Artificial Intelligence in Marketing: Concerns and Solutions

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1 Introduction

Artificial intelligence (AI) is the intelligence of machines. It is a computer science and engineering field that is concerned with creating smart machines that are able to perform activities and tasks which need human intelligence to be performed. AI cannot be defined as a single technology as it includes different types of software and hardware associated with machine learning, natural language understanding and processing, and computer vision. An example of AI is in maps and navigation when AI guides car travelers on how to travel to a specific destination, where it uses machine learning to recognize roads and building numbers to direct the user with the correct direction. It can also detect any changes in the flow of traffic and recommend the best route to avoid congestion. Another example is the AI chatbots in customer services websites, where AI machines use algorithms to answer frequently asked questions by customers, receive orders, and track orders (Sabouret, 2020).

According to Ertel (2018), there are four types of AI. The first type is the reactive machines type, which is the most basic type that is not capable of using past experiences or memories for decision-making. This type, however, functions by reacting to received inputs with a programmed output. The second type is the limited memory type, which stores previous data and use it for decision-making. This type, however, cannot be implemented directly; it requires monitoring specific data over time. An example of that is when sensors are used for self-driving cars to collect data of traffic lights, traffic signals, people crossing the road, and other related data to make

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better decisions in driving the vehicle and prevent road accidents. The third type is the theory of mind type. In this AI type, machines are able to make decisions similar to humans by understanding the emotions of humans they interact with. However, this type is still under development as AI developers did not reach the stage where machines are able to make decisions exactly the same as humans because the machines are not able to fully understand the way humans are thinking. The fourth type is the self-awareness type. It involves self-aware machines that are aware of themselves and have the same human level of self-consciousness. This type is considered as the future of AI since self-aware machines are not available yet and experts are working on the development of such machines for the future.

AI is associated with the Internet of Things (IoT), which is the concept of connecting interrelated computing devices, electronic components, machines, objects, and living creatures with the Internet to communicate, interact, and perform automated functions in our daily lives. Both AI and IoT are considered as the backbone of Industry 4.0, which is the fourth industrial revolution. Industry 4.0 refers to the digitalization of manufacturing and the transformation to cyber-physical systems in the industry. It is associated with automation, remote monitoring, smart systems, cloud computing, cyber security, renewable energy, big data analytics, and artificial intelligence (Sergi et al., 2019). The idea of AI ignited in 1950 when Alan Turing published a paper on creating thinking machines (Turing, 1950). In 1956, the definition of AI was presented by John McCarthy. From 1956 to 1974 the natural language processing was developed, which provided with the ability of solving complex mathematical expressions and the ability of creating logics rules that can form sentences. It also initiated the gaming theory, which was previously used in developing computer games. In the 1980s, algorithms and logic rules were used to develop complex systems that can mimic human reasoning. From 1993 to 2009, the neural networks software was launched, which is capable of imitating the way humans are identifying complex patterns. After 2010, big data science and advanced machine learning were applied to mimic the way humans are categorizing simple patterns to complex patterns. Today, research is conducted to increase the productivity of AI technologies and reduce error. Researchers are exploring AI technology that can be used to create other AI technologies without human interference (National Institute of Justice, 2018).

1.1   Research Problem

AI is an effective tool to improve marketing as it is more efficient and less expensive than traditional marketing practices. AI can be used to collect data from customers and recommend relevant products based on the collected data. It can also be used for real-time customer services, sales forecasting, ad targeting, and improving personalization for customers. According to Jim (2017), AI has many benefits, such as availability, reducing errors, exploring hazardous, and the ability to handle multiple jobs simultaneously. However, using AI in marketing comes with some issues and

risks. The main problem associated with AI in marketing is the lack of privacy of the data collected from the customers. Unfortunately, AI can be used unethically, such as private data sharing and privacy leakage of sensitive data. Therefore, marketers should take the responsibility of researching the privacy issues and figuring out solutions to use marketing in an ethical way. This research uses a literature review to conclude the main privacy concerns and problems associated with AI in marketing and highlight the solutions that can be used to solve these issues.

1.2 Research Significance

This research explores the privacy concerns related to AI in marketing in order to figure out the best practices for ethical AI marketing. This research will benefit product-based and service-based organizations to improve their marketing practices. It will also benefit software developers to reduce privacy concerns in AI marketing. Last but not least, the research will benefit marketers to use marketing in an ethical way and increase the efficiency of their marketing by relying on automation instead of manpower, which saves time and money.

