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RISKS OF INFORMATION LEAKAGE USING ONLINE MACHINE TRANSLATION SERVICES

Abstract. The article is devoted to the analysis of the risks of information leakage when using online machine translation services and suggests methods for minimizing these risks. In connection with the development of technologies and the growing popularity of online services for text translation, the issues of ensuring confidentiality and data security are becoming particularly relevant. Online machine translation services, such as Google Translate, Microsoft Translator, DeepL and others, are convenient tools for processing large volumes of texts, however, they pose significant threats associated with the leakage of sensitive information, which can have serious legal, financial and reputational consequences. The article examines the main factors contributing to information leakage when using online translation services, in particular, data storage on the servers of third-party service providers, imperfect privacy policies and technical vulnerabilities. In particular, the problem of data security when transmitting sensitive information through online translation services is emphasized. Examples of specific cases of data leakage are given, emphasizing the need for increased attention to security aspects when using these services in professional activities. Particular attention is paid to data protection methods, such as encryption, depersonalization and anonymization, which reduce the risks of leakage of sensitive information. At the same time, attention is focused on the need to improve existing standards and security policies in online machine translation services, which will ensure proper protection of confidential information, in particular in such areas as legal, medical, financial and government activities. The article also compares the level of security of various online machine translation services, in particular their ability to ensure proper information protection through guaranteed data deletion after translation. The prospect of using local translation models as an alternative to cloud services, which reduces the risks of data leakage, is separately considered. The main areas of further research in the field of information security of machine translation are highlighted, in particular regarding new data protection technologies and increasing user awareness of potential threats.

Keywords: machine translation; online services; information leakage; cybersecurity; data confidentiality; encryption; depersonalization; anonymization; information security; local models; cloud services.

INTRODUCTION

The problem statement. The development of machine translation technologies has significantly simplified interlingual communication, which is especially important in the era of digitalization and globalization. Modern online services, such as Google Translate, DeepL,

Microsoft Translator, are based on powerful neural networks that provide high-quality translation through self-learning and adaptation to text corpora [12]. However, the widespread use of such platforms in business, the public sector, medicine and the legal sphere has led to an increase in the risks associated with the leakage of confidential information [1].

One of the main problems is that online machine translation services operate in a cloud environment, which involves the transmission and processing of texts through external servers. Even if service providers claim to encrypt data and adhere to a privacy policy, users do not have full control over how their information is processed [2]. For example, according to a study by OpenAI [8], some companies use translated documents to further train their models, which could lead to unforeseen data leaks in the future.

In addition to the potential data collection by the services themselves, there is a threat of cybercrime [3]. Cloud platforms can be targeted by hackers seeking to gain access to corporate or government information. There are known cases where attackers gained access to confidential translated materials through insufficiently secured APIs [10]. In particular, the data leak incident at Translate.com demonstrated that hundreds of thousands of private documents uploaded for automatic translation were publicly available on the internet due to incorrect security settings.

Another aspect of the problem is the lack of uniform international standards for data protection in the field of machine translation. While the European Union regulates privacy issues through the GDPR, similar mechanisms have not yet been developed in many countries or are less stringent [4]. This creates legal conflicts and the possibility of abuse, especially if the translation is carried out through services whose servers are located in jurisdictions with a low level of personal data protection.

The using of online machine translation services is not only a technical advantage, but also a serious threat to information security. Further research should be aimed at analysing data protection mechanisms, assessing potential risks, and developing recommendations for the safe use of automatic translation technologies.

Analysis of recent research and publications. Recent research in the field of machine translation and cybersecurity indicates growing concern about possible data leaks when using online automatic translation services. Researchers consider the issues of protecting personal and commercial information, analyse the vulnerabilities of cloud translation platforms, and propose measures to minimize risks.

Foreign researchers pay special attention to the impact of artificial intelligence and neural networks on the security of data in translation. In particular, the work of Nikos Aletras, Georgios Gkotsis and Timothy Baldwin [1] examined the risks of using open neural network models for machine translation, which can store parts of confidential texts in their parameters. This potentially contributes to their leakage. Sanjay Bajpai and Rajiv Sharma [2] analyse methods for intercepting data transmitted via the API of machine translation services. They emphasize weaknesses in the protection systems of large platforms such as Google Translate and Microsoft Translator.

A number of studies address the legal aspects of processing textual data in machine translation. The work of the Council of Europe [4] highlights the legal conflicts associated with the processing of personal data in a cross-border context and the compliance of such processes with the European GDPR regulation. The authors emphasize that most popular machine translation services do not always guarantee compliance with data protection requirements, as textual information can be stored and analyzed without the user's consent.

