Machine Learning Model for detecting Fraudulent Job Listings on Recruitment Platforms

[1]B.Venkata Harivardhan Reddy, [2]P.S.Omprakash, [3]A.Karthikram

[1,2]Computer Science & Engineering (Cyber Security), Madanapalle institute of Technology & Science, Madanapalle-517 325, A.P., India

[3]Assistant Professor, Computer Science & Engineering (Cyber Security), Madanapalle institute of Technology & Science, Madanapalle-517 325, A.P., India

E-mail: [1]venkatharivardhanreddy@gmail.com, [2]psomprakash30@gmail.com, [3]karthikram86@gmail.com

Abstract - **The growing menace of fake job postings has become one of the main issues in the online job market, which wastes the time and resources of job seekers and may harm them. Many such fraudulent postings disguise themselves as real opportunities for job seekers to get confused. The research aims to solve the problem using machine learning algorithm like Random Forest (RF), Logistic Regression (LR) and neural networks, which can classify a job posting as either real or fake by extracting features and posting patterns. We strive to develop an machine learning (ML) model capable of detecting fake job postings effectively and preventing the gullible job seekers from potential scams. Advantages of the proposed system include improvement in efficiency and scalability, potential reduction in multiple platforms of phony job posts.**

Keywords: Fake Job Postings, Machine Learning, Job Classification, Fraud Detection, phony job posts.

I. INTRODUCTION

Online job platforms have revolutionized the job market in the last few years. The advantage of online job platforms is that they are easy and quick to use for people looking for job opportunities, and companies get a wide pool of talent to select from. But with convenience comes its own set of challenges, one of which is very disturbing, and that is the mushrooming of fake job postings. These fraudulent listings can be serious in the sense that they waste the time and [1] resources of job needers, harm the reputations of legitimate companies, and could lead to financial or personal damage for unsuspecting applicants. The more people who look for jobs online, the more prominent this problem has become, and thus the need for effective solutions. Fake job postings often look like regular advertisements for open jobs, replicating the look, feel, and format of legitimate job ads. However, these postings have a hidden purpose of deceiving applicants for other motives, like stealing personal details, charging excessive fees, or collecting sensitive data for malicious activities.

Sometimes, the scam is also for offering non-existent jobs in return for money or for other forms of exploitation. The challenge here is that there [2] are so many legitimate job postings online, making it difficult for job seekers to find the fraudulent ones. Some fake postings may have obvious signs, such as suspiciously vague job descriptions, unrealistic compensation, or unverifiable company details, while others may be more subtle and make it difficult for candidates to discern whether an offer is trustworthy. The complexity and scale of the problem make it impossible to identify fake job posts manually, especially with the amount of data generated on job platforms every day. As the online job market continues to expand, it becomes increasingly important to develop automated systems that can effectively flag or block fraudulent postings in real time. With the growing need to detect fake job postings, one of the latest explorations was the use of machine learning techniques. Machine learning allows for an analysis of massive datasets, extraction of patterns, and prediction with data-driven insight, making it a perfect tool for detecting such fake job postings.

This can be achieved by training models on a variety of features extracted from job listings [3] including descriptions of jobs, company names, salary offers, and posting patterns to learn how to distinguish between legitimate and fraudulent job ads. One of the primary advantages of the use of ML for detecting fake job postings is its ability to improve continuously as it processes more data. Machine learning algorithms adapt well to new emerging trends of fraudulent job postings. Therefore, ML is more efficient at detecting new kinds of scams. Further, it is possible to incorporate ML systems with existing job platforms so that fraudulent job postings are flagged easily while they appear. This will greatly reduce the burden on the users, as they can concentrate on real opportunities and minimize risks from fake job offers. The development of a ML-based system to detect fake job posts aims to make the online job search experience for job seekers safer and more reliable.

The system can reduce how much time and energy are spent on pursuing [4] non-legitimate opportunities by identifying and removing fraudulent listings from job platforms. Additionally, the removal of listings containing fraudulent information can contribute to the overall integrity of the online job market, thus enhancing trustworthiness of job boards and protecting the reputation of reputable companies. With the increased application of AI and ML in various sectors, the introduction of these technologies into job search platforms is one of the best ways to handle the rising menace of fake job postings. In this study, we narrow down our attention to two established techniques: LR and RF. LR is a simple yet powerful algorithm that works well for binary classification problems, such as distinguishing between fake and real job postings.

