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A Novel Hadith Authentication Mobile System for Android and Ios Phones With Arabic to English Language Translation

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ABSTRACT

This paper endeavors to create a groundbreaking Hadith authentication mobile system providing Arabic to Malay translation for Android and IOS devices. The background highlights the importance of Hadith in Islamic tradition and the challenges Malay-speaking Muslims face in accessing authentic Hadith resources. The problem statement underscores the language barrier, authenticity concerns, and the lack of comprehensive mobile solutions. The paper's objectives encompass developing the mobile system, implementing authentication criteria, offering user-friendly features, and enhancing access to authentic Hadith sources. The paper's significance lies in providing access to authentic Hadith, promoting authentication, and empowering the Malay-speaking Muslim community. The scope includes essential app features and authentication algorithms, while limitations pertain to language support, authentication variability, resource constraints, translation nuances, and continuous updates. This paper aspires to bridge the gap in Hadith accessibility and contribute to a deeper understanding of Islamic tradition among Malay-speaking Muslims. This paper explores the issue of Hadith authentication and scrutiny, focusing on critical scholars' impressions and the standard used by Hadith compilers. The system uses a client-server architecture and combines web and mobile technologies for administrative and public access. The web interface uses Springboot for Java, while the mobile interface uses React Native for cross-platform applications. The system communicates through rest services and is validated using statistical analysis. The paper also translates authentic Hadith from Arabic to Malay language.

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Introduction

The study of Hadith, the recorded sayings and actions of the Prophet Muhammad (peace be upon him), plays a central role in Islamic tradition and jurisprudence. Hadith serves as a critical source of guidance for Muslims, providing insights into the Prophet's life and teachings. However, the accessibility and authenticity of Hadith sources have been a longstanding concern in the digital age, especially for Malay-speaking Muslims [1]. In recent years, mobile technology has transformed how individuals access religious words and information. Smartphones have become indispensable tools for learning and practicing religion, making it essential to bridge the gap in accessing authentic Hadith resources, particularly for Malay-speaking Muslims. A hadith describes Muhammad's behavior, statements, or habits [2]. Some scholars' Hadith collections are more famous than others. The most common Hadith categorization duty is establishing a Hadith's authenticity. Classification requires Hadith science researchers [3-5].

Conversely, we try to classify Hadith as a natural language word. This assignment uses word content to identify a word label without outside information [6]. We also considered that regular people may choose the proper Hadith label if they know the language. Modern technology has made individuals use the digital Quran on mobile devices and the Internet instead of the physical Quran (Mushaf). Digital Qurans are portable [7]. However, digital Quran apps' legitimacy and authenticity are seldom assessed. Thus, such ignorance has caused the widespread distribution of illegal or erroneous digital apps and Quranic reproductions. Because of this, a plan to address the issue must be proposed. The proposed programme is detailed in this document [8]. No one can assert that al-Bukhari, Muslim, and other Hadith experts have ever examined the "plural of Hadith" words against consistently accepted standards. Establishing a Hadith's chain of narrators usually ensured its word legitimacy. The major focus was validating Hadith by thoroughly analyzing its narrators [9]. This challenge was based on the chain alone when Hadith's writings, particularly genuine ones, were criticized. But it doesn't mean Hadith scholars did not evaluate substance. Authentic Hadith words, such as al-Bukhari and Muslim, mention word difficulties. Thus, significant effort is absent. Traditional Hadith classification by Islamic scholars is done to verify its validity [10].

The validity of Hadith is usually determined by its links, reference to a specific authority, number of reporters involved in every step, type of word and Isnad, and finality, the trustworthiness and memory of the Hadith reporters [11]. One requires deep Hadith knowledge to analyze the entire requirements. Additionally, it is a sensitive and important work that should only be done by a Hadith scientific specialist and should not use computational methods. However, expert categorization research is scarce. Although the researchers indicated that the goal was to help experts make decisions or novices understand decision standards [12].

