MURAJAAH AI FEATURE IN THE QARA'A APPLICATION VERSION 5.1.26: AN EPISTEMOLOGICAL ANALYSIS

THESIS

Submitted to Ushuluddin and Humanity Faculty in
Partial Fulfillment of the requirements for the degree
of S-1 of Islamic Theology
On Department Al-Qur'ān Science and Interpretation

By:
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FACULTY OF USHULUDDIN AND HUMANITIES
WALISONGO STATE ISLAMIC UNIVERSITY SEMARANG
2025

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I declare truly that this thesis is my own work. Overall, I am responsible for the contents of this thesis. The opinions, arguments and findings of other authors contained in this thesis have been quoted or referred to in accordance with applicable ethical standards.

Semarang, June 5, 2025

The author



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APPROVAL PAGE

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MOTTO

مهْما كانت الظروف صعْبة ، علَّم قلْبك أن يقْبل الوضْع بدون كراهية

".. No matter how difficult your life may be, teach your heart, so that you can accept its reality without hatred..."[1]

[1] Imam Shafi'i, "Advice from the Author's Father in the Afternoon,".

DEDICATION

I dedicate this entire work with great respect and gratitude:

To my beloved parents, Imam Syafi'i and Sri Purwanti. Your prayers and love have always been the light of my life's journey. There are no words sufficient to express my gratitude for all the sacrifices and struggles you have given. Especially for my father who before his death gave me the mandate to be able to continue my further education in the field of Quranic Sciences and Tafsir.

To the greatest kiai and teachers, who have been the intermediaries of priceless enlightenment. Their knowledge and guidance are like lamps that illuminate the path of knowledge and wisdom.

And to all the good people who tirelessly provide support, enthusiasm, and motivation in every step of my struggle.

TRANSLITERATION

The international standard for converting Arabic text to English letters is as follows:[2]

1. Kosonan

Arabic Letters	Name	Writing	Arabic Letters	Name	Writing
ا	**Alif**	None	ط	ṭā'	ṭ
ب	Bā'	B	ظ	ẓȧ'	ẓ
ت	Strike'	T	ع	'Foot'	‘
ث	Ṡā'	ṡ	غ	Gain	G
ج	Jīm	J	ف	four.	F
ح	Ḥā'	ḥ	ق	Qāf	Q
خ	Khā'	kh	ك	Käf	K
د	Dāl	D	ل	Lam	L
ذ	Żāl	Ż	م	Hmmmm.	M
ر	Date'	R	ن	Nūn	N
ز	Zai	Z	و	WWE	W
س	Sīn	S	هـ	Wow.	H
ش	Syīn	Sy	ء	Hamzah	`
ص	ṣād	ṣ	ي	Yes."	Y
ض	Dø□ād	ḍ			

2. Double Consonants

Double consonants, because *São Paulo* double-written.

Example: **شَرْعِيَّة**with writing *São Paulo‘Yi Yi*

[2] Tim Penyusun, *Pedoman Penulisan Skripsi Fakultas Ushuluddin dan Humaniora*, ed. oleh Sulaiman, Cet. III (Semarang: Fakultas Ushuluddin dan Humaniora UIN Walisongo Semarang, 2020).

3. **Tā' Marbūtah** (ة) is at the end of a single word or is in the middle of a combination of words.

   a) When it appears at the end of the word with breadfruit, it is generally transliterated as (ة). For example, وَٰحِدَةٍ becomes *wahidah*. However, this rule has exceptions for Arabic words commonly used in Indonesian, such as salat and zakat, where (ة) is omitted.

   b) If Tā' Marbūtah is followed by the verb ال(al) and is read with breadfruit, then the transliteration still uses the letter (ة). We can see this in ٱلْجَٰهِلِيَّةِ ٱلْأُولَىٰ which became al-jāhiliyyati al-ūlā

   c) When Tā' Marbūtah is followed by ال but is read as a conjunction phrase (*iḍāfah*), it changes to 't' in transliteration. The same sentence ٱلْجَٰهِلِيَّةِ ٱلْأُولَىٰ is then written as al-jāhiliyyatil ūlā.

   These rules help maintain consistency in the transliteration of Arabic texts while maintaining the grammatical relationships between words in sentences.

4. **Short, Long, Gannda Vowels and Their Application**

   a) Short Vowels

ـَ	A
ـِ	I
ـُ	U

خَلَقَ	*Khalqa*
ضِلَعٍ.	*Ḍila'in*
ثُلَثَ	*Ṡulāṡa*

b) Long Vowels

بِمَا	*Bima*
عَلِيمٌ	*Alheim*
تَعُولُواْ	*Stuttgart*

c) Dual Vocals

بَيْنَ	*Baina*
قَوْل	*Qaula*

5. Alif + Lam ال

a) If followed by the letter Qamariyyah, it is written using the initial letter "al"

القرأن	*Al-Qur'ān*

b) If followed by the letter Shamsiyyah it is written according to the first letter of the Shamsiyyah

الشُّعَرَاءُ	*Ash-Shu'ara*

6. Writing Words in Sentence Sequences

أهل السّنّة	*Ahl as-Sunnah*

ACKNOWLEDGMENTS

Bismillahirrahmanirrahim

All praise to Allah SWT Almighty, for the opportunity and health given so that the author can complete the preparation of this thesis well. Prayers and greetings do not forget to always pour out to the Prophet PBUH, may we be among those who get his intercession in Yaumil Akhir in the future.

Thesis titled MURAJAAH AI IN THE QARA'A APPLICATION VERSION 5.1.26: AN EPISTEMOLOGICAL ANALYSIS It was prepared to meet one of the requirements to obtain a Bachelor's degree in Strata 1 (S.1) Department of Qur'an Science and Tafsir Faculty of Ushuluddin and Humanities, State Islamic University Walisongo Semarang.

In the preparation of this thesis, the author received a lot of guidance and direction from various parties so that the preparation of this thesis could be completed. Therefore, the author expresses his gratitude to:

1. Honorable, Mr. Prof. Dr. Nizar, M.Ag., as the Rector of UIN Walisongo Semarang.
2. Dear Mr. Dr. Mokh. Sya'roni, M.Ag., as the Dean of the Faculty of Ushuluddin and Humanities
3. The most honored, Mr. Muhtarom, M.Ag., as the Head of the Department of Qur'an and Tafsir who has approved the discussion of this thesis.
4. Honorable, Mr. Muhammad Ma'mun Abha, M.Hum., as Supervisor I who has taken the time, energy, and mind to provide guidance in the preparation of this thesis.
5. The lecturers of the Faculty of Ushuluddin and Humanities UIN Walisongo Semarang who have equipped various sciences so that the author can complete the writing of this thesis.
6. Mr. Imam Syafi'i S.Pd., M.Eng and Mrs. Sri Purwanti S.Pd, Mr. and Mrs. writers who always provide motivation and affection in educating their

children so that their children can reach this point. All forms of success of writers will never escape the role of both parents.

7. Comrades in law who have extraordinary enthusiasm complete the final project well and on time. To Fadhil Wathani, and Wawan Ariaji, Nafila Nariswari, Rifa Anis Fauziah, Syakila Jundana, Sofia Viona, thank you for being an encourager and accompanying in such a way in the process of preparing this thesis.

In the end, the author realizes that writing this thesis is far from perfect, but the author hopes that this thesis can be useful for the author himself in particular, and readers in general.

Semarang, June 2025

Writer

Hafidh Abrar Albar

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A. CONCLUSION 68

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ABSTRACT

This study discusses the integration of artificial intelligence (AI) in the Qara'a digital Qur'an application, especially in the Muraja'ah AI feature, through an epistemological approach. The main focus of this study is how AI acquires, processes, and validates knowledge in the context of Qur'anic learning, especially tajwīd and makhārij al-ḥurūf. The method used is library research with a descriptive-analytical approach to primary data from the Murajaah AI feature in the Qara'a application version 5.1.26 and relevant secondary literature. The findings of the study show that the Muraja'ah AI feature on the Qara'a application shows the validity of coherence due to its consistency in applying the rules of tajwīd and makhārij al-ḥurūf based on the standard references of Matan Al-Jazariyah and Tuhfatul Athfal. Pragmatically, this feature is valid because it provides users with high practical benefits and usability, such as instant feedback and flexibility of learning time.

Keywords: Epistemology, artificial intelligence, Qara'a Applications,

CHAPTER I
INTRODUCTION

A. Background

The term epistemology refers to the branch of philosophy that studies the origins, natures, and limits of knowledge. The term epistemology was first used by J.F. Feriere to distinguish between two branches of philosophy, namely epistemology and ontology (general metaphysics).[3] In particular, epistemology is a branch of philosophy that studies the theory of science which includes the study of the nature of science, sources of knowledge, methods, and tests of the truth of an invention or science.[4] In this context, epistemology will be used to understand how artificial intelligence can contribute to the learning process and understanding of the Qur'an. "Artificial intelligence" (AI) is a technology that allows machines to mimic human cognitive functions, such as learning and solving problems.

Artificial intelligence is a branch of computer science where the computer can do human work.[5] Actually, artificial intelligence began in 1956 which was designed by a group of computer experts and researchers from other disciplines from the academy who gathered at Dartmouth College, there were some scientists involved, namely Allen Newel, Herbert Simon, Marvin Misket, Oliver Selfridge, and John McCarthy.[6] Initially, artificial intelligence (AI) only existed in universities and research laboratories, and very few practical products have been developed. Towards the end of the 1970s and early 1980s, it began to be fully developed and the results gradually began to be marketed. Currently, there have been many research results that are being and have been converted into real products that bring benefits to users.[7]

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[33]Surajiyo, *Filsafat Ilmu dan Perkembangannya Di Indonesia: Suatu Pengantar* (Jakarta: Bumi Aksara, 2015), p 24.

[4]Abdul Mustaqim, *Epistemologi TafsIr Kontemporer* (Yogyakarta: Idea Press, 2020).

[5]Ana Khoirunnisa dkk., "Islam in the Midst of AI (Artificial Intelligence) Struggles: Between Opportunities and Threats," *SUHUF* 35, no. 1 (2023):p. 26–30.

[6]Victor Amrizal dan Qurrotul Aini, "Kecerdasan Buatan" (Halaman Moeka Publishing, 2013), p.11..

[7] Victor Amrizal dan Qurrotul Aini, "Kecerdasan Buatan" (Halaman Moeka Publishing, 2013), p11.

Globally, Islam has successfully responded quickly and used digitalization as a new opportunity to make strategic decisions, such as selling Muslim clothing online, uniting Muslims through da'wah, and giving rise to da'wah on social media and others[8]. The development of information and communication technology has brought significant changes in various aspects of life, including in religious practices[9]. In the 24th Century, there have been a lot of religious practices that are sustainable with digital technology. The digitization of Islam occurred not long ago in the 20th century. Digitalization is a transformation process from just conventional to conventional in collaboration with digital technology.

As with the Qur'an which used to be in a conventional form, namely those written or printed using ink on print media, but now it has collaborated with technology to become the Qur'an in digital form. The conventional period occurred in the 19th century, Indonesia began to print the Qur'an by handwriting. In the 20th century, a major breakthrough in the world of printing occurred with the introduction of printing technology, which allowed the Qur'an to be printed in mass and more easily accessible to Muslims in various parts of the world. This technology has had a significant impact on the spread of the holy book, so that more people can have copies of the Qur'an at a more affordable cost. Then, entering the 21st century, technological development is increasingly rapid with the presence of digital printing technology. With digital printing, the production process of the Qur'an becomes more efficient and flexible, allowing printing in various formats and sizes according to needs, and facilitating global distribution through various digital platforms.[10]

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[8]Saeful Anwar Anwar, "Revolusi Industri 4.0 Islam Dalam Merespon Tantangan Teknologi DigitalisasI," *At-Tuhfah: Jurnal Studi Keislaman* 8, no. 2 (2019): p.16–28.

[9] Tati Rahmayani, "Pergeseran Otoritas Agama dalam Pembelajaran Al-Qur'an," *MAGHZA: Jurnal Ilmu Al-Qur'an dan Tafsir* 3, no. 2 (2018): p.189–201.

[10]Jamaluddin M. Marki, "Strategi Pemeliharaan Mushaf Al-Qur'an (Studi Komparasi Percetakan Mushaf Al-Qur'an Di Indonesia Dan Arab Saudi)" (doctoral, Institut PTIQ Jakarta, 2024).

If we look deeper into the history of the Qur'an, it can be seen that the journey of this holy book has undergone significant developments over time. So that the Qur'an does not lag behind the times, but still follows the existing era according to its era. One of the innovations that has emerged is the digital Qur'an application. Where in this all-digital era, of course we are familiar with the term Digital Al Quran which is developing so rapidly[11]. Starting from just writing with ink which then continues to develop to become something that is equipped with various advanced features that utilize artificial intelligence (AI).

The use of artificial intelligence (AI) used in the Qur'an must be in accordance with the Maqāṣid ash-Sharīʿah in the creation of ethics and moral principles for artificial intelligence (AI) itself because the moral and legal code of ethics is rooted in Islamic culture and traditions, if in the creation of artificial intelligence (AI) it uses an Islamic artificial intelligence (AI) ethical approach it will definitely be in line with the Islamic religion. It is necessary and requires further research efforts to consolidate its application.[12]

The Qara'a app is one example of a digital Qur'an app that uses artificial intelligence (AI) to improve the user experience in reading and understanding the Qur'an. The digital Qara'a Al-Qur'an application is a platform that facilitates interactive and modern learning of the Qur'an. The use of technology in Qur'an learning has become a growing trend, as explained in research on virtual learning of Qur'an taḥfīẓ which shows that technology can be an effective tool in religious education[13]. However, behind the advances in the use of technology, there are still challenges in integrating artificial intelligence effectively in the context of Qur'an learning.

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[11] Syarif Hidayat, "Al-Qur'an Digital (Ragam, Permasalahan dan Masa Depan)," *Mukaddimah: Jurnal Studi Islam* 1, no. 1 (2016): p.1–40.

[12]Mawloud Mohadi and Yasser Tarshany, "Maqasid Al-Shari'ah and the Ethics of Artificial Intelligence: Contemporary Challenges," *Journal of Contemporary Maqasid Studies* 2, no. 2 (July 15, 2023): p.79–102, https://doi.org/10.52100/jcms.v2i2.107.

[13] Lilik Ummi Kaltsum, "Resepsi Mahasiswa Ilmu Al-Qur'an dan Tafsir Fakultas Ushuluddin UIN Jakarta terhadap Pembelajaran Virtual Tahfidz Al-Qur'an," *Quran and Hadith Studies* 10, no. 1 (2021): p.41.

The Qara'a Al-Qur'an Digital application is an application created by a group of youth in Pontianak, West Kalimantan. Hajon Mahdy Mahmudin, *Co-Founder* of Qara'a Indonesia explained, since its launch in 2018 active users of Qara'a have now reached 450 thousand people per month. *This startup* also then ranked sixth as the best-selling application in the education category on *the Google Play Store*[14]. Artificial intelligence (AI) in the Qara'a application offers various potentials that can make it easier for Muslims to interact with the Qur'an. Artificial intelligence features such as voice recognition, tajwīd analysis, and automated interpretation are some examples of how artificial intelligence (AI) can be used to provide a more interactive and immersive experience on the Qara'a app.

However, the current reality is that the potential of artificial intelligence in providing answers is still not 100 percent correct in improving the understanding of the Qur'an such as makhārij al-Ḥurūf.[15] Some previous research has shown that, while there are some applications that use technology, they often don't optimize for the interactive and personalization aspects that artificial intelligence (AI) can offer. The ideal condition to be achieved is the creation of an application that not only presents the text of the Qur'an, but is also able to provide context, explanations, and feedback that is relevant to users and can be responsible.

In the trending digital artificial intelligence ecosystem, and artificial intelligence that collaborates with religious sciences has entered. Where in today's life it is easy to access all the sophistication of artificial intelligence. This research is with the object of the Qara'a application because the Qara'a application is a digital Qur'an application that has used the sophistication of artificial intelligence and has been used by many users. The author's anxiety about this phenomenon is especially the validity of an ASR-made defect in this Qara'a application.

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[14] "Qara'a, an Advanced Application for Learning the Qur'an Based on AI Technology," Cloud Computing Indonesia, accessed September 27, 2024, http://www.cloudcomputing.id/berita/qaraa-aplikasi-canggih-belajar-alquran-ai.

[15] Nazik O'mar Balula, Mohsen Rashwan, and Shrief Abdou, "Automatic Speech Recognition (ASR) Systems for Learning Arabic Language and Al-Quran Recitation: A Review," *International Journal of Computer Science and Mobile Computing* 10, no. 7 (July 30, 2021): p.91–100,

The expected outcome is to answer how knowledge about artificial intelligence is understood and applied in the digital Qur'an application, so review how to source and how to measure the truth of this application. Development of a more effective and interactive application model, which can assist users in understanding the Qur'an in a more fun and meaningful way.

B. Research Questions

1. What is the source of knowledge used by Murajaah's Artificial Intelligence in the Qara'a application?
2. What is the epistemic validity of the knowledge generated by Murajaah's Artificial Intelligence on the Qara'a application?

This issue needs to be researched because with the increasing use of technology in education, it is important to ensure that the applications developed are not only technically effective, but also able to meet the needs of users in understanding the Qur'an in depth.

C. Research Objectives

1. Describe and analyze the source of knowledge that is the foundation for AI Muraja'ah Qara'a.
2. Analyze and test the epistemic validity of knowledge on Muraja'ah Qara'a's AI feature using the framework of the theory of truth coherence, correspondence, and pragmatism and assess it based on the principles of Qur'anic scientific transmission.

D. Research Benefits

The benefits of writing this research are as follows:

1. For Application Developers :D with this research, it is hoped that developers can develop the Qara'a application more optimally and trustworthily.
2. For Users:

This research is expected to be able to provide an overview to application users of how Qara'a uses artificial intelligence used, so that they know how the authority of artificial intelligence in petrifying us learn to recite.

3. For researchers in the field of Qur'an and Tafsir:
   It is hoped that with this research, researchers will pay more attention to the current era which is all about using artificial intelligence.

