# The Current Research Trend about Machine Learning as a New Way of Fostering Islamic Education in School

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**Abstract:** *This study has the purpose of observing the usage of machine learning as a new way of teaching Islamic education according to the Qur'an and hadith to the young generation. The method used for data collection is bibliometrics, using secondary data in the form of metadata on the Scopus website. The sample is divided into two charts: the Qur'an and the hadith. Around 49 samples were found for the Qur'an category and 16 for the Hadith category. The data was analyzed using bibliometric methods with two software. The result of this study was that the most used words in the author's keywords for Qur'an subjects were machine learning SVM, KNN, and ANN. This means that SVM, KNN, and ANN were used for certain purposes and situations in analyzing the interpretation result inside the text of the Qur'an done by Ulamas. The practical implication of this study is to be used as a reference for Islamic education in Indonesia to use machine learning features.*

**Keywords:** *Citation, education, Islam, pesantren, topic*

**Abstrak:** *Penelitian ini bertujuan untuk melihat penggunaan machine learning sebagai cara baru dalam mengajarkan pendidikan Islam berdasarkan Al Qur'an dan hadis kepada generasi muda. Metode yang digunakan untuk pengumpulan data adalah bibliometrik dengan menggunakan data sekunder berupa metadata di situs Scopus. Sampel dibagi menjadi dua grafik, yaitu Al-Qur'an dan hadis. Ditemukan sekitar 49 sampel untuk kategori Al-Qur'an dan 16 sampel untuk kategori Hadis. Data dianalisis menggunakan metode ebibliometrik dengan dua perangkat lunak. Hasil dari penelitian ini adalah kata yang paling banyak digunakan dalam kata kunci penulis untuk subjek Al-Qur'an adalah machine learning yaitu SVM, KNN, dan ANN. Hal ini berarti SVM, KNN, dan ANN digunakan untuk tujuan tertentu dan situasi tertentu dalam menganalisis hasil penafsiran di dalam teks Al Qur'an yang dilakukan oleh para Ulama. Implikasi praktis dari penelitian ini diharapkan dapat digunakan sebagai referensi bagi pendidikan Islam di Indonesia untuk menggunakan fitur-fitur pembelajaran mesin.*

**Kata Kunci**: *Kutipan, pendidikan, Islam, pesantren, topik*

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**Introduction**

Indonesia is the country with the largest number of Muslims in the world, with a Muslim population reaching 240.62 million people in 2023. This number is equivalent to 86.7% of Indonesia's total population of 277.53 million people (Ghifara et al., 2022). Based on data from the World Bank, Indonesia has been the country with the largest Muslim population in the world since 2010 (Rahman et al., 2022). This is due to the growth of the Muslim population in Indonesia which is faster than the growth of the Muslim population in other countries (Iman, Sukmana, et al., 2022). Indonesia has the largest Muslim population in the world and has great potential for economic growth, both domestically and internationally (Iman, Sukmana, et al., 2022).

However, Islamic religious education is needed to be able to direct the young generation of Muslims so that the negative culture of globalization does not influence them. Islamic religious education can instill noble moral values, such as honesty, justice and compassion. This can help the young generation of Muslims to become individuals with noble character and can be role models for society. Apart from that, Islamic religious education can provide provisions for the young Muslim generation to face the challenges and dynamics of life. This can help them to become strong individuals who can face various life problems (Wardhana, 2021).

The excellence of the younger generation of Muslims in Indonesia is not balanced by competent Islamic education (Syafiq Humaisi et al., 2019). Moreover, today's invasion of social media can worsen the morals of the young Muslim generation and can lead them to immoral acts. In the digital era, like now, digital technology can help students understand the Islamic religion. Machine learning (ML) or machine learning can be used to improve the quality of Islamic religious education. ML can be used to develop an adaptive Islamic learning system, which can adapt learning materials and methods to student needs and progress. This can help students to learn more optimally (Sutrisno et al., 2019).

Machines can be used to personalize Islamic learning according to the needs and abilities of each student. This can help students to learn more effectively and efficiently (Wardhana & Ratnasari, 2022a). Not all students have the same cognitive talents, so different learning methods are needed (Wardhana & Ratnasari, 2022b). ML is still a rapidly developing technology but has great potential to improve the quality of Islamic religious education. With the correct application of ML, Islamic religious education can be more effective, efficient and enjoyable for students (Febriyanti et al., 2022).

