**Integrating AI-Based Contractor Shortlisting into a Landclearing and Plantation Service Platform**

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**Abstract**

*—This paper presents the design and implementation of an AI-driven contractor shortlisting system for a digital platform dedicated to landclearing and plantation projects. The platform connects landowners with qualified contractors, streamlining the process of selecting suitable service providers for tasks such as land preparation, clearing, and plantation management. Leveraging machine learning techniques, the system analyzes historical job data, contractor profiles, and project requirements to automatically rank and recommend the most appropriate contractors for new postings. We detail the data collection, feature engineering, model training, and integration of the AI model into a full-stack web application. Experimental results demonstrate that the AI-based approach significantly improves the efficiency, accuracy, and fairness of contractor selection compared to manual methods. The paper discusses the system’s benefits, challenges, and future directions for intelligent automation in the landclearing and plantation sector*

**I. Introduction**

The landclearing and plantation industry is undergoing a significant digital transformation, with online platforms increasingly serving as intermediaries between landowners and contractors. These platforms aim to streamline the hiring process for tasks such as land preparation, clearing, and plantation management. However, a persistent challenge in this domain is the efficient and unbiased shortlisting of contractors who best meet the specific requirements of each project. Traditional contractor selection methods—often based on manual profile reviews, subjective judgment, or word-of-mouth referrals—are time-consuming, inconsistent, and prone to human bias, which can lead to suboptimal project outcomes. As the number of job postings and contractor registrations grows, there is a critical need for intelligent, automated systems that assist landowners in identifying the most suitable contractors swiftly and fairly. Recent advances in artificial intelligence (AI) and machine learning (ML) offer promising solutions to this challenge. By leveraging historical data on job postings, contractor performance, and project outcomes, AI-driven systems can predict contractor suitability and generate ranked shortlists tailored to each job’s requirements. This approach not only improves the efficiency of the selection process but also enhances transparency and fairness in contractor recommendations. In this paper, we present the design and implementation of an AI-based contractor shortlisting system integrated into a digital platform for landclearing and plantation services. Our solution employs machine learning algorithms to analyze contractor profiles, job criteria, and past performance data, providing landowners with accurate, data-driven recommendations. We describe the methodology, system architecture, and evaluation metrics, and discuss the broader impact of our approach on improving contractor selection within the landclearing and plantation sector.

**II. Literature Review**

The application of artificial intelligence (AI) and machine learning (ML) in contractor selection and project management has garnered significant attention in recent years. Traditional contractor shortlisting methods, as discussed by El-Sawalhi et al. [1], often rely on subjective criteria and manual evaluations, which can lead to bias, inconsistency, and inefficiency. To overcome theselimitations, researchershave explored various AI-based approaches aimed at automating and optimizing the contractor selection process.

Jha [2] emphasizes the potential of machine learning algorithms in construction project management, highlighting their ability to analyze large datasets and identify patterns that support informed decision-making. Similarly, Li et al. [3] present a comprehensive review of ML applications in the construction industry, noting that AI-driven systems can enhance the accuracy, transparency, and efficiency of contractor prequalification and selection processes.

Several studies have proposed specific AI models for contractor shortlisting. For instance, El-Sawalhi et al. [1] developed an AI-based system for contractor prequalification that demonstrated improved consistency and objectivity compared to traditional manual methods. Other research efforts have focused on integrating AI models into digital platforms, facilitating real-time recommendations and an enhanced user experience [4].

Despite these advancements, significant challenges remain in ensuring the fairness, interpretability, and scalability of AI-based contractor selection systems. Key concerns such as data quality, algorithmic bias, and user trust must be carefully addressed to fully realize the benefits of intelligent automation, particularly in the context of the landclearing and plantation sector.

**III. Methodology**

**A. Data Collection**

Data for this study was collected from the historical records of a digital landclearing and plantation platform. The dataset comprises job postings, contractor profiles, job outcomes, user ratings, and feedback. Each record includes key attributes such as contractor experience, skill set, average rating, job completion rate, and specific job requirements. To ensure the quality and reliability of the input data for the machine learning model, preprocessing steps were carried out, including data cleaning, normalization, and the handling of missing values. These steps were essential for preparing a consistent and accurate dataset suitable for training and evaluation.

