

different encrypted messages, this information can make it possible for the attacker to ascertain the target's private key.

Most implementations of RSA avoid this attack by adding a one-off value during the encryption process, which removes this correlation. This process is called cryptographic blinding.[2]

Conclusion. The thing about RSA is that for a long period of time it will still remain reliable cryptographic algorithm. Good news is that RSA is considered safe to use, despite these possible attacks. The caveat is that it needs to be implemented correctly and use a key that falls within the correct parameters. As we have just discussed, implementations that don't use padding, use inadequately sized primes or have other vulnerabilities can not be considered safe. If you want to use RSA encryption, make sure that you are using a key of at least 1024 bits or more. As long as you are conscious of the weaknesses that RSA has and use it correctly, you should feel safe to use RSA for key sharing and other similar tasks that require public key encryption.

REFERENCES

1. RSA cryptosystem Wikipedia: [https://en.wikipedia.org/wiki/RSA \(cryptosystem\)](https://en.wikipedia.org/wiki/RSA_(cryptosystem)).
2. What is RSA encryption and how does it work? By Josh Lake:<https://www.comparitech.com/blog/information-security/>.
3. RSA algorithm (Rivest-Shamir-Adleman). By Margaret Rouse: <https://searchsecurity.techtarget.com/definition/RSA>.
4. Етапи створення і розвитку асиметричних криптоперетворень: <https://studfiles.net/preview/3026228>.

² **Bosyi A., Simkiv O., Savchenko N.**

¹ *Vasyl Stefanyk Precarpathian National University, Ivano-Frankivsk, Ukraine*

² *MindCraft, Lviv, Ukraine*

team@mindcraft.ai

ARTIFICIAL INTELLIGENCE IN E-COMMERCE

This paper outlines the possible ways of how e-commerce businesses, both the existing and the new ones, can benefit from artificial intelligence.

Keywords: *artificial intelligence, data science, machine learning, chatbot, smart product recommendation, intelligent searches, warehouse automation, post-sale support, automated inventory management, AI-based sales forecasting, pricing optimization, analytics.*

It is important to point out that this paper is only a summary of basic capabilities of AI in e-commerce. We created it to give a better understanding of what data science can do for your business, and how it is already applied by companies in industry.

Chatbots

Many online-stores have proven that chatbots can significantly boost the customer experience, providing round-the-clock support, some level of customization and lower expenses.

On the downside, most of the chatbots that are currently in use, are based on a decision-tree logic, often limiting their intelligence to simple generic answers. But conversations with customers rarely go the way you thought they would. And when a customer breaks the pattern, such chatbots don't have the needed answers.

This is exactly the kind of problem that deep learning and natural language processing can solve. Chatbots programmed with the help of data science can learn and evolve over time, providing deeper, insightful responses and more human-like conversations. With the ability to learn, chatbots can not only sound more realistic, but they can also find out more about your users and their real needs and be able to generate highly-targeted offers and recommendations.

Smart Product Recommendations

AI engines are the fastest known way to process customer data. Unlike any human, they are thorough, tireless and can process large volumes of data in relatively little time.

When connected to the e-commerce portal, AI engines can collect and analyze data about the customer behavior, helping to better shape the customer journey, detect weak spots, spot patterns and predict tendencies.

By means of analyzing the customer's preferences, browsing habits, buying history and current searches, artificial intelligence can make smart recommendations tailored to

every specific customer. This personalized approach combined with improved customer experience results in better conversion and retention rates. Customers will want to return to the site for more purchases, because they will know there is what they need, thus bringing more sales, more revenue, and faster inventory turnover.

The insights such an engine will generate about customers will help make smarter data-backed strategic decisions, improve communications, better target ad and email campaigns.

Intelligent Searches

In offline stores interaction with customers is a key. A good sales assistant will talk to the customers, and relying on their needs and his experience, will suggest where to look for things customers are searching for. Even when they are not sure what those might be. What if online-stores could do the same, and do it with thousands of customers requiring minimum manual input?

AI engines are constantly learning and gaining their own experience to rely on while making suggestions to customers. Using lessons learned from the previous customers, AI systems make offers that reflect not only the existing needs but also the predicted ones. Personalized search results help take care of your online buyers, maximize sales, improve the website SEO and bring the customer profiling in marketing and upsales to a totally new level.

