Abdimas Serayu: Journal of Community Service
Vol. 1 No. 1, November 2025| E-ISSN: 3124-1581
Journal URL: https:// journal.zahirastudies.org/index.php/abdimas
DOI: https://doi.org/10.63254/as.v1i1.15

Training on the Importance of Halal Food Certification

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Article History

Received : 03 November 2025
Revised : 12 November 2025
Accepted : 18 November 2025
Published : 25 November 2025

Keywords: *Artificial Intelligence, Halal Certification, Halal Literacy, Haram Material Detection, Online Training.*

Abstract

This study aims to evaluate the effectiveness of online training on the theme of AI Application for Halal Food Detection in improving public halal literacy, particularly regarding the application of artificial intelligence (AI) technology to detect non-halal food ingredients. The study used a qualitative participatory approach with a case study method, involving 150 participants from various regions in Indonesia and abroad. Data were collected through observation, digital documentation, and pre- and post-tests. The training materials covered the concept of halal and haram, the challenges of detecting ingredients such as pork gelatin, and the use of AI methods such as Support Vector Machine (SVM) and Convolutional Neural Network (CNN) based on FTIR/NIR spectrum. The pre-test results showed a high understanding of general concepts (99.1%) but low understanding of technical aspects such as CNN (71.3%). After the training, the average score increased from 93.09 to 95.45, reflecting a significant increase in technical understanding. The findings suggest that case study- and technology-based training can bridge the halal literacy gap and strengthen community capacity in ensuring halal consumption. This study recommends the integration of digital technology in the national halal literacy program as well as the development of advanced training based on practical workshops with the integration of technologies such as IoT and blockchain.

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1. INTRODUCTION

The development of the global food industry increasingly demands a credible quality and safety assurance system, particularly related to the need for halal products.[1] This phenomenon arises not only from the religious needs of the global Muslim community but also from growing consumer awareness of the importance of safe, healthy, and ethical food.[2] A report[3] states that global Muslim spending on halal products has reached over USD 1.3 trillion and is projected to increase as consumer literacy regarding the values of halal and thayyib increases. Indonesia, as the country with the largest Muslim population in the world, has strategic potential to lead the global halal ecosystem, but in reality, it still faces several challenges in implementing a comprehensive halal certification system.

The fundamental problem currently faced is related to low public awareness and understanding of the halal certification process and the procedures that guarantee a product's halal status. Based on interviews with micro-business owners in East Java,[4] it was found that more than 60% of food SMEs are unaware of the stages of halal certification and are unable to differentiate between official halal labels and independent halal claims. Furthermore, cases of cross-contamination between halal and non-halal ingredients are still found due to the use of equipment, production facilities, or additives that are not strictly monitored.[5] This contamination can occur in invisible forms, such as the use of emulsifiers

from non-halal animal sources, synthetic dyes, or product processing in facilities that also handle non-halal ingredients.[6]

The importance of a halal certification system is reinforced by the fact that most consumers lack the skills or information to detect non-halal elements in products on the market.[7] A study conducted by [8] showed that only 35% of processed meat consumers in Greater Jakarta (Jabodetabek) actively verify a product's halal status before purchasing, while the remainder rely on assumptions based on packaging labels or the location of purchase. This lack of awareness indicates an urgent need to increase halal literacy in the community through educational approaches that are easily understood and accessible to all groups. However, most previous studies have focused more on formal certification aspects and have not explored community service-based approaches in the form of direct training for target groups. Furthermore, there is still little research integrating artificial intelligence (AI) as a tool to detect or educate the public about problematic ingredients in the context of halal certification. Existing literature, such as research by [9], shows that AI has the potential to be applied in halal supply chain tracking and the identification of haram ingredients in product formulations. However, this utilization has not been synergized with digital-based community training efforts.

Therefore, it is necessary to develop a training model that not only conveys halal-thayyib material conceptually but also provides AI-based digital tools that can assist participants in the practical process of detecting the halal status of food products. This training will target strategic groups such as SMEs, housewives, students, and mosque administrators, to create a community- and technology-based halal literacy ecosystem.[10] Through this training, participants are expected to gain a deeper understanding of the concept of halal and be able to identify ingredients or products that have the potential to contain non-halal elements through the assistance of simple AI technology[11]

The purpose of this research is to design, implement, and evaluate the effectiveness of training on the importance of halal food certification, integrated with the use of artificial intelligence as an educational tool. This research focuses on changes in the understanding and behavior of training participants regarding halal issues, as well as their perceptions of the application of technology in the process of identifying halal ingredients. This research uses a participatory qualitative approach that focuses on the experiences of participants as the main subjects in the learning process. Theoretically, this research contributes to the development of a technology-based halal education model, as well as expanding interdisciplinary studies between food science, information technology, and Islamic studies [12]. Meanwhile, practically, the results of this research can be a policy reference for halal certification institutions, the Ministry of Religious Affairs, and halal activist communities in designing more inclusive, effective, and evidence-based training programs. Thus, this research also encourages the formation of a society that is more aware, capable, and independent in ensuring the halalness of their consumption amidst the complexity of the modern food industry.