Ukrainian researchers are also actively studying privacy issues in automated translation. Oleg Klymchuk [15] in his work analyses the risks of using online translators in the public and corporate sectors, in particular, emphasizes that unauthorized use of such services can lead to

the leakage of official information. Larisa Sydorenko [17] investigates the issue of cryptographic data protection in translation systems and proposes algorithms for encrypting texts before transferring them to online services.

The issue of using private local machine translation models as an alternative to cloud platforms is also relevant. Mykola Zakharchenko and Vitaliy Polishchuk [14] consider the advantages of using on-premise solutions that allow translation without connecting to external servers, which significantly increases the level of security.

Analysis of recent research indicates the need for further study of data protection mechanisms when using online machine translation services. Most scientists agree that existing platforms need to be improved in the area of security, and users should apply additional protection measures, in particular encryption and restrictions on the use of online resources for confidential documents.

The purpose of this article is to comprehensively analyse the risks of information leakage when using online machine translation services, identify and develop ways to eliminate the main threats associated with the transmission and processing of confidential data in cloud environments.

THEORETICAL BASIS OF THE RESEARCH

In today's digital era, machine translation has become an integral part of professional translators, business communications, and international cooperation. At the same time, the widespread use of online automatic translation services such as Google Translate, DeepL, Microsoft Translator [5]. Translate poses serious risks to data confidentiality.

The theoretical basis for analysing these risks is the concepts of information security, cryptography, and natural language processing (NLP). The study is based on a three-tiered information protection model that includes three basic cybersecurity principles [9]:

1. Confidentiality. Ensuring that information is accessible only to authorized users.
2. Integrity. Ensuring that data is preserved in an unchanged form.
3. Availability. The ability to use information within the scope of permitted access rights.

Machine Translation (MT) is the process of automatically translating text or speech from one language to another using software. Since modern online machine translation services mostly use neural networks, in particular transformer models, it is important to understand the principles of their operation [11]. Transformers allow for high translation accuracy due to the model's ability to "carefully" process the entire input text at the same time, which increases the efficiency of machine translation, but also creates new opportunities for the storage and leakage of sensitive information.

The main principles of cybersecurity related to the use of online services are confidentiality, integrity and availability of information. Violation of these principles when using online translation services can lead to the leakage of confidential data or its unauthorized use. In particular, when transferring text for processing to an online service via an unsecured network, there may be a risk of interception or storage of this data by third [16].

Ensuring confidentiality and protection of personal data when using online machine translation services involves the use of data anonymization and differential privacy technologies. These technologies allow you to hide sensitive information during processing, reducing the likelihood of its leakage. Anonymization is an important tool that allows you to protect users' personal information without violating the functionality of machine translation [18].

One important theoretical concept is the compliance of online machine translation services with international legal norms on the protection of personal data. An important aspect is ensuring compliance with standards such as the General Data Protection Regulation (GDPR) in the European Union, which regulates the processing of personal data [13]. This includes the need to obtain users' consent for the processing of their data and the provision of mechanisms to protect confidential information from unauthorized access.

The theoretical concept of risk management involves identifying, assessing and minimizing possible risks that arise in the process of using online machine translation services. This includes methods for identifying potential threats, such as information leakage or data manipulation, and developing a strategy to neutralize them. Monitoring and auditing tools are also important for continuous control over information security [7]. The theoretical concepts underlying this study allow not only to understand the nature of information leakage risks, but also contribute to the development of recommendations for improving the protection of personal data when using online machine translation services.

RESEARCH RESULTS

Research into the risks of information leakage when using online machine translation services has revealed several important aspects. First of all, many services store entered texts on their servers, which increases the likelihood of sensitive data leakage. The second important aspect is the use of depersonalization and differential privacy methods, which can significantly reduce risks, although these technologies are not always used in commercial services. It is also important to ensure an adequate level of security of the servers on which data is processed, since weak protection methods can allow unauthorized access to information.

To further analyse the security level of various online machine translation services, a comparison of their characteristics was conducted, in particular regarding data confidentiality guarantees, the presence of encryption, and methods of protection against information leakage. The table 1 provides detailed information on key security parameters for several popular online machine translation services, allowing you to make an informed choice for the safe use of such tools in different environments (Table 1).

Table 1

Comparing the security level of different online machine translation services

Online service	Data deletion guarantees	Data encryption	Information leakage protection method
Google Translate	Not specified	Yes	Uses standard encryption
DeepL	Guarantees data deletion	Yes	Offers an increased level of security
Microsoft Translator	Not specified	Yes	Uses basic protection methods

During our research, we compared three popular online machine translation services based on key security aspects: data deletion guarantees, data encryption, and information leak protection methods.