2 Literature Review

2.1 Applications of AI

According to Jia et al. (2019), AI can be applied to support our daily activities, such as agriculture, education, healthcare, gaming, social media, marketing, national defense, data security, finance, etc. Below are examples of these applications.

- Education: In traditional classrooms, teachers cannot figure out if the students are listening and understanding the lecture or not unless they monitor them and participate with them in the class. Therefore, AI has been utilized for classroom monitoring to ensure that all students are listening to the lecture. The technology uses face recognition and motion recognition to automate class monitoring. Moreover, speech recognition technology is used to monitor the lecturer and evaluate his/her teaching.
- Traffic: AI image recognition is used to control traffic lights. It can also collect real-time data from the vehicles and the roads, which can be used for self-driving cars. For example, it can collect data from sensors mounted on the roads and on other cars in order to command the car to drive in the most optimum route while preventing accidents.
- Intelligent society: The aim of the intelligent society is to provide high-quality services for society through AI. It is done mostly to reduce the risk of dangerous jobs or to save time in repetitive activities. The enhancement of smart societies is

continuing to grow by developing smart buildings, smart hospitals, automated factories, and robots for human activities and customer services.

- Social governance: In social governance, AI is used to develop smart courts and smart cities. A database can be built for smart courts to combine trials, case analysis, evidence collection, and legal documents. Moreover, AI machines are used for decision-making in social governance. For example, AI can be used to predict public requirements by continuously gathering data from the public through surveys. It can also be used for risk assessment and emergency response.
- Public security: The development of AI has promoted intelligent safety monitoring and control systems. AI safety and security products, such as face recognition security cameras and detection technologies, are being introduced in the market. Moreover, AI is implemented in food safety systems, and it is also used as a warning system for natural disasters.

According to Xiang et al. (2020), the demand for AI has increased in the medical sector. AI can be used for many applications in the medical sector, such as imaging, pathology, surgery, and other medical services. A study by Patra et al. (2021) demonstrated applications of AI that can be used to provide protection in the COVID-19 pandemic. The author suggests that AI can be used as a replacement for the polymerase chain reaction (PCR) swab test that requires sufficient manpower to meet the demand of patients. AI-based tools can be used for healthcare management in the pandemic. The AI technology of machine learning is combined with an advanced bio-computational methodology to precisely detect the diagnosis of COVID-19. It can also predict the spread of the disease and send warning notifications. Moreover, the research found that AI can also be used for the development of COVID-19 vaccines. By providing the machine with worldwide data related to the disease, it can provide proposals and suggestions for the vaccines.

2.2   AI in Marketing

According to Dilmaghani et al. (2019), AI in marketing is designed to collect data from customers as the input and develop an advanced marketing tool or technique based on the input. There are many methods to implement AI in marketing. The most commonly used method of AI in marketing is machine learning. In the machine learning method, algorithms and mathematical models of computer systems are used to achieve tasks without logic-based programming or human interference. The mathematical models are developed based on the collected data, which is also called in that case, the training data. The AI machine uses the training data to learn and improve from customer experiences. Consequently, the machine will be able to detect, predict, and make strategic marketing decisions.

According to Li et al. (2021), the application of AI has a positive impact on enterprise marketing. The implementation of AI can push accurate information on targeted customers and enhance customer interaction. Customers today do not

usually have enough time to browse products and services regularly. AI has the ability to understand their searching habits and most commonly used products to send relevant information. After the customer purchases a product, AI can enhance customer interaction by sending surveys to evaluate the level of customer satisfaction. AI has the ability to receive feedback from customers, analyze it, and process it much faster than the traditional marketing approach. To increase the efficiency of adopting AI in marketing, it is advised to combine it with the thinking of staff. This can significantly save time in the detailed planning of marketing activities, and it can be edited and modified by the staff. AI should also be used to manage the relationship between marketing and user needs. For example, using the function of closing unrelated or repeated marketing advertisements makes the marketing platform more convenient for users. Moreover, enterprises should improve the knowledge of their marketing staff in AI by providing them with proper training from experienced and qualified organizations.