Unfortunately, due to a lack of study and controlling authority, phony Qurans are being produced to pervert Muslims worldwide [13]. It is difficult for readers to verify a poem's authenticity and the accuracy of a typo-based verse. E-content might lose readers' trust. Thus, controlling and improving its integrity is crucial [14]. A Hadith authentication system that can translate Arabic to Bahasa was suggested in this research. This study uses data from several famous researchers. Also, the recommended system works on Android and iOS phones.

The remainder of the paper is divided into five sections. Section 2 lists the works that are linked. Section 3 outlines and discusses the system architecture and dataset. Section 4 describes the Hadith compilation system and the findings. Section 5 contains a statistical study and assessment of the proposed novel authentication mechanism. Section 6 includes the paper's conclusion.

Related Literature

The process of Hadith categorization, undertaken by several Muslim scholars, serves the purpose of determining the validity of a certain Hadith. However, there is a scarcity of research on developing an expert system specifically designed for the authentication procedure and categorization in question. Stahl, (2019) has suggested many learning approaches, such as integrating the Naïve Bayes (NB) machine learning method with the idea of Jarh Wa-Ta'dil. The proposed system aims to streamline the process of Hadith authentication and facilitate the search for Hadith based on their relevance by using keywords from the distinct kinds of Hadith, namely Maqbuˆl and Marduˆd [15]. The accuracy level was assessed using several data testing ranges, 10, 20, and 100, resulting in corresponding accuracy rates of 50%, 55%, and 90%, respectively. One limitation of this technique is its ability to authenticate entities that may be classified as either Maqbuˆl or Marduˆd. Naseri & Gharehchopogh (2022) proposed a decision tree (DT) classifier that was designed to serve as a model for detecting missing data (MDD). This study investigates a unique strategy for categorizing Hadith by using a combination of two methodologies: expert systems and data mining methods [16].

The objective is to enhance the categorization of Hadith based on their degree of validity. The findings indicate that the MDD significantly influences the performance of the DT Hadith classifier. The Correct Classification Rate (CCR) has steadily increased, progressing from an initial value of 50.150% to a much higher value of 97.597%. However, it is difficult to claim that the suggested model is a definitive representation of all Mohadeethen approaches, which poses challenges regarding interoperability and consistency with knowledge mining. A proposal was put out by Yuslan & Bakar (2018) to develop an automatic Hadith Isnad processing system to assist in the automated determination of the acceptance (Sahih) or rejection (Da'ief) of Hadiths [17]. This proposal suggests the use of an associative categorization approach. The offered methodologies provide significant potential for developing an automated information system to categorize Hadith into the categories of Sahih or Da'ief. However, this idea remains speculative and has not been constructed or substantiated. The domain-specific ontology established by Baraka & Dalloul (2014) encompasses a Hadith narrator's comprehensive qualities and relationships, hence establishing a fundamental framework for evaluating Isnad [18]. This methodology involves querying Hadith data to identify narrators and get the required information. One limitation of this technique is its inability to determine Hadith's authenticity autonomously.

Furthermore, Martínez-Romero et al. (2019) introduced the hyperrectangle approach as a technique for extracting and classifying Hadith keywords [19]. Therefore, the extracted keywords are fed into a machine learning system, and the experimental results demonstrate that increased consensus among Hadith experts leads to improved classification accuracy. However, to achieve a higher level of accuracy, it is necessary to consider specialized Hadith ontologies. Aldhlan et al., (2010) introduced a multi-binary classifier within supervised learning classification. The researchers used a data mining approach to provide novel insights and guidelines about the automated identification of genuine Hadith [20]. The efficacy of this methodology relies on two underlying assumptions: firstly, the availability of a comprehensive database of Rejal Hadiths, and secondly, the premise that the Matn is structurally sound and devoid of flaws. However, the methodology used in this study utilized predetermined input values rather than the Hadith word. In Malaysia, a recent study has presented a method for validating and substantiating Hadith words by comparing authenticated records with word records stored in a database [3, 21]. However, it is important to note that this particular kind of verification does not include the ethical considerations associated with authentication methods rooted in the science of Hadith. This study aims to design a web-based authentication system for Hadith, which would be compatible with both Android and iOS mobile devices.

System Design and Dataset

This section provides an overview of the system design strategy and the dataset used for the authentication process in the proposed system.