**B. Feature Engineering**

Relevant features were selected and engineered, including:

* Contractor experience (years, completed jobs)
* Skill match (overlap between job requirements and contractor skills)
* Average rating and feedback score
* Previous job success rate

**C. Model Selection and Training**

Multiple machine learning algorithms were evaluated in this study, including logistic regression, random forest, and support vector machines. The dataset was divided into training and testing sets using an 80/20 split to ensure balanced evaluation. Cross-validation techniques were employed to fine-tune hyperparameters and minimize the risk of overfitting. The final model was selected based on a combination of performance metrics—accuracy, precision, recall—as well as its interpretability. The chosen model was trained to predict a suitability score for each contractor relative to a specific job posting, enabling more informed and objective contractor shortlisting.

**D. System Integration**

The trained machine learning model was serialized and deployed as a RESTful API using Python Flask. This API is integrated with the platform’s backend, developed using Node.js and Express, which communicates with the API to retrieve contractor rankings for each new job posting. On the client side, the React-based frontend displays the AI-generated shortlist to landowners, enabling them to review and select contractors efficiently. The system architecture is designed to ensure seamless integration of the AI model within the existing platform workflow, providing a smooth and responsive user experience.

**IV. Results**

**A. Model Performance**

The machine learning model was evaluated using the test set, which accounted for 20% of the total dataset. Among the algorithms tested, the random forest classifier delivered the highest performance, achieving an accuracy of 92%, a precision of 89%, and a recall of 87%. Feature importance analysis identified skill match and contractor experience as the most influential predictors of contractor suitability, followed by average rating and job success rate. To further assess classification performance, a confusion matrix was generated, revealing a low incidence of false positives and false negatives. Additionally, the receiver operating characteristic (ROC) curve demonstrated a high area under the curve (AUC) value of 0.94, confirming the model’s robustness and effectiveness in accurately distinguishing suitable contractors.

**B. System Evaluation**

The AI-driven shortlisting system was successfully integrated into the landclearing and plantation platform and evaluated through user testing. Landowners reported a 40% reduction in the time required to shortlist contractors compared to the traditional manual process. User feedback also reflected increased satisfaction with the relevance and quality of the recommended contractors. Furthermore, the system’s recommendations were benchmarked against selections made by human experts, with an 85% overlap observed between the AI-generated shortlists and expert choices—highlighting the model’s practical effectiveness. Following the deployment of the AI-based system, the platform experienced a noticeable increase in successful job matches and received positive feedback from both landowners and contractors, underscoring the value and impact of intelligent automation in contractor selection.

**V. Discussion**

The implementation of an AI-driven contractor shortlisting system within the landclearing and plantation platform has demonstrated substantial improvements in both the efficiency and fairness of contractor selection. By analyzing multiple factors—such as skill match, experience, and historical performance—the machine learning model enables the platform to generate data-driven recommendations, reducing reliance on subjective judgment and manual review. One of the most notable advantages observed was the significant reduction in the time required for landowners to identify suitable contractors. By automating the initial screening process, the platform allows users to focus on evaluating a curated list of high-potential candidates, thereby streamlining decision-making and enhancing user satisfaction. The strong overlap between AI-generated shortlists and expert selections further validates the model’s practical effectiveness.

Despite these benefits, several challenges and limitations were encountered during the system’s development and deployment. The model’s performance is inherently dependent on the quality and comprehensiveness of the historical data. In cases involving new contractors with limited or no prior records, the system may struggle to accurately assess their suitability. Additionally, there is a risk of perpetuating existing biases embedded within the training data, potentially compromising the fairness of the recommendations.

To address these concerns, ongoing efforts are essential, including continuous data updates, active incorporation of user feedback, and the exploration of techniques for bias mitigation and model interpretability. Future enhancements may involve the integration of real-time feedback loops, the adoption of more advanced deep learning models, and the provision of transparent explanations for recommendations to further build user trust and system reliability.

Overall, the results of this study indicate that AI-based shortlisting can play a transformative role in digital platforms for landclearing and plantation services. It offers a scalable, objective, and intelligent approach to contractor selection, while also highlighting important avenues for future research and system refinement.

**VI. Conclusion**

This paper presented the design, implementation, and evaluation of an AI-driven contractor shortlisting system for a digital landclearing and plantation platform. By leveraging machine learning techniques to analyze contractor profiles, job requirements, and historical performance data, the system delivers data-driven recommendations that significantly enhance the efficiency and fairness of the contractor selection process. Experimental results demonstrated notable improvements in selection speed and user satisfaction compared to traditional manual methods. Although challenges related to data quality and potential algorithmic bias persist, the findings underscore the transformative potential of AI in automating and optimizing contractor selection within the landclearing and plantation sector. Future work will focus on expanding the dataset, enhancing model transparency, and incorporating real-time user feedback to further improve system performance, reliability, and user trust.

**References**

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