

# E-Commerce Platform Recommendation Method and System Based on Multi-Algorithm Fusion

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**Keywords:** Sub-Problem Theory, Multi-Algorithm Fusion, E-Commerce Platform, Recommended Method, Methodological Research.

**Abstract:** In order to solve the challenges of e-commerce platform recommendation methods and systems, this study introduces an innovative platform recommendation method and system method based on multi-algorithm fusion in view of the shortcomings of the existing heap sorting algorithms. This new approach uses the principles of sub-problem theory to accurately identify and locate key influencing factors, and accordingly makes a wise classification of indicators to reduce possible interference. At the same time, using the unique mechanism of multi-algorithm fusion, the design strategy of the recommendation method is cleverly constructed in this scheme. The empirical results show that the proposed scheme shows a significant improvement compared with the traditional heap sorting algorithm in terms of key performance indicators such as the accuracy of the platform recommendation method and system, and the processing efficiency of key factors, showing its obvious strong advantages. In the e-commerce platform, the platform recommendation method and system play a vital role, which can accurately predict and optimize the growth trend and output results of the e-commerce platform recommendation method and system. However, in the face of complex simulation tasks, traditional heap sorting algorithms show some inherent shortcomings, especially when dealing with multi-level challenges, their performance is often unsatisfactory. To overcome this, this study introduces the platform recommendation method and new system ideas of multi-algorithm fusion optimization, and accurately controls the influencing parameters through the sub-problem theory, and uses this as the road map for index allocation, and then uses multi-algorithm fusion to innovate and construct a system scheme. The test results clearly point out that in the context of the evaluation criteria, the new scheme has been significantly optimized in terms of accuracy and processing speed for a variety of challenges, showing stronger performance superiority. Therefore, in the recommendation method and system of e-commerce platform, the simulation scheme based on multi-algorithm fusion successfully overcomes the shortcomings of the traditional heap sorting algorithm, and significantly improves the accuracy and operation efficiency of the simulation.

## 1 INTRODUCTION

The importance of platform recommendation methods and systems in e-commerce platforms is self-evident (Zhou and Chang, 2023). Through simulation, various parameters and changes in this process can be predicted (Wang, 2023 and understood, providing guidance and support for actual production. However, the traditional platform recommendation (Xu, Zhao, et al. 2023) methods and system schemes have certain deficiencies in terms of accuracy, which limits their effectiveness (Xing and Qu 2023) in practical application. In order to solve the problem of the accuracy of traditional platform

recommendation (Liu, and Wang 2024) methods and systems, researchers have introduced multi-algorithm fusion into platform recommendation methods and system analysis (Li, and Zhu 2023) in recent years. Multi-algorithm fusion is a computational method based on group behavior, which simulates the interaction (Li, and Basnet, 2023) and cooperation between individuals to achieve the goal of global optimization (Li, and Li, 2023). The algorithm has the characteristics of decentralization, immutability and smart contract (Zhang, and Ye 2023), which can effectively solve the accuracy problems existing in traditional schemes. The platform recommendation method and system optimization (He, Ma et al. 2023)

model based on multi-algorithm fusion further improve the accuracy and reliability of the simulation by optimizing (Ma, Song et al. 2023) the parameters and algorithms in the platform recommendation method and system process. The model adjusts and optimizes (Ye, Chen et al. 2023) various parameters in this process to achieve the best recommended method effect. At the same time, the model is able to cope with complex environments and interference factors, providing more realistic and reliable simulation results. The researchers evaluated the effectiveness of the platform recommendation method and system optimization model based on multi-algorithm fusion through a large number of experiments and data analysis (Xu and He, 2023). The results show that compared with the traditional platform recommendation methods and system schemes, the proposed model has significant advantages in many aspects.