E. Literature Review

Research with a focus on discussion of artificial inelegance & Qara'a has certainly been researched. In order to emphasize the difference in the focus of this research, the researcher collected previous research related to and in line with the research theme. Some of the literature sources that are in line with or related to this research include the following:

1. Abdullah Hemmer's international journal article, "Harmonizing Artificial Intelligence with Islamic Values: A Thoughtful Analysis of Religious, Social, and Economic Impacts of Technological Advancements," explores the integration of AI with Islamic principles and its impact on religious, social, and economic structures in Muslim-majority societies. This qualitative research uses semi-structured interviews and case studies with academics, AI experts, and religious scholars. The main focus is on the application of AI in the digitization of the Qur'an and Hadith, as well as Sharia law compliance in the financial sector (e.g., Islamic financial consulting chatbots and AI-based zakat distribution systems). The findings show the potential for digitization of the Qur'an and Hadith for accessibility, but raise doubts about AI's compliance with tajwīd rules and Arabic syntax. AI ethical challenges related to morality, fairness, transparency, and the potential for work automation are also discussed. The authors conclude that AI has the potential to advance humans, but it must be managed so as not to contradict Islamic principles and human values, emphasizing the

importance of strict supervision of AI applications to maintain the sanctity of the Qur'an.[16].

2. The international journal article "Islam in the Midst of AI (Artificial Intelligence) Struggles: Between Opportunities and Threats" by Ana Khoirunnisa et al. analyzes the relationship between Islam and AI, discussing opportunities and challenges for the Muslim community. Although Islam accepts technological advances, it is important for Muslims to ensure the development and application of AI is based on ethical and moral considerations. Potential benefits of AI include improved Qur'an translations, assistance in fatwas, and improved halal product certification. However, this article also warns of the risks of misusing AI to promote apostasy, radicalization, and terrorism. The authors conclude that the use of AI should be aligned with Islamic principles, focusing on human dignity, ethical standards, and rational problem-solving, with caution to avoid adverse impacts.[17].
3. The international journal article "Maqasid Al-Shari'ah and the Ethics of Artificial Intelligence: Contemporary Challenges" by Mawloud Mohadi and Yasser M. A. Tarshany discusses the importance of an ethical framework for Artificial Intelligence (AI) that is based on Islamic principles, in particular Maqasid al-Shari'ah. The authors emphasize that AI evaluation needs to consider not only technological aspects, but also human values and experience. They propose that an Islamic ethical approach can address AI ethical challenges such as privacy and manipulation, as well as promote a more just society. The article also highlights the ethical challenges that arise from AI advancements, including bias against marginalized communities, as well as negative impacts on people's privacy and autonomy. Therefore, the authors call for the need for ethical guidelines in the development and

[16] Abdullah Hemmet, "Harmonizing Artificial Intelligence with Islamic Values - A Thoughtful Analysis of Religious, Social, and Economic Impacts of Technological Advancements," *American Journal of Smart Technology and Solutions* 2, no. 2 (December 4, 2023): p.65–76, https://doi.org/10.54536/ajsts.v2i2.2239.

[17] Khoirunnisa et al., "Islam in the Midst of AI (Artificial Intelligence) Struggles."

application of AI, as well as interdisciplinary collaboration to integrate Islamic perspectives. In addition, this article underscores the importance of public education about the risks of AI and the need for further research to strengthen the application of Islamic ethics in AI development. Thus, this article contributes to the global discourse on AI ethics by proposing an Islamic ethics-based approach.[18].

4. Abdul Majit's thesis entitled "Shifts in the Isnad System in the Transmission of Qur'anic Reading Knowledge on the Qara'a Application" analyzes the phenomenon of isnad shifts in the Qara'a application, a worship support application that provides Qur'anic learning services with reading correction based on machine learning and artificial intelligence. The service allows users to have a "teacher" of the Qur'an anytime and anywhere.
5. This research departs from the view of as-Suyūṭi who states that this kind of method of scientific transmission of reading the Qur'an is not justified. Thus, the formulation of the problem focuses on the causes of this shift in the isnad system and its implications. Using a qualitative (naturalistic) approach, the primary data of the study came from the Qara'a application, while the secondary data was in the form of books, articles, news, and related websites. The data is processed in a descriptive-analytical manner to produce conclusions. The results of the study show that the shift in the isnad system in the transmission of the science of reading the Qur'an is inevitable due to mediamorphosis and the development of information and communication technology. This shift is driven by industry needs, demand for other technologies, supportive legal actions and regulations, and societal pressures. The implication of this shift is the mediamorphosis of the transmission media of the science of reading the Qur'an (and other potential Islamic sciences), as well as the birth of machine learning and artificial intelligence as new religious authorities.[19]

[18] Mohadi dan Tarshany, "Maqasid Al-Shari'ah and the Ethics of Artificial Intelligence."

[19] Abdul Majit, "Pergeseran Sistem Isnad dalam transmisi keilmuan baca Al-Qur'an pada Aplikasi Qara'a" (undergraduate, Universitas Islam Negeri Maulana Malik Ibrahim, 2022), http://etheses.uin-malang.ac.id/42828/.

6. The thesis entitled "The Effectiveness of the Use of the Qara'a Application on Qur'an Learning" discusses the role of technology in facilitating access to learning the Qur'an, especially through the Qara'a application. This application is presented as a solution to the difficulty in understanding and reading the Qur'an well, offering various features supported by Artificial Intelligence (AI) as a reference for Muslims. This field research focuses on the effectiveness of using the Qara'a application. The results of the study show that the Qara'a app is very effective in helping users improve the recitation of makhārij al-ḥurūf, tajwīd, and tahsin. This application is considered easy to understand, equipped with community features, and can be accessed for free. This effectiveness is evidenced by an average user satisfaction of 83%, which is in the good category. Internal factors such as user motivation and enthusiasm also support these positive results. However, the authors identify the need for improved updates in the application to further improve its functionality.[20].

Table 1

Classification of Past and Present Similarities and Differences Related to Artificial Intelligence With Islam

No.	Heading	Typology	Equation	Difference
1.	Abdullah Hemmer. *Harmonizing Artificial Intelligence with Islamic Values: A Thoughtful Analysis of Religious, Social,*		Together research artificial intelligence that is integrated with Islamic ethics	In this study, the focus is narrower, namely on one digital Qur'an application that is integrated with

[20] Sri Rezeky, "Efektivitas Penggunaan Aplikasi Qara`a Terhadap Pembelajaran lL-Qur`an" (skripsi, Universitas Islam Negeri Sultan Syarif Kasim Riau, 2024), https://repository.uin-suska.ac.id/77945/.

	and Economic Impacts of Technological Advancements			artificial intelligence
2.	Ana Khoirunnisa, Fathur Rohman, Hilda Aulya Azizah, Devi Ardianti, Arinta Lailatul Maghfiroh, Aditya Muhammad Noor: *Islam in the Midst of AI (Artificial Intelligence) Struggles: Between Opportunities and Threats*	Artificial Intelligence Systems in Islam	Together research artificial intelligence that is integrated with Islamic ethics	In this study, the focus is narrower, namely on one digital Qur'an application that is integrated with artificial intelligence
3.	Mawloud Mohadi, Yasser M. A. Tarshany.: *Maqasid Al-Shari'ah and the Ethics of Artificial Intelligence: Contemporary Challenges*		Together research artificial intelligence that is integrated with Islamic ethics	In this study, the focus is narrower, namely on one digital Qur'an application that is integrated with artificial intelligence
4.	Abdul Majit.: *Pergeseran Sistem Isnad dalam Transmisi Keilmuan Baca Al-Qur'an*	Artificial Intelligence	It has the same object of study, namely researching the	This study has a different focus on problems. Namely artificial intelligence that is

	pada Aplikasi Qara'a	Apps in Qara'a app	Qara'a Application.	integrated with the Digital Qur'an.
5.	*"Efektivitas Penggunaan Aplikasi Qara`a Terhadap Pembelajaran Al-Qur`an"*		It has the same object of study, namely researching the Qara'a Application.	This study has a different focus on problems. Namely artificial intelligence that is integrated with the Digital Qur'an.

As far as the author's reasoning as the data above, there has been no research that examines the epistemology of the digital Qara'a Al-Qur'an that is integrated with artificial intelligence, namely the "Murajaah AI" feature.

F. Research Methods

In order to make it easier to write this research, the author took several steps as follows:

1. Types of Research

   This research is one type of research *Library Research*, (literature research), with a qualitative descriptive presentation, namely by presenting problems in a sequential manner and supported by the existence of primary and secondary data which is then analyzed to solve the problem and its solutions[21]. Literature research is a type of research that studies various literature such as reference books and previous research findings that are useful as a reference for the problem to be researched[22]. The materials or data used to support the completion of this research are sourced from libraries, either books, books, documents, articles, journals, news, or theses that are relevant to the discussion of the

[21] Diagram Alir, "Metodologi Penelitian," *Jakarta : PT Rajawali Prees*, 2005, p.21.

[22] Milya Sari dan Asmendri Asmendri, "Penelitian Kepustakaan (Library Research) dalam Penelitian Pendidikan IPA," *Natural Science* 6, no. 1 (10 Juni 2020):p.43, https://doi.org/10.15548/nsc.v6i1.1555.

research.

2. Data Source

In this study, the author utilizes two types of data sources, namely primary data and secondary data. Primary data sources are core sources that provide core data directly to researchers, while secondary sources are sources that provide indirect data to researchers and are needed to strengthen primary data[23]. Primary data sources include digital Qara'a Al-Qur'an which is specifically on artificial intelligence features. Meanwhile, secondary data sources include a number of books, books, documents, articles, journals, news, or theses that are relevant to the discussion of the research.

3. Data Collection Techniques

The data collection techniques in this study were carried out through literature study methods, digital document analysis (analyzing the Qara'a application as a "document" or "text") and interviews with key sources (with the Co-Founder). By searching and collecting various relevant literature such as books, books, documents, articles, journals, news, thesis, and other sources. In addition, the researcher also uses the documentation method as a data collection tool. That is, researchers collect data through the Qara'a digital Qur'an application.

4. Data Analysis Techniques :

The data analysis that the researcher will use is descriptive-analytical, that is, the author will collect and analyze the data obtained by the author from primary and secondary data, so that the alignment in the research context will be more structured and in accordance with the classification of the discussion. In this study, the researcher will describe the process of integrating artificial intelligence contained in the Qara'a application. After that, the researcher will analyze the suitability of the process with the existing knowledge of tajwīd of the Qur'an. In addition, if

[23] Fenti Hikmawati, *Metodologi Penelitian*, 1 ed., 4 (Depok: Rajawali Pers, 2020), p.33.

there is a discrepancy in the tajwīd knowledge of the Qur'an in the Qara'a application, an analysis will be carried out on how the epistemic validity of artificial intelligence can be integrated with the digital Qur'an.

G. Thesis Outline

To create an easy-to-understand presentation, the discussion needs to be systematically arranged so that the delivery in this study can be well structured. In addition, writing systematics also aims to keep research focused on its main goal. Therefore, this research is structured in five chapters as follows:

In the first chapter, introduction, in this chapter the author will explain the background of the problem that is the basis for why it is necessary to conduct research and raise several questions that are outlined into problem formulations. Furthermore, it is explained about the purpose or urgency and benefits that will result from the authorship of this research. In addition, of course, the literature review on artificial intelligence and the application of Qara'a has been studied by previous researchers, therefore the researcher presents several relevant studies that are also a reference for the author which is summarized in the literature review subchapter. Finally, it is explained about the sequential research methods used to create an easy-to-understand presentation and keep the research focused on its main goal.

The second chapter, the theoretical foundation. In this chapter, the author will explain the definition of epistemology, the definition and history of artificial intelligence, types of artificial intelligence, Digitization of the Qur'an in Indonesia, Standards for teaching Qur'an science in Indonesia and sources of tajwīd knowledge in Indonesia.

The third chapter, data presentation. This section will be explained in detail about the overview of the Qara'a App, which covers the history of the app's formation to all the features.

Chapter four, data analysis. In this chapter, the author will present the results of data analysis on how artificial intelligence can be integrated with the digital Qur'an

as a benchmark for correctness and not in reciting. How to benchmark artificial intelligence when providing value to users who are already using the feature.

The fifth chapter is the last chapter that contains conclusions and suggestions.

CHAPTER II
EPISTEMOLOGY OF ARTIFICIAL INTELLIGENCE, DIGITALIZATION, & QUR'AN EDUCATION QUALITY STANDARDS

A. Epistemology

1. Definition of Epistemology

Epistemology is a term derived from the Greek language consisting of the words *Epistim* which means knowledge and *Logos* means word or discussion.[24] The term "epistemology" refers to the branch of philosophy that studies the origins, natures, and limits of knowledge or often also called "theory of knowledge".[25] The term epistemology was first used by J.F. Feriere[26] to distinguish between two branches of philosophy, namely epistemology and ontology (general metaphysics).[27] In particular, epistemology is a branch of philosophy that studies the theory of science which includes the study of the nature of science, sources of knowledge, methods, and tests of the truth of an invention or science.[28] In this case, epistemology is a branch of philosophy. Meanwhile, in Western epistemological sources of knowledge, it can be divided into three main categories*: rationalism, empiricism, and criticism.*[29]

Etymologically, the word "*Empiricism*" comes from the Greek words "*empeiria*" and "*empeiros*," which means to have deep experience, knowing, and skill. In Latin, the equivalent term is "*experientia*," which means experience. Therefore, terminologically, Empiricism refers to the doctrine that states that all sources of knowledge come from experience. Sensory knowledge is considered the only source of knowledge, not reason or ratio.[30] Throughout the history of Western

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[24] Luthfiyah Luthfiyah dan Abdul Lhobir, "Ontologi , Epistimologi dan Aksiologi Filsafat Pendidikan," *Jurnal Basicedu* 7, no. 5 (17 November 2023): 3249–p.54.

[25] Dudi Badruzaman, "Perkembangan Paradigma Epistemologi dalam Filsafat Islam," *Idea : Jurnal Humaniora*, no. 0 (9 April 2019): p.52–64.

[26] Ahmad Tafsir, *Filsafat Umum: Akal Dan Hati Sejak Thales Sampai Capra* (Remaja Rosdakasya, 2004), p.23.

[27] Surajiyo, *Filsafat Ilmu dan Perkembangannya Di Indonesia: Suatu Pengantar*, p.24.

[28] Abdul Mustaqim, *Epistemologi TafsIr Kontemporer*.

[29] Salminawati Salminawati dan Fachri Husaini Hasibuan, "Epistemologi Perspektif Barat & Islam," *Jurnal Pendidikan Tambusai* 5, no. 3 (2021).

[30] Salminawati and Hasibuan.

philosophy, Plato (427-347 BC) is often considered the founder of idealism, which came to be better known as rationalism. Plato's epistemological view is speculative rational, that is, rational thinking based on the belief in the existence of a world of ideas, that is, innate human ideas, which do not depend on empirical facts. Then, in the era of Aristotle, epistemological views underwent changes. Aristotle based his epistemology on observation through the senses.[31]

In general, rationalism is a philosophical approach that emphasizes reason (ratio) as the main source of knowledge. This indicates that the role of reason is more dominant than the role of the senses, so innate concepts such as ideas and categories are acceptable. According to Rationalism, it is impossible for science to be built solely on facts and empirical data (observations).[32]

As for Immanuel Kant as a German philosopher (1724-1804). Where Kant changed culture by combining the schools of Rationalism and Empiricism, thus forming the famous school *of Criticism*[33]. This cooperation between the two is what gives birth to the scientific method and from this method is born scientific knowledge which in Indonesian is often called scientific knowledge or science.[34] Epistemology by Abid al-Jabiri identifies three main sources of knowledge in Islam, also known as Islamic epistemology, namely bayani, irfani, and burhani. Although these three epistemologies have existed since ancient times, they are still followed and studied by intellectuals and generations of Muslims in various countries to this day.[35]

Al-Jabiri interprets the term al-bayan etymologically by referring to Ibn Mandzur's Lisān al-ʿArab dictionary. This dictionary contains Arabic materials from the beginning of the tadwin period, which still have original meanings without being mixed with other meanings, so that the character and situation around it can

[31] Rahmad Alkhadafi, "Epistemologi Filsafat Islam," *JMPI: Jurnal Manajemen, Pendidikan Dan Pemikiran Islam* 2, no. 1 (30 Juni 2024): p.34–41.

[32] Ahmad Tafsir, *Filsafat Umum*, p.25.

[33] Salminawati dan Hasibuan, "Epistemologi Perspektif Barat & Islam."

[34] Ahmad Tafsir, *Filsafat Umum*, p. 26.

[35] Titian Ayu Naw Tika, "Pemikiran Epistimologi Abid aL-Jabiri Dan Imolikasinya Bagi Dinamika Keilmuan Islam," *Jornal Scientific Of Mandalika (JSM) e-ISSN 2745-5955* 2, no. 12 (28 Desember 2021): p.615.

be understood. The term al-bayan here has four meanings: al-faṣl wa al-Infiṣāl and al-zuhūr wa al-Iẓhār .[36] If arranged hierarchically based on the difference between method and vision in bayani epistemology, then al-bayan as a method means al-faṣl wa al-Infiṣāl **literally, "al-fasl" means "separation" or "separation between two things," while "** al-Infiṣāl" means "separation" or "separation.", while al-bayan as a vision means al-zuhūr wa al-Iẓhār **:**"al-zuhūr" means "falsehood" or "dishonesty," while "al-Iẓhār" means "clarity" or "disclosure".[37]Irfani comes from the word "irfan" which in Arabic is the basic form (masdar) of the word "'arafa," which means the same as ma'rifat. In Arabic, the term al-'irfan is different from the word al-'ilm. Al-'ilm refers to the acquisition of the object of knowledge through the process of transformation or through rational thinking, while irfan or ma'rifat is related to the experience or direct knowledge of the object of knowledge[38].

In Arabic, al-burhan means a clear and unequivocal argument (al-hujjah), which in English is called demonstration, with a Latin root word: demonstratio (meaning to signify, attribute, description, and explanation). In logic (al-mantiq), burhani refers to the activity of thinking to establish the truth of a premise through the method of inference (al-istintaj), by connecting the premise with other premises that have been justified or proven to be true by reason. In general, burhani is a rational activity in establishing the truth of a premise. The term burhani, which has its roots in Aristotle's philosophy, is used by al-Jabiri to refer to a system of knowledge (nidlam ma'rifi) that uses a particular method of thinking and has a particular worldview, without relying on the authority of other knowledge[39].

