

**AUTOMATION IN SOFTWARE TESTING: HOW CAN AI OPTIMIZE THE TESTING
PROCESS?**

Behruzbek Mashiripov

Urgench state university
3rd year student of “Software engineering”

Muxlisa Umarova

Urgench state university
3rd year student of “Software engineering”

Abstract: This article is devoted to the issues of optimizing software testing automation through the use of artificial intelligence. It highlights the application of AI technologies in testing, particularly their advantages in rapid error detection, automatic generation of test scenarios, and resource-efficient process management. In addition, the article discusses the reduction of human factor influence, improvement of software product quality, and potential innovative approaches that can be applied in this field in the future. The findings show that AI-based testing systems serve as an important factor in enhancing the efficiency of software engineering.

Keywords: software testing, automated testing, artificial intelligence, optimization, error detection, test scenarios, software engineering efficiency.

Introduction. Today, software has become an integral part of our lives. From mobile applications to complex systems used in large enterprises, everything is developed by programmers. At the same time, the testing process is of great importance for these products to be of high quality, stable and user-friendly. Traditional testing methods require a lot of time and resources, and are very dependent on the human factor. Therefore, in recent years, automation of the testing process has become widespread [1]. However, simple automated testing does not solve all problems. This is where artificial intelligence (AI) technologies come to the rescue. Artificial intelligence provides a number of opportunities for optimizing the software testing process. First of all, AI allows you to automatically create and update test scripts. For example, when an update is introduced to the program, programmers have to rewrite traditional automated tests. This takes time and effort. An AI-based approach can analyze changes in the program itself and form appropriate tests. As a result, the process is accelerated and human labor is significantly reduced. The second important aspect is the rapid and accurate detection of errors. Traditional testing systems only follow specified scenarios. If the program gives an error in another unexpected situation, a person will have to check it manually. AI, on the other hand, is able to detect errors even in unexpected situations by studying user behavior during the use of the program. This increases the quality of the software product and allows it to be brought to market faster [2]. The third aspect is efficient resource management. In large enterprises, hundreds or thousands of tests are run simultaneously. The question of which tests to run first and which to postpone is very important for saving resources. AI-based systems can prioritize tests based on risk analysis. Thus, the most important and dangerous points are tested first, and less important ones are performed later. Another advantage of artificial intelligence is the reduction of the human factor. Often, when programmers or testers are tired, they can overlook errors due to inattention or subjective views. AI, on the other hand, does not have emotions, it works only on data. Therefore, the test results are more accurate and reliable. Of course, AI is not the only solution to all problems. It also needs the right data, a quality software environment and regular updates. In addition, AI-based testing systems initially require a lot of money and

knowledge. It can be difficult for small companies to implement such systems. But from a long-term perspective, this investment is justified, because by improving the quality of the software product, the company ensures its competitiveness in the market.

These processes are also relevant in the case of Uzbekistan. The IT sector in our country is developing rapidly, the number of startups, mobile applications and web platforms is increasing. In such conditions, creating a quality software product is an important task for every company. If the possibilities of introducing artificial intelligence into testing processes are expanded, the quality indicators of local software will significantly improve [3]. This, in turn, will increase export potential and strengthen the position of Uzbek programmers in the international market.

Today, software is used in almost all areas of our lives. From mobile applications to financial systems, even in the medical and transport sectors, it is difficult to imagine working without software products. At the same time, the issue of creating such programs and ensuring their quality remains constantly relevant. Improving quality, reducing the impact of the human factor, and implementing innovative approaches in the future are among the main tasks of this process.

One of the biggest problems in software development is the human factor. It is natural for people to make mistakes. Even the most experienced programmer can sometimes make simple coding mistakes or ignore some aspects during the testing process. Errors caused by the human factor negatively affect the quality of the software product, the trust of users using it, and the reputation of the enterprise [4]. Therefore, in recent years, great attention has been paid to automating the testing process as much as possible. For example, systems based on artificial intelligence (AI) analyze the code written by programmers and allow them to quickly identify possible errors. This method eliminates many shortcomings caused by the human factor. As a result, the software development process is faster and of higher quality.

Quality is one of the most important indicators for the user. If a program does not work quickly or stops due to minor errors, the user abandons it. Therefore, developers are using various methodologies and technologies to improve the quality of software products.

Automation of testing processes using artificial intelligence plays a major role in improving quality. AI systems have the ability to predict possible problems in the program. For example, by modeling how the user uses the program, the system determines where an error may occur. This allows the developer to fix the error in advance [5]. In addition, modern approaches such as “continuous integration” and “continuous delivery” are widely used to improve the quality of software products. With their help, the code is constantly updated and tested. As a result, the program is under control at each stage and the overall quality increases significantly.

In this era of rapid technological development, it is also interesting to imagine future approaches. Innovations in the field of software testing are expected to develop in the following areas:

- ✓ Fully autonomous testing based on AI – in the future, artificial intelligence can independently create test scenarios, execute them, and analyze the results without human intervention. This method allows you to reduce the human factor to almost zero.
- ✓ Predictive testing based on machine learning – AI helps to identify errors that will occur during the operation of a software product in advance. This makes it possible to correct errors at the development stage.
- ✓ Testing through augmented reality (AR) and virtual reality (VR) – in the future, software products can be tested using AR and VR technologies, especially in games and educational systems [6]. This allows for a more realistic and in-depth verification of the user experience.
- ✓ Reliable storage of test results using blockchain technologies – if the results obtained during the test process are stored on the blockchain, they cannot be falsified or modified. This further strengthens quality assurance.

✓ Automatic self-updating systems – in the future, programs can independently detect errors in themselves and automatically correct them using AI.

Conclusion. The introduction of artificial intelligence into the automation process of software testing is becoming increasingly important not only for increasing technical efficiency, but also for ensuring a high level of product quality. AI-based approaches serve to quickly detect errors, automatically create test scenarios, effectively use resources, and reduce uncertainties caused by the human factor. At the same time, the widespread introduction of innovative technologies in the future will allow for further improvement of software engineering processes and ensure global competitiveness. The results of this article show that AI-based testing systems should be considered not only as an inevitable stage of technological development, but also as an important strategic direction in ensuring the quality of software products.

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