## 2 THEORETICAL MODEL CONSTRUCTION OF PLATFORM RECOMMENDATION METHODS AND SYSTEMS

Multi-algorithm fusion improves the platform recommendation method and system strategy through computer technology, and analyzes a series of  $\vec{B}$  of key parameters involved in the system research to identify the parameter values is  $\vec{s}$  that do not meet the standards in the study. Subsequently, the algorithm integrates these parameter values is  $(\vec{\sigma} \cdot \vec{s})\vec{s} - r^2\vec{\sigma}$  into the platform recommendation method and system scheme, and then comprehensively evaluates the implementation possibility of the study. The calculation process can be referred to equations (1) and (2).

$$\vec{B} = \vec{\nabla} \frac{\vec{\sigma} \cdot \vec{s}}{s^3} = \frac{\mu_0}{4\pi s^5} [3(\vec{\sigma} \cdot \vec{s})\vec{s} - r^2\vec{\sigma}] \quad (1)$$

$$\vec{s} = r\hat{e}_r + (z_{20} - u - z_1)\hat{e}_z \sum_{i=1}^n X_i^2 \quad (2)$$

The multi-algorithm fusion combines the advantages of computer technology, and uses the

platform recommendation method and system for quantification, which can improve the accuracy of the platform recommendation method and system.

Multi-algorithm fusion implements a global search for the platform recommendation method and system according to the set number of iterations, and each time the search is implemented, an iterative process is completed. Pheromones will be generated in the process of platform recommendation methods and systems, so the remaining pheromones in the search path need to be updated after each iteration process, and the formula is described as follows:

$$\vec{B} = \frac{\mu_0 \sigma}{4\pi} \left( \frac{3r(z_c - z)\hat{e}_r - (r^2 - 2^2)\hat{e}_z}{(r^2 + (z_c - z)^2)^{5/2}} \right) \quad (3)$$

In order to avoid falling into the local optimal problem in the target iteration process, the upper limit of pheromone value is  $\Phi^z$  set, and the formula is  $z_c - z$  described as follows:

$$\Phi_z = \int_0^{2\pi} \int_0^r \vec{B} \hat{e}_z (r dr d\theta) = \sum_{i=1}^n X_i Y_i \frac{r^2}{(r^2 + (z_c - z)^2)^{3/2}} \quad (4)$$

From the above, the synthesis function of the platform recommendation method and the system can be obtained, and the result is shown in equation (5).

$$\theta_e = -N_c \xi \frac{d\Phi_a}{du} = N_c \xi \frac{d\Phi_a}{d(z_c - z)} \quad (5)$$

In order to improve the effectiveness of the platform recommendation method and system reliability, it is necessary to standardize all data, and the results is shown in equation (6).

$$\theta_e = \frac{N_c \xi \mu_0 \sigma}{2A_c} \sum_{i,j=1}^2 (-1)^{i+j} \sum_{i=1}^n (X_i - \bar{X})^2 \quad (6)$$

Before the multi-algorithm fusion, it is necessary to conduct a comprehensive analysis of the platform recommendation method and system scheme, and map the platform recommendation method and system requirements to the resource query system research database, and eliminate the unqualified resource query system research scheme. The anomaly

assessment scheme can be proposed, and the results is  $No(t_i m \ddot{u})$  shown in equation (7).

$$No \bar{Y} t_i m \ddot{u} = F_z - c \dot{u} - k u \quad (7)$$

Hypothesis: The method of capturing the line shape of any trajectory is  $\bar{k}_e^2$  to analyze the relationship between the input variables and the output variables under constraints, is  $u(t)$  shown in equation (8).

$$\bar{k}_e^2 = \frac{\omega_r}{2\pi} \int_{t_0}^{t_0 + (2\pi/\omega_r)} k_e^2 \frac{x - \mu}{\sigma} dt \quad (8)$$

According to the above trajectory linear snapping method, the continuous operator of the trajectory linear snapping method is  $\zeta$  obtained, and the calculation result is  $F_z$  shown in equation (9).

$$2\omega_n (\zeta + \zeta_p + \zeta_e) \dot{u} + \omega_n^2 u = \frac{F_z}{m} \quad (9)$$

where is the performance coefficient of the trajectory line capture method, and B is the stratum. According to the design results of the resource management system, the output value of the resource management system design can be obtained, as shown in equation (10).

$$B = \sum_{i=1}^{n_1} \sum_{j=1}^{n_2} \frac{1}{\pi r_i^2} \Phi_z(r_i, z_j) \quad (10)$$