There is not much previous research on using machine learning in Indonesia for Islamic education, or it may not exist yet (Wardhana, 2022). It is necessary to review previous studies that have applied machine learning to matters of Islamic religious

education. Developed countries with a majority Muslim population, such as Saudi Arabia, the United Arab Emirates, Brunei and Malaysia, have widely implemented machine learning for Islamic education (Ryandono et al., 2022).

Studying the Koran and Hadith is an important material in Islamic education. A study regarding innovation in Islamic education with new technology based on the Koran and Hadith is very important to direct the young generation of Muslims on the right path. Moreover, Muslims in Indonesia are entering the fourth industrial revolution era, where digitalization is immersing in every aspect of human life. It could be harmful to young Muslims who do not have a wise perspective in avoiding the negative effects of digitalization culture (Fauziana et al., 2022). The import of this study is to take advantage of the advancement of digital technology to teach Islamic education to young Muslims (Pratiwi et al., 2022). It is hoped that the results of this research can provide suggestions for school educators to utilize machine learning for Islamic education in Indonesia based on the Koran and Hadith.

This study aims to see how machine learning is implemented abroad so that it can guide on whether learning the Koran and Hadith as the foundation of Islamic education can use machine learning in Indonesia. Therefore, researchers need to research further about the application of machine learning in developed countries, as well as what the potential and obstacles are if applied in Indonesia. This research references how machine learning is applied abroad and whether it can be applied in Indonesia. This study aims to examine research trends on machine learning for Islamic religious learning globally so that it can be applied in Indonesia.

**Research Method**

One of the quantitative methods, namely bibliometrics, is used in this research to collect and analyze data. The data collected came from two websites, namely Scopus. The reason why this study collected data from Scopus is that Scopus website is a journal indexation institution with a credible international reputation. Only journals that comply with international superior research competency standards can be indexed (Mendo et al., 2023).

This study uses document metadata as secondary data from Scopus. Data was collected by typing several queries in the search feature on the Scopus website. These queries are divided into 2, namely:

1.  (TITLE-ABS-KEY (Quran) AND TITLE-ABS-KEY (machine AND learning)
2.  (TITLE-ABS-KEY (hadith) AND TITLE-ABS-KEY (machine AND learning))

After searching, it found around 90 documents for the first category (Quran) and 37 for the second category. Before the sample is downloaded, the sample is first

