Research on the Big Data Intelligent Application

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Abstract: In order to improve the big data intelligent application ability based on network information system, the big data intelligent application mode with advanced system, unified standard and efficient service is constructed from different dimensions and levels, and the direction for the overall technology and system development of the big data intelligence application is pointed out.

1. Introduction
With the rise of the wave of big data and artificial intelligence, major countries in the world have taken it as a "sharp tool" and an important starting point to enhance national strategic capabilities and safeguard national security interests[1-3]. The US has released the big data national strategy[1] and summary of the department of defense artificial intelligence strategy[2]. Russia has released the national artificial intelligence development strategy by 2030 [3]. Our Country has issued the program of action for promoting the development of big data[1].

In the aspect of the artificial intelligence, big data technology development, it has achieved some stage research results such as TPU and GPU hardware architecture[4], TensorFlow, Theano, Caffe neural network framework[5], and VOC, ImageNet, COCO authoritative datasets[6], etc, which has contributed to the methods and paths exploration and construction of the big data intelligent application. However, the application of data construction still lags behind the development process of intelligent construction, and there are the following contradictions:

First, the system design is scatter. Data intelligent application lacks top-level and systematic design, which can not play a strong supporting role for data intelligent application. Second, intelligent application construction is less. Information system construction has always been highly valued, however, the construction of the data intelligent application lacks deep thinking, so it is urgent to systematically construct data intelligent application models. Third, the technical level is low. As the frontier technology in the current informatization development, big data application has obvious "gap" in intelligent application, which requires a lot of tackling work in theoretical research, system framework, implementation technology and other aspects.

Big data intelligent application research is mainly on the basis of large data intelligent application requirements and real data base, to build intelligent parallel systems[7], intelligent unmanned systems[8] as the main application scenarios, carry out theoretical and technical research centering on basic theories such as big data and artificial intelligence, supporting technologies such as digital twinning[7] and brain-like intelligence[8], and application models such as intelligent computing, integration and verification, and research to build digitization, servitization, intelligentization and visualization of large data intelligent application architecture based on open source big data platform, for providing intelligent simulation evaluation analysis, situational understanding and application services. The research objective is to build...
an innovative application mode of big data with advanced system, perfect function, intelligent efficiency and benign ecology.

(1) Build intelligent application system of big data. In accordance with the basic principles of "top-level planning, grasping the key points, and special self-research", the intelligent application system of big data will be built, and the core application support and service guarantee capability will be preliminarily formed.

(2) Build the intelligent application model system of big data. Three types of intelligent application models are constructed, namely intelligent analysis, situation understanding and simulation evaluation. Among them, intelligent analysis focuses on building intelligent identification, intelligent detection, intelligent association and other application models for intelligent analysis and processing of big data. Situation understanding focuses on classifying and aggregating big data according to situation factors based on intelligent analysis results to generate data products that are easy to understand intelligently. Simulation evaluation covers the whole life cycle of big data application, supporting the expected effect evaluation before intelligent application of big data, the generation of auxiliary decision in the application process and the optimization and improvement of models after application.

(3) Build intelligent application ecology of big data. On the one hand, carry out data BGF processing, mining analysis and visual presentation through the use of big data analysis[9], deep learning[10] and augmented reality[11] technology, implement massive fine integration, accurate analysis and accurate service of heterogeneous data resources under the condition of informatization, and provide effective support for comprehensive application of big data based on the network information system. On the other hand, build development, management tool sets for intelligent application models with the features of flexible customization, dynamic assembly, easy to extend, carry out secondary development and service application of standardization big data intelligent application models, which can help big data applications autonomously integrating into the data system, adaptively expanding the scope of data acquisition and BGF, continuously expanding the connotation extension of data system, and then the data system will be more complete aggregation and the "ecological chain" of intelligent application of big data will be built.

2. The overall plan

Around the theoretical technical dimension, architectural dimension and application model dimension, carry out the research on the big data intelligent application. The theoretical technical dimension includes theoretical support, model approach, support technical and application model. The architectural dimension includes resource layer, platform layer, support layer and application layer. The application mode dimension includes intelligent parallel systems and intelligent unmanned systems, as shown in the figure 1 below.
3. Theoretical technical dimension

Digital twin needs to construct the high geometry, logical, physical, functional models, design and train the real-time monitoring data’s collection, labeling, intelligent model, use real-time interaction of virtual and real-reality simulation scene as the demonstration means, finally generate hi-fi digital intelligent processing and decision model, the evolution of the approaching online adaptive model, the intelligent coordination and evaluation model, etc.