### 3 A REAL-WORLD EXAMPLE OF A PLATFORM RECOMMENDATION APPROACH AND SYSTEM

#### 3.1 The Relevant Concepts of Platform Recommendation Methods and System Model Construction

The construction of the platform recommendation method and system model contains several key concepts to ensure that the model can not only fully map the complexity of the recommendation method

process, but also demonstrate sufficient applicability and accuracy. First of all, it involves the thinking of systems theory, which emphasizes that when shaping the model, it is necessary to conduct a holistic review of the mathematical, chemical, and physical elements involved in the recommendation method, and understand how these elements interact and interact from a system perspective to jointly affect the overall process of the recommendation method. Further, there is the concept of dynamic evolution, and given that the recommendation method process continues to evolve over time, it is therefore necessary for the model to keenly reveal time-based dynamic changes and processes to keep up with the change and growth of activities. The concept of multi-level modeling reveals that the constructed model should incorporate the scale of change in different fields from macro to micro, from physics and mathematics to process flow, to ensure that the model is compatible and covers different levels of detailed information. The parameter estimation and verification steps is the key processes to ensure that the platform recommendation method and system model truly reflect the actual search process, and these parameters is determined and fine-tuned through actual data to ensure that the model results is consistent with the actual observations. The data-driven principle further highlights the central role of observational data in the model building and validation stage, and the collection, processing, and analysis of data constitute an indispensable part of building accurate models. Furthermore, considering that different recommendation method scenarios and different e-commerce platform paths may require different model configurations, the scalability of the model is particularly critical, which means that the model should be designed to be easy to change and add new components to adapt to the changing recommendation method environment and needs.

Based on the above concepts, the construction of platform recommendation methods and system models requires not only thorough scientific insight into multidisciplinary processes, but also a broad system analysis perspective, strong data processing technology, and future-oriented open thinking. The synergy of many elements creates an accurate and broadly applicable e-commerce platform process simulation model.

Simulate the recommended method and system process of the platform, as shown in Figure 1.

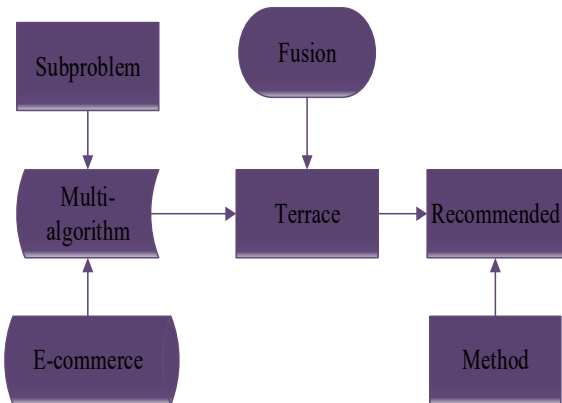


Figure 1: The analysis process of the platform recommendation method and system

Compared with the heap sorting algorithm, the introduction of multi-algorithm fusion in the platform recommendation method and system has brought a lot of innovation to solve practical problems. As a critical step in processing natural language, accuracy is critical in understanding and processing natural data in search. This algorithm can better deal with the complexity of the semantic and syntactic aspects of the recommendation method, so in terms of the rationality and accuracy of the platform recommendation method and system, the multi-algorithm fusion shows its inherent advantages compared with the traditional heap sorting algorithm. As shown in Figure II, the changes in the platform recommendation method and system scheme show that the search results can be obtained with higher accuracy by using multi-algorithm fusion, because the multi-algorithm fusion can more accurately analyze the keywords and structures in the user's search intent and achieve more detailed information matching, compared with heap sorting algorithms, which often rely on preset rules and paths, multi-algorithm fusion can process data more flexibly in the face of complex searches, reducing misunderstandings and ambiguities.

In terms of search speed, although the heap sorting algorithm searches quickly in the case of clear structure, multi-algorithm fusion can also achieve fast and effective search feedback by optimizing the cutting and matching process of words, especially in the face of large-scale thesaurus and dynamically updated search resources, multi-algorithm fusion can maintain efficient search ability. In terms of stability, multi-algorithm fusion can cope with the changing search environment and usage patterns through continuous learning and self-optimization, so as to provide a stable search experience. However, due to

the lack of learning mechanism, the heap sorting algorithm may need to be redesigned and adjusted once it encounters a change in search mode or a new data type, which is slightly inferior in terms of stability. In practical applications, multi-algorithm fusion can be combined with other advanced machine learning technologies, such as deep learning and semantic understanding, to further improve the overall performance and user experience of platform recommendation methods and systems. As for the heap sorting algorithm, although it still has its unique application scenarios in search tasks with clear rules and fixed rules, it is obvious that multi-algorithm fusion provides a more advanced and adaptable solution in modern platform recommendation methods and systems.

