

A Framework for Next-Generation Internet Scheduling: Leveraging Intelligent Computing

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Abstract: *This paper explores how intelligent computing drives the application of smart scheduling algorithms in internet services. It begins by explaining the theoretical foundations of intelligent computing and smart scheduling algorithms, then provides a detailed analysis of how intelligent computing enhances these algorithms across various internet scenarios. Through practical case studies and data analysis, the paper demonstrates their effectiveness and outlines future development trends. The research reveals that intelligent computing significantly improves the performance of smart scheduling algorithms in internet services, providing robust support for the efficient development of the internet industry.*

Keywords: Intelligent computing; Internet; Intelligent scheduling algorithm; Applied research.

1. INTRODUCTION

With the rapid development of Internet technology, various services have experienced explosive growth, and data volumes have surged, placing extremely high demands on system processing capacity and efficiency. As a key technology for optimizing resource allocation and improving system performance, intelligent scheduling algorithms have been widely adopted in the Internet domain. The rise of intelligent computing has injected new vitality into these algorithms, enabling them to better cope with the complex and ever-changing Internet environment. Through powerful computing capabilities, advanced algorithmic models, and efficient data processing, intelligent computing drives a qualitative leap in the accuracy, efficiency, and adaptability of intelligent scheduling algorithms, thereby enhancing the quality of Internet services and user experience [1]. In-depth study of how intelligent computing promotes the application of intelligent scheduling algorithms on the Internet is of great practical significance for fostering continuous innovation and development in the Internet industry.

2. THEORETICAL FOUNDATIONS OF INTELLIGENT COMPUTING AND INTELLIGENT SCHEDULING ALGORITHMS

2.1 Overview of intelligent computing

Intelligent computing, or smart computing, is a computing paradigm that integrates advanced technologies such as artificial intelligence, big data, and cloud computing. It possesses powerful parallel computing capabilities, enabling rapid processing of massive datasets. For example, in large-scale data centers, intelligent computing systems can simultaneously analyze and process hundreds of millions of data points. Intelligent computing also features intelligent decision-making capabilities; leveraging algorithms like deep learning, it can uncover hidden patterns in vast amounts of data to support decision-making [2]. Take intelligent security systems as an example: intelligent computing can perform real-time analysis of surveillance footage to quickly identify abnormal behavior and issue alerts. The development of intelligent computing is driven by advances in hardware technologies, such as high-performance GPUs and FPGAs, as well as continuous innovation in software algorithms, including the widespread adoption of deep learning frameworks like TensorFlow and PyTorch.

2.2 Principles of intelligent scheduling algorithms

Intelligent scheduling algorithms aim to allocate limited resources rationally among different tasks to achieve optimal performance objectives. Common intelligent scheduling algorithms include genetic algorithms, simulated annealing algorithms, and ant colony algorithms. Genetic algorithms seek the optimal solution by simulating selection, crossover, and mutation operations in biological evolution. In online advertising placement, genetic algorithms can allocate advertising resources rationally based on user characteristics and behaviors, thereby improving click-through and conversion rates. Simulated annealing algorithms, grounded in the principle of solid annealing, use random search under a given temperature to find the global optimum [3]. They perform well on

combinatorial optimization problems such as the traveling salesman problem, enabling the discovery of superior path-planning solutions in complex solution spaces. Ant colony algorithms mimic the food-seeking behavior of ant colonies, achieving rational task allocation through pheromone transmission and updating. In logistics distribution, ant colony algorithms can optimize delivery routes, enhance delivery efficiency, and reduce costs. Each algorithm has distinct features and suits different Internet application scenarios.

3. SPECIFIC MANIFESTATIONS OF AI COMPUTING DRIVING THE APPLICATION OF INTERNET INTELLIGENT SCHEDULING ALGORITHMS

3.1 Improving Algorithmic Computational Efficiency

The formidable computing power of AI computing can markedly shorten the computation time of intelligent scheduling algorithms. In ride-hailing platforms, real-time matching of large numbers of vehicles and passengers places extremely high demands on algorithmic efficiency. Traditional algorithms often require a long time to produce a dispatch plan when handling such massive datasets, leading to excessive passenger wait times. By leveraging AI computing platforms and their parallel computing capabilities, multiple orders and vehicle data can be processed simultaneously, rapidly calculating the optimal matching solution [4]. Research shows that after adopting AI computing, the average order-matching time on ride-hailing platforms dropped from 30 seconds to under 5 seconds, greatly improving passenger satisfaction and platform operational efficiency. During e-commerce promotional events, order volumes surge instantaneously, posing enormous challenges for intelligent logistics scheduling. AI computing can accelerate the computation of logistics path-planning algorithms, quickly devising optimal delivery routes for each order and ensuring timely delivery to customers.