Architecture of the System

The system has been created with a client-server architecture. Given the significant role of Hadith in the comprehensive development of Islamic law, individuals must exercise caution about the reliability and validity of Hadith [22]. According to John KenOffenhartz & Dawes Dana, (2017), the system is built around two prominent technologies: web technology for the back end and mobile technology for the front end [23]. The web-based interface is used for administrative functions, while the mobile-based interface is designed for public accessibility. The online interface was created using Spring Boot, a framework based on the Java programming language, and the mobile interface was constructed using React Native. React Native uses JavaScript syntax to develop cross-platform apps compatible with iOS and Android operating systems. In addition, the communication between web and mobile interfaces is facilitated via REST services. The system design technique is shown in Figure 1.

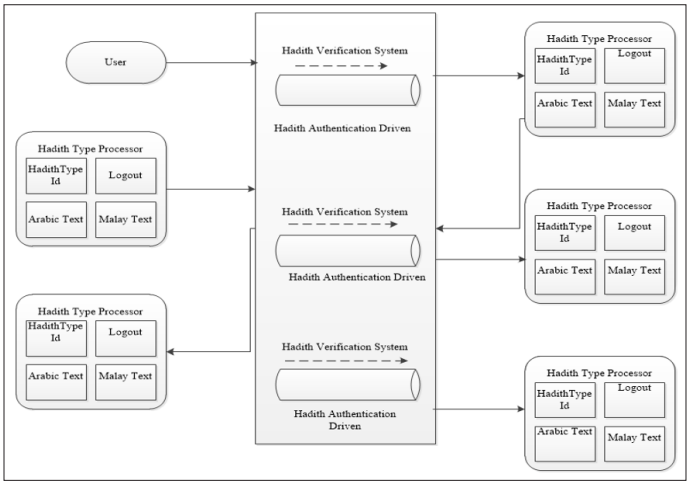

Figure 1: Proposed System Hadith Authentication Design Approach (Fadele, Kamsin, Ahmad, & Rasheed, 2021)

Hadith Dataset

The Hadith dataset used for this work is the translation version from Arabic to Bahasa, and all Hadith were acquired from Sunni Hadith experts. We utilized a total of twelve (12) books that are known to contain genuine Hadith passages for this study. These books are; "al-Syaikhan (al-Bukhari dan Muslim) with seven (7) different kinds of authentic Hadith words, al Bukhari (Sahih al-Bukhari) with twenty (20) different kinds of authentic Hadith words, Muslim (Sahih Muslim) with twenty-six (26) different kinds of authentic Hadith words, Abu Da'ud (Sunan Abi Da'ud) is having eighteen (18) authentic Hadith words, al-Tirmidhi (Sunan al-Tirmizi) is having thirty-eight (38) authentic Hadith words, al-Nasa'i (Sunan al-Nasa'i) is having fifteen (15) different kinds of authentic Hadith words, Ibn Majah (Sunan Ibn Majah) is also having twenty-six (26) different kinds of authentic Hadith words, Imam Malik (al-Muwatta') is having three (3) kinds of authentic Hadith words, Imam Ahmad (Musnad Imam Ahmad) is having thirty-one (31) kinds of authentic Hadith words, al-Darimi (Sunan al-Darimi) is having two (2) kinds of authentic Hadith words, Ibn Hibban (Sahih Ibn Hibban) is having twelve (12) kinds of authentic Hadith words, and finally, al-Hakim (al-Mustadrak) with twenty-five (25) kinds of authentic Hadith words". The authenticity of the chosen Hadith has previously been examined, and they have been translated into the Malay language and categorized into three (3) major groups by, depending on the subjects discussed in them [24]. The authors claim that the classifications are also "sahih," which means legitimate, "Hasan," which means excellent, and "da'if," which means weak. In this research, the datasets provided above serve as the genuine Hadith. As a result, the credibility of the suggested system is examined with the help of the dataset.

Entities in the Database

After investigating the significant entities included within the requirements, each attribute and the connections between the entities were found. In addition, the discovered entities were subjected to the normalization process to generate a database with a high level of data integrity. Figure 2 depicts the entity relationship diagram of the potential solution that has been suggested.

