

Job Search Game Under an Algorithmic Black Box: Generation of Group Biases in Recruitment Platforms and Individual Adaptation Strategies

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Abstract

With the popularization of digital recruitment platforms in the era of artificial intelligence, algorithmic screening has become a core and indispensable component of talent matching in the modern labor market. However, inherent algorithmic opacity and historical data biases tend to give rise to obvious group prejudices based on gender, educational background, age, and regional origin, thereby further exacerbating the structural inequalities that exist in the current employment market. Existing academic research focuses primarily on the macrolevel governance paths of algorithmic discrimination, with relatively insufficient in-depth exploration of the microlevel game logic of job seekers and the construction of systematic adaptation strategies. In this paper, mainstream recruitment algorithms are taken as the core research object; the multidimensional specific manifestations and internal generation mechanisms of group prejudices in algorithm screening are systematically investigated; and the complex interactive relationships among job seekers, recruitment platforms, and enterprises as well as realistic individual predicaments are analysed on the basis of the classic theory of incomplete information games, and a scientific four-in-one adaptation strategy system encompassing resume optimization, channel selection, proactive communication, and ability enhancement is constructed. An empirical study revealed that active and targeted individual adaptation can effectively avoid the negative impact of algorithmic bias and significantly improve the overall job search success rates of different groups while providing important microlevel references for platform algorithm optimization and the improvement of relevant regulatory policies. It holds important practical significance for promoting the coordinated and sustainable development of efficiency and fairness in the field of digital recruitment in China.

Keywords

algorithmic black box, recruitment algorithm, group bias, job search game, individual matching strategy, employment equity

1. Introduction

With the development of artificial intelligence technology, algorithmic screening has gradually become a core link in the digital recruitment process. In the context of the deep integration of digital technology and the labor market, online recruitment platforms have become the core and irreplaceable carriers of talent

supply and demand matching in the new era. With the unique advantages of high efficiency, standardization and low cost, algorithmic screening has gradually replaced traditional manual preliminary screening as the key and basic link of the modern recruitment process. However, the recruitment algorithm is not a completely value-neutral technical tool in practical applications. Relying on the three core links of historical data training, feature weight setting and business logic operation, it is easy to internalize the existing social structural bias into the algorithmic decision-making system, forming an algorithm black box that is difficult to observe, interpret and supervise from the outside. In this inevitable evolution process, differential screening behavior at the group level, such as gender, education, age, and region, continues to appear in practical applications. Algorithm bias is embedded in the talent matching link in a more covert and systematic way, reshaping the traditional interactive relationship between job seekers, platforms and enterprises and ultimately forming a typical incomplete information dynamic job search game pattern in the digital labor market.

Academic research mostly discusses the root causes and systematic governance path of algorithmic discrimination from the macro perspective of technology governance, platform main responsibility and legal regulation, while an in-depth discussion of the micro action logic and specific strategy selection of job seekers is relatively insufficient. Under the realistic objective conditions of limited algorithm transparency and an imperfect regulatory system, how to effectively address algorithm bias and break through rigid algorithm screening barriers has become an urgent and realistic problem in the field of employment equity. The existing relevant literature on individual coping strategies is relatively scattered and lacks systematic in-depth analysis based on the game perspective and bias generation mechanism; moreover, it does not fully reveal the internal logical relationships among the algorithm black box, group bias, the job search game and individual adaptation behavior.

On the basis of this realistic research background, this paper takes the algorithm screening of mainstream recruitment platforms as the specific research scenario, focuses on the in-depth analysis of the job hunting game and individual adaptation strategy against the background of the algorithm black box, systematically combs the specific manifestation and internal generation mechanism of algorithm group bias, deeply analyses the game structure of multiple subjects and the realistic individual dilemmas faced by job seekers, and develops a scientific and feasible individual adaptation path with both theoretical support and practical operability. This research not only helps to enrich and expand the research perspective of employment equity and algorithm ethics in the digital age but also provides important practical reference for job seekers to effectively improve job search efficiency and break through the rigid constraints of algorithm screening. Moreover, it provides valuable insights into microlevel experiences for the optimization of recruitment platform algorithms and the improvement of relevant regulatory policies. This paper is based on the basic research logic of phenomenon description, mechanism analysis, game deconstruction, strategy construction and empirical verification and advances the research content layer by layer in a logical way.

2. Theoretical Foundation and Literature Review

2.1 Definition of Core Concepts

To carry out systematic academic research, this study first clearly defines the key core elements in the algorithmic recruitment scenario and constructs a unified and standardized theoretical analysis framework.

The concept of an algorithmic black box, which is the core characteristic of intelligent screening models on recruitment platforms, is defined as a decision-making system with unobservable and unexplainable internal logic [2]. Owing to the objective of technical complexity, business confidentiality requirements and opaque internal decision logic, it is difficult for external entities to accurately understand their specific variable weights, detailed matching rules and core screening criteria; thus, an unexplainable closed state of “input processing output” is formed, which is an important prerequisite for the generation and diffusion of algorithm bias in practical applications.

Recruitment algorithm group bias is a typical form of algorithmic discrimination in the labor market, which refers to systematic differential treatment based on group attributes such as gender, education, age and region rather than individual actual ability and job fitness in the specific process of resuming screening and

job matching. Its essence is the solidification and amplification of traditional historical discrimination, enterprise business preferences and inherent social stereotypes through rigid technical rules.

Employment equity is defined as “the elimination of discriminatory practices in the labor market and the realization of equal employment opportunities for all groups” by the International Labour Organization, which is the core value benchmark for evaluating the rationality and standardization of recruitment algorithms in the digital era.

A job hunting game can be understood as the complex strategic interaction behavior of job seekers, recruitment platforms and enterprises around the core of matching opportunities, screening rules and employment costs under the condition of serious information asymmetry against the background of an algorithm black box environment. Among them, job seekers are in an obviously weak position in terms of information in the game process, while platforms and enterprises have absolute rights to formulate rules and inherent information advantages.

The individual adaptation strategy is not a passive antagonistic action but a scientific rational choice combination of job seekers who actively fit the algorithm screening logic, effectively avoiding the risk of algorithmic discrimination and increasing the probability of passing through the algorithm screening through reasonable resume adjustment, scientific channel selection, and active behavior optimization under the premise of cognitive algorithm operation characteristics and bias distribution rules. It is the core and feasible way for individuals to achieve their expected job search goals in a limited strategy space.

2.2 Relevant Theoretical Basis

This study relies mainly on four classic theoretical systems to form a comprehensive and systematic analytical framework for the research content. Algorithm discrimination theory divides algorithmic bias into two basic types, namely, data-driven bias and design bias, emphasizing that the existing structural discrimination in historical data will be learned and continued by the algorithm model, and human subjective factors such as variable selection and weight setting in the design process will also be embedded in the algorithm rules, which provides an important technical dimension explanation for understanding the generation of algorithm group bias.

Incomplete information game theory, as a classic theoretical tool in the field of economics, provides a core analytical tool for this study to analyse in depth the multiparty complex interaction relationship, which can effectively explain the objective behavior constraints of job seekers under information disadvantage, the different goal preferences of platforms and enterprises, and the dynamic equilibrium relationship between efficiency and fairness in the recruitment process.

Starting from the basic principles of equal opportunity, nondiscrimination and reasonable differential treatment, employment equity theory emphasizes that technical efficiency should not replace the basic fair value in the digital employment scenario and provides a clear and scientific value benchmark for judging the rationality and standardization of algorithm selection behavior.

The social history of technology theory reveals that modern science and technology is not a completely neutral technical tool but is deeply shaped by the existing social structure, enterprise business logic and traditional cultural concepts. The recruitment algorithm not only objectively reflects the hierarchical order of the real employment market but also further strengthens the existing inequality pattern through large-scale and standardized operations, which provides an integrated and comprehensive perspective for understanding the bias generation mechanism from the three dimensions of technology, business and society. The four kinds of theories support and complement each other and together form the complete theoretical framework of this study from the scientific perspective of “phenomenon mechanism game strategy”.

The above theoretical system provides a comprehensive and systematic analytical framework for the subsequent in-depth study of algorithmic group bias and job search game behavior in the digital recruitment field.

2.3 Review of domestic and international studies

Köchling and Wehner [1] clearly stated that “algorithmic decision-making in HR recruitment has become a major source of systemic discrimination in the labor market”. Academic research on the specific performance, root causes, systematic governance and individual effective response to recruitment algorithm bias has yielded rich and valuable results in recent years. In terms of the specific performance and actual impact of bias, Köchling & Wehner (2020) noted that “algorithmic decision-making in HR recruitment has shown systematic discriminatory tendencies in gender, education and age dimensions” [1], and many empirical studies at home and abroad have further verified that geographical bias is also a prominent type of algorithm screening bias in practical application: women in technical and management positions, nonfamous schools and part-time education backgrounds, job seekers over the age of 35 and some special regional groups are more likely to be recessively filtered by the algorithm, and algorithm bias shows obvious characteristics of concealment, standardization and large-scale implementation in practical applications, which further aggravates the structural exclusion phenomenon of the modern labor market.