### 3.2 Platform Recommendation Method and System Situation

When developing a design for a recommended methodology system, it is important to note that the scheme should cover all types of data. We categorize this data into unstructured, semi-structured, and structured information, each with its own characteristics and methods of storage, processing, and analysis. Using efficient multi-algorithm fusion, we are able to perform efficient preliminary screening of these diverse data types to obtain a set of preliminarily selected platform recommendation methods and system solutions. After the multi-algorithm fusion screening, we obtained a series of potential platform recommendation methods and system solutions. We then go further and analyze the practical feasibility of these options in detail. This step is crucial because it helps us identify those that can be implemented effectively in the real world, as well as those that may be theoretically feasible but difficult to apply in practice. In order to more comprehensively verify the effectiveness of different platform recommendation methods and system solutions, we must compare multiple platform recommendation methods and system solutions at different levels. These options must be rigorously selected and compared to ensure that they cover design strategies from basic to advanced. In this way, we can create a more detailed comparison framework, as shown in the table below (Table I.), which details the features, advantages, and performance of each design solution under different conditions, so that we can make the most reasonable choice accordingly.

Table 1: Subject-related parameters of the study

Category	Mean	SD	Analysis rate	Compatibility
Similar product recommendations	87.71	90.87	89.73	88.59
Hot product recommendations	87.88	86.89	90.07	89.53
Multi-dimensional recommendations	85.89	90.36	87.43	89.84
Combo recommendations	91.14	89.46	86.68	86.49
Mean	88.29	89.84	88.30	89.46
X6	89.14	89.79	89.21	90.49
Test Items	Test value	p-value	Test analysis	Test rate

### 3.3 Platform Recommendation Methods and System and Stability

The platform recommendation method and the stability of the system is the key elements to ensure the long-term effective operation of the system and provide reliable services. A stable recommendation methodology system can continue to deliver high-quality search results in the face of different search loads, changes in user behavior, and data updates, without drastic performance degradation or service interruption due to external changes.

Stability affects several aspects of the platform recommendation method and system, including: the robustness of the platform recommendation method and system architecture: A strong system architecture is the basis for ensuring stability. This typically involves redundant design, fault-tolerant mechanisms, and highly available hardwired and software resources to prevent a single point of failure that could lead to the collapse of the entire system. Accuracy of platform recommendation methods and system data processing: The recommendation method system needs to accurately process and analyze data to ensure the reliability of search results. This requires the algorithm logic to be able to handle a variety of boundary conditions and anomalies, and to maintain consistency in the results when the data is updated or the structure changes. Consistency between platform recommendation methods and system search efficiency: The system

should be consistent in its ability to handle searches of all sizes. Whether it's a small amount of data searching or a large batch of data processing, the system should provide stable response times to avoid performance degradation under high loads. Platform recommendation method and system anti-interference ability: A stable recommendation method system should be able to adapt to the influence of external interference factors such as network fluctuations and system load changes, and avoid service interruption or failure. Platform recommendation method and system scalability and adaptability: With the increase of resources and the development of technology, the system should be able to flexibly expand and adapt to new search needs and data types to ensure stable service delivery.

To achieve the stability of the recommendation method system, the following strategies is usually required: Platform recommendation method and continuous performance monitoring of the system: real-time monitoring of system performance and user behavior in order to detect potential problems in time and make adjustments. Platform recommendation method and system load balancing: Reasonable allocation of system resources and search load can improve the pressure resistance and stability of the system. Recommended methods of the platform and regular maintenance and update of the system: Regularly maintain and update the system to fix known problems and enhance system stability. Platform recommendation method and system optimization algorithm and data structure: Optimize the underlying algorithm and data structure to improve the computing efficiency of the system and the ability to stably handle a large number of concurrent searches. The platform recommends methods and systems to develop a detailed disaster recovery plan to ensure that the system can recover quickly after a major failure. Platform recommendation methods and system user feedback and system iteration: Actively collect user feedback, continuously iterate and update the system, and improve stability and satisfaction. Through these measures, the platform recommendation method and system aims to create a stable service platform that can not only adapt to the needs of reality, but also respond quickly to future changes. In order to verify the accuracy of multi-algorithm fusion, the platform recommendation method and system scheme is compared with the heap sorting algorithm, and the platform recommendation method and system scheme is shown in Figure 2.