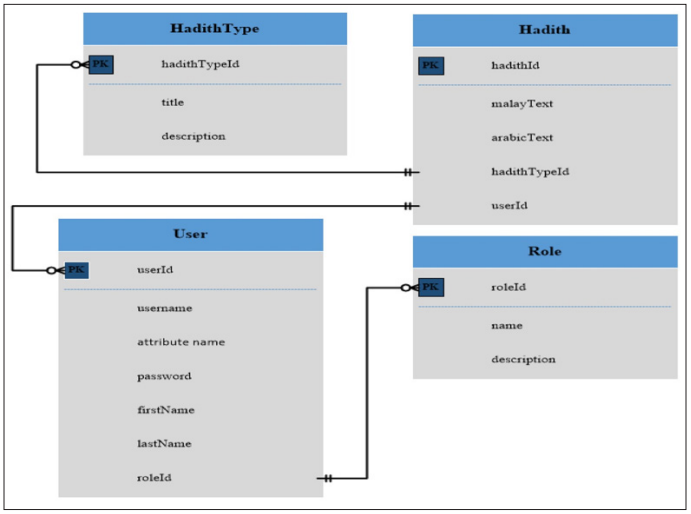

Figure 2: Entity Relationship Diagram For Hadith Application

According to Figure 2, the application is composed of four distinct entities, which are denoted as Hadith, HadithType, User, and Role. The most important parts of this application are the Hadith and HadithType elements. At the same time, the User and Role entities' primary functions are to provide authentication and authorization, respectively. Using the userId property, the User entity is connected to the Hadith object so that authors may be linked to their respective Hadiths. As a result, authors are given the ability to create, alter, and remove their very own Hadiths. Additionally, members of the general public can examine all Hadiths; however, they cannot change any of them in any way.

The System for Compiling Hadiths

Figure 3 depicts the user interface of the hadith authentication system, which allows for efficient communication through "Signing In.".

Figure 3: "Hadith App Sign-In Process"

Figure 3 depicts the interface where users can input their designated username and password and click the "Sign In" button. Upon successfully inputting the username and password, the user will be prompted with notifications to verify the effective data storage in the database. Once users have successfully registered, they can access and see genuine hadith types addressed by various scholars, as described in section 3.2. This may be shown in Figure 4.

Figure 4: Types of Authentic Hadith from Various Scholars

Users who click on genuine hadith categories will be offered the Arabic and Malay translations, as seen in Figure 5.

Figure 5: Translation of Hadith from Arabic into Malay

Figure 5 depicts the representation of authentic Hadith in Arabic with its corresponding Malay translation. Furthermore, the authenticity of additional hadiths, whether in Arabic or Malay, may also be verified using the "authenticate" button in Figure 5. The figure depicting the hadith authentication interface is shown in Figure 6, while Figure 7 illustrates the process of processing the authenticated Hadith.

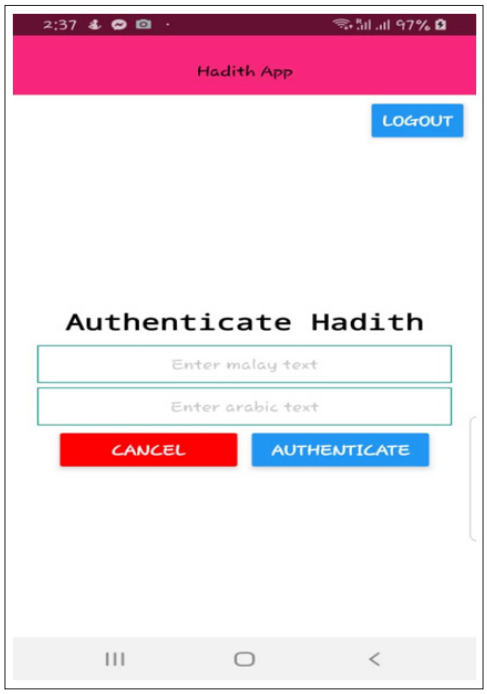

Figure 6: User Interface for the Hadith Authentication System

Figure 7: Method for Identifying a Fake Hadith

Figure 6 depicts the authentication interface used to insert Hadith texts, which may be in Arabic or Malay. Users must click on the "Authenticate" button to validate the authenticity of the entered Hadith. The outcome of this authentication process is then shown in Figure 7.