In this context, epistemology will be used to understand how artificial intelligence can contribute to the learning process and understanding of the Qur'an.

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[36] Mohammad Muslih, *Filsafat Ilmu; Kajian atas Asumsi Dasar, Paradigma, dan Kerangka Teori Ilmu Pengetahuan*, vol. 1, 1 (Lesfi, 2021), p.199.

[37] Ahmad Zohdi, "Islamic Scientific Epistemology in Al-Jabiri Perspective," *International Journal of Linguistics, Literature and Culture* 3, no. 5 (6 September 2017): p.30.

[38] Muslih, *Filsafat Ilmu; Kajian atas Asumsi Dasar, Paradigma, dan Kerangka Teori Ilmu Pengetahuan*, 1:p.219.

[39] Muslih, 1:p233.

"Artificial intelligence" (AI) is a technology that allows machines to mimic human cognitive functions, such as learning and solving problems.

2. History of Epistemology

The epistemological discourse can be traced to the history of the thought of the ancient Greek philosophers, namely Heraclitus (535-484 BC) who argued that the universe is always in a state of change, something cold turns to heat, and vice versa. The world is always moving, nothing is fixed, panta rhei, everything flows. The implication of this statement is that truth is always changing, not fixed.

On the other hand, Parmenides (304-475 BC) argued that everything that comes from the appraisal of the senses is nothing worthy of being called knowledge, and that the only true knowledge is related only to concepts. While the statement "snow is white" is considered full of ambiguity and uncertainty. Plato (427-347 BC) was more inclined to Parmenides' rationalism. He argued that sensory observation does not provide solid knowledge because its nature is always changing. Plato did not believe in the truth of sensory observation in the process of seeking knowledge. He posits that outside the realm of sensory observation there is an "idea". The world of "ideas" is fixed, immutable and eternal. Aristotle (384-322 BC) refuted Plato's theory by saying that innate ideas do not exist. If Plato emphasizes the existence of a world of 'ideas' that exists outside of empirical objects, then Aristotle does not acknowledge the existence of such a world.

According to Aristotle, knowledge must always contain perceptible reality, which stimulates our mind and is then processed by reason. In the era of Roman Hellenism, Plotinus (205-270 AD) appeared who tried to combine or synthesize the teachings of Plato and Aristotle, but in practice he leaned towards Plato. Plotinus argued that the One is the base of everything. The One is the original, the perfect, the First Cause of all that exists, from the One flows into diverse forms through the process of "emanation". The process of bestowal of this One can be analogous to the process of light radiation. Thus, knowledge can be obtained by man through the direct emanation of the One or God. The thoughts of the three philosophers above (Plato, Aristotle, and Plotinus) are representations of the pattern of philosophical

thought that developed throughout the Islamic world within the framework of Islamic teachings.

3. Epistemological Scope

M. Arifin explained that the scope of epistemology includes aspects of the essence, source, and validity of knowledge. Meanwhile, Mudlor Achmad expands it into six main aspects, namely essence, elements, types, foundations, limits, and goals of knowledge. A.M. Saefuddin also added that epistemology includes fundamental questions such as: what is science, where does it come from, what is its source, what is its essence, how true science is constructed, what is the definition of truth, whether we can achieve true knowledge, and the extent of the limits of knowledge.[40] All these questions can be simplified into two main problems, namely the problem of the source of knowledge and the truth of knowledge. M. Amin Abdullah argues that the study of epistemology is often limited to the conception of the origin or source of science from a conceptual-philosophical point of view. Paul Suparno added that epistemology tends to discuss more about what constitutes scientific knowledge.[41] On the other hand, other aspects of epistemology are often overlooked or underpaid in his studies. This tendency creates the impression that epistemology only focuses on the sources and methods of knowledge, and is often even equated with the method of knowledge. When connected to ontology and axiology systemically, the understanding is often simplified, where epistemology is seen as a method of thinking, ontology as an object of thought, and axiology as the result of such thoughts, both positive and negative. In fact, the method of knowledge is only one part of the broad scope of epistemology.[42]

Given that the theory of epistemology covers a wide range of aspects, Gallager draws the conclusion that epistemological theory is as broad as philosophy, experimentation, reconnaissance, and the creation of reality in line with

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[40] Meida Suswandari, *Filsafat Ilmu*, (Yogyakarta: CV Budi Utama Deepublish 2014), p. 60.

[41] Waston Waston, "Pemikiran Epistemologi Amin Abdullah Dan Relevansinya Bagi Pendidikan Tinggi Di Indonesia," *Profetika: Jurnal Studi Islam* 17, no. 01 (2016): 80–89, https://doi.org/10.23917/profetika.v17i01.2102.

[42] Wasmana, *Epistemologi dan Logika Pendidikan,* IKIP Siliwangi, 2018. p. 7

experiments to prove something known in a particular work. In the investigation of epistemological theories, it becomes clear that only certain aspects are studied with great attention by philosophers, although the investigation of the theory of knowledge is limited to certain aspects only.[43] However, other aspects that I consider are more overlooked. The scope of epistemology encompasses various aspects related to knowledge and the process of acquiring it. Some of the main elements in the scope of epistemology include the nature of knowledge, the source of knowledge, the method of knowledge, and the validity of knowledge (truth theory).[44] Epistemology focuses on the basic question of what knowledge is. Discussions in this realm include the definition of knowledge, how knowledge differs from belief, and what distinguishes true knowledge from information or assumptions.

One of the important issues in epistemology is the sources from which knowledge can be obtained. This includes rationalism that emphasizes that knowledge is acquired through reason and logical thinking. Then empiricism which holds the view that knowledge is obtained through experience and sensory observation. Furthermore, Intuition that highlights knowledge gained through direct understanding without logical or empirical processes. Finally, there is the authority of knowledge obtained from authoritative sources, such as teachers, scriptures, or experts.[45]

Epistemology also discusses the methods or means used to obtain knowledge. This includes the question of how we can ensure that the method used is correct and valid. Scientific, inductive, deductive, or speculative philosophical methods are all considered in epistemology. Validity of Knowledge (Theory of Truth). Theories of truth in epistemology explore how we can judge whether a knowledge is true or false. There are three main theories[46]:

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[43] Mujamil Qomar, *Epistemologi Pendidikan Islam: Dari Metode Rasional Hingga Metode Kritik.*. p. 5

[44] Mujamil Qomar, *Epistemologi Pendidikan Islam: Dari Metode Rasional Hingga Metode Kritik.* p. 6

[45] Siti Khamim dkk., "Sumber-Sumber Pengetahuan dalam Filsafat Ilmu," *Jurnal Pendidikan Tambusai* 8, no. 1 (2024): 4940–p.47.

- Correspondence theory: Knowledge is considered true if it corresponds to facts or reality.
- Coherence theory: Knowledge is considered true if it is consistent with other accepted knowledge systems.
- Pragmatic theory: Knowledge is considered correct if it is useful and has practical value.[47]

With such a wide scope, epistemology encompasses a wide range of topics related to the nature, sources, methods, and limitations of knowledge and truth.

4. Epistemology of Artificial Intelligence

John L. Pollock (1940-2009), an American philosopher who focused on epistemology and artificial intelligence (AI), stated that epistemology encompasses a wide range of questions. However, one key question is what is known as "*rational belief maintenance*". It has to do with how we maintain and update our belief systems in response to new sensory inputs and further "accountability" for beliefs we have previously held. Pollock used the term "reasoning" in a broad sense. According to him, theoretical responsibility is necessary when we want to adopt new theories and correct old beliefs. This gave birth to the technical term "epistemic *justification*". Epistemic justification involves beliefs held in relation to the rules of belief maintenance contained in our rational architecture. Epistemology is related to the competence of *rationaling accountability*.[48]

Epistemologically, artificial intelligence is a science based on several sciences such as philosophy, mathematics, physics, economics, neuroscience, psychology,

[46] Dimas Audrian, "Teori Kebenaran Koherensi, Korespondensi, Pragmatisme Dan Huduri," *Seroja: Jurnal Pendidikan* 1, no. 2 (2022): p.56–62.

[47] Audrian.

[48] Michael Reskiantio Pabubung, "Epistemologi Kecerdasan Buatan (AI) Dan Pentingnya Ilmu Etika Dalam Pendidikan Interdisipliner," *Jurnal Filsafat Indonesia* 4, no. 2 (1 September 2021): p.152–59, https://doi.org/10.23887/jfi.v4i2.34734.

computer engineering, linguistics.[49] Therefore, from some of these sciences, artificial intelligence is broadly categorized as follows:[50]

a. Thinking Like a Human

A system capable of thinking like a human. This approach is done in two ways: introspection, such as trying to understand our own thoughts when we think "How do you know that you understand?", and through psychological research.

b. Rational Thinking

A system that thinks rationally. This approach has two main problems: a. It is difficult to turn informal knowledge into formal terms in logical notation. b. There is a difference between solving problems "in principle" and solving them "in the real world."

c. Act Like a Human

A system that acts like a human. This approach was developed by Alan Turing in 1950, who designed a test for computers to determine whether a computer can deceive a human through long-distance text communication known as the Turing test.

d. Act Rationally

A system that can act rationally. This approach is carried out by rational agents who make logical conclusions, since rational actions are carried out by reasoning logically to determine whether the action will achieve the desired goal.

[49] Khen Dedes, Aji Wibawa, dan Laksono Budiarto, "Sistematika Filsafat Menurut Ontologi, Epistemologi, dan Aksiologi dalam Artificial Intelligence," *Jurnal Inovasi Teknologi dan Edukasi Teknik* 1, no. 8 (25 Agustus 2021): p.584–91, https://doi.org/10.17977/um068v1i82021p584-591.

[50] Khen Dedes, Wibawa, and Budiarto, p.588.

B. Artificial Intelligence

1. Definition of Artificial Intelligence

For many years, philosophers have sought to understand human intelligence. From their thinking, artificial intelligence (AI) emerged as a branch of science that also aims to understand human intelligence[51]. Artificial intelligence (AI) seeks to build intelligent entities that reflect human understanding. These intelligent entities developed by artificial intelligence (AI) are very interesting and accelerate the process of understanding human intelligence. Therefore, artificial intelligence (AI) is an important field in understanding human intelligence. Supported by the development of highly diverse hardware and software, artificial intelligence (AI) has produced many products that are important and useful for human life.

In 1955, John McCarthy, one of the pioneers of artificial intelligence (AI), was the first person to define the term artificial intelligence, broadly speaking, as follows: The purpose of artificial intelligence (AI) is to develop machines that behave as if they were intelligent[52]. Artificial intelligence (AI) is one of the branches of computer science that allows machines (computers) to perform tasks that are usually performed by humans with an equivalent level of performance[53].

Schalkoof defines artificial intelligence (AI) in general and from an engineering point of view. Artificial intelligence (AI) in general is a field of study that seeks to explain and mimic intelligent behavior in terms of computational processes. This explains the cross-disciplinary nature of artificial intelligence, involving cognitive scientists, computer scientists, engineers, and mathematicians. From Schakoof's point of view as a technique, artificial intelligence is about producing

[51] Hendra Jaya dkk., *Kecerdasan Buatan* (Makassar: Fakultas MIPA Universitas Negeri Makassar, 2018), p.3.

[52] Wolfgang Ertel, *Introduction to Artificial Intelligence*, Undergraduate Topics in Computer Science (London: Springer London, 2011), no. 1.1.

[53] Hendra Jaya dkk., *Kecerdasan Buatan* (Makassar: Fakultas MIPA Universitas Negeri Makassar, 2018), p.3

representations and procedures that automatically solve problems that have not been solved by humans[54].

Artificial intelligence (AI) methodologies and terminology are still evolving. Artificial intelligence (AI) is broken down into and finds related sub-fields: *logic, neural networks, object-oriented programming, formal languages,* and so on. This explains why the study of artificial intelligence (Al) is not limited to departments of mathematics, computer science, engineering, or psychology. On the contrary, each of these disciplines is a potential contributor.[55]

2. History of Artificial Intelligence

The position of artificial intelligence (AI) is considered a formal science thought to have started since the Dartmouth Conference that formally introduced the concept of artificial intelligence (AI) for the first time. The conference was held by John McCarthy, Marvin Minsky, and other experts in 1956. This conference lasts about 6-8 weeks which is basically a *brainstorming*[56] activity. Initially, the event was planned to be attended by eleven mathematicians and scientists, but not all of them were present, but at least more than ten scientists came for a short time, the development of artificial intelligence (AI) as presented in Table 1.1[57].

Table 1.1 History of Artificial Intelligence (AI)

Yes	Year	Key Events
1.	1959	Proof of the geometric theorem was carried out by Galenter (IBM)(Ertel, 2018).
2.	1960 -1966	The development of the "Eliza" program by Joseph Weizenbaum, which later became an early example of

[54] Robert J. Schalkoff, *Artificial Intelligence: An Engineering Approach* (United States Of America: McGraw-Hill, 1990), p.3.

[55] Robert J. Schalkoff, p. 4.

[56] Philip L. Frana and Michael J. Klein, eds., *Encyclopedia of Artificial Intelligence: The Past, Present, and Future of AI* (Santa Barbara, California Denver, Colorado: ABC-CLIO, 2021), p.169.

[57] Rony Zebua dkk., *Fenomena Artificial Intelligence (AI)* (Jambi: PT. Sonpedia Publishing Indonesia, 2023), p.6–9.

		natural language processing on computers (Ertel, 2018; Frana & Klein, 2021; Wooldridge, 2021).
3.	1963	McCarthy establishes AI Lab at Stanford University
4.	1964	The "Shakey" program was developed by NASA and SRI International, which is the first robot equipped with AI capabilities (Frana & Klein, 2021; Wooldridge, 2021).
5.	1965	Robinson invented calculus resolution for predicate logic (Ertel, 2018).
6.	1970 - 1972	Marvin Minsky and Seymour Papert presented a book on simple Perceptrons, which are very simple neural networks that can be represented with linear functions (Ertel, 2018; Wooldridge, 2021).
7.	1974	Development of artificial intelligence (AI) with expert system types by Edward Feigenbaum and Joshua Lederberg (Frana & Klein, 2021).
8.	1976	Shortliffe and Buchanan developed MYCIN, an expert system for diagnosing infectious diseases in uncertain situations, blood therapy and meningitis (Dov M. Gabbay et al., 2014; Ertel, 2018; Wooldridge, 2021).
9.	1980	The development of a knowledge-based approach that attempts to replicate human knowledge in computer systems.
10.	1981	Japan funded the development of a more reliable PROLOG machine and this is the Fifth Generation Computer Systems (Dov M. Gabbay et al., 2014; Ertel, 2018).
11.	1986	The year of the rise of neural networks with the development of the Nettalk System (a system that

		learns to read text), whose developers include Rumelhart, Hinton, and Sejnowski (Ertel, 2018; Rumelhart et al., 1986).
12.	1990	Probability theory began to be applied by Pearl, Cheeseman, Whittaker, Spiegelhalter to artificial intelligence (AI) in the form of Bayesian Networks (Ertel, 2018).
13.	1992	The TD-gammon Tesauros program introduces the benefits of Reinforcement Learning (a machine learning/computer system learning method, in which intelligent agents (i.e. computer programs) interact with the environment and learn to act in it) (Ertel, 2018; Frana & Klein, 2021; Wooldridge, 2021).
14.	1993	The organization of the RoboCup Football World Cup activities which motivated many parties around the world to build autonomous robots that play football (Ertel, 2018).
15.	1995	Vapnik developed Support Vector Machines from statistical learning theory (Ertel, 2018).
16.	1997	IBM's Deep Blue Chess Computer defeated world chess champion, Garry Kasparov (Ertel, 2018; Frana & Klein, 2021; Larson, 2021).
17.	2003	The robots in RoboCup demonstrated in a variety of abilities that could be achieved by artificial intelligence (AI) and robotics at that time (Ertel, 2018; Virvou et al., 2022).
18.	2005	Google started the Self-Driving Car project (Wooldridge, 2021).

19.	2006	Service systems in Robotics are the main areas of artificial intelligence (AI) research (Ertel, 2018; Frana & Klein, 2021).
20.	2009	Google's first Self-Driving Car trial on the California freeway, United States (Ertel, 2018).
21.	2010	The ability of autonomous robots to begin to improve their behavior through learning (Ertel, 2018; Frana & Klein, 2021; Virvou et al., 2022).
22.	2011	IBM's AI system named Watson defeated Jeopardy! champions, Brad Rutter and Ken Jennings, in a similar match (Ertel, 2018; Frana & Klein, 2021). Watson understands natural language and can answer difficult questions very quickly (Ertel, 2018; Frana & Klein, 2021; Larson, 2021).
23.	2012	Deep learning techniques became popular after the Google Brain team successfully trained neural networks to recognize cats in YouTube videos (Ferlitsch, 2021; Martin, 2018).
24.	2015	Daimler launched the first autonomous truck on the Autobahn (Ertel, 2018). Google's self-driving cars have traveled more than a million miles and operate within cities (Ertel, 2018). Deep learning allows for excellent image classification (Ertel, 2018). Artificial intelligence (AI) is able to make paintings in the style of Old Masters can be generated automatically with deep learning (Ertel, 2018).
25.	2016	Google's artificial intelligence (AI) program called AlphaGo defeated the world champion of the game Go in January and Lee Sedol of Korea in March (Ertel,

		2018; Frana & Klein, 2021; Larson, 2021; Martin, 2018).
26.	2019 - Present	Artificial intelligence (AI) technology is growing rapidly, especially in the field of machine learning and deep learning, and is beginning to be applied in various sectors.

3. Types of Artificial Intelligence

Artificial intelligence (AI) can be grouped into two main categories: General (or strong) and Narrow (or weak). Common artificial intelligence (AI), which often appears in science fiction stories, does not yet exist in the real world. Machines with general intelligence will be able to perform human intellectual tasks. This type of system will also appear to think across topics, make connections, and express creative ideas like a human, thus demonstrating the capacity for abstract thinking and problem-solving. This kind of machine will be able to demonstrate abilities such as reasoning, planning, and learning from past experiences. Narrow artificial intelligence (AI) is a system capable of achieving performance that is on par with (or even surpassing humans) in specially defined tasks[58].