2. METHOD

2.1 Type of activity

This community service activity was carried out in the form of an international webinar with the theme "AI Application for Halal Food Detection." This activity was held online on July 18, 2025, initiated by the Faculty of Computer Science, AMIKOM University, Purwokerto, as a form of academic contribution to addressing global challenges related to halal food in the era of digital transformation. This theme was chosen based on the high urgency of strengthening the halal certification system in facing the complexity of the increasingly long and diverse global supply chain. Modern Muslim society demands halal assurance that is not only based on verbal claims, but is supported by a scientific approach and advanced technology that can eliminate the risk of hidden nonhalal ingredients, such as gelatin from pork sources, as well as the potential for cross-contamination in the food production process. Furthermore, Artificial Intelligence (AI) technology has currently demonstrated high performance in various fields such as medicine, manufacturing, and big data analysis. Therefore, AI is considered a strategic solution that has a high capacity to automate, accurate, and accelerate the process of validating

halal products. This activity is also designed as an educational effort so that stakeholders from academia, industry, and the halal community have a comprehensive understanding of the potential of using AI to support the halal ecosystem. This webinar not only conveys theory, but also provides real-life case studies and empirical research results, particularly those developed by Prof. Dr. Rifda Naufalin, S.P., M.Si, in detecting haram substances using AI methods such as Support Vector Machine (SVM) and Convolutional Neural Network (CNN) based on FTIR/NIR spectrum data.

2.2 Audience profile

This community service activity involved participants from various regions in Indonesia and abroad, demonstrating the reach and appeal of the topic. Some of the participants' origins included Yogyakarta, Cilegon, Maluku, West Sulawesi, and even from abroad, such as Japan. The total number of participants recorded in this activity reached approximately 150 people, who participated online through a video conference platform that could be accessed flexibly from various locations. This activity succeeded in attracting interest from various groups with very diverse backgrounds, including students, lecturers, researchers, food industry players, halal food technology observers, and members of the halal community at the national and international levels. The diversity of professions and regions of origin of the participants reflects that the issue of halal certification and the use of advanced technologies such as artificial intelligence (AI) in the halal detection process is a highly relevant and strategic global issue. This also shows that there is still a great need for education and knowledge transfer regarding scientific approaches to ensuring the halalness of a product, especially amid the increasing complexity of the modern food distribution chain. The participants were not only present as passive audiences, but also actively participated in discussions, Q&A sessions, and responses to the material, demonstrating a high level of enthusiasm for exploring the implementation of AI technology in the context of halal certification.

2.3 Activity stages

This community service activity was implemented through three main stages: pre-activity, implementation, and monitoring and evaluation. These three stages were designed to ensure that the community service process was systematic, measurable, and had a direct impact on increasing participants' knowledge. In the pre-activity stage, the committee began with publicity activities through various digital channels to reach potential participants from various backgrounds and regions. Media used included Instagram, Facebook, academic community WhatsApp groups, and the distribution of informative digital posters and flyers. Information regarding the time, theme, speakers, and registration link was widely disseminated to ensure maximum participant engagement. Registration was conducted online through an online form prepared by the committee. In the form, participants were also asked to complete a pre-test as part of an initial data collection effort to determine their level of understanding before the activity took place. The next stage was the implementation of the main activity, which was held in the form of a webinar on July 18, 2025. The main resource person for this activity was Prof. Dr. Rifda Naufalin, S.P., M.Si, an expert in the field of food technology and halal. The material presented in this session covered various important aspects, such as an introduction to the basic concepts of halal and haram from an Islamic perspective, identification of the main challenges in detecting non-halal ingredients, especially pork gelatin, which is often hidden in food products, and the use of artificial intelligence technology to support a fast and accurate halal detection system.