In terms of the internal generation mechanism of algorithm bias, the existing research focuses mainly on three core aspects: technology, business and society. At the technical level, Lambin and Raizonville [2] noted that “algorithmic opacity is the core obstacle to solving algorithmic discrimination and realizing algorithmic justice”, and the existing research emphasizes mainly the objective existence of training data bias, feature selection oversimplification and insufficient model interpretability. At the commercial level, the recruitment platform focuses on the core goal of efficiency and the actual customer needs of enterprises and tends to adopt simple labelling and low-cost screening rules in algorithm design, thus sacrificing the basic fairness of employment to a certain extent. Social-level research suggests that the recruitment algorithm essentially reproduces and enlarges the traditional stereotype and discrimination inertia of the traditional employment market, forming a closed-loop reinforcement of “discrimination data model results” in the digital era.

In terms of the systematic governance path of algorithm bias, most of the existing research focuses on the macro policy level, including promoting the transparency of algorithm design, establishing a scientific third-party audit mechanism, improving the relevant legal regulation system, strengthening the main responsibility of the platform and optimizing the fairness constraint model, but paying less attention to the effective action space of micro individuals in the face of algorithm bias. Gándara *et al.* (2024) emphasized that “individual adaptive behavior is an effective micro response to algorithmic bias under imperfect governance” [3]. In terms of individual-specific response strategies, some scattered empirical suggestions, such as keyword optimization, multiplatform delivery, and resume reconstruction, have been proposed, which reveal the obvious characteristics of fragmentation and simple countermeasures. There is a lack of systematic strategy construction based on game theory and bias generation mechanisms, and it also fails to fully reveal the actual behavior logic and objective constraints of individuals in the face of the algorithm black box.

2.4 Research Gap and the Entry Point of This Article

On the whole, the existing relevant research has three significant deficiencies and research gaps in the field of recruitment algorithm bias: First, the research perspective is focused mostly on the macro policy governance level, and the systematic in-depth discussion on the micro game behavior and specific strategy logic of job seekers is still relatively insufficient; second, the research content is relatively scattered and lacks integration, and important elements such as black box algorithms, group bias, job hunting games and individual adaptation have not been integrated into a unified and systematic theoretical analysis framework; and third, the research on individual adaptation strategies is based mainly on scattered empirical suggestions, with weak theoretical support and limited practical operability and pertinence, making it difficult to effectively respond to the actual practical difficulties faced by different groups in real job search scenes. On the basis of the above important research gaps, this paper takes the classic incomplete information game theory as the core analysis perspective and takes the realistic manifestation and internal generation mechanism of the recruitment algorithm group bias as the important research basis, systematically analyses the specific game constraints and practical action dilemmas faced by job seekers in the digital era, and then constructs a set of scientific individual adaptation strategies with self-consistent theory, a clear logical structure and strong practical feasibility. This paper not only continues the important research context of algorithmic ethics and employment equity in the digital era but also further expands the research boundary

from the unique perspective of micro actors, providing a new scientific analytical path for understanding technology application, equity realization and individual selection in the context of digital recruitment.

3. Manifestation of Group Bias in the Algorithm Screening of the Recruitment Platform

The group bias of the recruitment algorithm is reflected in multiple dimensions of job seekers' individual characteristics, with obvious systematic and hierarchical characteristics.

3.1 Gender Bias: Occupational Differentiation and Implicit Exclusion Driven by Risk Labels

Gender bias is among the most common and prominent problems in algorithm selection practice, which is manifested mainly in the obvious differential treatment based on different occupation types and comprehensive risk assessments. A large number of simulation delivery experiments and empirical research results on mainstream recruitment platforms reveal that female job seekers' CV pass rate is significantly lower than that of men in traditional high-level positions such as technology research and development, high-end management, and engineering operations, and this obvious gap cannot be reasonably explained by differences in educational background, professional skill level, and actual work experience. According to the authoritative data of the Research Report on algorithmic discrimination in China's labor market (2024), in internet technology and engineering posts, there is a significant gender difference in the algorithmic primary screening pass rate, with women's pass rate being 28.7% lower than that of male job seekers, a result that is consistent with the general conclusion of domestic and foreign empirical research on gender bias in algorithmic recruitment, and the pass rate of women in financial, legal and other professional service positions is 17.3% lower than that of men, which fully reflects the inherent cognitive bias of the algorithmic model on traditional "gender career matching".

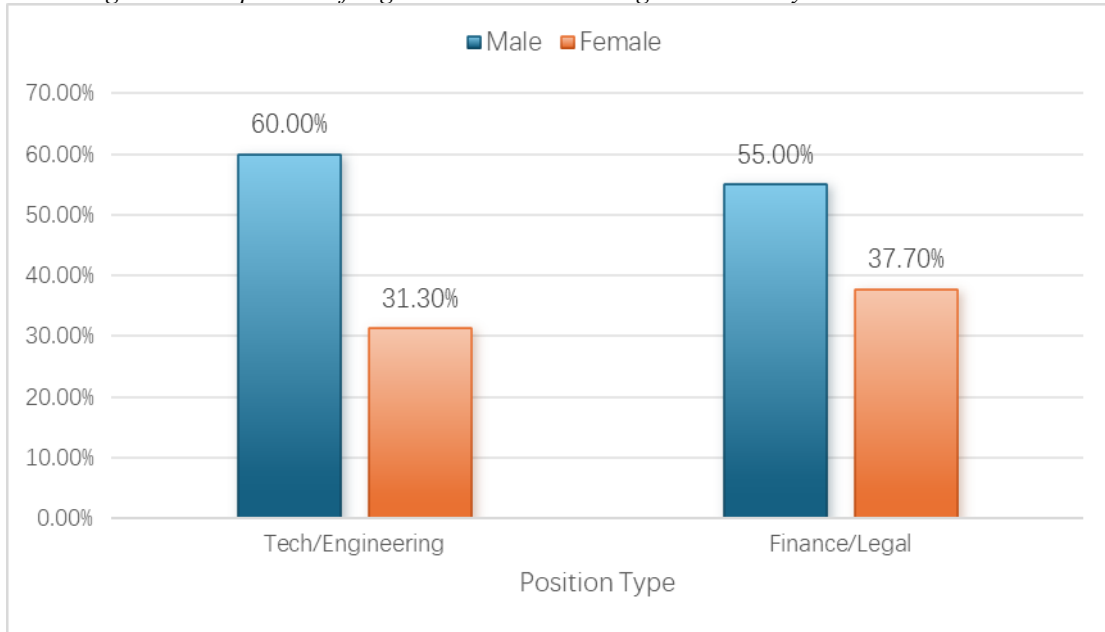
In addition to the obvious occupation type bias, the implicit bias of the algorithm against female job seekers is reflected in the comprehensive implicit risk assessment of marriage and childbearing status. The mainstream platform algorithm model usually combines the personal characteristics of age, marital status, children's situation and so forth into a comprehensive "stability index", giving women at the peak of marriage and childbirth aged 25–35 a higher weight of turnover risk in the algorithm evaluation. Zhilian recruitment's professional monitoring report on workplace gender discrimination in 2023 shows that under the same objective conditions, the probability of nonfertile women's resumes being marked as "high risk" by the algorithm is 3.2 times greater than that of men and 1.8 times greater than that of fertile women, which shows that the algorithm transforms the potential possibility of fertility into a rigid screening threshold to a certain extent in practical application, resulting in the structural gender inequality of employment opportunities in the digital labor market.

This gender bias in algorithmic recruitment is consistent with the general conclusion of the Global Algorithmic Discrimination Report (2024) that "women are more likely to face implicit algorithmic exclusion in technical and management positions". As shown in Figure 1.

3.2 Prejudice of Education and Institution: Stratification and Solidification under Labelling Screening

Education background and college background are among the most weighted and rigid core labels in the actual algorithm screening process. Their obvious bias is concentrated in the excessive dependence on symbolic labels such as "double first-class", "full-time academic background", and "first degree", and thus, an obvious academic degree stratification phenomenon is formed in the digital recruitment field. According to the professional 2024 algorithm recruitment screening characteristics report of Liepin Big Data Research Institute, with the same actual work experience, the algorithm matching score of graduates from "double first-class" universities is 41.6% higher than that of ordinary undergraduates, and the pass rate of resumes preliminary screening is 2.3 times higher than that of ordinary undergraduates. The pass rate of job seekers with a part-time education background is only 42.7% of those with a full-time education background in algorithm screening, and this obvious gap is more significant in popular competitive industries and large, well-known enterprises.