Statistical Results Validation

In the next part, the findings of the validation of the unique hadith authentication mobile system that was suggested and the modern methodologies that were used are shown using statistical models. The system's performance (also known as throughput) serves as the foundation for the statistical model. The results of the throughput measurements were obtained by applying a regression model to the whole collection of data obtained from the studies. To determine the importance of the suggested system throughput, we used linear regression due to the restricted nature of mobile devices and the heterogeneity of the devices themselves. To carry out data analysis, the statistical model is applied to the benchmarking trials to determine the different types of inferences that may be drawn from them.

Consequently, the objective of the statistical model is to build a model that, by using the information at hand, comes as close to representing the actual structure as is practically feasible. We used the modification approach to generate numerical values for the statistical analysis model. Additionally, to discover the correlation of our system's performance throughput, we use a regression model to calculate the throughput value based on the values of one or more variables. This allows us to forecast the value of the dependent variable, which allows us to find the correlation.

Collecting data from the experiments enables one to make predictions about the throughput. The limited capabilities of certain mobile devices and the ease of access to the dataset in Malay that was utilized for this study both factor into the decision to employ linear regression. As a result, linear regressions are the methods that are used so that the relevance of the system throughput may be determined. The linear regression connection is an example of a mathematical relationship between two variables, denoted

by the equation (1). The variables in question are the x-axis and the y-axis. The coefficients of the regression model, which had predetermined values, were represented by the parameters b and m of the model.

$$y= m*x+b \quad (1)$$

Linear regression is often used to predict the dependent variable based on the correlations between many independent factors. The primary objective of linear regression is to provide a probabilistic model that establishes a relationship between a dependent variable and a single independent variable. We used a numerical techniques approach to assess the accuracy of the regression model's outcome. Consequently, the data obtained from the trials are used to authenticate the model's output. Thus, the dataset was divided into two random subsets. The first subset was used for model development, while the second subset was employed to assess the predicted accuracy and uncover potential connections among the variables..

Determinantal Coefficient of Variance

Essentially, the measurement of projected output correlates to the actual output, and the coefficient of determination indicates the precision of this correspondence. It is represented by R^2, which magnitude varies between zero and one. The high number value implies that the forecast was made with a high level of accuracy. As was noted previously, the values of m and b that are depicted in equation (2) are to be calculated in the throughput that the linear regression models describe. There is a residual, also known as an error of fit, that can be calculated for each given data point and is denoted by the symbol r:

$$r_i = \alpha_i + \beta_i \quad (2)$$

Where α_i the actual execution time and β_i is the predicted execution time. The α_i can be less than β_i if the observation shows below the estimated regression line. Using the method of ordinary least squares, the criterion for an accurate prediction is that the sum of the squared residuals be as small as possible, which unexplained variation is represented in equation (3) as:

$$min \sum_{i=1}^{n} r_i^2 \quad (3)$$

For any "observation *I*, the execution time α_i deviates from the mean of the original execution times. This deviation is equal to the deviation of the predicted value from the mean plus the residual. The regression explains the expected value, while the residual remains unexplained. The proportion of the total variation in the throughput is measured by the coefficient of determination R^2 that is explained by the independent variables, which are the number of execution times", as such the *R* can be defined in equation (4) as:

$$1 - \sum_{i=1}^{n} r_i^2 = \frac{unexplained\ variation}{total\ variation} \quad (4)$$

The evaluation of how significant R2 is is contingent on the kind of communication between the network nodes that are under scrutiny at the moment. A R^2 value of 0.05 or higher is said to be a relatively good prediction.