A study by Lee (2021) examined changes in the marketing industry through the development of AI where marketing strategies are applied in order to meet market development in the future. One of these strategies is the development of the chatbot, which improves the communication with customers by relying on bots that are programmed to provide communication services for customers. By using the chatbots as a marketing tool, organizations can reduce manpower, save time, and save cost. AI has also improved customer services by allowing computers to study customers' behavior and analyze the current marketing strategies. This technology can customize ads for customers, learn from past behavior, and discover best marketing practices to implement in the future. Since using smart phone applications for advertising can significantly increase the revenues of a company, the demand for marketing purposes has increased, especially for Instagram application. On the other hand, some companies can utilize AI to improve search engine optimization and create the best and most relevant hashtags and pop-ups to easily target the customers. According to Park (2018), medical companies are implementing AI in marketing by collecting medical data such as drug purchases from their smart phone applications. Then they use machine learning to analyze the data and sell the data to medical insurance companies. This way they can understand customers' needs and target customers in different locations and different age groups.

According to Lai and Yu (2021), the development of AI has a major influence on the transformation from traditional media into digital media. The digital media changed the advertising industry, and it also changed the demand for communication talents in digital marketing and AI. For example, currently, there is more demand on communication talents with visualization ability in digital marketing, as marketers rely on tables, graphs, images, and videos, to present their products information. Another example is the demand for communication talents with the ability of scene construction in digital marketing. This ability is related to situational advertising, where interactive experience with users is added to the traditional instant attention. Scene construction is also implemented by converting static graphics into dynamic graphics to gather more of the customers' attention. The use of AI can support these talents in finding the best data and content. However, the

industries are facing difficulties in cultivating these talents. The main difficulties are the lack of training in AI and digital marketing, the lack of AI and digital marketing teaching equipment, and the lack of a dynamic measurement and evaluation system for the required talents. Therefore, the author suggests several strategies to cultivate these talents, including creating an experienced teaching team, creating a curriculum for AI in digital marketing, and building a training platform for AI and digital marketing courses and lectures.

Research by Eriksson et al. (2020) suggests that AI can be utilized as a tool for creating and formulating marketing strategies by replacing humans in the decision-making process. The research concludes that AI can create marketing strategies in two steps. The first step is searching and reviewing relevant data. The second step is the decision-making. The authors implied that AI could contribute to the rational process by identifying and analyzing the relevant data or by replacing managers in the final decision-making. In addition to the rational process, AI can also be used for creative thinking. Moreover, the authors recommend the process of communicating and coordinating between AI machines and company managers for future studies.

According to Arsenijevic and Jovic (2019), the use of AI in marketing significantly increases the opportunity for marketers by tracking customers' behavior and creating personalized products or services. The author interviewed marketers about AI, where 72% of them implied that the implementation of AI has a positive advantage in business and marketing. In order to obtain better results from AI, the authors recommend focusing on data collection as the most valuable element for a company to get better results from AI is the collected data. The more amount and quality of data a company collects, the better results it will get from AI. The authors also recommend chatbots as the most efficient AI tool, which is a computer software that implements automated tasks in the messaging platforms. These tasks include communicating with customers, understanding their questions and requests, and automatically responding to them. The authors found that the advantage of chatbots over other AI methods is that it is easy to implement, easy to use, and the provision of fast information. However, there is also a small probability that customers will get false information from chatbots, which is a problem that should be solved in the future.

2.3   Privacy Issues and Concerns in AI

According to Zhu et al. (2020), the main concerns of AI from the customers' perspective are the privacy and security problems, especially that AI relies on data collection and some of the data is personal and confidential. In that case, some companies prevented implementing AI in their marketing process in order to prevent privacy and security problems and obtain customers' trust. On the other hand, other companies are implementing AI while taking these problems into consideration in order to stay relevant and gain a competitive advantage in the market.