3.2 Optimizing Algorithmic Accuracy

AI computing can optimize the accuracy of intelligent scheduling algorithms by learning from and analyzing massive datasets. In Internet video recommendation systems, intelligent scheduling algorithms must recommend appropriate video content based on users' historical viewing records and preferences. AI computing platforms can collect and analyze vast amounts of user behavioral data, using deep-learning algorithms to train more precise user-interest models. By continuously refining the recommendation algorithm, the accuracy of video recommendations is improved, making it easier for users to find content that interests them.

3.3 Enhancing Algorithmic Adaptability

The Internet environment is complex and ever-changing; business requirements and data characteristics can shift at any moment. Intelligent computing enables smart scheduling algorithms to adapt more effectively to such dynamic changes. Take cloud-computing resource scheduling as an example: the volume of user tasks and resource demands on a cloud platform fluctuate greatly across different time periods. Intelligent computing can monitor the platform's resource usage and task loads in real time, automatically adjusting the parameters and strategies of the resource-scheduling algorithm based on this dynamic information. When task volume surges, intelligent computing can rapidly allocate additional computing resources to ensure timely completion; when resource utilization is low, it can optimize allocation to avoid waste [5]. On social-network platforms, users' active hours and behavior patterns vary with time, season, and other factors. Smart scheduling algorithms empowered by intelligent computing can perceive these changes in real time, adjusting information-push and traffic-allocation strategies to improve service quality and user engagement.

4. APPLICATION EXAMPLES OF INTELLIGENT COMPUTING IN SMART SCHEDULING ALGORITHMS FOR TYPICAL INTERNET SCENARIOS

4.1 E-commerce Logistics and Delivery Scenario

Within the logistics system of e-commerce giant Alibaba, massive numbers of orders must be processed and delivered every day. To achieve efficient logistics, Alibaba leverages intelligent computing to optimize its smart scheduling algorithms. By analyzing multi-source data such as historical order records, vehicle trajectories, and real-time traffic conditions, the intelligent-computing platform trains an accurate delivery-demand forecasting model. Based on this model, the smart scheduling algorithm can pre-plan vehicle routes and task allocation. During shopping festivals like "Double Eleven," order volume explodes. The intelligent-computing platform

monitors order information and logistics-resource status in real time, dynamically adjusting the scheduling algorithm. When orders in a region exceed expectations, it can swiftly redeploy vehicles and couriers from nearby areas to ensure on-time delivery. Statistics show that after adopting intelligent-computing-optimized smart scheduling, Alibaba Logistics' on-time delivery rate rose from 80 % to over 95 %, while logistics costs fell by 15 %.

4.2 Online Travel Platform Scenario

As China's leading online travel platform, Ctrip commands vast inventories of flights, hotels, and tour packages. To deliver a better service experience, Ctrip leverages intelligent computing to power smart scheduling algorithms. For flight bookings, the intelligent computing platform gathers and analyzes massive volumes of flight data, price fluctuations, and user search and booking behaviors. From this data, the smart scheduling algorithm generates the optimal flight recommendations whether the lowest price, shortest travel time, or fewest connections. When a user searches for flights to a destination, the algorithm backed by intelligent computing filters through millions of options in milliseconds, ranking them according to user preferences. For hotel bookings, the system uses past stays, reviews, real-time availability, and pricing to recommend the most suitable hotels. Since deploying intelligent computing to refine its algorithms, Ctrip has seen a 25% lift in booking conversion and a 30% drop in average search attempts, markedly improving user experience and platform competitiveness.

4.3 Internet Finance Transaction Scenarios

In internet finance, real-time accuracy is critical. Alipay, under Ant Group, processes tens of billions of transactions daily. To ensure efficient handling, Alipay optimizes its transaction scheduling algorithms with intelligent computing. The platform monitors transaction flow, user behavior, and fund movements in real time. During peak periods such as Lunar New Year red-envelope campaigns or e-commerce promotions requests spike instantly. The intelligent scheduling algorithm dynamically reallocates processing resources based on live data, prioritizing large-value or urgent transactions while ensuring small-value ones are completed promptly. This keeps Alipay's success rate above 99.9% and latency within milliseconds. Moreover, intelligent computing analyzes transaction data to flag risky transactions, providing users with a secure and reliable environment.