Warehouse Automation

Labor expenses constitute up to 70% of warehouse maintenance costs. Self-taught machines can help automate many repetitive operations, tirelessly work 24/7 and learn to be precise and accurate, relieving the strain on large enterprises.

Retailers now don't have to manually evaluate the financial data, AI can calculate how to organize purchasing in the most efficient way or how to choose the special offer from providers that business will benefit from the most [1].

Post-Sale Support

The sales process does not stop after one purchase. Customers who have already bought something from you once and were satisfied should be nurtured and encouraged to come back. Customers, who were not satisfied, should not have their complaints unanswered. And unless you have only a few customers and a team of account managers to handle them, the load of work is quite tangible. Especially when all the customer relationship personnel is more focused on gaining new clients. So why not entrust the task to an AI-powered system?

Nowadays it is possible to keep track of all customers, set up automatic follow-ups, teach the system to process and respond to complaints, handle refunds, returns, and warranty claims. Moreover, it is possible to automatically send special offers customized

to the customers you already know, and generate limited-time offers to drive more sales, while also staying in touch with the existing customers.

Automated Inventory Management

Inventory management is one of the aspects of e-commerce that can easily be automated with the help of AI. After collecting data from cameras and sensors, databases, previous, current and estimated sales, AI systems can automatically detect and fill shortages, identify and predict customer demand and items sitting idle.

Modern technology can go even further than that and analyze external factors that will influence the processes, such as weather conditions that can delay deliveries, changes in the market demand, or economic changes, that might affect the sales.

AI-Based Sales Forecasting

Forecasting is something that machine learning and artificial intelligence technologies totally shine at, as no human would ever be able to process the equal volume of big data and still be able to spot indicators and tendencies.

The AI engine, on the other hand, can be trained to make conclusions based even on multiple sources of information. And it is not only about seasonal changes, but it is also the data about previous sales, information about competitors, the general customer search trends and big changes in economics and society [2].

Pricing Optimization

Artificial Intelligence can help be smarter with the pricing. Taking into account numerous factors (e.g. cross-price and cross-promotional elasticity), self-taught systems can calculate the optimum prices for goods with regard to the current date and time, the state of market demand, the customer's geolocation and their buying habits.

AI can calculate the highest price the customers are able to accept to buy the product. The prices can differ from customer to customer. Even the same customer can see another price at a different point in time.

Analytics

All of the solutions we mentioned above touch upon analytics, one way or the other. In any business, especially in retail, data holds plenty of invaluable insights, that can step up the game or tank your business whatsoever if you do not catch them in time.

In addition to customer profiling, sales analysis, and forecasting, analyzing market demands and customer behavior, AI reveals a weak spots and potential risks to be aware of, shows the most and the least profitable activities and does all of that in real-time and with minimum need for human supervision

REFERENCES

1. Predictive Sales Analytics Tool for Special Offers Evaluation. URL: https://mindcraft.ai/concepts/predictive-sales_analytics_tool/

2. Machine Learning-Based Sales Forecasting Tool for Automotive. URL: <https://mindcraft.ai/concepts/machine-learning-based-sales-forecasting-tool-for-automotive/>

Toliupa S., Lukova-Chuyko N., Kulko A.

*^{1,2,3} National University of Taras Shevchenko, Kiev, Ukraine, E-mail: tolupa@i.ua,
lukova@ukr.net, ankulko529@gmail.com*

DATA PROTECTION WITH INTELLECTUAL SUPPORT OF ORGANIZATIONAL

The system of operational management of information security should be based on the application of system analysis methods, decision theory and the need to use intelligent technologies.

Система оперативного управління захистом інформації має базуватися на застосуванні методів системного аналізу, теорії прийняття рішень та необхідність використання інтелектуальних технологій.

The principles of the protection of information systems should provide effective defense, and not only by criminals, but also by incompetent or poorly trained users and staff. This system must have at least four security zones: the outer covering the entire territory on which the buildings; Belt structures, facilities or devices in the system; belt system components (hardware, software, database elements) and a belt process data processing (Input/Output, internal processing, etc.). The main challenges in implementing protection systems are that they must satisfy two groups of contradictory requirements. Prevent accidental and deliberate release of information to unauthorized users, and access control to devices and system resources for all users, administrators and staff. On the one hand, reliable protection located in the information system that the more specific terms formulated in the form of two generic tasks should be ensured. On the other hand, the protection system should not cause significant inconvenience in a work process using