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screened, and if the sample includes a review-type document or does not use English, the document will be discarded. Around 49 documents remain for the first category and 16 for the second category. Document metadata is then saved in a CSV form file.
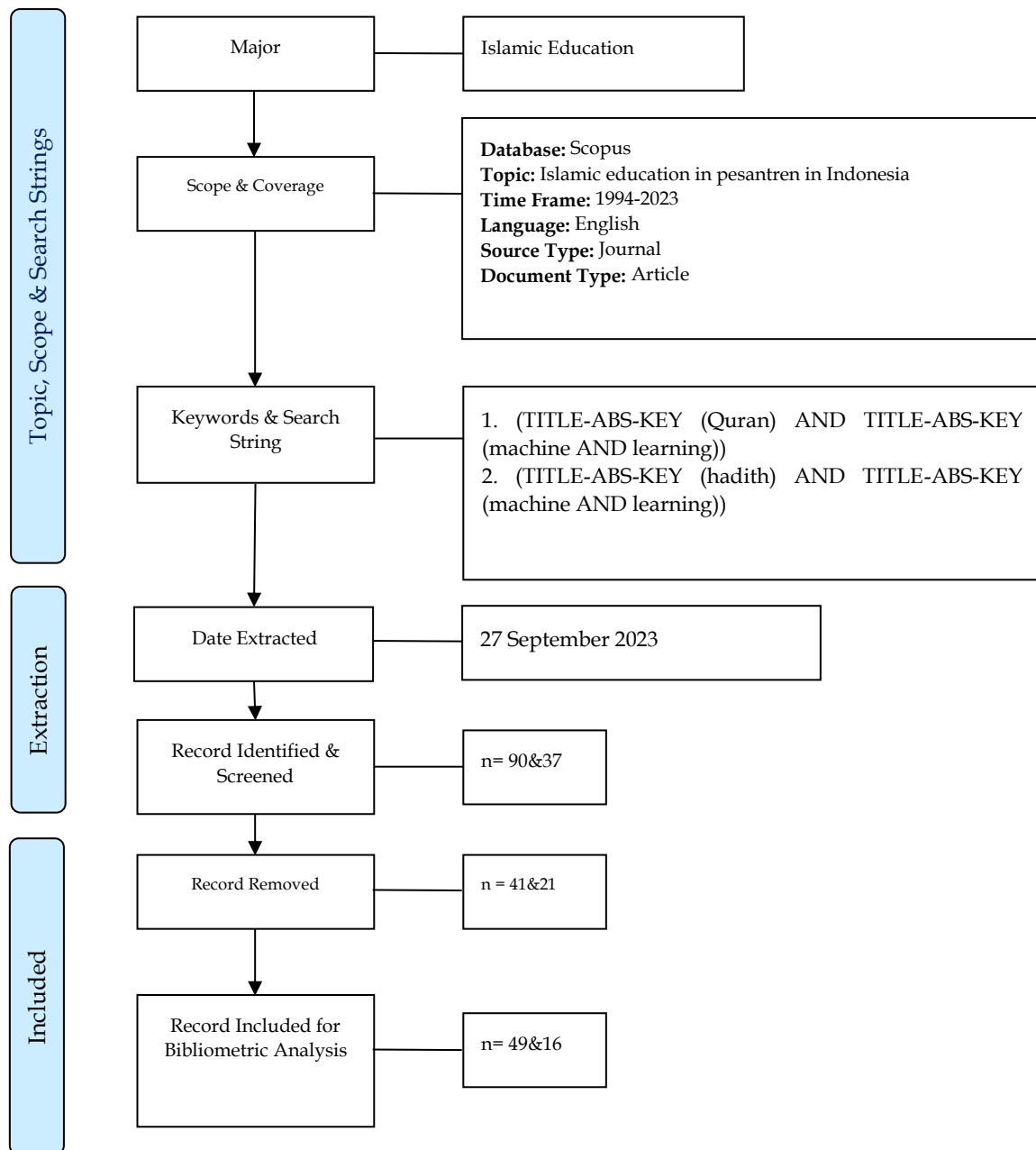


Figure 1. Diagram of data collection and sorting data that does not match the criteria (MAFRUCHATI et al., n.d.)

Data collected via the Scopus website is in CSV form and analyzed using bibliometric methods. There are two software used to analyze the data: Vosviewer to find out words that are often used in previous research keywords, and R Studio to find

out words that are often used in previous research abstracts. Data is presented in the form of images. The images between the analysis results using Vosviewer and R Studio have different shapes (Mafruchati et al., 2022).