A study by Dilmaghani et al. (2019) summarizes machine learning of AI in marketing into four phases, where each phase can be a target of privacy attacks (see
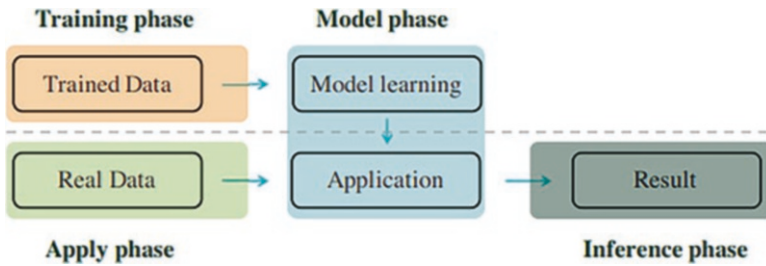
Fig. 1 Workflow of AI machine learning (Dilmaghani et al., 2019)

Fig. 1). The first phase is the training phase, where the collected data is transferred to the machine learning model in order to start the learning process. The privacy concern in the first phase is that the input data can be attacked and leaked when it is transmitted from the customer to the machine learning model. The second phase is the model phase, where a model is developed by the AI machine based on the trained data. Some attackers aim to target the trained data as it is more valuable. The third phase is the apply phase, where the new and untrained data is transferred to the training model. This phase can be penetrated by attackers where they can modify the output based on their needs. The fourth phase is the inference phase, which consists of the output of the machine learning model.

According to Dilmaghani et al. (2019), the following are the main privacy and security attacks of big data in AI.

- Data breach: This attack occurs when attackers obtain unauthorized access to personal and confidential data. Even though this attack is not limited to AI, it is a big threat to AI since it relies on big data to perform its operations. This type of attack can specifically occur in the training phase, the model phase, and the interference phase.
- Bias in data: If not used ethically, decision-making in AI can support injustice in the system. Bias in data specifically attacks the training phase because it is based on bias attitude toward an individual or a group, where the AI machine will learn this attitude and implement it in its operations. In simple terms, the injustice of humans will be learned and performed by AI machines.
- Data poisoning: This attack aims to sabotage and manipulate the training data in order to sabotage the output of the model. This attack can be used in marketing to suggest products that could harm an individual or a society.
- Model extraction: Sensitive and confidential data can be extracted from the machine learning model by reverse engineering, where another machine learning model can be created based on learning from how the inputs and outputs interact with each other. This newly created model can leak confidential data from the customers.
- Evasion: In this method, the system will not be able to detect the attacks toward the AI machine. This is done by tricking the system that it is not an attack and

classifying the attack as a non-threatening activity. Evasion occurs in the apply phase where the untrained data is transferred to the training model.

A research conducted by Sachdev (2020) studied security and privacy issues associated with AI in marketing. The following are the main privacy problems mentioned in the paper.

- Cloud-based AI models are suffering from a lack of privacy because the data collected from customers for marketing purposes is stored on a machine that is owned by another company or individual.
- If the device authentication is expansive and not used properly, the data that is collected from the customers will be at risk because more people will have access to it, especially since some of the data is personal, which is collected from the customers to provide them with personalized products.
- Privacy and confidentiality of customers' data can be compromised when AI machines are attacked by malicious software like ransomware.
- Data from sensors that are connected with AI and IoT can be leaked when one of the nodes in the control system is attacked.
- Availability of the marketing system is at risk when it is attacked by a Denial of Service (DoS) attack, which is a cyber-attack that intends to disrupt or limit access to specific websites or online applications.
- Social engineering can lead to privacy issues, where attackers can trick the customers into accessing their devices or accounts. Consequently, the attackers can steal their data and use it for offensive marketing aspects.
- Email spoofing is another security risk where the customer is not able to differentiate between real or fake marketing notifications. Fake email notifications can lead to customers losing their money to fake accounts or leaking some of their private data.

2.4   Suggested Solutions to Solve AI-Related Privacy Problems

A study by Zhu et al. (2020) suggests a mathematical model called differential privacy as a solution to the privacy problems in AI. Differential privacy works on the principle of measuring data leakage from the AI machines and figuring out a solution to prevent it from happening in the future. The study concluded that differential privacy can be beneficial especially in machine learning and multi-agent learning. However, it should be also implemented in other AI methodologies, such as robotics, natural language processing, etc.

According to Dilmaghani et al. (2019), the following table summarizes the main solutions that can be used to defend the privacy and security attacks of big data in AI, which were explained in Sect. 2.3 (Table 1).

A research conducted by Sachdev (2020) suggests the following as a solution for security and privacy issues associated with AI in marketing.