RF, on the other hand, is an ensemble method that can handle large datasets and capture complex patterns, making it highly effective for classification tasks. This study [5] aims to determine the most efficient and accurate approach to detecting fake job posts by comparing the performance of these two algorithms. The problem of fake job postings is a growing concern in the online job market, one that can have far-reaching consequences for job seekers and companies alike. Machine learning is promising in this regard because it provides a way to automate the detection of fraudulent listings and improve the overall safety of online job platforms. Algorithms such as LR and RF can be used to create an effective system for identifying fake job postings and ensuring that job seekers can trust the opportunities they encounter.

This work is organized as Section II presenting a review of the literature survey. Section III describes the methodology, highlighting its key features and functionality. Section IV discusses the results, analysing the system's effectiveness. Lastly, Section V concludes with the main findings and explores future implications.

II. LITERATURE SURVEY

Detection of false job postings has gained much attention in recent years because of the increasing number of online job scams. Many studies have been conducted on different techniques to identify fraudulent listings, mainly using ML and NLP techniques. These techniques are designed to analyze the characteristics of job ads, such as textual content, salary patterns, and company information, to distinguish between legitimate and deceptive offers. Some studies focus on the traditional rule-based systems, while others give emphasis to using sophisticated machine learning algorithms for more accurate and scalable applications. The present literature review considers the approaches, challenges, and advancements related to fake job posting detection.

This study proposes a specialized platform for IT professionals in Sri Lanka, where it addresses several important issues such as identifying fake job postings using NLP, recommending relevant jobs, making the application process more efficient by facial [6] analysis, and evaluating cv/resumes based on experience. The skill assessments, content-based filtering, and advanced models used for stress level estimation ensure that the job placement is real-time and personalized. A deep learning model enhances resume evaluation effectiveness, thereby improving the recruitment experience. It combines novel approaches to dealing with challenges in the Sri Lankan job market of IT.

It highlights the detection of job scams from online job portals using machine learning algorithms that operate on employer-defined linguistic features. The research majorly points out the precise, cost-efficient [7], and prompt identification of scam job postings. The proposed approach produced highly accurate results due to the training of various classifiers in machine learning, thus delivering a substantial increase in the ability to detect job scams. Linguistic features played a crucial role in improving models for better protection of privacy during the recruitment of jobs.

This work addresses the problem of fake news with the rapid spread of information on the internet by using machine learning techniques [8] to differentiate between real and fake news articles. Several NLP methods were used to pre-process textual data, which improved the accuracy of machine learning models. The study compares multiple machine learning classifiers, providing valuable insights into detecting fake news in the modern digital age. The performance metrics were used to evaluate the effectiveness of different algorithms in handling this complex issue.

This work focuses on the identification of fraudulent job postings using advanced classification techniques, employing TF-IDF and word embeddings like BERT, GloVe, and Word2Vec. The study [9] addresses challenges in detecting fake job descriptions by using a dataset of annotated fraudulent postings. To enhance the accuracy, the authors applied SMOTE to overcome the data imbalance and used various word embeddings to provide better feature representation. The ensemble model is stronger than others and provides robust categorization of fake job listings and contributes to more reliable job recruitment platforms.

This research work is focused on detecting fake online job vacancies through machine learning techniques and emphasizes the need for data [10] balancing methods. The research adopted TF-IDF for feature extraction and applied the Adaptive Sympathetic and Synthetic Minority Oversampling techniques in order to improve model performance.

Furthermore, it stresses the usage of classifiers such as k-nearest neighbors in efficiently identifying fraudulent postings. It shows that its proposed approach is significantly better than any existing model concerning precision, recall, and F1-score.

This work introduces a deep learning-based solution to the problem of fake job postings, using Recurrent Neural Networks (RNNs), specifically Bi-LSTM and Bi-GRU architectures, to improve detection [11] accuracy. The proposed method includes a focal loss function to address class imbalance, enhancing the model's ability to detect fake jobs. It tests with the EMSCAD dataset and compares its deep learning models to existing methods, ensuring significant improvements in accuracy, precision, and recall. For this research, the objective of providing a user-friendly web service that can check fake job postings for job seekers in real time is considered.