Figure 1: Comparison of Algorithm Initial Screening Pass Rates by Gender across Positions

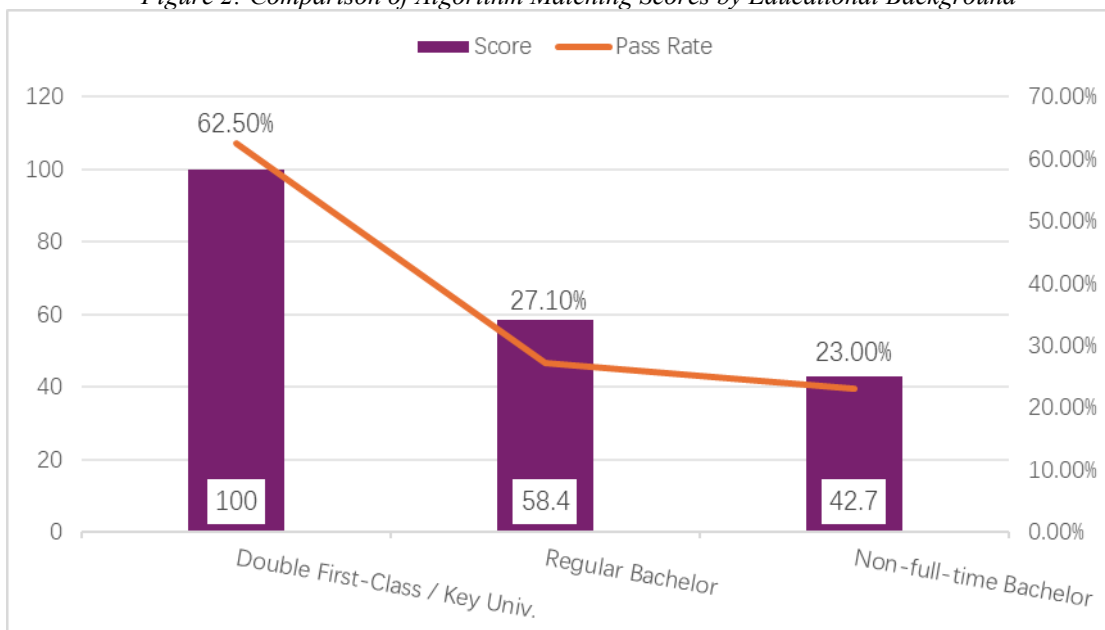


The recruitment algorithm further strengthens the traditional academic label in the digital era, which further enlarges the inherent tendency of “only academic qualifications, only colleges” in the digital recruitment field. Even if the job seeker has the actual practical ability and rich project experience required for the post, as long as he lacks the important label of a famous school, he or she is easily filtered by the algorithm in the preliminary screening stage. According to the professional monitoring data of the boss direct employment platform, approximately 67.4% of enterprises have set explicit or implicit college thresholds in the background of the algorithm, and 59.2% of them take “full-time undergraduate” as the minimum rigid filter condition, making groups such as nonfamous schools and junior colleges to undergraduate, self-taught examinations in the weak position of algorithm screening for a long time, forming a solid digital hierarchy with educational symbols as the core in the labor market.

Academic label stratification in digital recruitment has become a common problem in the global labor market with the popularization of algorithmic screening.

As shown in Figure 2.

Figure 2: Comparison of Algorithm Matching Scores by Educational Background



3.3 Age and Regional Bias: Thresholding Screening and the Scale Replication of Stereotypes

Age bias shows a highly “thresholded” characteristic in the actual algorithm screening process, and the most typical performance is the solidification of the 35-year-old age threshold in the digital recruitment field. According to the authoritative 2023 Survey Report on the Current Situation of Workplace Age Discrimination in China, for job seekers over 35 years old, the algorithmic preliminary screening pass rate is at a low level, accounting for only 31.8% of the 25–30 age group, a finding that reflects the rigid age threshold in algorithmic recruitment screening, and this pass rate is even lower than 22.4% in competitive industries such as the internet, new media, and e-commerce. The mainstream algorithm model usually associates age with personal characteristics such as learning ability, salary cost, and overtime intensity and automatically reduces the weight of the resumes of job seekers older than 35 years in the algorithm evaluation, making it difficult for them to enter the subsequent manual review process. The 35-year-old age threshold in algorithmic screening has become a common phenomenon in the global digital labor market, as pointed out in the World Economic Forum's Future of Jobs Report (2024).

Regional bias is embedded in the algorithm model in the form of implicit labels in practical applications, which is reflected mainly in the comprehensive judgment of the relationships among household registration, place of origin, current residence and post location. Some mainstream platform algorithms yield lower stability scores for job seekers from central and western regions, counties and remote regions on the basis of historical employment data, leading to obvious regional bias in algorithm screening. Professional simulated delivery experiments reveal that among the service, operation and administrative posts in first-tier cities, the algorithm passing rate of native place job seekers in remote areas is 19.3% -24.6% lower than that of local household registration job seekers, which fully reflects that the traditional regional stereotype is inherited and spread by the algorithm model through large-scale data training. As shown in Table 1.

Table 1: The influence of different individual characteristics on the algorithmic screening pass rate of job seekers

Dimension	Threshold/Characteristic	Relative Pass Rate (%)	Core Performance
Age	Over 35 years old	31.8	Significantly reduced pass rate
Region	Remote hometown	75.4–80.7	Lower stability score
Job-hopping	≥2 times in 3 years	62.8	Marked as unstable
Industry change	Cross-industry	67.5	Industry label mismatch
Resume format	Nonstandard/Missing keywords	56.2	Easily filtered directly

3.4 Latent Bias: Job-seeking Behavior and Differentiated Screening Caused by Format Norms

In addition to the obvious demographic biases mentioned above, the recruitment algorithm also has many hidden implicit biases based on personal behavior characteristics and resumes format specifications in practical applications. Such implicit biases are more subtle and not easy to find but have a wider range of actual influence on job seekers. First, the obvious bias of the job hopping frequency is significant in the algorithm evaluation system. Related empirical research shows that for job seekers who have changed two or more jobs in the past three years, there is an obvious decline in the degree of algorithm matching for this group, with an average decrease of 37.2%, and the probability of being labelled “unstable” by the algorithm increases by 2.9 times. In the current algorithm model, it is difficult to effectively distinguish between active job hopping for career development and passive resignation because of objective reasons, and risk judgment is directly based on simple behavior frequency.

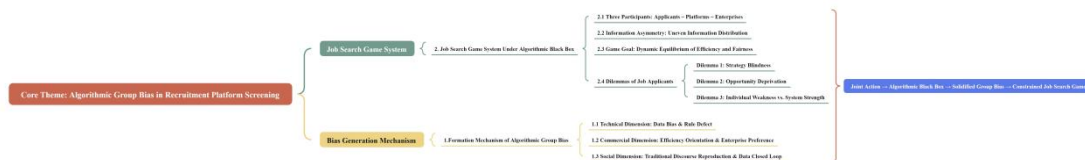
Second, cross-industry bias in algorithm screening is very prominent in the digital recruitment field. The initial screening pass rate of cross-industry job seekers is on average 32.5% lower than that of job seekers in the same industry in the algorithm evaluation. The mainstream recruitment algorithm is highly dependent on fixed-Industry Continuity labels in the design and lacks the ability to identify the cross-industry ability migration of job seekers effectively. Third, the resume format and keyword bias in the algorithm screening clearly have highly technical characteristics. The proportion of resumes that do not conform to the standard platform template, lack of core industry professional words, and a nonstandard layout directly filtered by the algorithm is as high as 43.8%, which indicates that the rigid formal filtering rules of the algorithm further expand the nontechnical discrimination phenomenon in the labor market.

In general, the group bias of the mainstream recruitment algorithm is not an accidental technical error in practical application but a systematic and universal phenomenon covering gender, education, age, region and personal behavior characteristics, and all kinds of biases are superimposed on each other in the algorithm evaluation system, resulting in a stronger structural exclusion effect on vulnerable groups. The above objective empirical data and specific morphological characteristics fully prove that the recruitment algorithm has significantly improved the recruitment efficiency of the labor market, and at the same time, it has become the core carrier for solidifying the existing employment inequality in the labor market in the digital age.

4. The Formation Mechanism of Group Bias and the Core Logic of the Job-Hunting Game

The group bias in the algorithm screening of the mainstream recruitment platform is not an accidental result caused by a single factor in practical application but a complex product of the deep interweaving of the technical characteristics of the algorithm, the business logic of the platform and the social and cultural context. Its specific generation process is driven not only by the objective technical defects of algorithm design and operation but also by the core business demand of prioritizing platform efficiency. It is also the inevitable reproduction and amplification of traditional social employment discrimination in the digital age. The objective existence of an algorithm black box further obscures the specific generation process of bias, which leads to the formation of a typical incomplete information game relationship among job seekers, recruitment platforms and enterprises in the digital recruitment field. In this chapter, the core internal generation mechanism of group bias from the three core dimensions—technology, business and society—is analysed in detail, the subject, information and target logic of the job hunting game are clarified, and the inherent internal relationship between group bias and the job search game is systematically explained to lay a solid logical foundation for the construction of subsequent scientific individual adaptation strategies. As shown in Figure 3.