Table 1 Summary of privacy and security attacks on big data in AI and the solutions to defend these attacks

Attack	Solution
Data breach	Data privacy protection techniques were developed to maximize data protection by encrypting sensitive data so that the attackers are not able to identify and differentiate between the records in different datasets
Bias in data	This attack is defended by identifying the bias metrics in the model and mitigating the biases by machine learning of fair representation. Moreover, bias in data can be mitigated by developing tools that can identify biases in the machine learning model and removing them from the system
Data poisoning	To defend against data poisoning attacks, the poisoned data is detected by anomaly detection, which is designed to identify data points and observations that are deviating from the normal behavior, which may be caused by a data poisoning attack
Model extraction	To defend the machine from model extraction, the learning model should be protected. This is mostly done by training each part of the model individually so that the attacker will not be able to extract all modes at the same time
Evasion	Defending against evasion attacks is done by developing a program that can be used to ensure that any small changes in the input cannot significantly change the output. Hence the system will still be able to detect attacks

- Governments should formulate rules and regulations to ensure the proper and ethical use of AI in marketing, especially that AI is rapidly growing in the market.
- To prevent the risk associated with cloud-based AI models, edge AI can be used instead, which processes the AI algorithms on a local hardware device instead of connecting to the Internet or the cloud.
- The use of recommender systems can mitigate the risk. In recommender systems, marketers can develop algorithms to provide advertising recommendations based on product features and customers' interests, while keeping the customers' data local to ensure privacy.
- Privacy problems can be mitigated by isolating the sensitive data only. This can be done by keeping most of the customers' data on the cloud except for the confidential data; it should be isolated from the cloud.
- Marketers should make sure that all the software that are interacting with AI devices are secure. Marketers can use a system security manager, which can defend the software and the data from security threats and alert the cyber security engineers.
- Authentication methods such as face recognition or fingerprints can be used so that no one can access the device or account except for the individual customer.
- Marketing firms should limit the access of customers' data and allow only specific employees to access it.
- AI service providers should provide privacy-related training for marketers and customers that deal with AI in marketing.
- AI marketers should obtain consent from customers to use their data for marketing purposes. AI marketers should also obtain consent from the customers to automate their data for AI marketing. By obtaining consent from the user, AI marketing firms can reduce or prevent marketing-related privacy violations.

2.5   Literature Summary

AI machines can be used to automate our daily traditional and non-traditional tasks, including education, traffic, public security, social governance, and building smart societies. Moreover, AI had a positive outcome after implementing it in healthcare. It can be used for many applications in the medical sector, such as imaging, pathology, surgery, and other medical services. Furthermore, the spread of the coronavirus required researchers to study the possibility of using AI to support healthcare employees in the pandemic. The success of AI in many sectors encouraged marketers to use it in marketing. AI can be used to replace humans in decision-making processes in marketing by searching and reviewing the relevant data and then making decisions based on the collected data. The most commonly used method in AI in marketing is the machine learning method, which is used to build a mathematical model that collects data from customers and uses it to make strategic marketing decisions. Another method is the chatbot, which relies on bots to communicate with customers, answer their questions, and solve their problems. Moreover, AI can be used to improve marketing in websites and smartphones by improving search engine optimization and recommending relevant hashtags to easily target the customers.

Since AI depends on data collected from customers, the main problem that is facing AI is that customers are concerned about their privacy and security. The main attacks on big data in AI are data breaches, data poisoning, bias in data, model extraction, and evasion. Several companies prevented using AI and relied on the traditional way for marketing. However, other companies used AI to support them in their marketing and other human intelligence functions in order to gain a competitive advantage, while taking the privacy and security problems into consideration. To solve the privacy and security problems in AI, researchers suggested several solutions, including formulating rules and regulations by governments to ensure that AI is used ethically, keeping the customers' data local while advertising, isolating the confidential data only from the cloud, ensuring that all software interacting with AI are secure, using authentication methods, and limiting access for customers confidential data for certain employees only.