Big data processing needs to carry out the research on mass heterogeneous data integration and fusion technology to achieve data access, cleaning and fusion, quality management and unified access. It needs to carry out the research on methods of shielding the difference of computing resources between multi-layer heterogeneous hardware and software to provide powerful computing power and unified computing interface, and to realize unified scheduling of computing services and collaborative optimization of computing resources. It needs to carry out the research on the realization of the visualization management of big data analysis process and intelligent debugging of analysis algorithm.

Augmented reality needs to carry out the research on the generation of 3d digital scene of telepresence, natural human-computer interaction and virtual deduction based on somatosensory and VR-based emergency response training evaluation.

Brain-like intelligence needs to carry out the research on brain cognitive mechanism[12], autonomous learning method, man-machine integrated intelligence method[13], etc., and construct the brain-like computational model based on biological cognition and brain-like cognitive model based on impulse neural mechanism.

Intelligent integration needs to carry out the research on the application verification and integration demonstration of various artificial intelligence technologies, accumulate data resources, and develop intelligent modeling, intelligent testing and intelligent experiment systems.
Intelligent validation needs to carry out top-level design and planning, form the practice carrier, policy system and safeguard measure for the artificial intelligence innovation driven, and establish a comprehensive technology integration verification system covering the overall framework, standard system, functional requirements, implementation approaches, test data and feasibility verification.

4. Architectural dimension
Custom tools include intelligent service development tools, specialized algorithm libraries and visual presentation tools. The intelligent service development tools define the input and output of intelligent service, infuse the core algorithm of intelligent service, and realize the standardization creation of intelligent service. The specialized algorithm libraries make unified invocation and visual debugging of all kinds of special algorithms needed to realize intelligent service, including knowledge map[14], high performance computing, deep learning and other customized algorithm resources. Visual presentation tools use augmented reality and other technical means to create 3d scenes combining virtual and real, and realize visual output of intelligent service results.

Service management includes service publishing, service retrieval, and service feedback. Service publishing provides functions such as description, registration, approval, cataloging and navigation of intelligent services. Service retrieval provides functions such as querying, sorting and rendering of intelligent services. Service feedback provides intelligent service evaluation, ranking and other functions.

Intelligent analysis needs to carry out the research on the construction of the application models such as constructing fine state image sample generation, image intelligent learning based on small sample and object feature extraction based on hierarchical projection to realize the intelligent recognition of small sample image features. It needs to carry out the research on the construction of the application models such as high-precision image registration, pixel-level change detection and semantic product automatic generation to realize the intelligent change detection of pixel level objects. It needs to carry out the research on the construction of spatial location relationship perception, multi-resolution image association, association probability assessment and other application models, to achieve the complex environment multi-source data intelligent spatio-temporal association.

Situational understanding defines situational understanding target, based on the complex network[15], depth study constructs the target-match situational understanding model, through cumulative training and iterative improvement of the model, realizes that from the basic attributes understanding of entity and environment to the understanding of entity relationship and then to the understanding of entity capability behavior layer by layer, and finally to the real-time situation understand cognitive.

The simulation assessment investigates the effectiveness of the intelligent application system by means of digital experiment technology, through carrying out the human-computer interactive system simulation and simulation in the 3d scene of virtual and real fusion, and analyzing and evaluating whether the system meets the requirements in the aspects of function composition, performance index, application mode and application applicability under human control.

5. Application model dimension
Intelligent parallel system is mainly based on parallel system, augmented reality, system simulation and digital experiment, geographic information system, mission space conceptual modeling technology[16], to build and provide the simulation experiment environment, which includes digital twin model system, domain conceptual model system and intelligent parallel system platform with functions such as scenario editing, guide control, simulation engine and evaluation.

Intelligent unmanned system needs to carry on the research on techniques such as automatic interpretation technology, intelligent perception technology, intelligent robot technology and intelligent decision technology.

6. Conclusion
This paper mainly carries out the research on the top planning, technical system, and theoretical of the big data intelligent application, that will help realizing the autonomous fusion of system, network and data, increasing the degree of information system integration, and raising the level of refinement in data
application and practical value. By building the big data intelligent application ecology, the construction of data and information systems should be on a positive development track of building while using, promoting use and using to promote reform, so as to continuously improve the application level of big data.

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