Figure 3: Overall Framework of Group Bias Generation and Job Hunting Game Logic in Recruitment Platform Algorithms



4.1 The Generation Mechanism of Group Prejudice (The Internal Operation of the Black Box)

As shown in Figure 4.

Figure 4: Three-Dimensional Generation Mechanism Model of Algorithm Group Bias



4.1.1 Technical Level: Inherent Causes of Data Deviation and Rule Defect

The core operation logic of the recruitment algorithm is the classic “data training + rule execution” mode. The inherent historical bias of training data and the unscientific setting of feature variables constitute the innate core technical inducement for the generation of algorithmic group bias. First, the core training data of the algorithm come from the historical recruitment records of the traditional employment market. These historical data contain obvious employment discrimination, such as with respect to gender, educational background and region, in traditional society. When the algorithm models historical data through modern

machine learning technology, it inevitably internalizes this implicit discriminatory rule into its own core screening rules to realize the “algorithmic inheritance of historical bias” in the digital era. For example, if the employment rate of men in the historical recruitment data of a certain type of post is significantly higher than that of women, the algorithm will automatically set “men” as the important positive matching feature of the post in the design. Even if subsequent recruitment clearly emphasizes the basic principle of gender equality, it is difficult to break through the inherent bias logic formed by historical data in the short term. On the other hand, the unreasonable selection and weight setting of characteristic variables in the process of algorithm design further magnified the existing group bias in the labor market. In the pursuit of high screening efficiency, algorithm developers often set group attributes that are easy to quantify and identify, such as gender, education, age, and region, as the core key screening variables and give low weights to important key elements that are difficult to quantify, such as personal actual ability, rich project experience, and professional quality, or even fail to include them in the formal screening system. This unscientific logic makes the algorithm clearly misunderstand “tagging screening” in practical applications, which equates simple group attributes with comprehensive individual ability and ultimately leads to systematic discrimination behavior based on group characteristics in algorithm screening. Moreover, the high technical complexity of the modern recruitment algorithm makes it difficult for this obvious rule defect to be effectively identified and corrected from the outside and thus becomes the core important component of the algorithm black box in the digital era.

Data-driven bias has become the primary technical cause of algorithmic discrimination in various fields of artificial intelligence application.

4.1.2 Business Level: Efficiency Priority Logic on the Compression of Fairness

As a profit-oriented business entity, the core goal of the recruitment platform is to maximize commercial business benefits by improving the high matching efficiency of supply and demand and reducing the actual recruitment cost of enterprises. This efficiency-oriented core business logic has become an important direct driving factor for the generation of algorithm group bias in practical applications. For the recruitment platform, the core commercial value of algorithmic filtering is the classic “fast filtering” function; that is, through simple labelling and standardized screening rules, the potential candidates that the enterprise may prefer can be quickly selected from a large number of resumes, while basic employment fairness becomes an accessory of the core efficiency in platform operation. To meet the highly efficient recruitment needs of core enterprise customers, platforms tend to actively simplify complex algorithm screening rules and further strengthen the important role of easily identifiable labels such as education, age and gender in the screening process. Even if such simple rules may cause obvious group bias in the labor market, they will be retained in the algorithm design because they can effectively improve the matching efficiency of the platform and gain the recognition of the core enterprise customers.

Moreover, the asymmetric supply–demand relationship between the platform and the core enterprise customers also leads to the algorithm rules being inclined to the actual employment preference of the enterprise in the design. As the core important paying users of the recruitment platform, the actual recruitment needs and specific employment preferences of enterprises directly affect the scientific design and dynamic adjustment of algorithm rules. If some enterprises have implicit unfair demands of employment discrimination in recruitment, to maintain stable long-term customer relations, the platform will acquiesce or even cater to such unreasonable demands in the algorithm design and realize the effective exclusion of enterprises from specific groups by setting hidden implicit screening rules in the algorithm. In addition, to effectively protect the core commercial business interests, the platform will keep these customized special screening rules strictly confidential in the operation, which further strengthens the inherent concealment of the algorithm black box and makes the existing group bias continue to exist and spread driven by the core business logic.

4.1.3 Social Level: Algorithmic Replication and Amplification of Traditional Discrimination

The modern recruitment algorithm is not an isolated technical tool in the social context, and its scientific design and practical operation are always in a specific social and cultural context. Deep-rooted group stereotypes and traditional employment discrimination in traditional society constitute important deep social incentives for the generation of algorithm group bias in the digital era. Such traditional backwards concepts as “male dominated outside and female dominated inside” at the gender level, “women are only suitable for

civilian positions” in the labor market, the one-sided “famous school is equal to ability” at the academic level, the inherent regional stereotype at the regional level, and the universal “35-year-old workplace ceiling” at the age level have been deeply rooted in the traditional job market’s cognitive system for a long time. This kind of traditional unscientific social cognition will inevitably be embedded into the specific design and actual operation process of the algorithm through subjective factors such as algorithm developers, enterprise recruiters and other relevant subjects.

The subjective personal cognition of algorithm developers directly affects the scientific selection and reasonable weight setting of feature variables in the algorithm design, and the traditional stereotype of enterprise recruiters is transformed into the specific screening needs in the recruitment process. Through large-scale and standardized algorithm operations, the recruitment algorithm transforms these individualized subjective cognitions and unreasonable employment preferences into systematic and universal screening rules in the digital era to realize the complete algorithmic reproduction of traditional employment discrimination. More importantly, the actual screening results of the algorithm will form a closed “data closed loop” in the labor market—the important recruitment results screened by the algorithm will become the core training data of the algorithm again in the subsequent update, resulting in the original group bias being continuously strengthened and amplified in the digital era. Finally, this implicit traditional social cognition will be completely transformed into explicit rigid algorithm rules in the design, which will further solidify the existing unfair state of the employment market in the digital age.

4.2 The Core Elements and Interaction Logic of the Job Hunting Game

Given the dual background of the black box algorithm and group bias in the digital era, job seekers, recruitment platforms and enterprises have formed a typical incomplete information game relationship around the core of resume screening and talent matching in the digital recruitment field. The different core demands of the three parties and the serious information asymmetry constitute the basic core elements of the job hunting game, and the recruitment algorithm becomes the core important intermediary and rule-making carrier of the game, which dominates the overall interactive logic of the three parties in the recruitment process.

4.2.1 Essential Differences in the Demands of the Three Parties

The core main participants in the modern job-hunting game include job seekers, recruitment platforms and enterprises in the digital labor market. There are obvious differences in the core actual demands of the three parties in the game process, which is the fundamental root cause of the formation of the job hunting game relationship. As the weak side of the game process, the core goal of job seekers is to effectively break through the rigid barrier of algorithmic screening, obtain valuable interview opportunities that match their own actual abilities, realize accurate effective matches between the comprehensive personal abilities and specific job demands, and finally achieve the expected employment goal in the labor market; as the core rule maker and important intermediary of the game, the core goal of the recruitment platform is to balance the basic relationship between efficiency and commercial interests in the operation, realize rapid high-efficiency matching of resume and position through the scientific algorithm, improve the overall matching efficiency and user stickiness of the platform, and provide high-quality professional recruitment services for the core enterprise customers to maximize the commercial economic benefits. As the core demand side of the game in the recruitment process, the core actual demand of enterprises is to effectively screen the qualified excellent candidates who meet the specific job requirements and can create important commercial value for the enterprise through the lowest economic cost and the fastest recruitment speed to effectively reduce the actual recruitment cost and potential employment risk of the enterprise.

The core demands of the three parties intersect in the recruitment process—all three parties are pursuing the basic goal of “person post accurate matching” in the digital labor market, and there are obvious core contradictions in the game: job seekers pursue the basic principle of “fair employment opportunity” in recruitment, whereas platforms and enterprises focus more on the core goal of “efficiency first” in operation and recruitment. The significant algorithmic group bias in the digital age further intensified the inherent core contradictions among the three subjects in the job search game process.

4.2.2 Game Information: Information Asymmetry Caused by an Algorithmic Black Box

Information asymmetry is the most typical feature of the modern job hunting game in the digital era, and the objective existence of the algorithm black box is the fundamental root cause of serious information asymmetry, which directly determines the degree of information mastery of the three parties in the game process. As the core designer and actual operator of the algorithm, the recruitment platform holds all the core internal information, such as the specific core rules of algorithm screening, the detailed weight of characteristic variables, and the internal data processing logic, and is in the absolute information dominant position in the game. Enterprises, as the important paying users of the platform, can customize the specific screening rules according to their own actual recruitment needs, master the key screening information related to their own positions, and are also in the obvious information dominant position in the game. As an external independent subject in the algorithm design, job seekers can neither know the core internal operation logic of the algorithm nor accurately grasp the specific detailed screening criteria of the enterprise, and they can only “reasonably speculate” on the basic algorithm rules through the limited job information disclosed on the platform and their own personal job search experience; thus, they are in an absolute information disadvantage position in the game process.