5. CHALLENGES AND COUNTERMEASURES FOR INTELLIGENT COMPUTING IN INTERNET SMART SCHEDULING ALGORITHMS

5.1 Data Security and Privacy Protection: Challenges and Countermeasures

During intelligent computing, vast amounts of internet data are collected and processed, posing challenges for data security and privacy protection. Once sensitive data such as users' personal information and transaction records are leaked, users can suffer enormous losses. Malicious actors may attack intelligent computing platforms to steal user data for illegal activities. To address this challenge, the first step is to strengthen the application of data encryption technologies. During data transmission and storage, advanced encryption algorithms such as the AES encryption algorithm should be used to encrypt data and ensure its security. Establish strict data-access permission management so that only authorized personnel and programs can access and process data. Conduct rigorous identity authentication and permission control for operators of intelligent computing platforms to prevent data leaks caused by insiders abusing their privileges. Blockchain technology can also be employed to make data tamper-proof and traceable, further enhancing data security and trustworthiness.

5.2 Algorithmic Complexity and Interpretability: Problems and Countermeasures

As intelligent computing drives the continuous evolution of intelligent scheduling algorithms, their complexity keeps increasing, making interpretability a prominent issue. Some deep-learning-based intelligent scheduling algorithms have intricate model structures and numerous parameters, rendering their decision-making processes hard to understand. In internet-based medical platforms, intelligent scheduling algorithms are used to allocate medical resources and diagnostic tasks; if the algorithms' decisions are unexplainable, doctors and patients may distrust the results. To solve this problem, on the one hand, research into interpretable algorithms is needed. Develop models that can explain their own decision processes, such as rule-based decision-tree algorithms whose decision paths are clear and easy to grasp, providing users with explicit rationales. On the other hand, visualization techniques can be adopted to present the algorithms' decision processes in intuitive graphical form. By drawing

decision paths, parameter-change curves, and other visual charts, users can better understand how the algorithms operate and the logic behind their decisions.

5.3 Intelligent Computing Resource Cost: Problems and Countermeasures

Intelligent computing requires powerful hardware and vast computational resources, leading to high costs. Purchasing high-performance servers, GPU clusters, and other hardware demands substantial capital, while operating and maintaining an intelligent computing platform consumes significant human and material resources. For many small and medium-sized internet companies, these high resource costs can become a barrier to adopting intelligent computing to drive smart scheduling algorithms. To reduce these costs, firms can turn to cloud computing services [6]. By renting cloud-based resources, they avoid the expense of procuring and maintaining large-scale hardware. Cloud platforms can flexibly adjust resource allocation according to actual needs, enabling pay-as-you-go pricing and improving utilization. Companies can also share resources and collaborate with others to jointly build intelligent computing platforms and split the costs. Internet firms in certain regions can unite to establish regional intelligent computing centers, optimizing and sharing resources to lower each individual firm's expenses.

6. CONCLUSIONS AND OUTLOOK

6.1 Research Conclusions

This paper's in-depth study of how intelligent computing drives the application of internet smart scheduling algorithms yields the following conclusions: Leveraging its powerful computing capacity, intelligent decision-making, and ability to process massive data, intelligent computing plays a vital role in improving the computational efficiency of smart scheduling algorithms, optimizing their accuracy, and enhancing their adaptability. In typical internet scenarios such as e-commerce logistics, online travel platforms, and internet financial transactions, smart scheduling algorithms optimized by intelligent computing have achieved remarkable results, boosting system performance and user experience. Nevertheless, challenges including data security and privacy protection, algorithmic complexity and interpretability, and the cost of intelligent computing resources remain; targeted countermeasures can effectively address them.

6.2 Future Outlook

As technology continues to advance, intelligent computing and intelligent scheduling algorithms will play an increasingly important role in the Internet domain. In the future, intelligent computing technologies will keep innovating, computing power will be further enhanced, and costs will continue to drop, providing a more solid foundation for the development of intelligent scheduling algorithms. On the algorithmic side, ever more efficient, accurate, and well-interpretable intelligent scheduling algorithms will emerge to meet the increasingly complex and ever-changing demands of Internet services. In terms of application scenarios, intelligent scheduling algorithms driven by intelligent computing will expand into more fields, such as smart transportation, smart homes, and industrial Internet. In smart transportation, intelligent scheduling algorithms optimized by intelligent computing can enable intelligent control of traffic lights and intelligent platooning of vehicles, improving traffic efficiency and alleviating congestion. In the industrial Internet, intelligent scheduling algorithms can optimize the allocation of production resources and the scheduling of production processes, raising the level of intelligence and production efficiency in industrial manufacturing. The application prospects of Internet intelligent scheduling algorithms driven by intelligent computing are vast, bringing new opportunities and transformations to the Internet industry and other related fields.

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