**Result and Discussion**
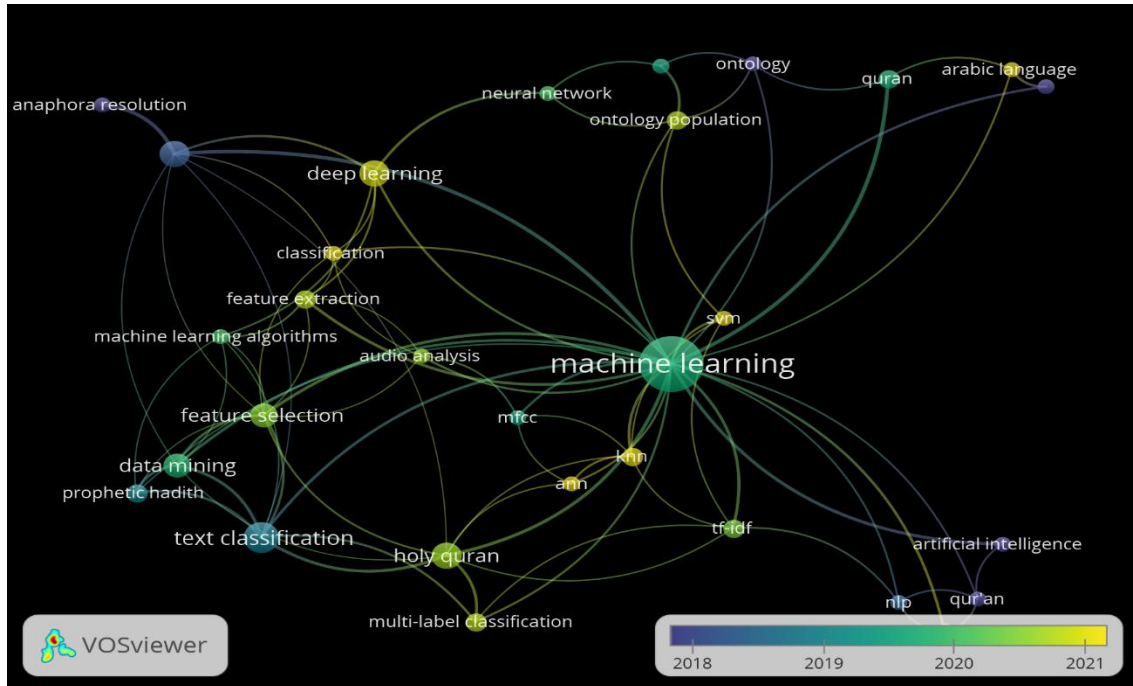


(a) Qur'an
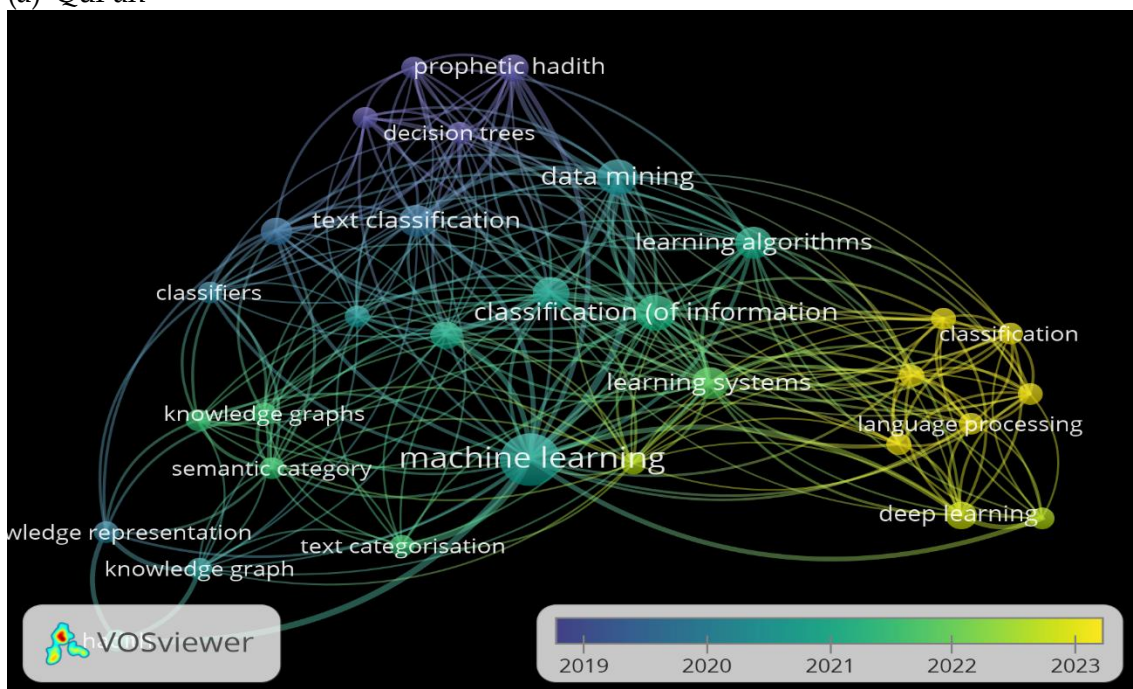


(b) Hadith
Source: Data processed with Vosviewer

Figure 2. List of most used words in author's keyword related to Qur'an and machine learning
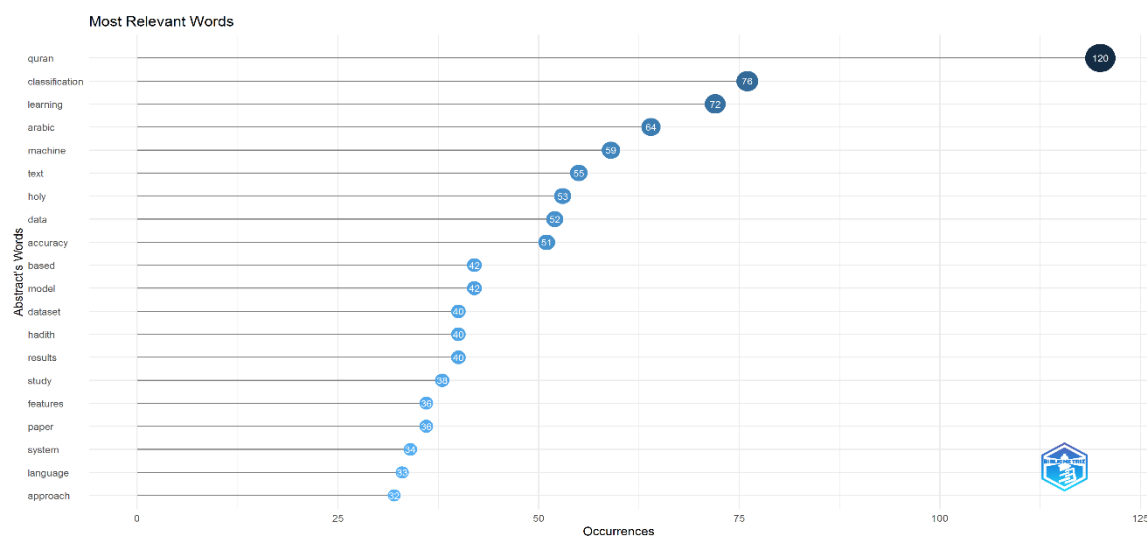
Figure 2a shows that the most current words used as the author's keyword connected to a word *machine learning* were SVM, KNN, and ANN. Those were the most common and current classifications of algorithms in the field of machine learning studies. Each algorithm is used for its own data characteristics and classification purposes because it has its advantages and disadvantages. SVM or Support Vector Machine is a classification algorithm that uses a hyper-plane to separate two data classes. SVM is suitable for high-dimensional data and has a linear data class. KNN or K-Nearest Neighbors is a classification algorithm that uses K-nearest neighbor networks to classify new data. KNN is suitable for non-linear data (Das, 2021). Meanwhile, ANN or Artificial Neural Network suits complex and non-linear data. ANN uses artificial neural networks to classify data (Mendo et al., 2023).