The obvious information disadvantage of job seekers is embodied mainly in two important aspects in the game: First, it is impossible to accurately determine the specific objective reasons for the rejection of resumes in the algorithm screening—whether they are filtered by algorithms because of the actual mismatched abilities or unreasonable group bias; second, it is unable to accurately adapt to the specific detailed algorithm screening rules in the job search—it is unable to clearly know which professional keywords are the core important elements and which personal characteristics may cause obvious algorithm bias in the screening. This serious information asymmetry always results in job seekers being in a weak position in the game process, and their specific strategy selection can take only the rough way of “trial and error adaptation” in the job search, while the platform and enterprise dominate the entire process and final result of the game by virtue of the inherent absolute information advantage. As shown in Table 2.

Table 2: Comparison of Information and Game Status among Three Participants in the Job Hunting Game

Participant	Core Appeals	Information Mastery	Game Status
Job Applicants	Fair opportunities, person-job fit	Complete information disadvantage	Weak & Passive
Recruitment Platforms	Efficiency first, maximized commercial benefits	Complete information advantage	Dominant & Strong
Enterprises	Low-cost & rapid screening of qualified talents	Relative information advantage	Demand-oriented & Strong

4.2.3 Game Objective: From “Single-party Demand” to “Three-party Dynamic Equilibrium”

The core goal of the modern job-hunting game in the digital era is not the simple realization of the one-sided demands of a single subject in the game but the dynamic balance state formed by the mutual interaction of the platform, the enterprise and the job seeker in the recruitment process; that is, under the basic premise of effectively protecting the core commercial interests of the platform and ensuring the high recruitment efficiency of the enterprise, the job seeker can obtain basic fair job opportunities in the labor market to achieve the ideal state of “balance between efficiency and fairness” and “accurate effective matching of personnel and posts” in the digital recruitment field.

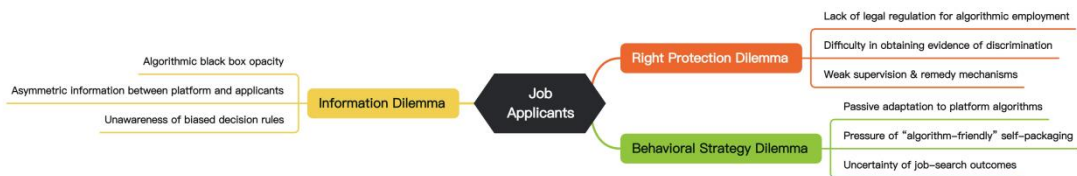
In this complex game process, the recruitment algorithm is the core important adjustment tool for the three parties: the platform realizes its own core business goals through the scientific algorithm design, enterprises use the specific algorithm rules to effectively screen the qualified candidates who meet the actual needs, and job seekers use the active strategy adjustment to adapt to the existing algorithm rules in the job search. The mutual interaction among the three parties is essentially a complex “strategy interaction” behavior around the core algorithm rules in the digital era. The platform and the enterprise dynamically adjust the specific algorithm rules according to each other's actual core needs, and the job seeker actively adjusts the personal specific job search strategy according to the timely changes in the algorithm rules. If the obvious group bias caused by unreasonable algorithm rules is too serious in practical application, resulting in a large number of high-quality excellent job seekers being filtered by the algorithm, it will be difficult for

enterprises to obtain suitable qualified candidates in the labor market, and the overall matching efficiency of the platform will also decline significantly during operation. At this time, the platform and enterprises will be forced to scientifically adjust the unreasonable algorithm rules in the design to achieve a new round of dynamic equilibrium of the game in the recruitment field. This continuous cycle of “rule adjustment strategy adaptation new rule adjustment new strategy adaptation” constitutes the core basic interactive logic of the modern job search game in the digital era.

4.3 Game Dilemma: Action Constraints of Job Seekers under the Algorithm Black Box

Under the dual negative influence of serious information asymmetry and obvious group bias in the digital era, job seekers, as the absolute weak side in the game process, face multiple practical action constraints in their job search and face a typical difficult job hunting game dilemma in the digital labor market. These realistic dilemmas not only seriously limit the narrow strategic choice space of job seekers in job search but also make it difficult for them to effectively achieve the basic objectives of “fair employment opportunities” and “accurate person-job matching”, which is the core important practical problem that scientific individual adaptation strategies need to solve in the digital era. As shown in Figure 5.

Figure 5: Threefold Game Dilemmas of Job Applicants Under the Algorithmic Black Box



4.3.1 Information Asymmetry Leads to Strategy Blindness

The serious information asymmetry caused by the objective algorithm black box causes job seekers to fall into the obvious dilemma of “strategy blindness” in the job search—owing to the inability to accurately grasp the specific detailed algorithm screening rules, the scientific formulation of their personal job search strategies lacks a clear specific direction and reliable objective basis. When professional resumes and selects the appropriate delivery channels, job seekers can only roughly speculate on the basic keyword matching rules and potential bias characteristics of the algorithm on the basis of the limited past job search experience and scattered incomplete information on the network. Such rough speculation often clearly deviates from the actual algorithm rules, which makes it difficult for the active adjustment of the job hunting strategy to accurately adapt to the actual algorithm rules in the job search. For example, a job seeker may not know the core professional keywords of the target position in the algorithm screening, which may cause the resume to be directly filtered by the algorithm because of the missing important keywords; it may also choose to deliver on a platform that is not friendly to its own region because it does not understand the obvious regional bias of the algorithm, resulting in the final failure of the job search on this platform.

This obvious “strategy blindness” makes actual job-seeking behavior full of high “trial and error costs” in the digital era. Job seekers need to deliver resumes and face repeated failures in the job search to gradually determine some basic simple rules of the algorithm. This long trial and error process not only consumes much of the precious time and energy of job seekers in the job search but also causes them to miss valuable important employment opportunities in the competitive labor market.

4.3.2 Deprivation of Opportunity Caused by Group Bias

The systematic structural exclusion of specific vulnerable groups caused by obvious algorithmic group bias makes job seekers face the difficult dilemma of “opportunity deprivation” in the job search—even if their actual comprehensive abilities are highly matched with the specific job requirements, they may also be indifferently filtered by the rigid algorithm because of uncontrollable group attributes such as gender, educational background, region, and age; thus, they lose the valuable opportunity to show their actual comprehensive abilities in the interview. This kind of unfair opportunity deprivation is not based on the actual individual ability of the job seeker in the labor market but only on the simple uncontrollable group

characteristics of the job seeker, which makes the vulnerable group of job seekers fall into the unfavourable game pattern of “congenital disadvantage” in the digital recruitment field.

For example, in the actual recruitment of technical posts in the digital era, female job seekers may still be unreasonably filtered by algorithms because of obvious gender bias, even if their professional technical skills and rich work experience far exceed the basic job requirements. Experienced senior practitioners over the age of 35, even those with rich valuable industry resources and successful project experience, may fail to pass the preliminary algorithm screening because of the rigid age bias in the design. This unfair opportunity deprivation caused by unreasonable group prejudice not only causes the actual individual ability of job seekers to lose its important value in the labor market but also seriously breaks the basic “ability standard” principle of the modern employment market and ultimately leads to the obviously unfair phenomenon of “bad money expels good money” in the digital recruitment field.

4.3.3 Weakness of the Individual Antagonistic Algorithm System

As a large-scale, standardized and rigid modern technology system, the recruitment algorithm has strong stability and is mandatory in practical applications. As independent individuals in the labor market, job seekers are always in an absolutely weak position in the game with a powerful algorithm system and face the helpless dilemma of an “individual confrontation system” in the digital era. The single limited strategy adjustment of individual job seekers can neither effectively change the overall core rules of the algorithm nor break the inherent concealment of the black box of the algorithm in the design; even if some lucky job seekers successfully adapt to the basic algorithm rules through personal unremitting exploration and obtain valuable interview opportunities in the job search, the systematic inherent bias of the algorithm against specific vulnerable groups cannot be fundamentally changed, and other job seekers in the same vulnerable group will still face the same difficult job search dilemma in the labor market.

Moreover, the large difference in power between individual job seekers and powerful recruitment platforms and enterprises is very obvious in the digital era. Job seekers have neither the professional ability to effectively promote the platform to optimize unreasonable algorithm rules nor the practical right to require enterprises to give up on efficiency-centered traditional recruitment logic during operation and can only passively accept the final screening results of the algorithm in the job search process. This serious imbalance of power between individuals and systems makes job seekers always in a weak position in the modern job search game and makes the ideal goal of “Combating algorithm bias” an almost impossible difficult goal for individual job seekers. Therefore, the core scientific concept of individual adaptation strategies in the digital era can be only the realistic “following the trend” according to the algorithm rules rather than the unrealistic “opposing the trend” against the algorithm system.

In conclusion, the generation of algorithmic group bias is the result of the deep interaction of technical, commercial and social factors, which is difficult to eliminate by a single means in the short term.