Validation of Results

In this part, we will provide the validation of the unique system that has been developed for performance assessment. In addition to this, the statistical analysis of our findings via the use of multiple regression models is provided. The performance accuracy of the proposed innovative authentication hadith system as well as the state-of-the-art methodologies (i.e., Hakak et al., 2017 and Kamsin, Gani, Suliaman, Jaafar, & Qalid, 2015) were recorded while considering their throughput as the performance metrics under varied execution times. This was done to compare and contrast the two systems. It is necessary to include a validation function in the system that is being presented to certify the quality of the findings being measured. The significance of the suggested authentication method is determined via *t-test* findings. The t-test results indicate statistically significant changes in the mean values of our performance measurements when the execution time is varied while using modern methods. The prediction strategy demonstrates a high level of accuracy, as shown by the high values of the coefficient of determination concerning the unique authentication method that has been suggested. We provide the findings of our investigation throughout and evaluate them in light of the most up-to-date research practices. Table 1 compares the state-of-the-art systems with the innovative authentication method that was just suggested, based on the varying time it takes for each approach to complete its tasks.

Table 1: State-of-the-Art Systems and the Proposed Novel Authentication System: A Comparison of Execution Times

Interval	State-of-the-Arts Systems	Proposed Novel Authentication System
1	68	85
2	72	86
3	75	88
4	76	89
5	78	90
6	80	91
7	81	92
8	83	93
9	84	94
10	86	96

Table 1 compares the throughput of the innovative authentication system and existing state-of-the-art systems, as determined using linear regression analysis of their respective execution times. The anticipated throughput is evaluated for all systems with identical execution times to ascertain their association. Table 2 presents the predetermined fit function using linear regression to analyze the throughput. The shown information includes the coefficient of determination, often referred to as R^2 or "R squared," which quantifies the proportion of variance in the outcomes obtained from the processed tasks. A coefficient of determination (R^2) equal to or above 0.95 often indicates a strong predictive performance. Given that the value of R^2 remains consistently near 1 and, in most instances, exceeds 0.95 even under greater load conditions, it can be inferred that the regression model, as represented by equation 1, has a high level of accuracy in its predictive capabilities.

Table 2: Throughput-specific predefined fit function based on multiple regression

Attribute	Value
R2	0.95
Mean squared error	8.4
Fit parameters	b=17.9 +/- 8.8 m=10.1 +/- 1.3
Unformatted fit parameters	b=17.878700000000023 m=10.071249999999997

Table 2 presents the temporal data pertaining to throughput, as analysed by the use of a regression model. The table displays the average coefficients, standard errors, and throughput of the 95% confidence interval for both the proposed and current systems. The coefficients in this context represent the impact on the response variable when the predictor variable changes while keeping all other predictors in the model unchanged. An inverse relationship exists between greater values of one variable and lower values of the other variable. A positive correction denotes a positive association between two variables, suggesting that an increase in the other variable often accompanies an increase in one measure. The table demonstrates a significant performance increase with the newly suggested authentication mechanism while executing operations. A strong positive relationship exists between performance and latency, indicating that the suggested authentication mechanism enables the system to achieve low latency.

The performance accuracy of the newly suggested authentication system demonstrates a much superior throughput compared to existing state-of-the-art systems. The high level of precision shown in the findings may be attributed to the use of datasets with a similar magnitude in terms of their respective sizes.

Furthermore, the data provided in Table 1 were subjected to analysis of variance (ANOVA), and the findings are shown in Tables 3 and 4. Table 3 displays the statistical significance, which is determined to be 0.008. The findings indicate that the regression technique, as predicted by the model, is statistically significant at a significance level of 0.05. Hence, it may be concluded that at least one of the regression coefficients has a non-zero value. The results of the study demonstrate a statistically significant difference ($F(2, 2) = 124.69$, $p < 0.008 = 124.692$). This suggests that the throughput accuracy of the proposed innovative authentication system is much superior to that of the present frameworks.

Table 3: Multiple regression analysis of the proposed novel authentication system and state-of-the-art systems' throughput

	df	SS	MS	F	Significance F
Regression	2	39.682	19.841	124.692	0.008
Residual	2	0.318	0.159	0.000	0.000
Total	4	40.000	20.000	124.692	0.008

According to the results shown in Table 4, the p-values for the estimated coefficients of the x-axis and y-axis are 0.028 and 0.048, respectively. These p-values suggest a significant relationship between the x-axis and y-axis at a significance level 0.05. In light of this, in comparison to other present systems, the system that we have proposed displays a high throughput while working on numerous tasks. The t-value and p-value provide insights into individual independent variables' magnitude and statistical significance.