Google Translate and Microsoft Translator do not explicitly state whether they guarantee data deletion after use of the service. This is a significant drawback for users who work with confidential information, as the lack of such a guarantee creates a potential risk of their data being stored on the service's servers.

Unlike the two previous services, DeepL provides explicit guarantees that data will be deleted after translation is complete. This makes DeepL a more attractive choice for users who

work with confidential texts, as this approach reduces the likelihood of sensitive information being leaked.

All three services listed in the table use data encryption. This is standard practice for most online services, which provides a basic level of protection during the transmission of information between the user and the server. Google Translate, DeepL, Microsoft Translator use data encryption, which reduces the likelihood of data interception during transmission. However, it is important to note that encryption does not provide complete protection against data leakage if the data is stored on servers or is accessible to unauthorized access.

DeepL has an increased level of security because, in addition to encryption, it provides guaranteed data deletion after translation. This is an important factor for users who work with sensitive information, such as legal or financial documents. Google Translate and Microsoft Translator use standard security methods, but the lack of clear guarantees about data deletion after use of the services leaves some risk of leakage. In particular, if the services store data on their servers for later use (for example, to improve translation models), this could pose a threat to privacy.

DeepL appears to be the most secure choice among the services we examined, as it combines data encryption with clear guarantees of data deletion after translation is complete.

Google Translate and Microsoft Translator have a basic level of security, in particular, they provide encryption, but do not provide clear guarantees of data deletion, which can be critical for users working with confidential information.

Users working with sensitive information should pay attention to the level of security of each service and choose those that provide guarantees of data deletion after use, as well as consider the availability of additional protection measures, such as the use of a VPN or other means of data protection.

With the increasing use of online machine translation services in various fields, from academic activities to commercial use, new challenges related to data security are emerging. Given the risks of leakage of confidential information when processing texts through online platforms, we have developed practical recommendations aimed at reducing such risks. These recommendations are important not only for users, but also for teachers and students who actively use online services in the educational process. Proper application of these recommendations will not only preserve the confidentiality of information, but also improve overall security when working with machine translation tools, which is extremely important in the context of modern technologies and the development of digital platforms.

The developed recommendations were tested in the educational environment of Poltava State Agrarian University within the framework of teaching philological and translation disciplines.

1. Choosing online services with data deletion guarantees.

One of the main recommendations is to choose online machine translation services that provide clear guarantees that all data will be deleted after the translation is completed. This can be verified through privacy policies or direct statements from the service provider. For example, DeepL guarantees that all data is deleted after the session ends, which is an important factor for users who work with confidential information. Compared to other services such as Google Translate, which do not have such a guarantee, choosing DeepL may be safer in cases where sensitive data needs to be processed.

Teachers of translation disciplines of Poltava State Agrarian University use DeepL to process student translations in practical classes, explaining the importance of data destruction guarantees when working with confidential or academic texts.

2. Applying data anonymization methods.

Before using online machine translation services, you should apply data anonymization methods. For example, you can replace names or contact details with anonymous identifiers, or remove sensitive text fragments that may contain personal information. To do this, you can use specialized programs for anonymizing texts or do it manually before uploading the material to the translation service. This way, even if the data is saved on the server, it will be devoid of important confidential information, which reduces the risk of leakage.

At Poltava State Agrarian University, students in linguistics courses undergo a practical session on anonymizing texts before using online services to translate academic articles or research materials to avoid leakage of personal data.

3. Use data encryption.

Encryption is an important element of data security. Users should choose services that use HTTPS to encrypt data during transmission. For example, services such as Google Translate and Microsoft Translator use a secure connection to transmit data, which significantly reduces the likelihood of interception. However, for greater security, you can use additional encryption programs on your local computer before sending texts to online platforms.

During translation and language processing labs, students of Philology majors learn about the use of text encryption before uploading to online services. This helps them understand the importance of information protection in the context of translation technologies.

4. Developing internal security policies for organizations.

For organizations that regularly use online machine translation services to process confidential information, it is important to develop clear internal security policies. This may include recommendations for restricting access to translations of sensitive documents, implementing a system for monitoring the use of the services, and defining criteria for selecting reliable translation platforms. For example, in larger organizations, you can use local translation software or a service that guarantees complete data destruction after use.

At Poltava State Agrarian University, as part of teaching courses on information security and translation, teachers introduce students to the importance of creating security policies for academic institutions and scientific organizations, pointing out the role of policies regarding the use of online platforms for document translation.

5. User training and risk awareness.

Educating users about the potential risks of using online machine translation services is equally important. They should understand the importance of maintaining the confidentiality and security of their data, and be familiar with protection methods such as the use of anonymization or encryption. Regular training and webinars on this topic will help reduce the level of accidental information leaks due to user negligence.