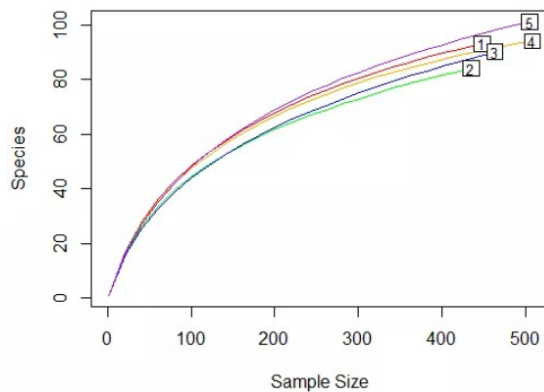


Figure 2: Platform recommendation methods and systems for different algorithms

By looking at the comparison of the data and charts in Figure II, we can clearly see that the multi-algorithm fusion surpasses the heap sorting algorithm in the execution effect of the platform recommendation method and the system, and its error rate is relatively low. This low error rate points to an important conclusion, that is, the application of multi-algorithm fusion to platform recommendation methods and systems brings a relatively stable and reliable performance. On the contrary, although the heap ranking algorithm also has its application in platform recommendation methods and systems, its results fluctuate greatly, resulting in inconsistent overall performance. This fluctuation may be due to the limitations and challenges that heap sorting algorithms may face when dealing with complex and varied recommendation method tasks. In other words, the heap ranking algorithm shows an uneven effect in the platform recommendation methods and systems, which reduces its application value and reliability in this regard to a certain extent. In summary, the stability and low error rate of multi-algorithm fusion show its superiority in the field of platform recommendation methods and systems, while the heap ranking algorithm shows limitations in such applications. Therefore, when seeking a platform recommendation method and system scheme with high efficiency and stable performance, multi-algorithm fusion may be a more reasonable choice.

Figure 3 shows the experimental results of using multi-algorithm fusion to obtain better performance than the heap sorting algorithm in the platform recommendation method and system. There may be several key factors that make multi-algorithm fusion work well: Introduction of adjustment coefficients: In the process simulation of the recommended method, multi-algorithm fusion may introduce adjustment

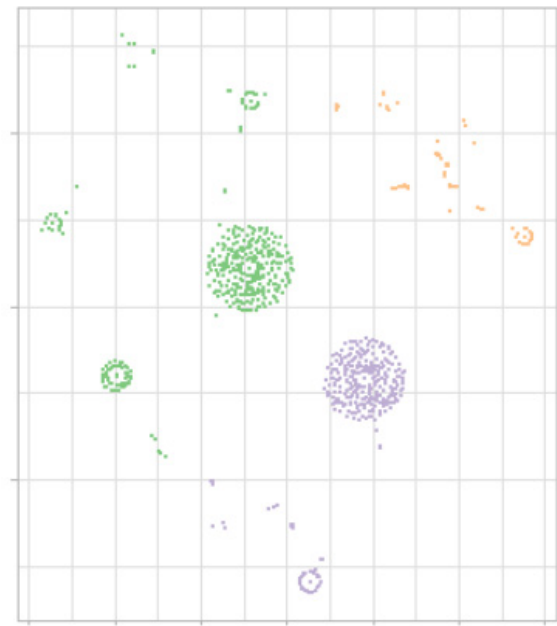


Figure 3: Platform recommendation methods and systems based on multi-algorithm fusion

coefficients to adjust the parameters in the simulation process in more detail. These coefficients may be closely related to the specific operating conditions or reactor design in the lab, allowing the algorithm to more accurately reflect and optimize real-world processes. Threshold setting and scenario filtering: By setting thresholds for the Internet information obtained, multi-algorithm fusion may retain only those that meet the set criteria among multiple candidates. This means that the algorithm is able to automatically reject simulation results that may be based on misinformation or unreliable data, ensuring the quality of the optimization process. Balance between exploration and utilization of swarm algorithm: It maintains a good balance between exploring and finding new solutions and optimizing known solutions by exploiting them. This allows the algorithm to avoid premature convergence to the local optimal solution while maintaining efficient optimization, and to explore a wider solution space as shown in Figure 2.