This means that the SVM, KNN, and ANN classifications can be used to classify interpretations of Koranic verses by several scholars that are relevant to a particular topic. This can make it easier for scholars as Islamic studies researchers to map out interpretations of Al-Qur'an verses based on the context of the topics studied by researchers. SVM, KNN, and ANN in machine learning can be used to learn the Koran and its interpretation based on content, language style, and themes (Sutrisno et al., 2019). This can help readers find verses from the Koran that can answer our questions or help us understand a certain concept. For example, we want to understand the concept of jihad in Islam. In that case, we can use a classification algorithm to search for verses in the Koran that contain words or phrases related to jihad (Iman, Wardhana et al., 2022).
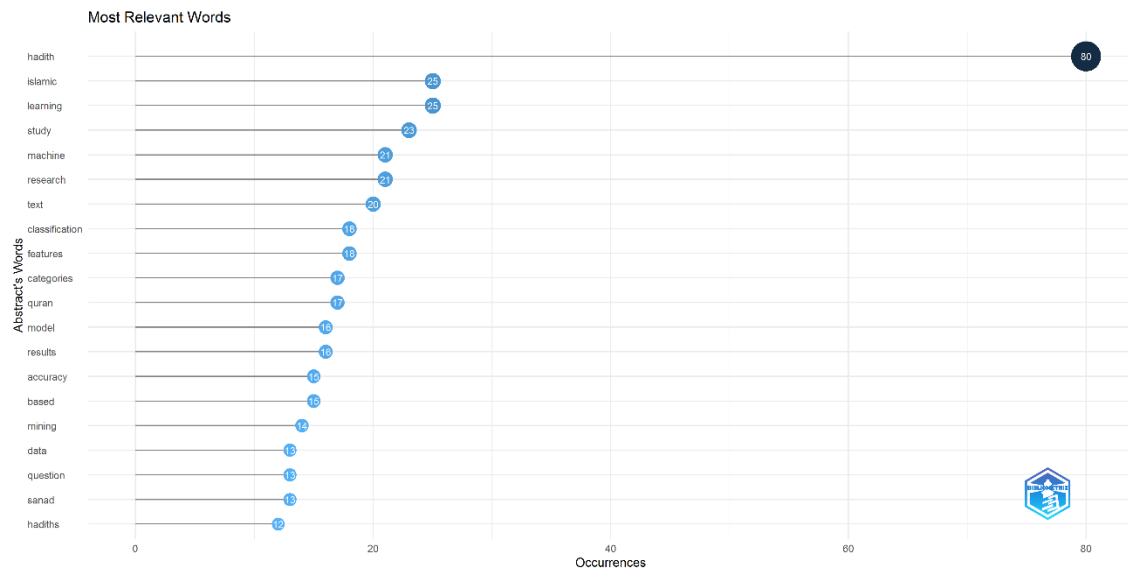
Figure 2b shows that *language processing* was closely connected to the word *machine learning.* The word *language processing n* was the most current word that was connected to the word *machine learning.* Language processing in machine learning and Islamic hadith studies can be used to develop tools to help scholars study hadith more efficiently and effectively (Bruun & Duka, 2018). Machine learning language processing can also classify hadith based on their content, such as topic, genre, or authenticity. After that, the interpretation of hadith can be translated from one language to another (Zauro et al., 2020).