Further explanations were provided regarding the Support Vector Machine (SVM) and Convolutional Neural Network (CNN)-based analysis methods used to differentiate gelatin types based on Fourier Transform Infrared (FTIR) and Near Infrared (NIR) spectrum data. In addition to the main material, participants were also invited to participate in an interactive discussion session guided by a moderator, resulting in an exchange of ideas that enriched participants' understanding. All activities were documented in real time by the implementation team. Furthermore, in the monitoring and evaluation stage, the committee conducted an evaluation of the effectiveness of the activity by comparing the results of the pre-test and post-test. The evaluation was carried out by giving five multiple-choice questions that reflected the core material that had been presented. The questions covered participants' understanding of hidden non-halal ingredients, the benefits of AI in halal detection, the stages of the AI system, and gelatin classification methods. The evaluation results showed a significant increase in participants' understanding, both in terms of conceptual knowledge regarding halal and the

technical aspects of how AI works to scientifically detect haram substances. A rundown of the activities is shown in Table 1.

Table 1 Rundown

Activity	Time	PIC
Preparation	12.30 - 13.00 WIB	Committee
Welcome from the committee/person in charge	13.00 - 13.20 WIB	MC
Brief introduction of the speakers	13.20 - 13.40 WIB	MC
Speaker 1	13.40 - 14.00 WIB	Yudi Budianto,S.Kom
Speaker 2	14.00 - 14.20 WIB	Prof.Dr. Rifda Naufalin,SP.,Msi
Speaker 3	14.20 - 14.40 WIB	Dr.Eng. Wildan Panji Tresna, MT.
Speaker 4	14.40 - 15.00 WIB	Gehad Omara
Discussion or Q&A forum	15.00 - 15.20 WIB	Panitia
Closing	15.20 - 15.40 WIB	MC

3. RESULTS AND DISCUSSION

3.1 Preparation for the implementation of activities

Before the implementation of the main activity, the committee had made a series of preparations systematically to ensure the success of the event. This pre-activity stage begins with the publication of webinars through various digital channels, including social media such as Instagram, Facebook, and the academic community's WhatsApp groups. Digital posters and pamphlets containing complete information about the theme, speakers, time, and registration links were widely distributed to reach maximum participation. The registration process is carried out entirely online through an online form, in which a pre-test session has also been integrated. The collection of this pre-test data aims to determine the initial level of understanding of participants which will later be used as a benchmark to evaluate the effectiveness of the webinar.

3.2 Implementation of Activities

This community service activity was carried out in the form of an international webinar with the theme "AI Application for Halal Food Detection". The activity was held online through the Zoom platform on July 18, 2025, which was initiated by the Faculty of Computer Science, AMIKOM Purwokerto University. This webinar succeeded in attracting participation from various circles with a total of around 150 participants from various regions in Indonesia and even abroad. One of the speakers in this activity was Prof. Dr. Rifda Naufalin, S.P., M.Si, an expert in the field of food technology and halal. He presented material on the urgency of halal product assurance and the potential use of artificial intelligence for the detection of non-halal materials. The material presentation session by the main speakers was documented as seen in Figure 1.

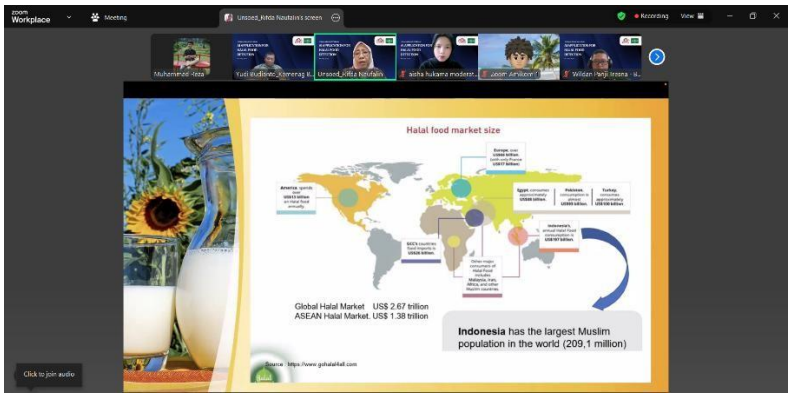


Figure 1 Documentation of the speaker's presentation session

After the presentation session, the activity continued with an interactive discussion and question and answer forum, guided by the moderator. The entire series of activities ended with the implementation of an evaluation in the form of a post-test to measure the improvement of participants' understanding.

3.3 Evaluation of Activity Results

The effectiveness of webinar activities was measured quantitatively by comparing the results of the pre-test filled out by participants before the event and the post-test completed after the event was completed. This evaluation aims to measure the impact of material delivery on the level of knowledge of participants. Overall, the results of the evaluation showed a positive increase in understanding. This is reflected in the increase in the average score of participants from 93.09 in the pre-test to 95.45 in the post-test. This improvement is visually illustrated in Figure 2.