The growing job-seeking scams in the digital world raise more concern with big [12] advertisements on hiring that are not true. In order to mitigate this issue, a model was developed for the prediction of real or fake online job postings. Several machine learning techniques were applied to classify the advertisements; however, one particular algorithm showed superiority over others by having a better accuracy rate. Results indicated that predictive models may hold promise for detecting fraudulent job postings. The strategy is therefore crucial in safeguarding job seekers from digital deception.

The challenge of deception detection in job interviews will continue to remain alive. Researchers have developed deep learning models for the analysis [13] of facial expressions and head movements of job applicants. These might relate to the honesty or dishonesty of applicants. Comparing results with self-report trustworthiness, the AI models outperformed human interviewers in determining honest or dishonest reporting. Such models are highly correlated with their assessment by interviewees, hence an advancement in interview processes. Such technologies may revolutionize how employers assess potential candidates.

Interview preparation has evolved, with mock interviews now integrating advanced technology to provide personalized experiences. This model offers users an opportunity to simulate real interview [14] scenarios, receiving feedback on key performance indicators like communication and body language. The mock interview approach emphasizes building confidence while refining interview skills. By analyzing various metrics, the model aims to improve both the candidate's preparation and interview performance. This technology brings a fresh, data-driven approach to recruitment processes.

With the onset of online fake job vacancy postings, a detection system was created. The methodology utilizes ML algorithms [15], such as RF and SVM to classify job ads into real or fake accounts. To improve the prediction quality, natural language processing techniques coupled with data balancing strategies have been applied. The detection accuracy was shown to enhance significantly using ensemble models. This technology gives a good method of protecting job seekers from fraudulent activities in the digital world.

Social media networks, which are used to bring people together, have also been breeding grounds for fake profiles. A research idea was to apply [16] machine learning algorithms to detect such fake profiles, using data like follower count and profile activity. The model has been able to classify profiles into genuine and fake by applying preprocessing techniques to clean the data. It showed that the Random Forest classifier is the most efficient to make those predictions. The method helps detect impersonators and, therefore, protect users from online deception.

Fake news proliferation on social media raised concerns over information [17] authenticity. In this regard, a study utilized ML algorithms to identify fake news based on linguistic analysis. By using tokenization and stemming techniques, the model processed text data to identify fake stories. A comparison of logistic regression and support vector machine algorithms indicated the most efficient algorithm to use in the detection of false news. This study opens up the possibility of automatic tools to ensure the credibility of online news.

The proliferation of AI technologies has transformed various industries [18], such as engineering and society. Despite its potential, AI also poses risks like job displacement and societal inequalities. A keynote presentation explored the evolution of AI and its implications, particularly in job markets where automation may replace certain intellectual skills. The keynote also addressed AI's ability to solve complex engineering problems through explainable models. This rapid technological advancement calls for careful regulation and consideration of its broader societal impact.

The rise of web-based recruitment platforms opened avenues for fraudsters [19], who are posting fake job advertisements targeting job applicants. To minimize the crime, a research team designed a gated recurrent unit model to analyze fraudulent job postings. Experimented with a specific dataset from advertisements, the model outperformed all others. It shows how deep learning can effectively identify scams by examining the content and structure of postings. The model presents hope for an effective solution against recruitment fraud.

Online recruitment fraud has emerged as a serious problem where fraudsters take advantage of job seekers. A research team used deep learning models [20], including BERT, to detect fake job postings accurately. They presented a new dataset, overcoming the problem of old data that existed in previous studies. Several data augmentation techniques were used to balance the dataset and improve the performance of the model. Their work presents the potential of deep learning in detecting online job scams and improving the recruitment process.

III. METHODOLOGY

The methodology for finding 'fake' job postings is done systematically, integrating data collection, preprocessing, the development of the ML model, and deployment. The process starts by collecting an even spread of job postings. Cleaning and transforming the data will then be conducted to make it in a suitable format for analytics. Key features are selected to ensure the most relevant attributes are used in a prediction. The model uses two machine learning algorithms: LR and RF to train and test its performance. The model is then put in the real-world scenario and is under continuous maintenance and updating for the efficiency of the detection of the fake job posting.