There are 6 types of artificial intelligence (AI) based on approaches, namely *Machine Learning*, *Deep learning, Natural Language Processing (NLP), Robotics, Expert Sytems, and Fuzzy Logic*[59].

b. Machine Learning

The Machine Learning *approach* is a method that develops artificial intelligence (AI) systems with the ability to study patterns and relationships in data, as well as use those patterns to make predictions. Examples that use this approach are recommendation systems, facial recognition, voice recognition, object detection, handwritten character recognition,

[58] Frana and Klein, *Encyclopedia of Artificial Intelligence*, p.244.

[59] Rony Zebua dkk., *Fenomena Artificial Intelligence (AI)* (Jambi: PT. Sonpedia Publishing Indonesia, 2023), p.16.

autonomous vehicles, stock price predictions, fraud detection, disease diagnosis.

c. *Deep Learning*

This approach is an extension of the Machine Learning approach and has made use of neural networks. This approach is used in applications such as games; the logic behind Facebook's facial verification algorithm; driverless cars; virtual assistants like Siri, Alexa, and so on.

d. *Natural Language Processing* (NLP)

This approach aims to build systems that focus on analyzing, understanding, and generating human language automatically. NLP is used in a variety of applications such as search engines, language translators, chatbots, virtual assistants.

e. *Robotics*

This approach builds a system that is capable of working automatically and intelligently in a real environment. One example that is still in the process of development is Sophia the humanoid. In addition, there are also robots used in the industrial world based on artificial intelligence (AI).

f. *Expert Systems*

This approach builds artificial intelligence (AI)-based computer systems that have the ability to learn and solve problems by mimicking the abilities of an expert in a particular field.

g. *Fuzzy Logic*

This approach develops an artificial intelligence (AI) system that is based on the degree of truth, not on the logic of certainty about something. This fuzzy logic approach is useful in conditions where the concepts or data obtained are likely or uncertain.

C. Digitization of the Qur'an in Indonesia

The development of the Qur'an in Indonesia has undergone a significant transformation, moving from a conventional mushaf to a digital era. This history can be divided into several main periods.

1. Before Indonesia's independence

In the mid-19th century to the beginning of the 20th century, there was a period of transition from written to printed mushaf, marking the beginning of mass printing of the Qur'an using modern and stone printing technology. Some of the important mushaf that appeared during this period include: The Palembang Qur'an (1848), which is the oldest Qur'an in Indonesia and Southeast Asia, was printed with lithography. Then, the Singapore Qur'an (1868) which was more widely printed and had the characteristic of "corner verse". The Qur'an Istanbul Turkey (1881) became a reference for the writing of the Qur'an in the corner of the Indonesian Standard Mushaf. Meanwhile, the Indian Qur'an (1885) became a reference for the mass printing of the "Bombay Qur'an". Domestic Qur'an publishers began to emerge in the 1930s, such as Maktabah al-Miṣriyyah in Cirebon and Mātba'ah al-Islamiyah in Bukittinggi.[60]

2. Post-independence of Indonesia

The government through the Ministry of Religious Affairs pays special attention to the Qur'an. The three official mushaf made by the government are the Heritage Mushaf of the Republic of Indonesia, the Indonesian Standard Mushaf, and the Istiqlal Mushaf. Mushaf Pusaka was born as a symbol of the struggle of the Indonesian nation against the colonizers. The Indonesian Standard Mushaf standardized the way to write texts, harakat, punctuation, and waqaf marks based on the results of the deliberations of scholars from 1974 to 1983. There are three types of Mushaf: the Baku 'Usmānī Qur'an Mushaf for the general public, the Bahriyah Qur'an Mushaf for Qur'an memorizers, and the Braille Qur'an Mushaf for the visually impaired. The writing of Mushaf Istiqlal

[60] Elok Maulidah, "Dari Mushaf Konvensional Ke Mushaf Digital: Sejarah Pengembangan Al-Qur'an Digital Kemenag" (2020),p. 45–49.

itself began during the time of President Soeharto at the First Istiqlal Festival in 1995.[61]

With technological advancements, the Qur'an has also begun to penetrate the digital world. Along with the development of information and communication technology, the Qur'an was developed in digital form such as cassette, vinyl records, CDs, VCDs, and DVDs. The Walters Museum of Arts in England became a pioneer in documenting and disseminating the Qur'an online. In Indonesia, the digital Qur'an began to enter around the 2010s with the emergence of various applications.

Seeing the rise of digital Qur'an applications that are circulating and there are still many that are not in accordance with the Indonesian Standard Mushaf, Lajnah Pentashihan Mushaf Al-Qur'an (LPMQ) of the Ministry of Religion of the Republic of Indonesia took the initiative to develop an official digital Qur'an application called "Qur'an Ministry of Religion". LPMQ's main motivation is to follow technological developments and carry out da'wah through service to the Qur'an, ensuring that the Indonesian Standard Mushaf can be accessed digitally. The goal is to socialize the Indonesian Standard Mushaf in a digital version and provide an alternative option of official applications to the public, considering that this application is not for commercial purposes and is funded by the State Budget.

The process of developing the Ministry of Religion's Qur'an application goes through several phases. The initial phase began in 2015 with the initiation of the application by all elements of LPMQ. Then continued with the progress of the preparation in 2016, where meetings were held to determine the appearance, features (such as Qur'anic text, translation, murottal, tafsir, bookmark, copy, download, and share), and focus on the Android system. The app was officially launched on September 1, 2016, coinciding with the International Seminar of Mushaf Al-Qur'an. The initial products released have

[61] Maulidah, p.49–55.

features of the Qur'an per Page, Search (pages, juz, surah), Translation of the Ministry of Religion 2002, Last Reading, Murottal (Qori Shaykh Mahmud Khalil al-Hussary), Brief Tafsir of the Ministry of Religion and Tafsir Tahlili, and About Us. Initially, the application used a scanned master mushaf at-Tin as a database. The next development phase is carried out in stages based on feedback from users. The first development in 2017 (released early 2018) focused on improving performance, switching to a text base and using Isep Misbah's LPMQ font to make the app lighter. Also added are the features of Concise Tafsir and Tafsir Tahlili 15 juz as well as Khatmil Qur'an Prayers. The second development (2018, released in early 2019) improved the previous version with the addition of the Qur'an per Verse and Asbabun Nuzul features. In the third development (2019, released in early 2020), LPMQ began to collaborate with other developers and leased servers to Telkom Indonesia. The app's appearance changed completely, and many features were added, such as Tafsir 30 Juz, Prayer Schedule, Qibla Compass, LPMQ Channel, Usage Statistics, Qori variations, and tajwīd Color Blocks. At this stage, LPMQ also adopted the master Mushaf of Cordoba for the Qur'an feature per Page. The fourth development (2020, released in early 2021) brought back the bookmark feature and added the Ministry of Religion Translate 2019, Word Search, Related Links, and Scan for Tashi Signs.[62]

In the future, LPMQ plans to continue to develop the Ministry of Religion's Qur'an application. The development plan is focused on adding features such as tajwīd coloring in the text of Qur'anic verses, the shared khataman feature, the feature of tapping verses to see the interpretation and translation of each verse, the addition of Qori variations, and the addition of a verse share feature template. In addition, LPMQ will also perform application maintenance so that system errors do not occur frequently. Even though it has complete features, the Ministry of Religion's Qur'an application still has a relatively minimal number of downloaders compared to other similar applications. Therefore, more

[62] Maulidah, p.100–105.

intensive socialization is needed to the public, for example through promotions on television stations and social media, so that this application is more widely known. Other recommendations include the addition of the Tahsin Online feature to help beginners learn to read the Qur'an well, as well as a language selection feature to reach users from various countries, so that it can introduce the Ministry of Religion's Qur'an application to the international arena.

D. Teaching Standards of Qur'an Science in Indonesia

A standard is something that is used as a valid example or basis for measurements, measurements, and scales. Standardization is the adjustment of form (size, quality, etc.) with established guidelines. SNP (*National Education Standards)* is the minimum criterion about the education system in all jurisdictions of the unitary state of the Republic of Indonesia. The standard of Islamic education is found in the Qur'an surah Luqman (31): verses 12-19, including monotheistic education, filial devotion to parents, discipline and obedience to the law, independent and responsible person, and morality of karimah. According to Ahmad Syar'i, Islamic education standards must have at least two criteria: educational materials and objectives that implement Islamic teachings and aim at devotion to Allah SWT; and personnel and management institutions must be Islamic.[63]

PQ (perception quality) quality standards can be achieved if all components of the implementation of Qur'an education meet the standards. Qur'an education is regulated in Government Regulation No. 55 of 2007, Regulation of the Minister of Religion No. 13 of 2014, and Regulation of the Minister of Religion No. 42 of 2016, as well as Regulation of the Minister of Religion No. 19 of 2019. TPQ is a non-formal religious education unit based on the Muslim community that uses the Qur'an as the main material. The goal is to form a generation of Qur'ans who love the Qur'an, are able to read it well, study its contents, and practice it in daily life. The level of Al-Qur'an education includes

[63] Dinda Zulaikha dkk., "Standar Mutu Pendidikan Al-Qur'an," *Journal on Education* 5, no. 2 (12 Januari 2023): p.4–9.

PAUD Al-Qur'an/TKQ, TPQ, TQA, Rumah Tahfidz Al-Qur'an (RTQ), and Tahfidz Al-Qur'an Islamic Boarding School (Takhasus Al-Qur'an). The material taught varies according to the level, including reading, writing, memorizing, translating, understanding, and practicing the content of the Qur'an. Learning is carried out through classical and private approaches. Teaching materials are adjusted to the curriculum. The learning method is adjusted to the age of the child with the principle of "play while learning". Learning media should be engaging, fun, safe, and supportive of teaching. Assessment includes cognitive, affective, and psychomotor aspects on an ongoing basis. The educational calendar pays attention to conformity with the formal school calendar and implements a semester system. Students who pass the exam will be awarded a diploma.[64]

E. Sources of Tajwīd and Makhārij al-Ḥurūf Standards Used in Indonesia

1. Sources of Tajwīd Knowledge in Indonesia

The teaching of tajwīd in Indonesia, or the archipelago, has long historical roots and developed along with the entry of Islam and the spread of the Qur'an itself. Initially, the transmission of tajwīd knowledge took place orally, not systematically, and without the support of written literature. The scholars of the Qur'an at that time focused on teaching good and correct reading of the Qur'an through the method of talaqqi or musyafahah (word of mouth), just like the Prophet PBUH who did talaqqi with Jibril AS, then the companions of the Prophet, and so on.[65]

Over time, especially with the establishment of suraus and Islamic boarding schools as more organized educational institutions, the tajwīd learning method began to develop to be more systematic with the use of special books. In this early phase, the tajwīd literature that became the main reference in the archipelago mostly came from the works of Middle Eastern scholars. These

[64] Zulaikha et al., p.9–11.

[65] Ali Mursyid, "Tajwid Di Nusantara Kajian Sejarah, Tokoh Dan Literatur," *El-Furqania : Jurnal Ushuluddin dan Ilmu-Ilmu Keislaman* 5, no. 01 (24 Maret 2019): p.75–104, https://doi.org/10.54625/elfurqania.v5i01.3366.

books were then translated and translated by Nusantara scholars into local languages such as Malay, Javanese, or Madura, so that they were easier to learn and understand by the indigenous people.

Some important tajwīd literature from Middle Eastern scholars used in the archipelago include[66]:

- ***Hidayah al-Mustafid fi 'Ilm at-Tajweed***. This book is the work of Muhammad al-Mahmūd al-Najar, known by the nickname Abu Rimah. It is written in the form of questions and answers which are divided into mukaddimah, discussion (15 articles on the laws of tajwīd), and conclusion. This book is specifically compiled based on the madzhab Qira'at 'Ashim narrated by Hafs.
- ***Fathurrahman fi Tajweed Al-Qur'an***. This book was compiled by Sa'id bin Sa'ad bin Nabhan. The structure of this book consists of a preface, a discussion (15 articles on the law of tajwīd such as izhhar, ikhfa, iqlab, idgham, the law of Ra, madd, and waqaf), and a conclusion. Although not explicitly mentioned, the qira'at used in this book is madzhab Qira'at 'Ashim narrated by Hafs.
- ***Hidayah al-Şibyan fi Tajweed Al-Qur'an***. Also compiled by Sa'id bin Sa'ad bin Nabhan, this book was written specifically for children's consumption. It is in the form of nazham (verse) as many as 39 stanzas and presents tajwīd material in a simple way.
- ***Tuhfah al-Atfal***. The compiler of this book was Sulaiman bin Husayn bin Muhammad al-Jamzury (Afandi) from Egypt. The full title is *Tuhfah al-Atfal fi Tajwid Al-Qur'an* (a gift for children in the field of tajwīd), indicating its target for children's students, although the verses are more complex than *Hidayah al-Şibyan*.

[66] Ali Mursyid, "Tajwid Di Nusantara Kajian Sejarah, Tokoh Dan Literatur," *El-Furqania : Jurnal Ushuluddin dan Ilmu-Ilmu Keislaman* 5, no. 01 (24 Maret 2019): 75–104, https://doi.org/10.54625/elfurqania.v5i01.3366."

- ***Matn Al-Jazariyah***. This book was compiled by Abu Al-Khair Shamsyuddin Muhammad bin Muhammad bin Muhammad bin Muhammad Al-Jazari (751-833 H/1350-1429 AD) in the form of nazham totaling 107 stanzas. The discussion includes makhārij al-Ḥurūf, the properties of letters, the laws of nun sakinah and tanwin, various madds, and waqaf. This book is universal and more complex, aimed at those who are serious about tajwīd, not just beginner students.

After the adoption and translation of Middle Eastern books, tajwīd books were also born which were the work of the archipelago scholars themselves. These works still refer to the existing rules of tajwīd, but are presented with an approach and language that is more appropriate to the local context. Some of them are:

- ***Hidayatul Mubtadi'in (Tajwīd Sundanese)***. Compiled by Sayyid Ali Al-Idrus from Jakarta. This book uses Sundanese with Pegon Arabic letters and is intended to encourage children who are just learning to recite.
- ***Tajwīd (Green Tajweed Book).*** This short book was compiled by A. Mas'ud Sjafi'i. It is widely known in Indonesian society because it is short and in Indonesian.
- ***Tajweed Al-Qur'anul Karim***. Compiled by Ustadz Ismail Tekan, this book is claimed to be systematic, popular, and practical. It is the result of 20 years of tajwīd teaching experience in the archipelago, Malaysia, and Singapore.
- ***Practical Instructions for Tahsin Tartil Al-Qur'an Maisura Method***. By Dr. KH. Ahmad Fathoni, Lc., MA. This book is intended for Qur'an readers who want to improve their reading in order to achieve optimal tartil. This book is considered complete and reliable, with a discussion that descends on laws that are often overlooked.
- ***Fathu al-Mannan (Javanese Tajweed Book).*** It is the work of KH. Maftuh Basthul Birri from Lirboyo, East Java. It is written in Javanese using Pegon Arabic characters with a simple language so that it is easy to understand.

Overall, despite differences in language, writing systematics, or depth of discussion, almost all tajwīd books used in the archipelago follow the rules of Imam 'Ashim narrated Hafs. This shows consistency in the tradition of tajwīd learning in Indonesia which is based on the history of reading the Qur'an which is commonly used in the Islamic world.

2. Makhārij al-Ḥurūf & The Knowledge of Tajwīd

A search of various sources of tajwīd knowledge used in Indonesia, both from the heritage of Middle Eastern scholars and the contributions of Indonesian scholars, provides a comprehensive overview of the theoretical foundation of Qur'an learning. These books not only serve as guidelines for understanding the rules of reading, but also reflect adaptations and innovations in the delivery of tajwīd knowledge according to the local context. The consistency in following the madzhab Qira'at 'Ashim narrated by Hafs found in most of the tajwīd literature in the archipelago shows the uniformity of standards in the practice of reciting the Qur'an.[67]

After identifying the various sources of literature, the next step in this study is to delve into the essence of the science of tajwīd itself, which is very crucial in ensuring the authenticity and perfection of the Qur'anic reading. One of the fundamental aspects that is the main discussion in the books of tajwīd is Makhārij al-Ḥurūf. Makhārij al-Ḥurūf, as the place from which each hijaiyah letter comes out, is the initial foothold for reciting the Qur'an correctly and correctly. A thorough understanding of makhārij al-Ḥurūf not only ensures accurate pronunciation, but also forms the basis for other more complex discussions of tajwīd, including the properties of letters, the laws of nun breadfruit and tanwin, mad, and waqaf and ibtida'. Therefore, the next section will review in detail the concept of makhārij al-Ḥurūf and its relevance in the entire discipline of tajwīd, based on a review of the literature that has been identified as the main source in Indonesia.

[67] Mursyid, p. 28.

However, the author will only discuss from the perspective of the book that is used as a source used in the Qara'a application. In the application, the co-founder explained in an interview.

"*Qara'a makes ijtima' between classical references and contemporary needs as a basis. The standard of makhārij al-Ḥurūf refers to the general rules that have been agreed upon by qira'at imams such as Imam Ibn Al-Jazari and Imam Ad-Dani, as well as tajwīd books such as Tuhfatul Athfal, Al-Jazariyah, and modern references from scholars of Al-Azhar and Lajnah Pentashihan Mushaf."*[68]

Makharijul Huruf (Places of Letter Exit) There are 17 places of hijaiyah letters, based on the opinion of scholars of qiraah.[69] The division is as follows:

- Cavity (Al-Jauf): Covering the throat cavity to the oral cavity, which is the place where the letters Alif, Wawu mad, and Ya mad come out. These letters stop as the breath stops.
- Throat (Al-Halq):
    - The furthest part of the oral cavity: Hamzah and Ha.
    - The middle part: 'Ain and Ha.
    - The part closest to the oral cavity: Ghain and Kha.
- Tongue (Al-Oral):
    - The base of the tongue in contact with the soft palate: Qaf.
    - Under the letter Qaf: Kaf.
    - Middle tongue: Jim, Syin, and Yes.
    - Edge of the tongue when in contact with molars (left or right): Chest.
    - From the Tongue to the Tongue: Lam.

[68] Hajon Mahdy Mahmudin, Co-Fouder Interview: Murajaah AI Feature of Qara'a Application, Instagram Direct Message, May 8, 2025.