Table 4: t-test Impact of Throughput Difference Between Proposed System and Current Schemes

	Coefficients	Standard Error	T-value	P-value
Intercept	-6.019	1.007	-5.977	0.027
Proposed Novel Authentication System	0.852	0.128	5.883	0.028
State-of-the-Arts Systems	-0.540	0.122	-4.420	0.048

According to the findings shown in Table 4, the p-value for both the suggested innovative authentication system and the current methods is less than 0.05. Given that the p-value is below the threshold of 0.05, the outcome is deemed statistically significant at a significance level of 5 percent. Hence, it can be inferred that there is no statistically significant difference between the newly suggested authentication system and the existing methods in terms of minimal execution time. Additionally, Table 4 presents the coefficients that provide each explanatory variable's intercept and the regression coefficients. The intercept value of -6.019 corresponds to the contender who predicted the throughput time. The study's findings also indicate a disparity in the perception of the suggested unique authentication system and existing state-of-the-art systems regarding throughput. The proposed system's coefficient score is 85.2. Ultimately, a comparison was conducted between the outcomes of the trials and the statistical modeling. Table 5 presents a comprehensive comparison of the statistical analysis performed on the findings about throughput.

Table 5: Comparison of throughput between proposed novel authentication system and state-of-the-art systems

	Throughput	Coefficients	Standard Error	P-value	R2
Proposed Novel Authentication System	High	0.852	0.171	0.145	0.91
State-of-the-Arts Systems	Medium	0.335	0.816	0.752	0.86

As shown in the table, the outcomes of all the algorithms and statistical analyses demonstrate a noteworthy increase in throughput when using the suggested innovative authentication technique. The mean high throughput of our proposed system is statistically significant, with an average value of 85.20%. Furthermore, the coefficient is measured at 0.852. The presence of substantial and robust evidence strongly supports the reliability and validity of the throughput.

Additionally, the table presents the coefficient of determination, denoted as R2 or "R squared," which quantifies the proportion of the variance in the findings that the independent variables can explain The R2 numbers are provided to evaluate the performance of each method across various scenarios. The suggested system achieved a coefficient of determination (R2) value of 0.91, while the state-of-the-art systems achieved an R2 value of 0.86. These values are above the 0.05 threshold are often accepted as indicative of a good prediction. This suggests that the regression model used in the study accurately predicts the outcome. Therefore, the observed and projected throughput are evaluated against a specified duration of execution. The standard error of each algorithm is also shown. As shown in Table 5 the p-value of the calculated coefficients of x-axis and y-axis, are 0.145 and 0.752, for the suggested sytem and state-of-the-arts systems accordingly, suggesting that they are substantially connected at the level of 0.05.

Conclusion

After the Quran, the Hadith is universally recognised as the primary source of Islamic jurisprudence. In light of the proliferation of the Internet and the widespread popularity of social media platforms, the potential threat to the accessibility and authenticity of fabricated Hadith is more pronounced than ever before. The field of hadith authentication has garnered significant attention in recent years, demonstrating considerable potential to revolutionize human lives and practises in many geographical areas. Certain areas have

translated Hadith texts from the original Arabic language into their own local languages. Nevertheless, the task of determining the legitimacy of these Hadith is a subject of ongoing debate within this area, since many scholars possess divergent criteria for evaluating the credibility of Hadith. Considering this, we have devised a meticulously organised relational database to store genuine Hadith in Arabic and its corresponding Malay translation. Esteemed Islamic scholars have scrutinized this database and is fully compatible with Android and iOS mobile devices. These advancements will enhance the compilation process by ensuring the accurate storage of data and conducting a thorough study and validation of our system utilising state-of-the-art statistical techniques. The programme will function as a comprehensive resource for anybody seeking to verify the credibility of Hadith in both Malay and Arabic languages on mobile devices, catering to the general population. In the future, the study will be expanded by including more datasets sourced from other renowned Islamic scholars.

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