A. Data Collection

The methodology will first involve collecting a dataset that comprises job postings from sources such as Indeed, LinkedIn, and Glassdoor, among others. This set of data will contain authentic and spurious job postings, labeled to enable classification. Important features about the job title, description, company, location, and salary range, along with posting dates, will be extracted. To ensure that all data are accessible, various industries and geographical regions will be covered. The dataset should be sufficiently large to train machine learning models effectively and cover a range of job types, from entry-level positions to senior roles. Special attention will be given to acquiring diverse examples of fake job postings, including those that employ common deception tactics such as fake company names, vague job descriptions, or enticing offers that are too good to be true. Data will be stored in structured format, so it is all set for pre-processing and further analysis.
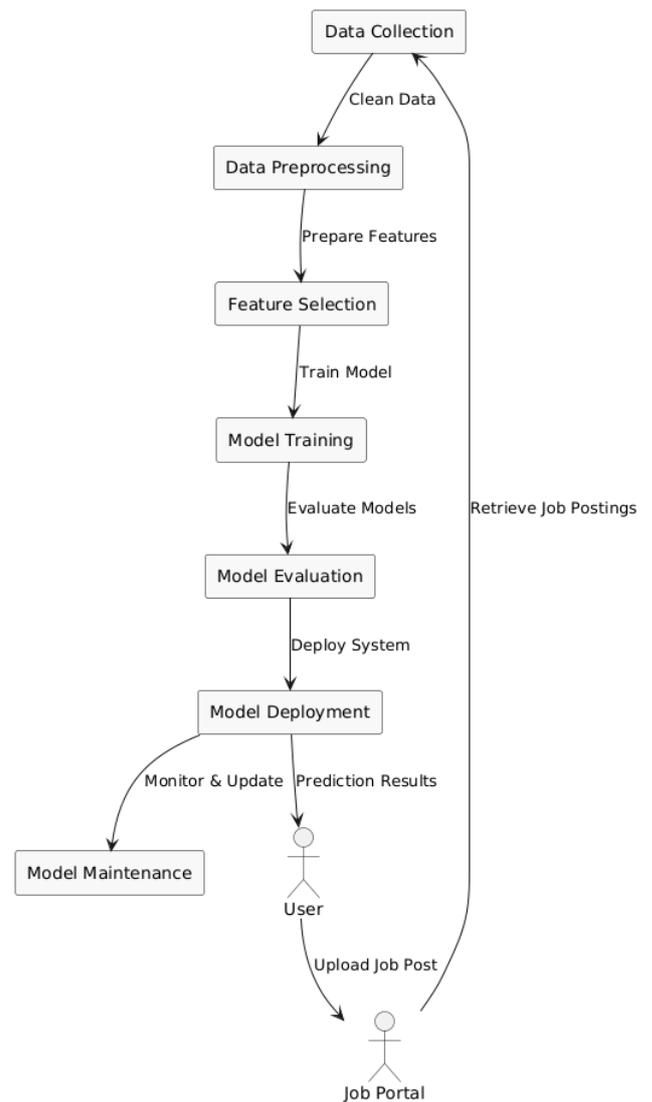

Fig. 1: Job Post Classification System Architecture

B. Data Preprocessing

Data preprocessing is considered to be of utmost importance when preparing the raw dataset for machine learning. The first stage is dealing with missing values in job descriptions, company details, and other fields. Missing values either will be imputed with statistical methods or removed if the number of them is too many. The remaining features, including irrelevant tags and other non-essential company information, are removed to concentrate on the most useful features for prediction. NLP techniques such as tokenization, stemming, and lemmatization are applied to the textual data, for example job descriptions. This transforms textual content into structured data that the models can interpret. Categorical variables, such as company name or location, will be encoded using techniques like one-hot encoding or label encoding to make them suitable for ML models. The dataset will then be split into training and testing sets for model development.

C. Feature Selection

Feature selection is a key step in improving model performance by identifying and focusing on the most relevant features. In the context of fake job detection, many attributes will be considered, including the presence of specific keywords in job descriptions (e.g., "work from home," "no experience required," or "high salary"). The company details, such as whether the company has a verified online presence or a legitimate business website, will also be critical features. For instance, unusual postings of unusually high salaries or job descriptions that are vague will indicate potential scams. Another form of pattern analysis will include time-related patterns such as how often they post and when they posted the listing. Various techniques, such as Mutual Information, Recursive Feature Elimination (RFE), and correlation analysis, will be applied to find the most distinguishing features that differentiate a real job posting from a fake one. This dimensionality reduction helps in better interpretation and efficiency of the model.