[69] Muhammad Ibn Jazari, "Matan Jazariyah," t.t., ch. 7.

    - The tip of the tongue that is in contact with the palate below where the letter Lam comes out: Nun.
    - Close to where the letter Nun comes out, but slightly goes into the back of the tongue: Ra.
    - The tip of the tongue that comes into contact with the back of the upper incisors: Tha, Dal, and Ta.
    - The tip of the tongue approaches the lower incisors (Shafir letters): Shad, Zay, and Sin.
    - Tongue tip contact with upper incisors: Zha, Dzal, and Tsa.
- Two Lips (Ash-Intercession): Wawu, Ba, and Mim.
- Nasal Cavity (Al-Khaisyum): The letters of Ghunnah (the buzzing sound in Nun and Mim).

tajwīd Practicing tajwīd is absolutely obligatory. Whoever deliberately does not practice tajwīd while reciting the Qur'an, then he is sinning. This is because Allah has revealed the Qur'an and how to recite it with tajwīd, and thus the Qur'an has come to us. Tajwīd is an ornament for the recitation of the Qur'an.

Tajwīd is defined as:

- Give each letter its rights, in the form of its characteristics and its essentials.
- Returning each letter to its original makhraj means not pronouncing the hijaiyah letter carelessly instead of the actual exit.
- Done perfectly without exaggeration, as well as gently in pronunciation without haphazard.
- There is no difference between a person who practices tajwīd and one who abandons it except continuous practice consistently with his or her words

CHAPTER III
QARA'A APPLICATION

A. Qara'a Application

1. Qara'a App Profile

The "Qara'a" application is an innovative application designed to facilitate the learning and teaching process. With the latest technology, Qaraa presents a feature that is the tagline on its website, namely artificial intelligence designed to improve the learning experience in the digital era. However, the Qara'a Application is not only limited by that one feature. Qara'a has its other additional features. This application was created in 2018 by a group of youth in the Pontianak area, West Kalimantan.. This Qara'a application is warmly welcomed by users. It can be proven that the "Qara'a" application has been used by more than 1 million users and gets an average of 4.8 reviews from 45.5 thousand reviews on *the Google Playstore*[70]. Meanwhile, on the *Appstore,* the "Qara'a" application gets an average of 4.8 reviews out of 5 thousand ratings[71].

The official website of Qara'a also explains on the home page about the app's rating, the number of users and the main features offered in the Qara'a application. If you look at the official website of Qara'a, the rating and users are mentioned as 4.8 ratings and users are 1.8M+.

[70]"Android apps on Google Play," accessed December 15, 2024, https://play.google.com/store/games?hl=id.

[71]"Qara'a #1 Quran Learning," App Store, December 3, 2024, https://apps.apple.com/id/app/qaraa-1-belajar-quran/id1520521429?l=id.A Man T

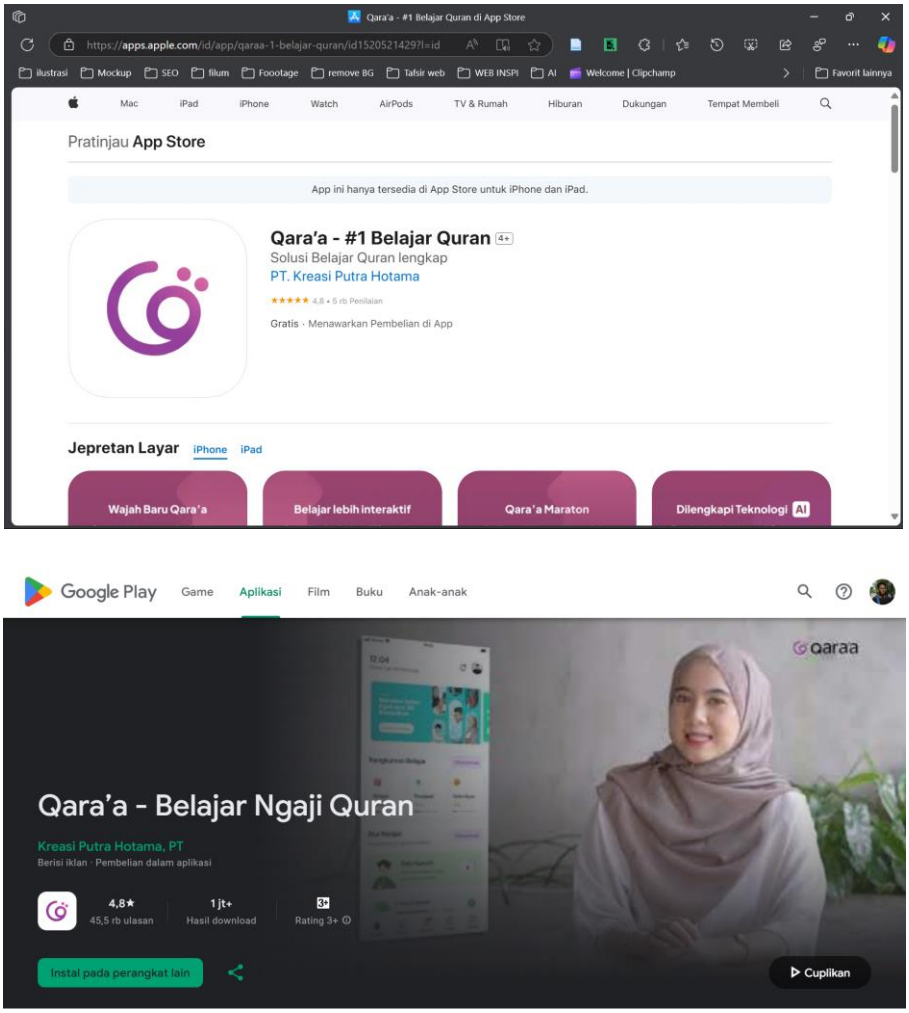


Figure 1.0 Qara'a App on *Google Playstore* & *Applestore*

Qara'a's official website features some general introductions in some of the focus sections. In the first part, there are features that are featured. On the Qara'a website, it claims that Qara'a has a complete meter ranging from letter recognition to tajwīd deepening. Then the second superior feature mentioned is reading correction, explained in general that the user's Qur'an pronunciation will be corrected by Artificial Intelligence technology in Real Time. The third excellent feature is Ustadz Competent, it is explained in detail that your pronunciation deposit is to the ustadz directly and you can get feedback in 1x 24 hours. The fourth excellent feature of Interactive learning explained on the website is about fun learning methods which are complemented by various types of mini quizzes and exercises.

The Qara'a application adopts a freemium-based application, which means that some of the features contained in the Qara'a application cannot be accessed for free. There are several features that require premium access so you can use these features. The premium access is called Qara'a Pro with a cost of Rp. 50,000 every 1 Month, 6 Months Rp. 300,000, and 1 Year Rp. 600,000.



Figure 1.1 Qara'a Pro Package Options

2. Background of the Formation of the Qara'a Application

Qara'a was initially launched as a digital Qur'an app in October 2018. However, based on research data from the Institute of Qur'an Sciences (2020) which revealed that 65% of Indonesian people experience Quranic illiteracy, this platform has undergone a pedagogical transformation into a technology-based educational solution. This phenomenon encourages developers to integrate artificial intelligence (AI) approaches to overcome two main challenges:[72] (1) temporal limitations in accessing religious mentors (ustadz) face-to-face, and (2)

[72] Ahmad kamel, Interview Ahmad kamel, Managing Director of the "Qara'a" application, Whatsapp, December 15, 2024.

psychological barriers such as embarrassment and low self-efficacy in religious learning.[73]

In response, Qara'a adopted Automatic Speech Recognition (ASR) technology — an artificial intelligence system that analyzes users' voice input through three critical stages: (a) audio processing for hijaiyah phoneme identification, (b) pattern matching with standard pronunciation databases, and (c) acoustic deviation-based feedback generation. This mechanism allows for automatic evaluation of the user's reading accuracy while providing an adaptive fault tolerance, creating *a low-anxiety*[74] learning environment.The implementation of ASR in Qara'a not only represents technical innovation, but also answers the socio-religious needs of modern society for flexibility of time and privacy in religious learning

B. Features of the Qara'a App

1. Features of Qara'a Pro

Qara'a Pro is a premium subscription service within the app that provides exclusive access to a number of special features. These paid features include structured Qur'an learning materials, Artificial Intelligence (AI)-based Murajaah, and unlimited verse delivery capabilities.

a. Qur'an Learning Materials

Learning materials are categorized into three levels of competence: Beginner, Intermediate, and Advanced. At the beginner level, the content focuses on basic recognition such as mastery of hijaiyah letters, punctuation (harakat), and letter joining rules (wasl). The intermediate level includes tahsin material, including detailed discussions of makhārij al-ḥurūf and ṣifāt al-ḥurūf. Meanwhile, the advanced level presents tajwīd material to deepen the understanding of the rules of recitation.

[73] Albert Bandura, *Self-efficacy: The exercise of control.* (New York: W.H. Freeman and Company, 1997).

[74]Ahmad kamel, Interview Ahmad kamel, Managing Director of the "Qara'a" application, Whatsapp, December 15, 2024.

b. Artificial Intelligence-Based Murajaah

Qara'a integrates artificial intelligence (AI) through the makhārij al-Ḥurūf reading checking feature using Automatic Speech Recognition (ASR) technology. The system works by analyzing the user's voice recordings, identifying the detected letters, and then comparing them to the correct reading references.[75] The ASR method was chosen because of its ability to produce high accuracy as well as adaptive tolerance, making it suitable for learning contexts that require gradual correction.[76] The Qara'a application implements artificial intelligence (AI) technology based on Automatic Speech Recognition (ASR) which is specifically designed to detect, analyze, and correct users' Qur'an readings.[77]

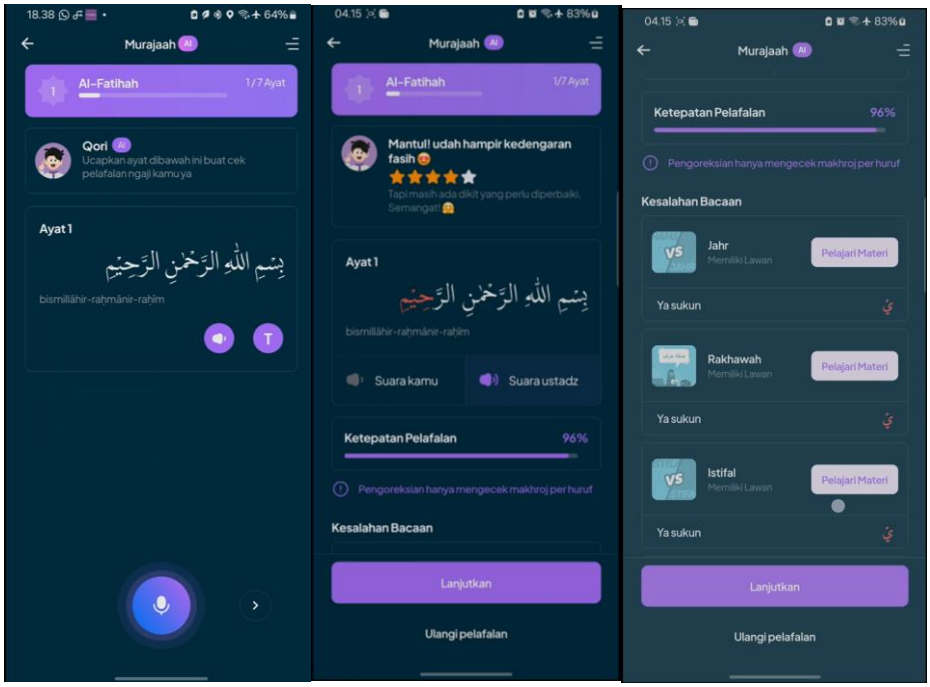


Figure 1.2 is a menu display of the Murajaah AI feature

[75] James H. Martin, *Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition with Language Models, chapter 16 3rd edition*, 1.

[76] Ahmad kamel, Interview Ahmad kamel, Managing Director of the "Qara'a" application, Whatsapp, December 15, 2024.

[77] Ahmad kamel, Interview Ahmad kamel, Managing Director of the "Qara'a" application, Whatsapp, December 15, 2024.

The mechanism for using artificial intelligence (AI)-based murajaah features in the Qara'a application adopts the principle of user interface (UI) design that is intuitive and oriented towards operational simplicity. Users can access this feature through a series of structured steps: (1) opening the Qara'a app, (2) navigating to the main menu that provides the "Murajaah AI" option, and (3) activating the feature via the integrated microphone icon. After the user records the reading through voice input, the artificial intelligence (AI) system will perform linguistic analysis based on speech recognition and natural language processing (NLP), then produce an evaluation output that includes tajwīd accuracy, fluency, and phonetic correction.[78]

2. Features of Qara'a

There are 4 feature menus in the qara'a application. namely home, qur'an, marathon, community, and worship

a. Qur'an

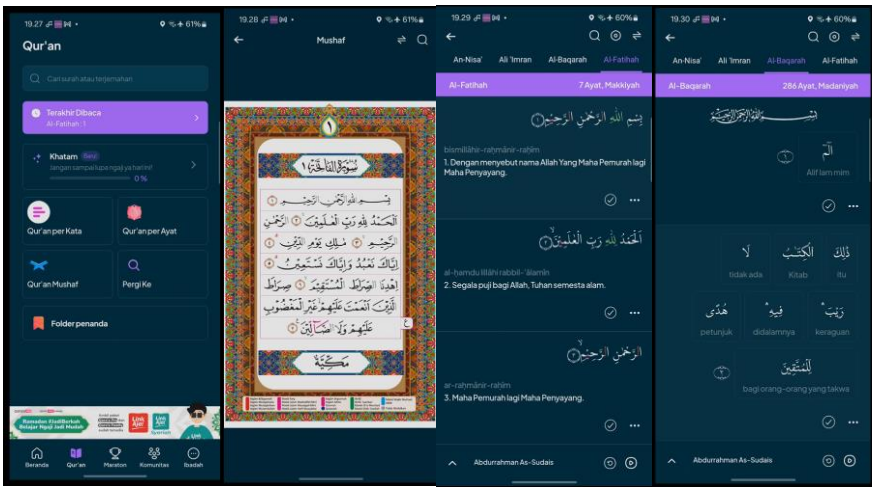


Figure 1.3 Display of Qur'an Features on the Qara'a Application

This feature of the Qur'an offers three practical ways to read in one platform. The "Mushaf" looks like the regular printed Qur'an, but in a digital version. "Mode per Verse" is a display of the Qur'an by verse, with a search for specific verses such

[78] James H. Martin, *Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition with Language Models, chapter 16 3rd edition*.

as selecting a surah and verse number, then the application will immediately display the translation and explanation. Meanwhile, "Mode per Word" is the appearance of the Qur'an which is broken down by each word that lists the translation word by word according to the fragments of the Qur'an. The translation of each piece of the Qur'an is placed right below it.[79]

The "Last Read" feature automatically saves reading progress, both in your phone's memory and cloud account, so you can resume at any time even if you change devices. "Khatam" works like a personal achievement: the system will calculate what percentage of the Quran has been recited and display it in the form of a percentage with a description of how many verses have been read and how many juz have been read so that the user is motivated to complete the recitation. "Bookmarks folders" allow users to store favorite verses or important notes in a special folder, similar to bookmarks in books.

From a physical mushaf-like appearance to a word-for-word analysis feature, the app combines the convenience of technology with the essence of traditional Qur'an reading. Suitable for both those who just want to read daily and those who want to delve into the meaning of verses in detail. The following is an explanation of the features in the Qur'an feature menu:

1) Audio Recitation by Famous Reciters

The audio recitation feature is useful for users to listen to the recitation of the Qur'an with correct tajwīd, especially for those who want to learn to recite verses correctly. Reciters such as Mishary Al-Afasy or Maher Al-Muaiqly were chosen because of the quality of their readings. The speed setting feature (0.5x to 2x) is useful for memorizing or analyzing details.

2) Basic Search

[79] Imam Mutaqien, "Mushaf Al-Qur'an Terjemahan Per Kata: Kajian Terhadap Metode Pemenggalan Lafaz Dan Terjemahannya," *SUHUF* 16, no. 1 (30 Juni 2023):p.54, https://doi.org/10.22548/shf.v16i1.852.

The basic search feature in qara'a is useful allowing for a quick search of a specific verse or topic. For example, searching for the word "patient" will bring up all the verses that contain the word. Users can also search by surah name or juz number. Example: If you want to read a verse about "gratitude," just type the keyword in the search field.

3) Simple Bookmarks and Notes

Usability: Saves favorite or important verses to revisit. Text notes can be used to write personal reflections or markers of specific themes. - Example: Mark Surah Ar-Rahman verse 33 and add the note: "Verse about the majesty of Allah in science."

4) Daily Target

The daily target feature is useful for building the habit of reading the Qur'an consistently. Users can set a target (e.g. 1 page/day) and receive reminders. Statistics show daily/weekly progress to monitor consistency. Example: If the target of 10 minutes/day is reached, the app will badge a virtual reward.

5) Transliteration

This transliteration feature helps non-Arab users read the text of the Qur'an with pronunciation that is close to Latin. Suitable for beginners who are not familiar with Hijaiyah letters. Example: The text " بِسْمِ اللَّهِ الرَّحْمَٰنِ الرَّحِيمِ" is transliterated to "Bismillāhir-Raḥmānir-Raḥīm".

6) Introduction to Surah (Asbabun Nuzul)

Usefulness: Provide historical context and the main theme of the surah before reading it. For example, Surah Al-Lahab is explained as a surah that came down about Abu Lahab who opposed the Prophet Muhammad.

Example: Before reading Surah Al-Kahf, users can read the background of the story of the Cave Youth.