According to the study (Das, 2021), Language processing in machine learning can also be used in the hadith-based Islamic education sector. Language processing algorithms can be used to analyze hadith data and produce learning material tailored to student needs. These study materials may include hadith summaries, questions and exercises, and additional resources (Sutrisno et al., 2019). Once analyzed, the language processing learning algorithm can be used to develop interactive and interesting hadith learning activities (Skorikov & Momen, 2020). This activity can help students to understand the hadith better and to apply it to their lives.

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(a) Qur'an

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(b) Hadith

Source: Data processed with R Studio

Figure 3. Most used words in abstracts in previous studies

Figure 3a shows that the five most used words in the abstract were *Quran, classification, learning, Arabic, machine text, and holy.* It could mean that The accuracy of machine learning in predicting the meaning of interpretations of the Koran depends on several factors, one of which is the quality of the data used to train artificial intelligence on digital devices to use machine learning. The data used to train machine learning models must be high-quality and accurate. This data can be a collection of Koranic verses, interpretations of Qur'anic verses, and other relevant sources.

Figure 3b shows that the five most used words in the abstract were *hadith, Islamic, learning, study, and machine.* The machine here can be interpreted as a digital device for studying the study of hadith and its implementation in real life. Digital devices make it easier for Muslims to access hadith sources, both hadiths in Arabic and those translated into other languages (Sutrisno et al., 2019). These hadith sources can be accessed via various platforms, such as websites, mobile applications and social media. Apart from that, digital devices provide various features that can help learn hadith, such as search features, translation features, and interactive learning features. These features can help Muslims more easily find relevant hadiths, understand the meaning of hadiths, and apply hadiths in everyday life (Mendling et al., 2018).

However, several words are different between images 3a and 3b. In Figure 3a, there are the words language and paper which are not in Figure 3b. Likewise, in Figure

3b, there are the words sanad, question, and data. This shows that the way of interpreting the Qur'an and Hadith is different and must be a special consideration in creating machine learning models for the Qur'an and Hadith (Samori et al., 2016). The words *language* and *paper* in the Qur'an can mean that the complexity of the sentences in the Qur'an is different. If even one punctuation mark is different in a particular verse, then the contextual meaning can be different. Meanwhile, in hadith, the *sanad* of the person conveying the hadith is very important (Zauro et al., 2020).

**Conclusion**

Based on the results above, the most used words in the author's keywords related to the Qur'an were *machine learning, which* were SVM, KNN, and ANN. This means that SVM, KNN, and ANN were used for certain purposes and situations in analyzing the interpretation result inside the text of the Qur'an done by Ulamas. On the other hand, the most used word in authors' keywords related to hadith was *language processing*. Language processing in machine learning and Islamic hadith studies can be used to develop tools to help scholars study hadith more efficiently and effectively.

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