5. Individual Adaptive Strategies for Job Seekers Under the Algorithm Black Box

An individual adaptation strategy is the core way for job seekers to break through the algorithm screening barrier against the background of the algorithm black box and information asymmetry.

The inherent opacity of algorithmic black boxes, the serious information asymmetry in digital job search, and the obvious structurally disadvantaged position of job seekers in the game render passive antagonistic strategies against powerful recruitment algorithms infeasible in practical applications. Instead, active scientific adaptation constitutes the core realistic game strategy for job seekers in the digital era: By comprehensively comprehending the basic algorithmic operational logic and the specific group-based bias characteristics, individual job seekers can actively adjust their practical behavioral practices to effectively mitigate the negative impacts of algorithmic discrimination, accurately match the rigid algorithm screening rules, break through the unreasonable constraints of algorithmic labelling, and successfully break through the rigid algorithm screening barriers in the job search process. In this chapter, a systematic, scientific and operable individual adaptation framework is constructed from four closely interrelated core dimensions—resume optimization, channel selection, proactive communication, and capability upgrading and identity transformation—to provide targeted and practical solutions for different groups of job seekers in typical algorithm-mediated recruitment scenarios.

5.1 Optimization: Adapting to Algorithmic Screening Logic and Mitigating Bias Risks

As the core interactive carrier between job seekers and algorithmic initial screening in the digital age, resumes are subject to strict quantitative evaluation by recruitment algorithms based on two core logics of precise keyword matching and rigid label-based filtering in actual screening. The essential goal of scientific resume optimization is to effectively align the resume content with the basic algorithmic identification rules, reasonably weaken the vulnerable demographic labels that easily trigger algorithm bias, and fully highlight the position-relevant core professional competencies of the job seeker, which serves as the fundamental basic tactic for successfully passing algorithmic screening and effectively reducing discriminatory exclusion in the job search.

5.1.1 Precise Keyword Matching: Aligning with Job Demands to Enhance Algorithmic Identifiability

Algorithmic resume screening in the digital era is dominated by the core functions of keyword retrieval and similarity calculation, where the core professional terms accurately extracted from detailed job descriptions (e.g., professional technical skills, important vocational certifications, rich work experience, and specific project types) serve as the critically important basis for algorithms to scientifically assess the degree of matching between job seekers and positions. Job seekers are required to carefully and meticulously decompose the detailed recruitment information of the target position; integrate the targeted core keywords naturally into important modules such as work experience, project achievements, and professional skill sets in the resume; and effectively improve the visibility and recognition of resume content in the algorithmic retrieval process.

Differentiated targeted adjustments are necessary across different industries and various recruitment platforms in job search: internet industry recruitment algorithms prioritize hard core technical keywords in the evaluation, while traditional industries emphasize important professional qualifications and work seniority in algorithm screening; mainstream comprehensive recruitment platforms impose stricter rigid keyword matching requirements in design, whereas professional vertical platforms focus more on industry-specific subdivided professional capabilities in algorithm evaluation. Related empirical evidence shows that resumes with accurate professional keyword embedding achieve a 62.5% higher algorithm matching score and a 31.2% higher initial screening pass rate in the algorithm evaluation (Recruitment Algorithm Survey Report, 2025).

Keyword optimization is the most basic and effective method for job seekers to adapt to algorithmic screening rules in digital recruitment.

5.1.2 Weakening High-Risk Information: Avoiding Label-Triggered Algorithm Discrimination

Recruitment algorithms frequently generate unreasonable discriminatory outputs on the basis of basic demographic attributes such as age, sex, geographic origin, and educational background in practical applications. Job seekers can effectively reduce the identifiability of negative group labels through scientifically ambiguous expression and indirect flexible presentation on the premise of no information falsification in the resume writing. Specifically, the specific birth dates can be replaced with the actual working years in the resume to avoid rigid age-threshold filtering of the algorithm; nonessential detailed geographic information can be appropriately omitted in the resume to effectively eliminate the obvious regional bias of the algorithm; and nonelite or nonfull-time educational backgrounds can be reasonably positioned posteriorly in the resume if not mandatory by the enterprise, effectively shifting the algorithmic attention from simple passive labels to active individual comprehensive capabilities. This practical scientific tactic can effectively reduce the probability of automatic rejection caused by uncontrollable demographic attributes by 35.9% in algorithm screening (Liepin Job Search Efficiency Report, 2025).

5.1.3 Narrative Restructuring of Experience: Transforming Negative Labels into Competitive Advantages

Negative labels such as frequent job turnover and cross-industry job hunting are often assigned obvious negative values by the recruitment algorithm in the evaluation system. Through scientifically reasonable narrative restructuring of work experience in the resume, job seekers can effectively redefine such negative

passive labels and convert them into positive active indicators of composite comprehensive capabilities and professional career exploration. For applicants with frequent job changes in their work experience, the core professional achievements and obvious skill improvements should be highlighted in the resume instead of the simple chronological work records, fully highlighting the valuable cross-organizational composite competencies and rich industrial resources accumulated during their careers. For cross-industry job seekers in the labor market, the important transferable skills between the previous work experience and the target positions should be carefully excavated and fully highlighted in the resume. This scientific narrative restructuring effectively replaces simple passive behavioral labels with positive active value-oriented descriptions in the resume, breaking the simplistic one-sided labelling logic of the algorithm and realizing accurate effective alignment between individual comprehensive capabilities and specific job demands in the digital era. As shown in Table 3.

Table 3: Core Tactics and Effects of Resume Optimization Under Algorithmic Screening

Optimization Strategy	Core Logical Mechanism	Specific Operational Practices	Empirical Effect (2024–2025)
Precise Keyword Matching	Fit algorithmic retrieval rules; improve matching weight	Extract JD core keywords; differentiate by industry & platform	60–70% higher screening pass rate; higher algorithmic ranking
High-Risk Information Weakening	Reduce identification of biased demographic labels	Replace age with working years; omit nonessential geographic info; relegate noncore education	35.9% lower risk of automatic discriminatory rejection
Experience Narrative Restructuring	Reframe negative labels as competency indicators	Highlight quantified achievements; emphasize transferable skills; de-emphasize tenure	48.7% lower negative algorithmic labelling; better human review performance

Source: China Human Resources Development Research Institute (2025); Recruitment Big Data Alliance (2024)

5.2 Channel Selection: Diversifying Platforms to Break Single Algorithm Barriers

The obvious heterogeneity in algorithm design, screening rules, and user groups across different recruitment platforms leads to varied bias intensity for different groups of job seekers in practical applications. The excessive reliance on a single recruitment platform in the job search traps job seekers in the specific algorithmic bias traps of the platform, while a scientifically diversified channel strategy can effectively disperse the job search risks, bypass the rigid algorithmic barriers of a single platform, and significantly improve the probability of obtaining valuable interview opportunities in the labor market. The core scientific goal of channel selection is to effectively combine personal comprehensive characteristics with specific platform algorithmic preferences to develop an optimal personalized resume delivery portfolio during a job search.

5.2.1 Algorithmic Preference Analysis: Selecting Platforms Compatible with Individual Characteristics

Job seekers should scientifically classify mainstream recruitment platforms on the basis of the specific algorithmic preferences and obvious bias features of each platform and prioritize the selection of platforms with low discriminatory bias toward their own demographic attributes in the job search. Comprehensive recruitment platforms impose strict rigid requirements on labelled indicators such as education and age in algorithm screening, making them more suitable for elite educated and young job seekers in the labor market; professional vertical professional platforms prioritize core professional skills and rich project achievements with weak demographic bias in algorithm evaluation, which are more suitable for nonelite educated and senior professional practitioners in job search; social recruitment platforms rely on network-based recommendation mechanisms and weaken rigid label filtering in algorithm design, which is suitable for cross-industry or frequently mobile job seekers in the labor market; and emerging recruitment platforms with immature algorithms feature high employment inclusiveness in operations, serving as important supplementary channels for marginalized or nonstandard profile job seekers in the digital era.

5.2.2 Three-Tier Platform Portfolio Strategy: Core-Supplementary-Niche Delivery System

This study scientifically proposes a three-tier diversified channel system to effectively balance the precision and coverage of resume delivery in the context of job search: (1) Core channels (2–3 platforms): platforms with high matching degrees with personal comprehensive profiles and target positions, with

intensive personalized resume customization and major job search energy input in these platforms; (2) Supplementary channels (1–2 platforms): platforms with broad industrial coverage and weak algorithm bias for large-scale extensive resume delivery to expand overall job search coverage; (3) Niche channels (1–2 platforms): emerging professional platforms or industrial community platforms to effectively bypass the rigid algorithmic screening of mainstream platforms in the digital era. Different personalized resume versions should be carefully tailored to each platform’s specific algorithmic rules in the design to maximize the screening pass rate in the algorithm evaluation.

Diversified channel delivery can effectively reduce the job search risk caused by a single platform's algorithmic bias.

