds a multifaceted application framework, ranging from rich scenarios, covered content to diverse forms of presentation, and injects sufficient vitality into the provision of public governance and public services as well as all levels of society. Although facing many challenges, but through targeted strategies to deal with, is expected to continue to release the synergistic dividends of the two, the future should further deepen the integration of technology, optimize the application ecology, open a new chapter of digital transformation, for related fields of academic research and practical applications to expand new horizons, provide solid theoretical and practical guidance.

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