On the other hand, the poor performance of heap sorting algorithms in this context may be related to some of their inherent limitations: Overfitting: Decision trees may tend to be complex and, in some cases, overfit the training data, resulting in insufficient generalization of new data. Select the local optimal solution: The decision tree is split at each node only considering the local optimal attributes, which may not capture the global optimal

parameter configuration of the complex recommendation method process.

Multi-algorithm fusion searches and optimizes multiple solutions in parallel, and continuously uses information sharing among group members to guide the search process, so it is better to find the global optimal or near-global optimal solution than a single heap sorting algorithm when dealing with complex platform recommendation methods and system scenarios. The robustness and adaptability of this algorithm make it an indispensable tool in fields such as bioengineering and industrial process optimization.

Table 2: Comparison of platform recommendation methods and system rationalization of different methods

Algor ithm	Size of sam ples	Me an R	Se	99%Con fidence interval	P- val ue	Accu racy
Multi - algori thm fusio n	673	0.6 008	0.7 350	0.6722~ 0.7294	0.7 362	1.451 3
Heap sortin g algori thm	679	0.7 985	3.7 818	0.6700~ 0.8270	0.1 542	4.170 4

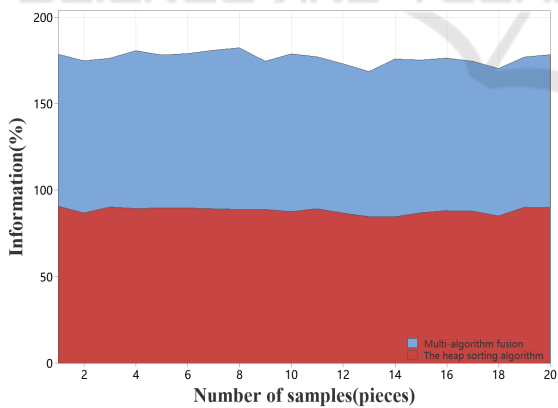


Figure 4: Comparative study of the research scheme of the algorithm

It is evident from Figure IV that the performance of the platform recommendation method and system using multi-algorithm fusion far exceeds that of the design using the heap sorting algorithm. This significant gap is mainly due to the introduction of a special adjustment coefficient in the platform recommendation method and system process by

multi-algorithm fusion. The introduction of this coefficient enhances the flexibility and adaptability of the algorithm, allowing it to better adjust the strategy according to different situations. In addition, multi-algorithm fusion sets a specific threshold for Internet information processing. Through this threshold setting, the algorithm can effectively identify and exclude those platform recommendation methods and system solutions that do not meet the predetermined criteria. This intelligent screening mechanism makes multi-algorithm fusion more efficient when dealing with a large number of candidates, ensuring that only the most suitable solutions is selected to continue to participate in the further design and evaluation phases. Combining these two innovations, namely the introduction of adjustment coefficients to improve the regulation ability of algorithms, and the setting of information thresholds to accurately screen design solutions that meet the standards, the integration of multiple algorithms makes the platform recommendation method and system process more efficient, and the output design scheme is more high-quality. These improvements finally form the core advantages of the algorithm over the heap sorting algorithm in the platform recommendation method and system problems.

#### 4 CONCLUSIONS

Aiming at the accuracy of the platform recommendation method and system, a new comprehensive optimization scheme was proposed, which was based on multi-algorithm fusion and advanced computer technology. Initially, the security of information and the credibility of tampering with it were ensured by using the decentralized characteristics of multi-algorithm fusion and its data consistency guarantee. Then, combined with computer technology, the collected data is deeply analyzed and processed in detail, so as to dig out the intrinsic attributes and potential value of the data. This study also delves into the key performance indicators required to ensure the accuracy and credibility of platform recommendation methods and systems, and constructs a comprehensive network information collection platform, which plays a crucial role in ensuring the accuracy of the research output. However, it is worth noting that when applying multi-algorithm fusion, the selection of platform recommendation methods and system evaluation systems must be cautious, so as to effectively explore and utilize the advantages of multi-algorithm fusion

and further improve the accuracy and practical application value of research results.

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