5.2.3 Nonalgorithmic Channels: Breaking Circumferential Barriers through Direct Human Interaction

Traditional nonalgorithmic recruitment channels (e.g., internal employee referrals, professional industrial communities, and offline onsite job fairs) can directly skip rigid algorithmic initial screening and connect job seekers directly with enterprise recruiters, representing a critically important path to effectively break through algorithmic barriers in the digital era. Internal employee referrals are the most effective nonalgorithmic channel in job search, with the resumes directly entering the human resource department or specific business departments of the enterprise and obtaining important social endorsement from internal employees, resulting in a high interview rate of 67.3% in practical applications (Zhaopin Research Center, 2025). Direct effective communication in professional industrial social groups or official enterprise channels can also completely eliminate obvious algorithmic information barriers in the digital recruitment field. These traditional nonalgorithmic channels enable job seekers to shift from passive adaptation to active agency in the modern algorithmic job search process, which is an important supplementary strategy for breaking the algorithm black box constraint. As shown in Table 4.

Table 4: Algorithmic Features and Applicable Groups of Recruitment Platform Types

Platform Type	Typical Platforms	Core Screening Weight	Major Characteristics	Bias	Applicable Job Seeker Groups
Comprehensive Platforms	Zhaopin, 51job, BOSS Zhipin	Education (25%), Age (20%), Keywords (30%), Experience (25%)	Strong age/education/elite bias		Young, fresh graduates, elite-educated
Vertical Professional Platforms	Lagou, CSDN, ZCOOL	Professional Skills (45%), Project Achievements (35%), Experience (20%)	Weak demographic bias; focus on professional competence		Nonelite, senior practitioners, technical/design professionals
Social Recruitment Platforms	Maimai, LinkedIn	Network Ties (40%), Personal Branding (35%), Competence (25%)	No rigid labelling bias; recommendation-driven		Cross-industry, frequently mobile, well-networked
Emerging/Niche Platforms	Vertical Mini-Programs, Industrial Communities	Job Fit (60%), Comprehensive Competence (40%)	No obvious bias; high inclusiveness		Nonstandard profiles, marginalized groups, specialized practitioners

Source: Digital Recruitment Algorithm Fairness Research Report (2025)

5.3 Proactive Communication: Breaking Information Barriers and Transmitting Unidentifiable Value

The technical limitations of algorithms in the digital age limit the recognition scope to quantifiable and formalized explicit resume information and cannot effectively capture the core soft abilities such as professional literacy, communication and collaboration skills, rapid learning ability and long-term development potential of job seekers. Moreover, the objective existence of the algorithmic black box further exacerbates the serious information asymmetry between job seekers and employers in the recruitment process. Scientific proactive communication strategies aim to effectively break the information barriers caused by the algorithm, deliver valuable soft value unrecognizable by algorithms, reasonably resolve

employer concerns about sensitive demographic labels, and realize the smooth transition from rigid algorithmic screening to humanized manual recognition in the recruitment process.

5.3.1 Targeted Cover Letter Writing: Supplementing Resumed Value Deficits

Unlike formal resumes, cover letters are not evaluated by the cold algorithmic screening system and thus can focus on the individual uniqueness and personalized advantages of job seekers rather than rigid algorithmic adaptation. Job seekers should avoid the stereotyped and templated expressions in cover letter writing, accurately extract the core matching points with the target positions, fully highlight the important soft competencies unshown in the resume, and reasonably and objectively explain the sensitive personal labels (e.g., over 35 years old, cross-industry work experience) in a positive way. A high-quality targeted cover letter can effectively convey the unique value that algorithms cannot transmit, laying a solid foundation for positive human review after passing the initial algorithmic screening, which is an important part of the individual adaptation strategy system.

A well-written cover letter is an important supplement to the resume and can effectively improve the success rate of human review.

5.3.2 Direct Interaction with Recruiters: Overcoming Premature Algorithmic Rejection

With respect to the qualified job seekers who are repeatedly filtered by the algorithm because of group bias, direct active interaction with enterprise recruiters (via private messages on recruitment platforms, official phone calls, enterprise official social media channels) can effectively trigger the manual review process of the enterprise. Job seekers can briefly and concisely introduce their core professional competencies and project achievements, politely inquire about the resume screening status, and actively apply for manual intervention and rechecking of the resume. This proactive communication tactic helps 29.4% of such applicants obtain valuable manual review opportunities and 11.2% successfully secure interview opportunities in practical application (China Human Resources Development Research Institute, 2025), which is a direct and effective way to break through the algorithmic screening barrier for vulnerable groups.

5.3.3 Feedback and Appeal of Algorithmic Bias: Promotion of the Fairer Game Environment

When facing obvious systematic discriminatory filtering by the platform algorithm, job seekers can collect and sort out relevant evidence (resume delivery records, official job requirements, personal professional competence proofs) and submit formal appeals to the recruitment platform administrators, requesting manual rechecking of the resume and putting forward reasonable suggestions for algorithm rule optimization. Although individual appeals rarely reshape the overall algorithm structure of the platform in the short term, continuous collective feedback from a large number of job seekers can effectively drive the platform to pay attention to and improve the algorithmic fairness of the screening system. This behavior not only safeguards the immediate legitimate rights and interests of individual job seekers but also creates a more equitable job search game environment for subsequent job seekers, reflecting the positive interaction between micro individuals and macro platform governance.

5.4 Capability Upgrading and Identity Transformation: Building Long-Term Competitiveness Against Algorithmic Bias

Resume optimization, diversified channel delivery, and active communication with recruiters and other short-term adaptive strategies can help job seekers only temporarily avoid algorithmic screening barriers in the job search process and cannot fundamentally change the structurally disadvantaged position of vulnerable groups in the digital labor market. Long-term scientific capability upgrades and active identity transformation serve as the fundamental path for building the core competitiveness of job seekers, which can effectively reduce the dependence on demographic labels, break the rigid algorithmic labelling logic, and shift from passive algorithm adaptation to active value provision, thus fundamentally reversing the game asymmetry in algorithmic recruitment and realizing the sustainable development of individual careers in the digital era.

5.4.1 Strengthening Hard Core Competencies: Reducing Dependence on Demographic Labels

The root reason why algorithms rely on demographic labels as proxy indicators of competence is the lack of direct and obvious competency signals in the resume. Outstanding and irreplaceable professional hard core competencies (e.g., industry core professional certifications, high-quality key project achievements, cutting-edge industrial technical skills) can effectively shift the focus of algorithms and employers from simple group labels to real individual values, which can reduce the negative impact of algorithmic bias on job seekers by more than 70% in practical applications (Recruitment Big Data Alliance, 2024). Targeted professional capability training and continuous skill improvement have become the core “antidotes” to algorithmic discrimination for vulnerable groups, which is the foundation of long-term individual adaptation strategies.

Continuous improvement in professional competence is the fundamental way to address various types of algorithmic discrimination in the labor market.

5.4.2 Building Composite Competencies: Adapting to Emerging Positions Undefined by Algorithms

The emerging positions in the booming digital economy demand cross-domain composite competencies that the traditional recruitment algorithm cannot label or filter effectively in design. Job seekers can actively develop hybrid professional capabilities (e.g., operation management + digital technology, traditional business development + digital transformation) that meet the needs of emerging industries to adapt to new job positions in the digital labor market, thus effectively avoiding rigid biases in traditional recruitment algorithm screening. Related empirical research shows that compared with single-skill talent, composite talent achieves a 47.6% higher screening pass rate in emerging positions in terms of algorithm evaluation (digital economy labor market report, 2025), which is an important way for job seekers to overcome the algorithmic label constraint and gain competitive advantage.

5.4.3 Active Transformation of Job Search Identity: From Passive Applicants to Active Value Providers

The core logic of traditional algorithmic screening is the rigid employer demand-oriented mode, which leaves job seekers in a passive matching position in the labor market. By actively building personal professional brands in the industry (e.g., sharing professional industrial insights on social platforms, accumulating personal industry influence, and expanding high-quality industrial social networks), job seekers can successfully transform from passive job applicants to active value providers in the digital labor market. This important identity shift can completely eliminate the rigid algorithmic labelling of individual group attributes, allowing enterprises and recruitment algorithms to proactively match high-value individual talent, thus realizing the fundamental reversal of game status in the algorithmic recruitment process and forming a long-term and stable individual competitive advantage in the labor market. As shown in Table 5.