7) Read Mode

Usability: Customize the appearance of the text to make it comfortable to read. Users can zoom in on the font, change the background color (dark/light mode), or choose an Ottoman writing style. Example: Users with visual impairments can choose large, high-contrast fonts.

b. Marathon

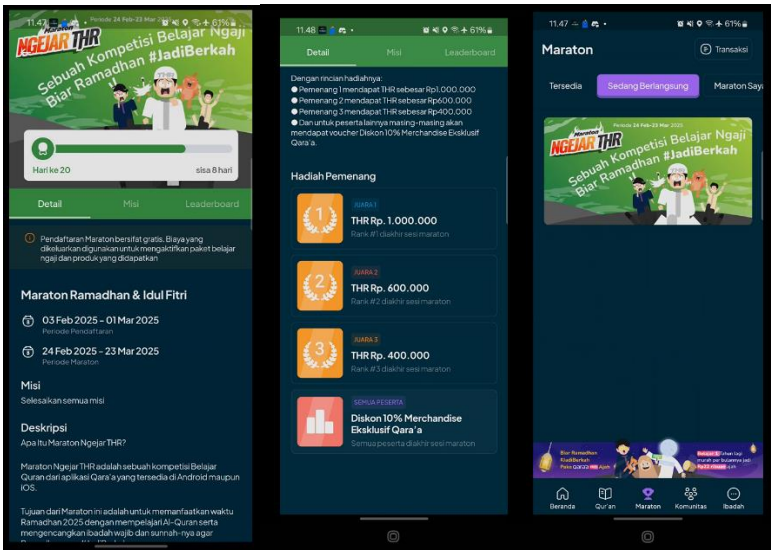


Figure 1.4 Is the marathon feature menu display

The "Marathon" feature in Qara'a is a time-bound challenge-based learning mechanism that aims to improve consistency, motivation, and retention of memorization or recitation of the Qur'an through a gamification and community approach. This feature adopts the principle of goal-setting theory (Locke & Latham, 2002) by utilizing positive reinforcement to build sustainable Qur'anic habits.

c. Community

The "Community" feature on Qara'a revitalizes the concept of traditional scientific halaqah in a digital format, creating a space where technology reinforces—not replaces—the values of Islamic ukhuwah. By combining advanced algorithms, expert curation, and Islamic ethical principles, this feature becomes not only a forum for discussion, but also a social laboratory for developing users'

spiritual and intellectual competence. This initiative emphasizes that learning the Qur'an in the digital era does not have to be individualistic, but can be a means of building a collaborative and knowledgeable ummah.

d. Worship

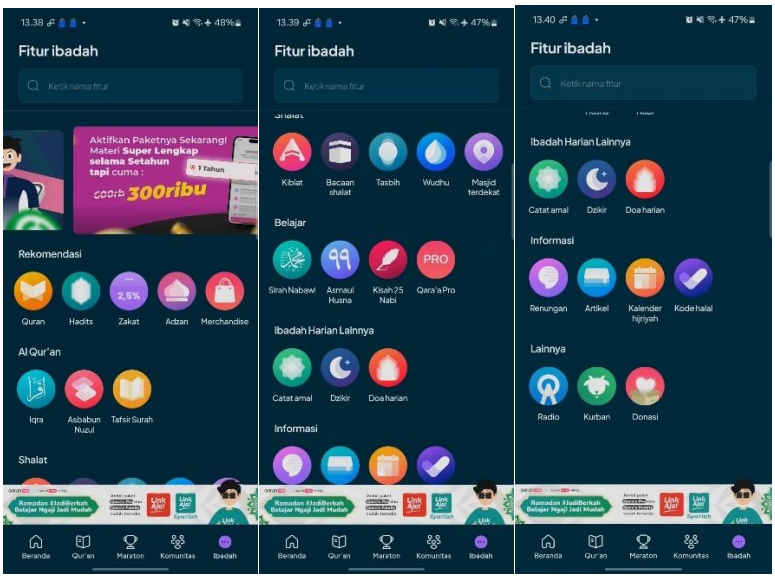


Figure 1.5 Displays the worship feature menu on the Qara'a application

The Qara'a Worship Menu represents the convergence between Islamic religious traditions and digital innovation, where technology not only facilitates, but also educates users about the essence of worship.[80]This feature adopts habit formation theory (Clear, 2018) by utilizing cue-routine-reward loops to build sustainable worship habits.[81] This worship feature is structured in 27 sub-features that are classified into 7 main categories: (1) Recommendation, (2) Qur'an, (3) Prayer, (4) Study, (5) Daily Worship, (6) Information, and (7) Others.

In the Recommendation category, there are sub-features of Qur'an, Hadith, Zakat, Adhan, and Merchandise. Meanwhile, the Qur'an category includes the modules Iqra', Asbabun Nuzul, and Tafsir Surah. For the Prayer category, the

[80] Majit, "Pergeseran Sistem Isnad dalam transmisi keilmuan baca Al-Qur'an pada Aplikasi Qara'a,", p. 80.

[81] Lailan Thawila, Nurmisda Ramayani, dan Ahmad Sanusi, "Pengaruh Habit Forming (Pembiasaan) Terhadap Motivasi Belajar Pendidikan Agama Islam Kelas X Di SMK Negeri 1 Tanjung Pura," *Journal Idarah At-Ta'lim* 2, no. 1 (21 November 2023): p.17–24

supporting components include Qibla directions, prayer reading guides, digital prayer prayer tools, ablution tutorials, and localization of the nearest mosque. In the Learning segment, users can access Sirah Nabawiyah, Asmaul Husna, the narration of the Acts of the 25 Prophets, and exclusive content of Qara'a Pro. The Daily Worship category is elaborated through the sub-features of charity recording, dhikr collection, and daily prayer guides. The Information category contains thematic content such as spiritual reflections, Islamic articles, interactive hijri calendars, and halal code verification. Lastly, the Other category provides Islamic radio streaming facilities, qurbani management, and an integrated donation platform.

C. Features of Murajaah AI Qara'a App

1. Murajaah AI Services and Functions

a.) Murajaah AI Services For Qur'an Learners

In an interview with the Co-founder of the Qara'a application, it was revealed that the Murajaah AI feature was born in 2021, the Qara'a application development team began to think of solutions for Muslims who want to repeat the memorization of the Qur'an independently but face a big obstacle, namely the absence of a companion or teacher who can listen to their readings at all times. This anxiety arises from the many cases where hafidz or Qur'an learners have difficulty performing murajaah without direct guidance. Along with the rapid development of voice recognition technology, the Qara'a team began to research how artificial intelligence (AI) could play a role in helping Muslims in murajaah, especially in listening to and evaluating the recitation of the Qur'an automatically. Qara'a strives to present a solution that allows murajaah to be carried out anywhere and anytime without losing the quality of healing. It is important to note that this feature is not intended as a replacement for the role of a teacher or ustadz, but rather as a personal assistant in reciting or repeating the Qur'an recitation used. This feature can help users in improving their reading accuracy before the schedule to meet the teacher in person[82]

[82] Mahmudin, Co-Fouder Interview: Murajaah AI Features of Qara'a Application.

Therefore, the Qara'a application creates additional features to complement the limitations of the Murajaah AI feature which functions as a murajaah tool, not as a substitute for teachers or ustadz. Verse Deposit Feature, a feature used to deposit verses online and will be corrected by teachers or ustadz directly.

b.) The Function of Murajaah AI as a Murajaah Assistant Is Not a Substitute for Teachers

Qara'a integrates artificial intelligence (AI) through a reading checking feature using *Automatic Speech Recognition* (ASR) technology. *Automatic Speech Recognition* (ASR) is an implementation of narrow artificial intelligence (Narrow AI) that focuses on converting acoustic signals of human speech into textual representations. As a sub-field in *Natural Language Processing* (NLP), *Automatic Speech Recognition* (ASR) integrates deep learning-based machine learning techniques. The goal of an *Automatic Speech Recognition* (ASR) system is to accurately and efficiently convert speech signals into text message transcriptions of words spoken independently of the speaker, environment, or device used to record speech (i.e. microphone).[83] The process involves three main components: (1) an acoustic model that maps sound signals to linguistic units (phonemes), (2) a language model that predicts the order of words based on context, and (3) a decoder that combines the two to produce optimal transcription.

The system works by analyzing the user's voice recordings, identifying the detected letters, and then comparing them to the correct reading references.[84] The *Automatic Speech Recognition* (ASR) method was chosen for its ability to produce high accuracy as well as adaptive tolerance, making it suitable for learning contexts that require gradual correction.[85] The Qara'a application implements artificial

[83] Balula, Rashwan, and Abdou, "Automatic Speech Recognition (ASR) Systems for Learning Arabic Language and Al-Quran Recitation," p.92.

[84] Dan Jurafsky James H. Martin, *Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition with Language Models, chapter 16 3rd edition*, 2025, 1, https://web.stanford.edu/~jurafsky/slp3/.

[85] Ahmad kamel, Interview Ahmad kamel, Managing Director of the "Qara'a" application, Whatsapp, December 15, 2024.

intelligence (AI) technology based on *Automatic Speech Recognition* (ASR) which is specifically designed to detect, analyze, and correct users' Qur'an readings.[86]

In the development of Murajaah AI features, Qara'a utilizes *phoneme-level-analysis-based* machine learning *technology*. This system is designed to assist Muslims in repeating the Qur'an memorization more accurately by automatically detecting phonetic errors. *Co-Founder* Qara'a explained that this system works by comparing each verse read by the user with the ideal voice model that has been trained using a large *dataset*.Qara'a [87] *'s Co-Founder* explains: "Every sentence that the user reads will be phonetically compared to the ideal sound model (trained dataset)."

This technology allows AI to detect whether the pronunciation of letters corresponds to makhraj and its properties. For example, the system can identify whether the letter "shad" sounds like "sin", which indicates an articulation error in the user's reading.[88] *Qara'a's Co-Founder* explains further: "*The system checks whether the pronunciation of the letters corresponds to the makhraj and its properties (e.g. whether 'shad' sounds like 'sin'). If a significant phonetic deviation occurs, it will be marked as an error.*"One of the main advantages of this approach is that the evaluation is not only done at the word level, but more in-depth down to the letter and syllable level. *The Co-Founder* of Qara'a emphasized that: "*The evaluation is done at the level of letters and syllables, not just words.*"That is why[89]

With this method, users can perform murajaah with a more precise system in listening and assessing their readings. This technology opens up opportunities for anyone to improve the quality of their Qur'an reading, even without a direct companion. The Murajaah AI feature is one of the innovations that combines tajwīd

[86] Ahmad kamel, Interview Ahmad kamel, Managing Director of the "Qara'a" application, Whatsapp, December 15, 2024.

[87]Hajon Mahdy Mahmudin, Co-Fouder Interview: Murajaah AI Feature of Qara'a Application, Instagram Direct Message, May 8, 2025..

[88] Hajon Mahdy Mahmudin, Co-Fouder Interview: Murajaah AI Feature of Qara'a Application, Instagram Direct Message, May 8, 2025.

[89] Hajon Mahdy Mahmudin, Co-Fouder Interview: Murajaah AI Feature of Qara'a Application, Instagram Direct Message, May 8, 2025.

science with artificial intelligence, presenting solutions that are not only technology-based but also based on Islamic scientific principles.

2. Source of Science Feature Murajaah AI

In the development of Murajaah AI features, Qara'a carries an approach that harmonizes ijtima' between classical references and contemporary needs. The foundation of this technological development still adheres to the standard of makharijul letters that have been agreed upon by the imams of qira'at, including Imam Ibn Al-Jazari and Imam Ad-Dani, as well as the tajwīd books of Tuhfatul Athfal and Al-Jazariyah. In addition, this approach also draws on modern references from the scholars of Al-Azhar and Lajnah Pentashihan Mushaf, ensuring that the standards used remain in harmony with the authentic rules of tajwīd. *Co-Founder* Qara'a explained that although classical principles remain the main reference, challenges arise in the application of technology. In this case, it is necessary to simplify the sound parameters so that they can be recognized by the AI, without sacrificing the phonetic accuracy of the makhraj and ṣifāt al-ḥurūf.[90] He revealed: "*However, in technical practice, we have to simplify the sound parameters that can be read by AI, while keeping the phonetic accuracy of makhraj and ṣifāt al-ḥurūf as the main standard."*

This approach ensures that even though AI works with simplified algorithms, the quality of the evaluation of the readings still refers to the scientifically and academically tested principles of tajwīd. Thus, Murajaah AI can be an effective tool for users in improving the quality of their Qur'an readings independently, without losing the scientific essence inherited by scholars.

3. Artificial Intelligence Patterns in Validating User Readings

The development of the Murajaah AI feature relies on a machine learning-based approach with *phoneme-level-analysis* as the foundation in detecting the accuracy of Qur'an readings. Each sentence read by the user is phonetically compared to the

[90] Hajon Mahdy Mahmudin, Co-Fouder Interview: Murajaah AI Feature of Qara'a Application, Instagram Direct Message, May 8, 2025.

ideal sound model that has been trained using *the trained dataset*.[91] Thus, the system checks whether the pronunciation of each letter is in accordance with the makhraj and its nature—for example, whether the letter "shad" is pronounced correctly or even sounds like "sin". When a significant phonetic deviation occurs, the system automatically flags it as an error. Evaluations are carried out not only at the word level, but also at the letter and syllable level, thus providing more detailed feedback on each aspect of pronunciation.

The working mechanism of this system can be explained through the integration of three main components: audio signal processing, linguistic-structured analysis, and machine learning-based adaptation, which together create interactive solutions.[92]

a) Voice Data Acquisition and Preprocessing

The process begins with the acquisition of voice data through the user's microphone input. The analog signal from the reading recording is converted to digital form (sampling) at a specific frame rate (e.g., 16 kHz) to optimally capture the frequency of the human voice. Furthermore, preprocessing is carried out to reduce noise (background disturbance) and isolate vocal signals using techniques such as spectral subtraction or filter banks. This stage ensures the processed sound data is free from distortion, thus facilitating accurate analysis at the next stage.

b) Analysis of Ṣifāt al-Ḥurūf

The digital signal is then parsed through an acoustic model built using Deep Neural Network (DNN) or Hidden Markov Models (HMM). The model has been pre-trained with extensive datasets that include variations in the pronunciation of hijaiyah letters (such as: (ص,ض,ط) by a variety of voices, ages, and accents. Each signal frame is mapped into a feature vector (e.g., Mel-Frequency Cepstral

[91] Hajon Mahdy Mahmudin, Co-Fouder Interview: Murajaah AI Feature of Qara'a Application, Instagram Direct Message, May 8, 2025.

[92] Balula, Rashwan, and Abdou, "Automatic Speech Recognition (ASR) Systems for Learning Arabic Language and Al-Quran Recitation," p.92.

Coefficients (MFCC)[93] to identify the unique spectral patterns of each phoneme. This process allows the system to recognize subtle differences between phonetically similar letters, such as "ت" (Tā') and "ط" (ṭā'), which are often a source of error for novice learners.

c) Linguistic Modeling and Validation of Tajwīd Rules

After the identification of the phonemes, the system switches to a linguistic model that is integrated with the rules of tajwīd and the morphology of the Arabic language of the Qur'an. This model uses rule-based algorithms and statistical language modeling to verify the context of the reading. Examples:

Short Length Validation (Mad): Artificial intelligence (AI) calculates the duration of the vowelization of the letter mad (such as ا, و, ي) and compares it to the original mad, far'i, or 'arid terms. Correction of makhārij al-Ḥurūf: The system maps the articulation points (makhraj) of letters based on the reference database, and then detects deviations (e.g., the pronunciation of "ق" [Qāf] mixed with "ك" [*Kāf*]).

The achievement of the accuracy of the detection of letters is currently 92–95%.[94] That accuracy, although dependent on sound conditions such as background or articulation clarity, was achieved through model training with more than 60 million voice samples involving Muslim users from various demographics including children, adults, and non-natives. However, the developers emphasized that this AI functions as a tool, not as a muhaqqiq (authentic scientific assessor), so

[93] Ibnu Kasyful Haq and Agi Prasetiadi, "Makhraj 'AIN Pronunciation Error Detection Using Mel Frequency Cepstral Coefficiant And Modified ED VGG-16," *Journal of Informatics Engineering (Jutif)* 4, no. 1 (February 10, 2023): p.219, https://doi.org/10.52436/1.jutif.2023.4.1.419.

[94] Haq dan Prasetiadi, "Makhraj 'AIN Pronunciation Error Detection Using Mel Frequency Cepstral Coefficiant And Modified ED VGG-16."

that the final validation still involves the role of ustadz through the feature of depositing verses/talaqqi to confirm errors in sanad.

4. Roadmap for the Development of Murajaah AI Feature in the Qara'a Application

The validation process of the Qara'a AI model is carried out through an iterative approach that involves continuous fine-tuning to improve the accuracy and functionality of the system. The development of this model can be broken down chronologically[95]:

1. Initial Version (Base Model):

   The initial model was only capable of binary classification (determining "true" or "false" readings) based on basic phonetic analysis. This capacity is limited to the detection of gross errors (critical errors) without considering pronunciation variations.

2. Increased Tolerance (Version 2-3):

   At this stage, a calibration of the tolerance value is carried out to accommodate dialect differences or minor articulation variations. The model began to integrate error margin parameters that allowed the system to distinguish between fatal errors (e.g. error errors) and non-critical inconsistencies (such as read extensions).

3. Structured Error Analysis (Version 3+):

   The model was developed to identify specific types of errors (e.g. idgham, ikhfa', or makhraj errors*) through acoustic pattern mapping and comparison with tajwīd reference databases. This stage involves retraining using a dataset enriched with a multi-level reading sample.

4. Version 4: Adaptive Recommendations:

[95] Ahmad kamel, Interview Ahmad kamel, Managing Director of the "Qara'a" application, Whatsapp, December 15, 2024.

The latest model adopts an AI-based diagnostic system that not only detects errors, but also generates personalized learning recommendations. By utilizing learning gap analysis, the model is able to recommend specific materials (e.g. tahsin or tajwīd modules) according to the user's profile. This mechanism is supported by a predictive analytics algorithm that connects error patterns with curricular needs.

To optimize the ability to distinguish between right and wrong readings, Qara'a has developed a systematic development roadmap, including[96]:

- Stage 1: The main focus is on the detection of letter meanings and individual pronunciation errors, ensuring a more fundamental and accurate evaluation.
- Stage 2 (ongoing): Integration of the analysis of the law of tajwīd, such as aspects of idgham, ghunnah, and mad, which requires an assessment of the context of the verse, the length of the voice, and the speed of the reading.
- Stage 3: Development of error reporting in the form of a visual learning path that provides suggestions for improvement materials for users.
- Stage 4: Engagement of digital ustadz with a human-in-the-loop approach for real-time validation and evaluation refinement.
- Stage 5: Training of special models based on madzhab qira'at or local styles (e.g. Qalun, Warsh, Hafs) so that the results of the evaluation are more in accordance with the existing reading variations.