3   Conclusion

AI is a new technology that allows machines to perform activities that require human intelligence. It includes different types of software and hardware that are associated with machine learning. AI has been used in marketing to replace the less efficient and more expensive traditional marketing methods. However, with all the advantages associated with implementing AI in marketing, some privacy risks should be considered in order to ensure that AI is implemented in an ethical way. This paper studied the applications of AI, the implementation of AI in marketing, privacy issues and concerns in AI, and suggested solutions to solve AI-related

privacy problems. AI can be used in many applications to assist us in our daily activities, including education, traffic, intelligent society, social governance, and public security. AI has also been implemented in the medical sector. It can assist medical staff in imaging, pathology, and surgery. Moreover, AI can be utilized to support medical staff in the COVID-19 pandemic. It can be used to reduce manpower for the PCR swab test, and it can be used for general healthcare management during the pandemic. The advanced bio-computational methodology is combined with AI machine learning to detect the diagnosis of the coronavirus and send notifications and warnings to prevent the spread of the virus. Moreover, AI can collect global data of the virus and provide suggestions for developing coronavirus vaccines.

The success of AI in many fields encouraged marketers to use it as a replacement for traditional marketing methods. Marketers are working with software developers to use machine learning algorithms and mathematical models in order to build advanced marketing tools and strategies based on data collected from customers. By gathering data on searching habits and purchases of customers, marketers use AI to target customers and enhance customer interaction based on the input data. However, to increase the efficiency of implementing AI in marketing, it is advised to combine it with the thinking of staff, which can save time in planning marketing activities, and it can be modified and updated by the staff in the future instead of creating a new marketing plan from scratch. One of the most successful AI in marketing applications is the chatbot, which uses bots that are programmed to provide communication services with customers. Another successful application is utilizing AI to improve search engine optimization for social media marketing, where it can recommend the best hashtags or pop-ups to easily target relevant customers.

The development of AI had a major influence on the transformation from the traditional media into the digital media, as AI can be utilized as a tool for creating and formulating marketing strategies by replacing humans in the decision-making process. AI can create marketing strategies in two steps. The first step is searching and reviewing relevant data, and the second step is the decision-making step. Furthermore, AI can contribute to the creative thinking and rational process by identifying and analyzing the relevant data as it can replace the managers' final decision-making. In order to get better results from AI, it is suggested to focus more on data collection as the results depend on the quality and relevance of the collected data.

The implementation of AI in marketing has many advantages, such as availability, reducing errors, reducing manpower, saving time, using more advanced technologies, and the ability to handle multiple jobs simultaneously. On the other hand, there are disadvantages and concerns associated with implementing AI in marketing. The main disadvantage is that it suffers from some privacy and security issues. Since AI focuses on the collection of big data, there is a risk of the data being attacked. The main privacy and security attacks of big data in AI are data breaches, bias in data, data poisoning, model extraction, and evasion. Furthermore, AI in marketing is facing other privacy and security problems, such as leakage of data from cloud-based AI models, attacks from malicious software, denial of service attacks, social engineering, and email spoofing.

4   Recommendations

Based on the literature review, the following recommendations are to prevent privacy and security problems of AI in marketing.

1. Developing data privacy protection techniques to encrypt sensitive data and prevent data breaches.
2. Identifying the bias metrics in the model and mitigating the biases by machine learning of fair representation to prevent bias in data.
3. Using anomaly detection to detect and prevent poisoned data.
4. Protecting the AI learning models to prevent model extraction.
5. Developing a program that can be used to ensure that any small changes in the input cannot significantly change the output to defend against evasion attacks.
6. Formulating governmental rules and regulations to ensure the proper and ethical use of AI in marketing.
7. Replacing cloud-based AI with edge AI, which is more secure.
8. Isolating the sensitive data only from the AI model to mitigate data privacy problems.
9. Ensuring that all software interacting with AI are secure.
10. Using authentication methods such as face recognition or fingerprints to maximize data security.
11. Limiting the access of customers' data and allowing only specific employees to access it.
12. Providing privacy-related training for marketers and customers that deal with AI in marketing.

5   Study Limitations and Future Studies

To make the study more accurate, data privacy protection techniques and edge AI should be tested at a large scale. Data privacy rules and regulations are not up to date in many countries making it difficult to implement ethical AI in marketing. It is recommended to study the total cost of implementing AI in marketing and compare it to the return on investment while taking maintenance and operational cost into consideration. Also, to study the development of anti-virus software that is concerned with protecting AI systems from data leakage and malicious attacks. New protocols and standards for AI in marketing are to be considered in order to increase reliability and transparency and prevent security problems.

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