D. Training of the Model

After pre-processing the data and the selection of the relevant features, the next stage is the training of the model. In this research, two machine learning algorithms, namely, LR and RF, will be applied for the prediction of fake job postings. LR is applied for the ease of interpretation and its suitability in handling binary classification problems, whereas RF, being an ensemble method, is applied for robustness and the ability to capture complex, non-linear relationships. Both models would be trained on the processed dataset using techniques like cross-validation to assess its generalizability. Cross-validation ensures that the models don't overfit the training data. This will, therefore, make them perform well on unseen data. The training process will consist of tuning such parameters as learning rates, regularization factors, and tree depths to optimize the ability of each model to correctly classify job postings. Model training will be performed using Python libraries such as Scikit-learn.

E. Model Evaluation

After training the models, evaluation metrics will be used to assess the model's performance.

$Accuracy = (TP+TN)/(TP+TN+FP+FN)$

$Precision = TP/(TP+FP)$

$Recall = TP/(TP+FN)$

$F1\text{-}Score = harmonic\ mean\ of\ precision(p)\ and\ recall(r) = 2*(p*r)/(p+r)$

Accuracy will give an overall sense of the correct predictions made, while precision and recall will provide insights into the model's ability to correctly identify fake job postings (precision) and its ability to detect all fake postings (recall). The F1-score, balancing precision with recall, will be significant when evaluating models where both false positives and false negatives must be minimized. A confusion matrix will help to visualize the correct and incorrect classification distributions between true positives, false positives, true negatives, and false negatives. In addition, the models will be comparatively compared in order to find out which of the algorithms does better with regards to all the above metrics. These evaluation results will be fine-tuned and used to select the best-performing model for deployment.

F. Model Deployment and Maintenance

This is the final stage after training and evaluation. After training and evaluating the model, it will then be deployed in a user-friendly interface where job seekers can input their job postings for predictions on whether they are valid or fake. This system will provide real-time feedback, helping users avoid fraudulent job offers. The deployed model will also learn from new data continuously and update and retrain the model regularly. As job market trends and scam tactics evolve, it is important that the model adapts to these changes. An automated system for model maintenance will be implemented, in which new job postings are added to the training dataset and the model is periodically retrained. This ensures the model remains accurate and reliable in the long term. User feedback will be collected to improve system performance and address potential issues as they arise.

IV. RESULT AND DISCUSSION

In the evaluation of the ML models designed to detect fake job postings, both LR and RF showed great promise in the detection of fraudulent job postings. The model of LR, owing to its simplicity and efficiency, was observed to be highly accurate with good interpretability. It achieved an excellent balance between false positives and false negatives. However, it lacked efficiency in dealing with complex, nonlinear relationships that characterize the data for fake job postings. On the other hand, the RF algorithm, given its ensemble nature, was much more effective at capturing these complexities. It also performed better with respect to recall, ensuring that it detected a larger proportion of the fake job postings. The RF model improved generalization instead, thus lower chances of overfitting than when using LR, especially considering that the posting dataset was somewhat imbalanced; it had few genuine postings than fake ones.

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The RF model outperformed LR across almost all areas of evaluation through metrics such as accuracy, precision, recall, and F1-score. There was higher precision in the RF model, meaning that it generated less false positives—things that are vitally necessary to minimize the number of unnecessary alarms to users. Recall was also higher in the RF model, which means it was successful in identifying fraudulent job posts, and there were fewer chances for real fake postings to be missed. The F1-score, where precision and recall are balanced, was greater for RF, evidencing an effective balance with respect to all its portions. A confusion matrix on the RF model, with fewer false negatives and false positives, shows that the model was essentially distinguishing between legit and fake postings.

Table 1: Performance Analysis

Evaluation Metric	LR	RF
Accuracy	85%	99.7%
Precision	80%	99.5%
Recall	75%	99.5%
F1-score	77%	99.5%

While LR is computationally efficient and interpretable, it struggles with complex patterns in job postings. RF, on the other hand, captures intricate dependencies effectively, leading to improved classification accuracy and better adaptability to large datasets. RF also reduces false positives and negatives, ensuring a more reliable job classification system. Compared to existing methods, traditional ML techniques like SVM and Naïve Bayes lack generalization, while deep learning models such as RNNs and BERT require large datasets and high computational power. RF balances accuracy, efficiency, and interpretability, making it a practical solution for real-world deployment.