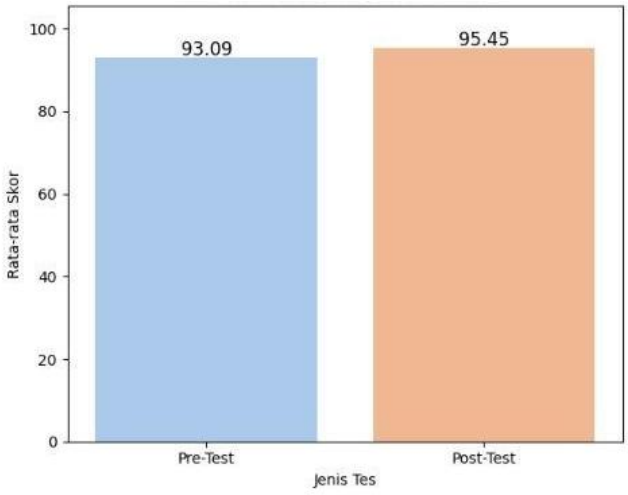


Figure 2 Average Pre-Test and Post-Test Scores

For a more in-depth analysis, the initial level of participants' understanding of five key questions sourced from Prof. Dr. Rifda Naufalin's material was identified. These five questions cover conceptual to technical aspects regarding halal detection using AI[13]. The results of the pre-test analysis from a total of 108 respondents are presented in Table 2.

Table 2 Pre-Test Answers to Questions Related to Resource Material

No	Questionnaire	Correct Answer	Number of Correct Answers	Correct presentation
1	Apa bahan yang sering menjadi tantangan dalam deteksi halal karena berasal dari hewan?	Gelatin	107 / 108	99,1%
2	Salah satu keuntungan penggunaan AI dalam deteksi halal adalah	Proses cepat dan akurat	94 / 108	87,0%
3	Dalam sistem AI untuk deteksi halal, tahapan pra-pemrosesan biasanya meliputi	Filter data, normalisasi, dan penghapusan noise	101 / 108	93,5%
4	Apa tujuan dari klasifikasi bahan dengan teknologi AI dalam konteks halal?	Menentukan status halal atau haram suatu bahan	103 / 108	95,4%
5	Salah satu metode AI yang digunakan untuk membedakan gelatin babi dan sapi adalah	CNN (Convolutional Neural Network)	77 / 108	71,3%

3.4 Discussion

The evaluation data provides some important insights. The high initial scores on common questions such as gelatin challenges (99.1%) and AI classification objectives (95.4%) indicate that participants already have a strong basic awareness of halal issues and the role of technology in general. However, the most prominent finding from the pre-test data is the knowledge gap on more technical aspects. The question about the specific method of AI, namely CNN (Convolutional Neural Network), was only understood by 71.3% of the participants. This figure is the lowest compared to other questions and indicates that participants' understanding is still limited to the general concept of AI, not to its technical implementation. This gap is the main focus of the material delivered by Prof. Dr. Rifda Naufalin. In his presentation, he specifically discussed an example of pig gelatin detection using the FTIR/NIR spectrum whose data is classified by machine learning methods such as SVM (Support Vector Machine) and CNN. He also emphasized that this method is able to distinguish gelatin from pork, cow, or fish sources with an accuracy rate of 90-98%. The increase in the average score on the post-test (Figure 2) strongly indicates that exposure to this detailed, case-study-based material successfully fills the knowledge gap. This webinar proved to not only refresh the general knowledge of the participants, but also be effective in transferring specific and in-depth technical knowledge. Thus, this service activity has succeeded in achieving its goal of increasing public literacy towards the use of advanced technology in the halal ecosystem.

4. CONCLUSION

The webinar activity "AI Application for Halal Food Detection" has been successfully carried out and proven to be effective in increasing the understanding of participants, which was measured through an increase in the average score from 93.09 in the pre-test session to 95.45 in the post-test session. In more depth, this training succeeded in bridging the knowledge gap of participants on technical aspects, especially regarding specific methods such as CNN (Convolutional Neural Network) for the detection of non-halal materials, which was previously the lowest area of understanding. Thus, it can be concluded that technology-based education like this is very relevant and strategic to build public literacy and trust in the halal product assurance system in the digital era.

ACKNOWLEDGMENTS

We would like to express our gratitude to the Faculty of Computer Science, AMIKOM Purwokerto University as the organizer, the speakers Prof. Dr. Rifda Naufalin, S.P., M.Si., Yudi Budianto, S.Kom, Dr.Eng. Wildan Panji Tresna, MT., and Gehad Omar, the entire organizing committee, and all participants for their support and active participation in making this international webinar "AI Application for Halal Food Detection" a success.

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