This modular and step-by-step approach shows that Murajaah AI is designed to strike a balance between advanced technology and traditional rules in tajwīd. Thus, this feature is not only able to accurately distinguish between right and wrong readings, but also provides a solid basis for further development to answer the needs of the ummah in the murajaah process holistically.

[96] Hajon Mahdy Mahmudin, Co-Fouder Interview: Murajaah AI Feature of Qara'a Application, Instagram Direct Message, May 8, 2025.

CHAPTER IV
EPISTEMOLOGY OF ARTIFICIAL INTELLIGENCE IN THE QARA'A DIGITAL QUR'AN

A. Source of Murajaah AI Qara'a Application Features

Based on an interview with Hajon Mahdy Mahmuding, Co-Founder of the Qara'a Application, it was stated that the sources of knowledge used were Matan Al-Jazariyah and Tuhfatul Athfal.[97] Therefore, this study aims to validate the suitability of the source of material used by the Murajaah AI feature in the Qara'a application with the Co-Founder's claim. Validation is carried out through a direct comparison between the material displayed by Murajaah AI and the two main reference sources. It is important to note that as of the Qara'a version 5.1.26, the Murajaah AI feature is still limited to makhārij al-Ḥurūf correction and has not been able to evaluate other aspects of tajwīd science.

1. Murajaah AI Feature Testing

The testing of the Murajaah AI feature was carried out using the reading of Surah Al-Fatihah, both intentionally wrong and right. Testing on intentionally incorrect readings aims to identify and analyze the results of AI assessments of types of reading errors. Meanwhile, testing on correct readings is carried out to observe the response of Murajaah AI's features to accurate readings.

[97] Hajon Mahdy Mahmudin, Co-Fouder Interview: Murajaah AI Feature of Qara'a Application, Instagram Direct Message, May 8, 2025.

a.) Test Results If Accuracy 0%

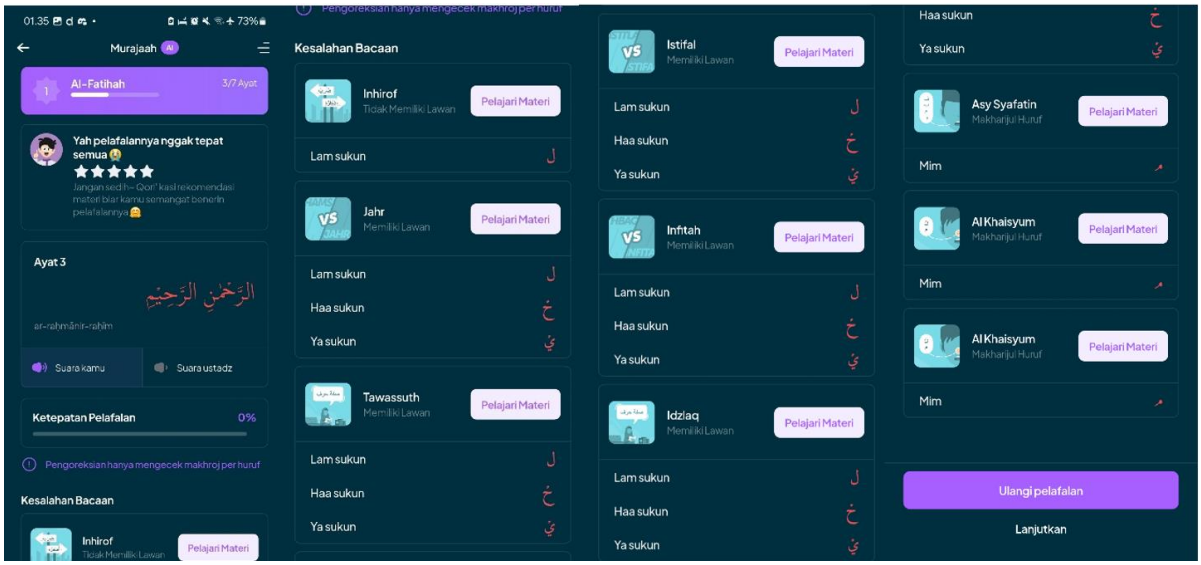


Figure '1.6 is a picture of the result of an incorrect reading test

In this test, Murajaah AI detected a total of 9 errors in the reading of Verse 3 of Surah Al-Fatihah. These errors include: inhirof (on the letter ل), jahr (on the letters ل, خ, يْ), tawassuth (on ل, خ, يْ the letters), istifal (on the letters ل, خ, يْ), idzlaq (on ل, خ, يْ the letters), asy-syafatin (on the letters م), and al-khaisyum (on both letters م).[98]

b.) Test Results If the Accuracy reading reaches 100%

[98] Hajon Mahdy, Ahmad Kamel "Qara'a" Application (Qara'a Indonesia, t.t.).

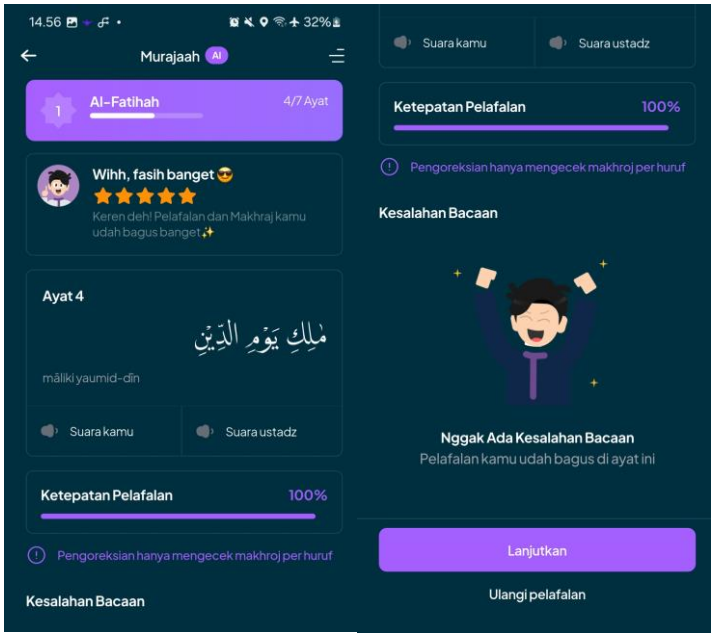
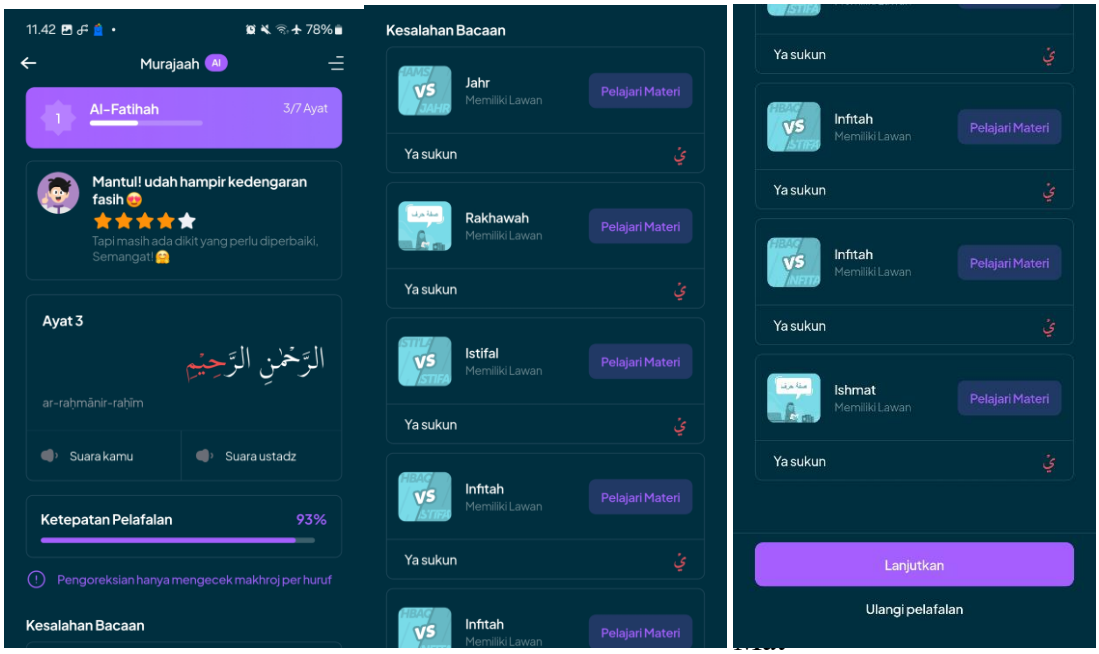


Figure 1.7 Test results if the readings are correct

If the Murajaah AI feature detects the readings as correct or reaches a 100% accuracy level, then no correction or identification of typo errors is displayed.

c.) Margin of Error in Surah Al-Fatihah



Based on testing on Surah Al-Fatihah verse 3, an error was identified in the pronunciation of the sentence "Ar-Raḥīm" in the Murajaah AI application. Even if the user has made readings and repetitions according to the example given by the application, the system still gives an evaluation that is not entirely correct, especially on the letter "yes". This indicates that although the accuracy of the system is generally high, there are certain anomalies or limitations in phonetic detection in that specific case.

2. Comparison of Knowledge Sources

The comparison of knowledge sources involves evaluating the reference sources implemented in the Qara'a application with the information obtained from interviews with the Co-Founders of Qara'a. The Co-Founder stated that the sources used were consensus (ijtima') of several references, including Tuhfatul Athfal and Matan Al-Jazariyah.

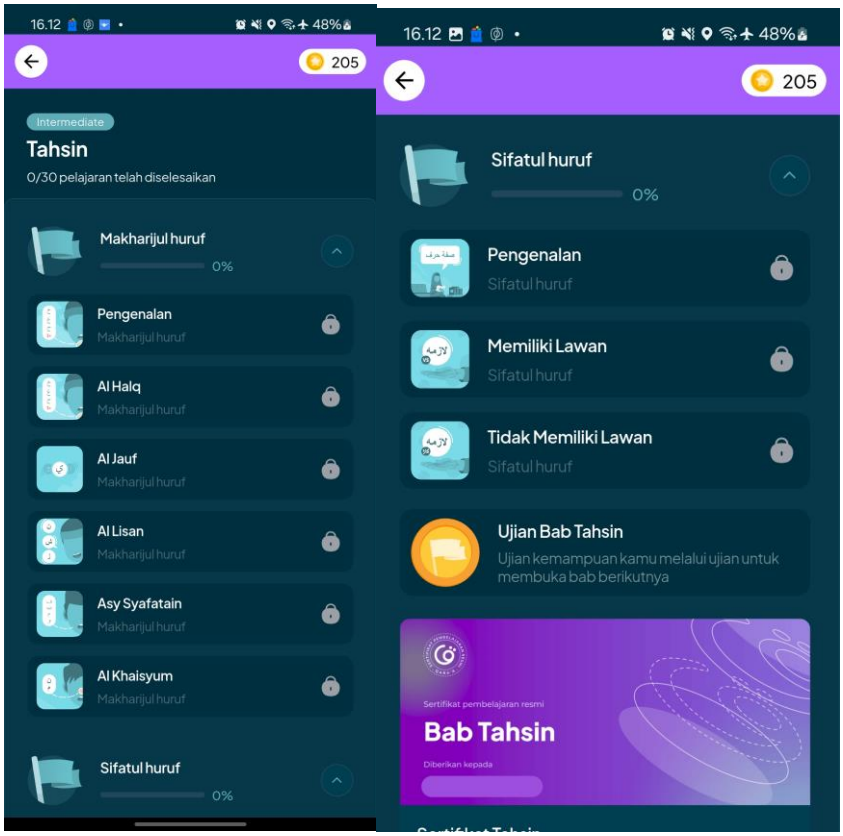


Figure 1.8 Is the source of the material used by the Qara'a application

The analysis of the corrections provided by the Murajaah AI feature allows the identification of reading errors and suggestions for corrections connected to the material features in the Qara'a app. The explanation of makhārij al-Ḥurūf in the application is divided into five main points: Al-Halq, Al-Jauf, Al-Lisan, Ash-Shafatain, and Al-Khaisyum. The details of the explanation of each term in the Qara'a application are as follows:

a. Al Halq

   The hijiyah letter that comes out of the throat of the letter Halq consists of six letters which are divided into 3 parts, namely, the lower throat (Aqsol Halqi) ء,ه, the middle throat (Wasthul Halq) ع ح, and the upper throat (Adnal Halq) غ خ.

b. Al Jauf

   The place where the hijaiyah letter (ا ,ي, و) is pronounced from the oral cavity.

c. Al Lisan

   The hijaiyah letter that comes out of the tongue and consists of 10 regions where the letter comes out. There is a base of the tongue (ق), front of the base of the tongue (ك), middle of the tongue (ج,ش,ي), edge of the tongue (ض), edge of the tip of the tongue (ل), tip of the tongue (ر,ن).

d. Ass Syafataini

   The place where the hijaiyah letters come out of the lips. (م, و,ف,ب).

e. Al Khaisyum

   Letters that come out of the nasal cavity (م,ن).

Let's compare it with the source of Matan Al Jazariyah. The following is an explanation of makhārij al-Ḥurūf according to the matan of Al Jazariyyah makhārij al-Ḥurūf (Places of Letters) The places of the letters hijaiyah are 17, based on the opinion of scholars of qiraah.[99] The division is as follows[100]:

- Cavity (Al-Jauf): Covering the throat cavity to the oral cavity, which is the place where the letters Alif, Wawu mad, and Ya mad come out. These letters stop as the breath stops.
- Throat (Al-Halq):
    - The furthest part of the oral cavity: Hamzah and Ha.
    - The middle part: 'Ain and Ha.
    - The part closest to the oral cavity: Ghain and Kha.
- Tongue (Al-Oral):
    - The base of the tongue in contact with the soft palate: Qaf.
    - Under the letter Qaf: Kaf.
    - Middle tongue: Jim, Syin, and Yes.
    - Edge of the tongue when in contact with molars (left or right): Chest.
    - From the Tongue to the Tongue: Lam.
    - The tip of the tongue that is in contact with the palate below where the letter Lam comes out: Nun.
    - Close to where the letter Nun comes out, but slightly goes into the back of the tongue: Ra.

[99] Ibn Jazari, "Matan Jazariyah," p. 7.
[100] Ali Mursyid, "Tajwid Di Nusantara Kajian Sejarah, Tokoh Dan Literatur," *El-Furqania : Jurnal Ushuluddin dan Ilmu-Ilmu Keislaman* 5, no. 01 (24 Maret 2019): p.75–104, https://doi.org/10.54625/elfurqania.v5i01.3366.."

- The tip of the tongue that comes into contact with the back of the upper incisors: Tha, Dal, and Ta.
- The tip of the tongue approaches the lower incisors (Shafir letters): Shad, Zay, and Sin.
- Tongue tip contact with upper incisors: Zha, Dzal, and Tsa.

- Two Lips (Ash-Intercession): Wawu, Ba, and Mim.

Nasal Cavity (Al-Khaisyum): The letters of Ghunnah (the buzzing sound in Nun and Mim).

In terms of the source of the theoretical naming is the same as the source of Matan Al Jazariyyah with a difference in interpretation only which uses language that is easy to understand but with the same intention. Meanwhile, in the book of tuhfatul Athfal it is not specifically explained the meaning of makharijul letters.

B. Validity of Murajaah AI in Qara'a Applications

Although this system lacks consciousness or reflective reason, its algorithms show didactic potential that can be observed consistently in the context of Qur'anic learning. In studying validity or criteria, it will be seen to what extent the explanation is scientifically valid. This study was conducted to find out the position of artificial intelligence (AI) objectively and scientifically, so there needs to be a wise conclusion in assessing artificial intelligence because something called truth itself is something relative. The author tries to establish a standard based on the theory of truth in philosophy, namely the theory of coherence, correspondence, and pragmatism.

1. Qara'a Artificial Intelligence Coherence

In coherence theory, a statement is considered true if it is consistent with an existing belief system or knowledge. In contrast to correspondence theory, which assesses truth based on conformity with external reality, coherence theory emphasizes logical relationships and internal harmony in an information system.[101]

[101] Dimas Audrian, "The Theory of Truth Coherence, Correspondence, Pragmatism and

When applied to the Murajaah AI feature in the Qara'a app, coherence theory can explain how AI ensures that the user's reading correction remains consistent with the programmed rules of tajwīd and harakat. The AI in Qara'a not only matches the readings to the correct standard, but also ensures that the corrections given are in line with the principles that have been established in the system, namely with the Sources that are more inclined towards Matan Al Jazariyah.

With this approach, Muarajaah AI in Qara'a serves as an adaptive learning assistant system, which not only provides feedback based on conformity with correct reading, but also considers the user's overall reading pattern and structure. This allows artificial intelligence (AI) to provide more contextual and integrated corrections, so that users can learn more effectively.

In this case, it is strengthened by the data above, namely the consistency in the correction of the Murajaah AI recitation in Qara'a not only matching the user's reading with the correct standard, but also ensuring that the correction given is in line with the principles of tajwīd and makharijul letters. If the user makes a mistake in reading a verse, artificial intelligence (AI) will provide corrections that remain coherent with the rules that have been set, namely those that are seen to be more inclined to one source of Matan Aljazariyah.

Improved accuracy through Murajaah AI's historical data in Qara'a continues to learn from previous user reading data. If the user has corrected an error, artificial intelligence (AI) will take the change into account in subsequent corrections, keeping the system coherent with the user's reading progress.

2. Qara'a Artificial Intelligence Correction

The theory of correspondence in philosophy states that a statement is considered true if it corresponds to existing reality or facts.[102] In the context of correspondence theory, the artificial intelligence on Qara'a can be attributed to how the AI system matches the user's reading with the correct reading standard. In this case, the

Huduri," *Seroja: Journal of Education 1* 2 (2022): 56–62.

[102] Dimas Audrian, "Teori Kebenaran Koherensi, Korespondensi, Pragmatisme Dan Huduri," *Seroja: Jurnal Pendidikan 1* 2 (2022): p.56–62.

artificial intelligence (AI) in Qara'a works by comparing the user's readings with validated reading data, and then providing feedback based on that conformity.