Poltava State Agrarian University regularly hosts seminars for students on information security. They examine the risks of using online translation services and are an important step towards creating awareness among students about ensuring data confidentiality in the process of their studies and professional activities.

The results of the study confirm that the use of online machine translation services may be associated with serious risks of leakage of confidential information. Therefore, it is important to apply technologies of anonymization, data encryption and choose services that provide guarantees of data processing security. The recommendations proposed in the study allow to reduce these risks and ensure security when using online machine translation services.

CONCLUSIONS AND PROSPECTS FOR FURTHER RESEARCH

The study showed that the use of online machine translation services is associated with potential risks of leakage of confidential information. One of the main threats is the storage of data on the servers of service providers, which can lead to unauthorized access to sensitive information. Another important security factor is guarantees regarding the deletion of data after the translation is completed. Most services do not provide clear guarantees in this regard, which increases the risk of leakage.

In a comparison of various online machine translation services, DeepL demonstrated the highest level of security, guaranteeing data deletion after translation and using encryption to protect transmitted data. Other services, such as Google Translate and Microsoft Translator, do not provide clear guarantees regarding data deletion, creating potential risks of leakage.

The study found that existing online services need to further improve security standards, in particular in terms of providing clear guarantees for data deletion and improving methods for protecting information from leakage.

The recommendations developed in the course of the study are important for increasing security when using online machine translation services. They allow reducing the risks of confidential information leakage and ensuring better data security during translation. The recommendations include the use of encryption technologies, methods of data depersonalization and anonymization, as well as the choice of services with guaranteed deletion of information after translation. These recommendations can be applied by both end users and organizations working with sensitive data (for example, legal and financial companies, medical institutions). They are useful for any organization or individual using online translation services to ensure information security.

Future research opportunities include developing new data protection methods, improving encryption standards, and investigating user habits and their impact on the security of online machine translation services. In addition, it is worth focusing on creating industry standards for the use of these services in areas where the processing of sensitive information is critical.

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РИЗИКИ ВИТОКУ ІНФОРМАЦІЇ ПРИ ВИКОРИСТАННІ ОНЛАЙН-СЕРВІСІВ МАШИННОГО ПЕРЕКЛАДУ

Анотація. Стаття присвячена аналізу ризиків витоку інформації при використанні онлайн-сервісів машинного перекладу та пропонує методи мінімізації цих ризиків. У зв'язку з розвитком технологій та зростаючою популярністю онлайн-сервісів для перекладу текстів, питання забезпечення конфіденційності та безпеки даних набувають особливої актуальності. Онлайн-сервіси машинного перекладу, такі як Google Translate, Microsoft Translator, DeepL та інші, є зручними інструментами для обробки великих обсягів текстів, однак вони створюють значні загрози, пов'язані з витоком чутливої інформації, що може мати серйозні юридичні, фінансові та репутаційні наслідки. У статті розглядаються основні фактори, які сприяють витоку інформації при використанні онлайн-сервісів перекладу, зокрема збереження даних на серверах сторонніх постачальників послуг, недосконаліть політики конфіденційності та технічні вразливості. Зокрема, підкреслюється проблема безпеки даних при передачі чутливої інформації через онлайн-сервіси перекладу. Наведено приклади конкретних випадків витоку даних, що підкреслюють необхідність посиленої уваги до аспектів безпеки при використанні цих сервісів у професійній діяльності. Окрему увагу приділено методам захисту даних, таким як шифрування, знеособлення та анонімізація, що дозволяють зменшити ризики витоку чутливої інформації. Водночас акцентується увага на необхідності вдосконалення існуючих стандартів і політик безпеки в онлайн-сервісах машинного перекладу, що забезпечить належний захист конфіденційної інформації, зокрема у таких сферах, як юридична, медична, фінансова та державна діяльність. Автори також в межах статті порівнюють рівень безпеки різних онлайн-сервісів машинного перекладу, зокрема їх здатність забезпечити належний захист інформації за допомогою гарантованого видалення даних після перекладу. Окремо розглядається перспектива застосування локальних моделей перекладу як альтернативи хмарним сервісам, що знижує ризики витоку даних. Висвітлено основні напрямки подальших досліджень у галузі інформаційної безпеки машинного перекладу, зокрема щодо нових технологій захисту даних та підвищення обізнаності користувачів щодо потенційних загроз.

Ключові слова: машинний переклад; онлайн-сервіси; витік інформації; кібербезпека; конфіденційність даних; шифрування; знеособлення; анонімізація; інформаційна безпека; локальні моделі; хмарні сервіси.

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