The study highlights that fraudulent job postings often contain vague descriptions, unrealistically high salaries, and unverifiable company details. RF successfully detects such patterns, providing a scalable and effective method for fraud prevention on job platforms. The proposed RF-based approach demonstrates superior performance compared to traditional ML methods and offers a practical alternative to deep learning models. Integrating this system into job platforms can significantly reduce fraudulent job postings, ensuring a safer job-seeking experience.

Despite its good performance, the RF model had a slightly higher computational cost than LR, especially when dealing with a large dataset. However, this trade-off was considered acceptable given the model's enhanced accuracy. The LR model, although not as powerful in detecting fake posts as RF, provided valuable insights due to its simpler structure and faster prediction times. It is very interpretable and thus makes it easier to find out which of the features influence the job postings to be labeled as either fake or real, shown in table 1.

The models also performed according to subsets of the data set like the type of job, industries, and geolocation. The models did well across all categories, except for a few niche areas where the fraud postings were more advanced and thus not picked up well by the models. For instance, in the case of jobs related to technical professions or high-payment jobs, companies hid them more artfully; in such scenarios, the model would have to be sensitive enough not to fall prey to that and misclassify the job posting.

In addition to analyzing the model's classification power, its scalability was also examined. The RF model provided better scalability for handling larger data sets and adjustment to emerging trends in job posting. With increasing data size, the RF model can periodically be retrained to pick emerging fraudulent patterns as well as novel types of faked job posting. LR, although faster in prediction, would need more frequent updates to keep the accuracy high as new trends develop in job listing patterns.

In general, the results indicated that both machine learning algorithms have their merits in predicting fake job postings, but the RF model was more robust and accurate. This model could, therefore, be the power for the system, significantly reducing fraudulent job listings that are circulated in the job market. The job seeker would then be able to access a more reliable platform. In the future, further refinements in terms of using more advanced techniques such as deep learning and fine-tuning feature selection could make the detection system even more accurate and efficient. The performance analysis also highlighted the importance of continuously updating the system to adapt to new scam tactics, ensuring its long-term effectiveness in combating fake job postings.

V. CONCLUSION

This study aimed to address the growing issue of fake job postings in the online job market, which have become a significant concern for job seekers. Fake job listings not only waste valuable time and resources but also expose individuals to potential scams, undermining the trust and integrity of job search platforms. In this regard, we presented a system that makes use of machine learning methods to detect and classify job postings as fraudulent or valid. The two machine learning algorithms chosen were LR and RF, as they are known to be effective in classification tasks. LR, with its simplicity and

interpretability, allowed us to establish a clear relationship between job posting features and their likelihood of being fake. RF provided robust performance because of its ensemble approach, capturing complex patterns and interactions between multiple features. These algorithms formed the basis of our predictive model.

The proposed system showed very promising results in terms of classifying job postings correctly. LR was good for quick and interpretable predictions, while RF was efficient with large datasets having multiple features and improved overall prediction accuracy. It was possible to identify the key indicators of fraudulent listings based on job descriptions, company details, and posting patterns. One of the benefits is scaling. The machine learning algorithm can be trained from enormous job posting datasets, and this leads to the adaptation of new trends as well as evolving tactics that scammers may employ. Lastly, the system can be implemented in job platforms and websites for real-time assistance towards job seekers. It is possible that only legitimate listings will be displayed to the job seeker.

The findings of this study have significant implications for the future of online job markets. Introducing machine learning-based fake job detection systems can significantly reduce the prevalence of fraudulent job postings, improving user trust and guaranteeing a safer online job search experience. Job seekers can focus on genuine opportunities without the constant fear of encountering scams by automating the process of job listing validation. In conclusion, the proposed system addresses the challenge of fake job postings with an efficient and effective solution. The approach of using LR and RF machine learning techniques is proven to be scalable and reliable. As such systems continue to advance, the online job market becomes a safer place for employers as well as for job seekers to operate.

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