With this approach, Murajaah AI in Qara'a functions as an automated validation system, ensuring that user readings are in accordance with the rules that have been set to guide the user's readings. This allows for more effective and accurate learning, and helps users improve their ability to read the Qur'an but still needs to rely entirely on human teachers because artificial intelligence (AI) is only a tool.

However, if tested on the verses of Al-Fatihah, the Murajaah AI feature in the Qara'a application still has a low margin of error in detecting errors, as shown by the accuracy of the detection of makhraj letters which reaches 92-95%. So the Murajaah AI Feature in the Qara'a application can be said to be quite a correspondence tool because actually the Murajaah AI Feature is only a tool for murajaah and there is still a margin of error. However, with the additional feature of Depositing Ayat with teachers or ustadz online, it can cover the non-correspondence on the Qara'a application as a place to learn the Qur'an.

3. Qara'a Artificial Intelligence Pragmatism

In pragmatic theory, the correctness of a concept or system is judged based on its benefits and effectiveness in practice. In contrast to correspondence theory, which assesses truth based on conformity with external reality, or coherence theory, which emphasizes consistency in knowledge systems, pragmatism focuses more on tangible results and the direct impact of a concept or technology.[103] When applied to the Murajaah AI feature in the Qara'a application, the theory of pragmatism explains how this technology is valuable and beneficial for users in helping the Qur'an. Here are some of the ways artificial intelligence (AI) in Qara'a applies the principle of pragmatism.

The effectiveness of Murajaah AI's features in Qara'a is designed to provide users with immediate feedback on their readings. If the user makes a mistake in reading a verse, the AI immediately provides corrections that can be applied immediately, making learning more practical and efficient. Ease of access and

[103] Audrian.

flexibility with AI technology, murajaah users read the Qur'an anytime and anywhere, without having to rely on a teacher directly. This shows that the Murajaah AI feature in Qara'a has practical value in everyday life, in accordance with the principle of pragmatism.

Adapting to the needs of Qara'a Application users, there is an advanced feature that allows people to make online deposits to teachers or ustadz who will immediately provide corrections. With this approach, Murajaah AI in Qara'a not only serves as a technological tool, but also as a tangible solution that helps Muslims in murajaah and learn to read the Qur'an better. This is in line with the principle of pragmatism that assesses the success of a system based on its impact and benefits in real life.

CHAPTER V
CONCLUSION

A. CONCLUSION

Based on the above statements and explanations, it will be concluded that Murajaah AI in the application of Qara'a based on epistemology contains the following conclusions:

1. Two sources of knowledge were found to be really data references in the Murajaah AI feature on the Qara'a application. Matan Al-Jazariyah for makhārij al-Ḥurūf material. The Co-Founder's claim that Tuhfatul Athfal was cited as a source was also analyzed, but it was found that the book did not detail the discussion of makhārij al-Ḥurūf, so that Tuhfatul Athfal became an identified reference for tajwīd other than makhārij al-Ḥurūf. This knowledge is then processed by the system using Automatic Speech Recognition (ASR) technology which works at the phoneme level (phoneme-level-analysis) to analyze and correct the user's reading.
2. Epistemic validity of Murajaah AI Coherence features, Murajaah AI features have sufficient coherence validity because the corrections it provides are in accordance with the factual rules of makhārij al-Ḥurūf contained in its standard reference, namely Matan Al-Jazariyah. Although there is a low margin of error (92-95% detection accuracy. Correspondence, Murajaah AI in Qara'a Quite correspondence as it functions as an automated validation system, ensuring that the user's reading is in accordance with the rules that have been set to petrify the user's reading. This allows for more effective and accurate learning, as well as helps users improve their Qur'an reading skills. However, if tested on the verses of Al-Fatihah, the Murajaah AI feature in the Qara'a application still has a low margin of error in detecting errors, as shown by the accuracy of the detection of the letters makhraj which reaches 92-95%. Pragmatically, Murajaah AI is quite valid because it is proven to have high practical benefits and usability for users, such as providing instant feedback, flexibility of learning time, and personalization of learning. Nevertheless, this

study emphasizes that this technical validity cannot replace the holistic validity of the process of learning through talaqqi and musyafahah, which contains the essence of the transmission of sanad, adab, and spirituality from a human teacher.

B. SUGGESTION

Based on several conclusions that have been drawn, the researcher suggests the following suggestions:

1. To students, especially students of the Qur'an and Tafsir study program, it is recommended to research related to the validity of the Qur'anic artificial intelligence system in its Qira'at which is used in the Qara'a application. Artificial intelligence (AI) in the Qur'an is important for several reasons that have been mentioned. Meanwhile, the digitization of the Qur'an and artificial intelligence (AI) is a field that will continue to develop along with the development of the digital world. However, these two fields have not fully received the attention of scholars of the Qur'an and commentary. Or from the party to the religion.

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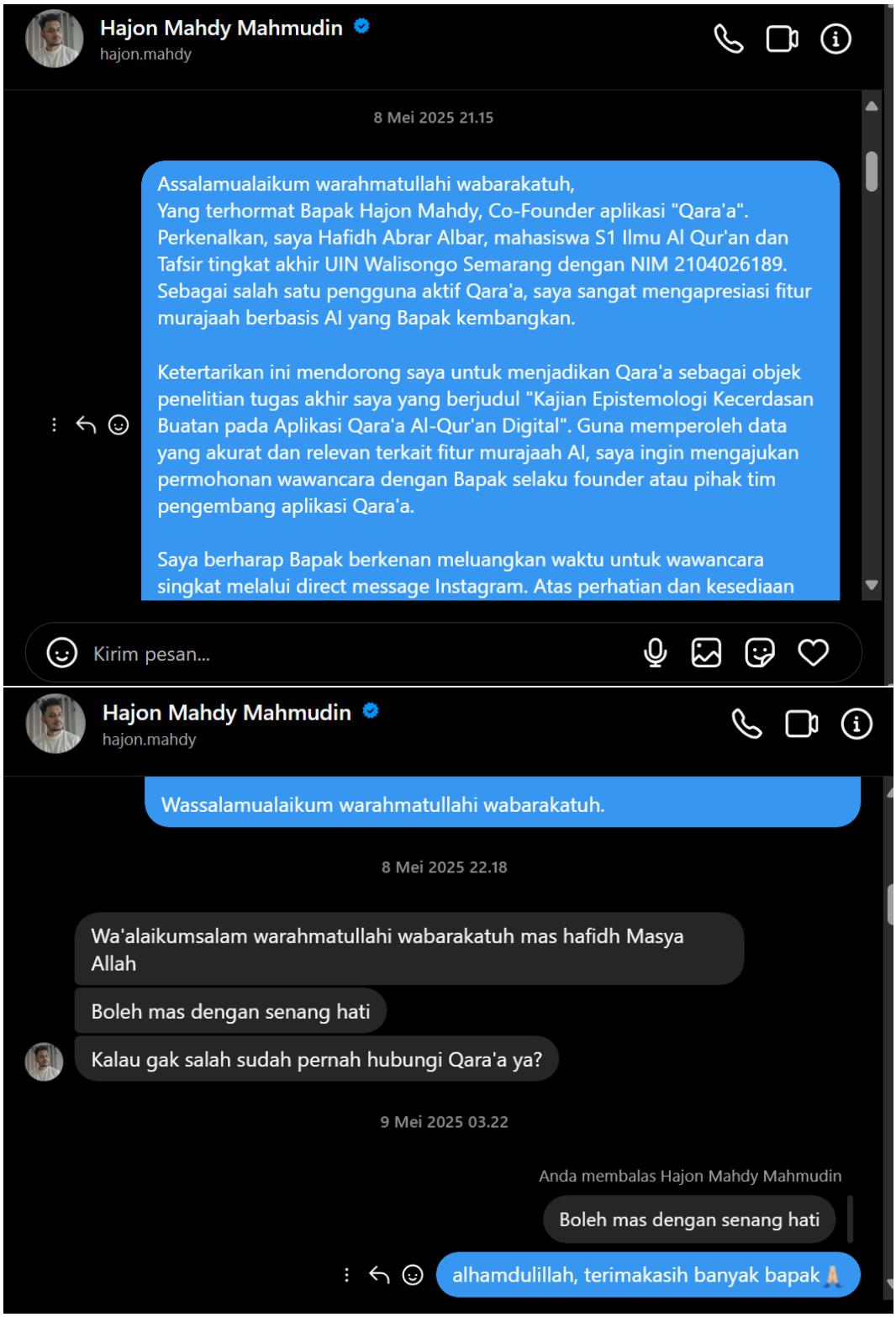
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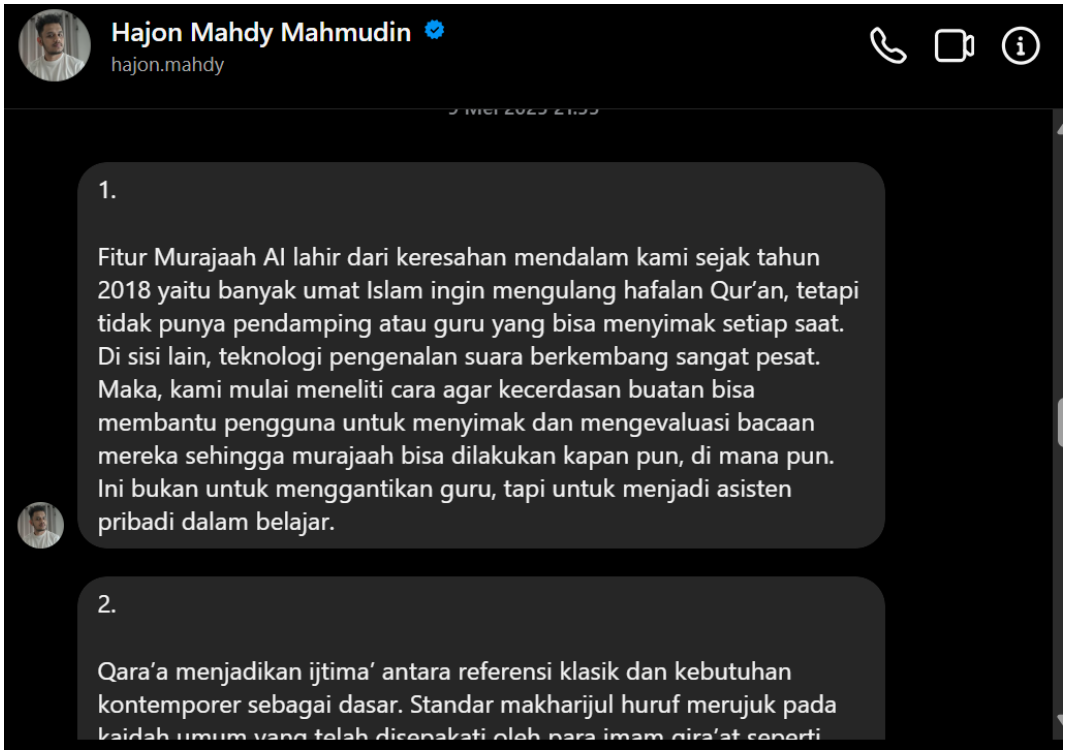
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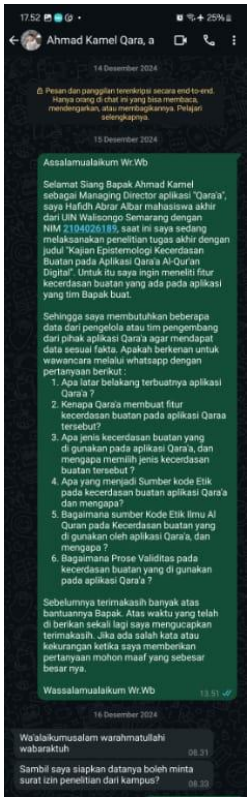
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APPENDIX


Hajon Mahdy Mahmudin
hajon.mahdy
8 Mei 2025 21.15
Assalamualaikum warahmatullahi wabarakatuh,
Yang terhormat Bapak Hajon Mahdy, Co-Founder aplikasi "Qara'a".
Perkenalkan, saya Hafidh Abrar Albar, mahasiswa S1 Ilmu Al Qur'an dan Tafsir tingkat akhir UIN Walisongo Semarang dengan NIM 2104026189.
Sebagai salah satu pengguna aktif Qara'a, saya sangat mengapresiasi fitur murajaah berbasis AI yang Bapak kembangkan.
Ketertarikan ini mendorong saya untuk menjadikan Qara'a sebagai objek penelitian tugas akhir saya yang berjudul "Kajian Epistemologi Kecerdasan Buatan pada Aplikasi Qara'a Al-Qur'an Digital". Guna memperoleh data yang akurat dan relevan terkait fitur murajaah AI, saya ingin mengajukan permohonan wawancara dengan Bapak selaku founder atau pihak tim pengembang aplikasi Qara'a.
Saya berharap Bapak berkenan meluangkan waktu untuk wawancara singkat melalui direct message Instagram. Atas perhatian dan kesediaan
Kirim pesan...
Hajon Mahdy Mahmudin
hajon.mahdy
Wassalamualaikum warahmatullahi wabarakatuh.
8 Mei 2025 22.18
Wa'alaikumsalam warahmatullahi wabarakatuh mas hafidh Masya Allah
Boleh mas dengan senang hati
Kalau gak salah sudah pernah hubungi Qara'a ya?
9 Mei 2025 03.22
Anda membalas Hajon Mahdy Mahmudin
Boleh mas dengan senang hati
alhamdulillah, terimakasih banyak bapak 🙏


Hajon Mahdy Mahmudin
hajon.mahdy
1.
Fitur Murajaah AI lahir dari keresahan mendalam kami sejak tahun 2018 yaitu banyak umat Islam ingin mengulang hafalan Qur'an, tetapi tidak punya pendamping atau guru yang bisa menyimak setiap saat. Di sisi lain, teknologi pengenalan suara berkembang sangat pesat. Maka, kami mulai meneliti cara agar kecerdasan buatan bisa membantu pengguna untuk menyimak dan mengevaluasi bacaan mereka sehingga murajaah bisa dilakukan kapan pun, di mana pun. Ini bukan untuk menggantikan guru, tapi untuk menjadi asisten pribadi dalam belajar.
2.
Qara'a menjadikan ijtima' antara referensi klasik dan kebutuhan kontemporer sebagai dasar. Standar makharijul huruf merujuk pada


Ahmad Kamel Qara, a
14 Desember 2024
15 Desember 2024
Assalamualaikum Wr.Wb
Selamat Siang Bapak Ahmad Kamel sebagai Managing Director aplikasi "Qara'a", saya Hafidh Abrar Albar mahasiswa akhir dari UIN Walisongo Semarang dengan NIM 2104026189, saat ini saya sedang melaksanakan penelitian tugas akhir dengan judul "Kajian Epistemologi Kecerdasan Buatan pada Aplikasi Qara'a Al-Qur'an Digital". Untuk itu saya ingin meneliti fitur kecerdasan buatan yang ada pada aplikasi yang tim Bapak buat.
Sehingga saya membutuhkan beberapa data dari pengelola atau tim pengembang dari pihak aplikasi Qara'a agar mendapat data sesuai fakta. Apakah berkenan untuk wawancara melalui whatsapp dengan pertanyaan berikut :
1. Apa latar belakang terbuatnya aplikasi Qara'a ?
2. Kenapa Qara'a membuat fitur kecerdasan buatan pada aplikasi Qaraa tersebut?
3. Apa jenis kecerdasan buatan yang di gunakan pada aplikasi Qara'a, dan mengapa memilih jenis kecerdasan buatan tersebut ?
4. Apa yang menjadi Sumber kode Etik pada kecerdasan buatan aplikasi Qara'a dan mengapa?
5. Bagaimana sumber Kode Etik Ilmu Al Quran pada Kecerdasan buatan yang di gunakan oleh aplikasi Qara'a, dan mengapa ?
6. Bagaimana Prose Validitas pada kecerdasan buatan yang di gunakan pada aplikasi Qara'a ?
Sebelumnya terimakasih banyak atas bantuannya Bapak. Atas waktu yang telah di berikan sekali lagi saya mengucapkan terimakasih. Jika ada salah kata atau kekurangan ketika saya memberikan pertanyaan mohon maaf yang sebesar besar nya.
Wassalamualaikum Wr.Wb
16 Desember 2024
Wa'alaikumusalam warahmatullahi wabaraktuh
Sambil saya siapkan datanya boleh minta surat izin penelitian dari kampus?


Wa'alaikumusalam warahmatullahi wabaraktuh
Sambil saya siapkan datanya boleh minta surat izin penelitian dari kampus?
Baik bapak
IZIN PENELITIAN - HAFIDH ABRAR ALBAR.pdf
Saya siapkan dulu yaa
Baik bapak
Terimakasih banyak
19 Desember 2024
Assalamualaikum wr wb
Selamat siang bapak , mohon maaf menggangu waktu bapak kamel. Mohon izin untuk bertanya, kapan saya bisa mendapatkan data aplikasi yang saya tanyakan kepada bapak ?.
Wa'alaikumusalam warahmatullahi wabarakatuh, insyaAllah diakhir pekan ini ya
Baik bapak saya tunggu, Terimakasih banyak bapak atas waktu nya.
23 Desember 2024
Assalamualaikum wr wb
Selamat sore bapak , mohon maaf menggangu waktu bapak kamel. Mohon
Ketik pesan

CURRICULUM VITAE

A. Personal Identity

1. Full Name : Hafidh Abrar Albar
2. NIM : 2104026189
3. Place and Date of Birth : Tegal, August 18, 2002
4. Address :
5. Gender : Male
6. Religion : Islam
7. Email : Hafidhalbar51@gmail.com

B. Education Background

a. Formal education
   1. SDIT LUQMAN AL HAKIM Slawi 2015
   2. SMP IT LUQMAN AL HAKIM Slawi, graduated 2018
   3. SMAS Takhassus Al- Qur'an Wonosobo, graduated 2021

b. Non-formal education
   1. Al Asy'ariyyah Islamic Boarding School Wonosobo

This curriculum vitae is made in truth and hopefully used properly.

Semarang, 06 June 2024

I am concerned

Hafidh Abrar Albar

2104026189