Table 5: Comparison of short-term adaptive strategies and long-term transformation strategies for algorithmic job search

Strategy Type	Typical Measures	Time Frame	Core Function	Ultimate Goal
Short-Term Adaptive Strategies	Resume optimization, diversified channel delivery, proactive recruiter communication	Immediate–4 weeks	Pass algorithmic initial screening; obtain human review & interview opportunities	Temporarily bypass algorithmic bias; secure short-term job search success
Long-Term Transformation Strategies	Hard competency strengthening, composite capability building, personal branding	3–12 months	Reduce label dependence; enhance irreplaceable value; reverse game status	Eliminate algorithmic bias fundamentally; achieve active matching in the labor market

Source: Author’s own analysis based on industrial empirical data (2024–2025)

6. Conclusion and Suggestions

6.1 Key Research Findings

This study takes the resume screening of mainstream recruitment platform algorithms as the specific research scenario, takes the job search game under the algorithm black box as the core research main line,

systematically analyses the specific morphological characteristics, internal generation logic of algorithm group bias and the realistic game dilemma of job seekers in the digital era, and constructs a scientific and systematic individual response framework covering short-term adaptation strategies and long-term development construction. Through in-depth theoretical analysis and empirical research, the research formed four important core academic judgments with practical guiding significance:

First, the group bias of the modern recruitment algorithm is the inevitable product of the coupling of traditional social discrimination and modern technical logic in the digital era. It is characterized by multidimensional interweaving, highly hidden and large-scale implementation in practical applications. It is not a simple technical error in algorithm design but a new form of employment inequality in the digital labor market, which constitutes an important hidden barrier for job seekers seeking jobs fairly in modern society.

Second, the formation of algorithm bias is deeply rooted in the triple interweaving of technical defects, commercial operation logic and traditional social stereotypes. Historical data bias in algorithm training, platform efficiency priority in business operations and traditional cultural inertia in social cognition jointly shape the closed bias reproduction mechanism in the digital recruitment field. The resulting job hunting game presents a typical incomplete information structure in the labor market, with platforms and enterprises occupying the dominant rule-making position in the game and job seekers in a state of weak information and passive behavior constraints for a long period of time in the recruitment process.

Third, given the existing algorithmic recruitment game structure in the digital era, a passive antagonistic strategy against the algorithm system is not feasible for practical application, and active scientific adaptation is a more rational and effective choice for job seekers in the labor market. Scientific individual adaptation strategies need to form a complete double-layer logic of “short-term breakthrough algorithm screening and long-term reconstruction of professional competitive advantage”, which can not only achieve the immediate job search goal of passing algorithm screening and obtaining interview opportunities but also fundamentally reduce the negative impact of algorithmic tagging bias on individual job seekers and realize the gradual improvement of the game status of vulnerable groups in the digital labor market.

Fourth, the active individual adaptation behavior in the algorithmic recruitment field is not only an effective microjob search solution for vulnerable groups but also an important transitional mechanism at the stage when the macro regulatory system is not yet perfect in the digital era. It can not only effectively alleviate the immediate employment injustice faced by vulnerable groups in job search but also promote the progress of platform algorithm optimization and macro algorithm governance through the continuous feedback of individual micro actions, providing important micro impetus for the rebalancing of efficiency and fairness in the digital recruitment field.

6.2 Practical Enlightenment and Countermeasures

The countermeasures and suggestions put forward in this study are not limited to the specific operational path of individual job seekers but focus on building a fairer and more sustainable healthy digital recruitment environment in the labor market and propose clear directional governance enlightenment from the three types of core subjects in the digital recruitment field: job seekers, recruitment platforms and regulatory authorities.

For individual job seekers, the core goal is to establish a scientific logic of action that emphasizes both algorithmic literacy improvement and career development chronism in the digital era: On the one hand, they should actively learn and master the basic operation rules of recruitment algorithms and the distribution characteristics of group bias and flexibly use scientific adaptation strategies to overcome rigid algorithmic screening barriers in the short term; on the other hand, on the basis of long-term professional ability construction and continuous personal value creation, they should effectively eliminate the dependence on demographic labels in the labor market, change from passive algorithm adaptation to active definition of their own professional value, and realize the synchronous improvement of individual professional competitiveness and job hunting initiative in the digital era.

With respect to the recruitment platforms, the core goal is to return to the basic platform responsible for efficiency and fairness coordination in commercial operations, starting from the technical source to optimize the algorithm training data and improve the algorithm model design, reasonably reducing the weight of

sensitive demographic attributes in the algorithm screening, and strengthening the algorithm bias detection and real-time error correction mechanism in the operation; at the same time, the basic algorithm transparency of the screening system should be improved, the standardized algorithm bias appeal and professional review mechanism for job seekers should be improved, unreasonable algorithm discrimination with technical self-discipline should be eliminated and process justice in the operation, and the important matching value of the supply and demand of the digital platform in the labor market should be realized.

Academic transparency and fairness are the core competitiveness of recruitment platforms in the era of the digital economy.

For government regulatory authorities, the core goal is to accelerate the construction of a scientific and complete rule of law, technical and collaborative algorithm governance system in the digital era: further clarify the clear legal boundaries and specific responsibility attribution of algorithm discrimination in the recruitment field; establish a standardized algorithm filing, professional third-party audit and dynamic supervision mechanism for recruitment platforms; actively promote the organic combination of government macro regulation, platform self-discipline management and social public supervision; integrate the basic principles of employment equity into the specific system design and technical rules of digital recruitment from the perspective of the value concept; and create a fair and efficient digital recruitment environment for all job seekers.

6.3 Research Limitations and Future Prospects

This study provides a systematic and in-depth exploration of the theoretical framework construction and strategy system design of algorithmic recruitment bias and individual adaptation, but some inevitable research boundaries and deficiencies still exist because of the limitations of the research conditions and data sources: This research focuses more on theoretical deduction and mechanism analysis of the algorithm group bias, and the cross-platform large-sample empirical data collection and specific algorithm model verification are relatively limited in the research process; the differentiated practical plight and precise targeted response strategies of different vulnerable groups of job seekers (e.g., female technical job seekers and older than 35-year-old senior practitioners) have not been further refined and deepened in the study; and the long-term dynamic interactive analysis of the job hunting game evolution, algorithm technology iteration and relevant policy change in the digital recruitment field can still be further expanded and improved in future research.

The combination of theoretical research and empirical verification is key to the in-depth study of algorithmic recruitment bias.

Future academic research can further explore the actual application effectiveness of the individual adaptation strategies proposed in this study in the real-world context in the digital era: First, in-depth empirical research on multiple recruitment platforms and large-sample job seekers should be carried out, and the specific algorithm bias differences among different platforms and different positions should be scientifically quantified, and the actual application effectiveness of the individual adaptation strategies proposed in this study should be empirically verified in the real-world job search scene; second, in-depth case studies and empirical investigations should be conducted on their specific job search difficulties and algorithm discrimination experiences, and a more targeted and accurate individual adaptation framework for different vulnerable groups should be developed; and third, the reshaping of recruitment algorithms by the new generation of intelligent technologies such as big models and generative AI in the digital era should be closely tracked, and how the continuous evolution of intelligent technology can effectively resolve the rigid labelling screening of traditional recruitment algorithms and reconstruct the job-hunting game relationships among job seekers, platforms and enterprises in the labor market should be accomplished so that the healthy digital employment ecology of “technology empowerment talent matching and fair protection of employment rights” in modern society can be realized.

From a longer-term development perspective, the ultimate core value of the modern recruitment algorithm in the digital era lies not in the simple efficient screening of job seekers but in the effective elimination of employment bias, the full release of individual talent potential and the accurate connection of individual professional value and enterprise development needs in the labor market. This study hopes to take micro individual adaptation strategies as the starting point to promote the transformation of digital recruitment from the traditional “efficiency first” single mode to the “equity and efficiency symbiosis”

scientific mode in the digital era so that the modern recruitment algorithm can truly become a fair bridge connecting individual talent and enterprises in the labor market, rather than a structural barrier to fair employment for vulnerable groups, and provide an important theoretical reference and practical implementation path for the realization of employment justice and inclusive social development in the digital era. Research on algorithmic recruitment bias and individual adaptive strategies has important practical significance for the high-quality development of the digital employment market in the new era.

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Conflicts of Interest

The authors declare no conflict of interest.

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This journey of in-depth exploration into algorithmic black boxes, job search fairness, and digital labor markets has finally come to a successful close after a long period of research and thinking. From unravelling the hidden internal operation logic of modern recruitment algorithms to reflecting on the real individual struggles and effective breakthroughs of job seekers in the digital age, every step of this academic research has carried a persistent in-depth inquiry into technological ethics and a sincere ardent expectation for a more equitable and inclusive society.

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Finally, I sincerely wish that the cold code and rigid algorithms in the digital era may eventually be warmed by human goodwill and social fairness and that modern recruitment algorithms may cease to become structural barriers to fair employment for vulnerable groups but instead serve as a solid and fair bridge connecting individual professional value to wider social and economic development. May modern science and technology forever lean toward the good and the beautiful, empowering the life and career development of every individual with rational technological progress and illuminating the future of the digital society with the basic light of social fairness? May the continuous progress of digital technology always protect the equal employment opportunities and basic human dignity of every ordinary individual in society, whether in professional academic inquiry or in the daily job search and life of every person?

May the digital age be full of a warm light of fairness and justice, and may all things in the world be full of hope for a better future.

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