



A Review Of AI And ML In Optimizing Software Automation With Security Features

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Abstract: The rapid advancement of Artificial Intelligence (AI) and Machine Learning (ML) has significantly transformed the landscape of software automation. This paper presents a comprehensive review of the current state and emerging trends in leveraging AI and ML techniques to optimize software automation processes while integrating robust security features. We explore how intelligent algorithms contribute to enhanced testing, code generation, deployment, and monitoring, thus reducing human effort and errors. Furthermore, we delve into the role of ML models in proactively identifying security threats, predicting vulnerabilities, and automating responses to cyberattacks in real-time. This review also highlights key frameworks, tools, and case studies that demonstrate successful implementation in industrial and enterprise-level environments. Finally, we identify challenges and propose future directions for integrating secure, intelligent automation in software development lifecycles. Also, in this paper our aim is to conduct the software testing with AI for fulfilling customer's application and to create related applications with latest AI tools.

Index Terms - Artificial Intelligence (AI), Machine Learning (ML), Software Automation, Cybersecurity, Secure Software Development, Intelligent Testing, DevSecOps

I. INTRODUCTION

Software engineering is the formation and application of sound engineering principles to yield cost-effective software which is both reliable and functional on actual machines. A well-managed development procedure is needed to produce a high-quality software artefact. Software development is a human attempt which involves various activities. The doings are; analysis, design, execution and testing and each of them donates to the creation of the final product. These doings continue in the development process, and thus creating a working version of the system can be onerous. Software testing is one of the main activities in software development for confirming and corroborative a software system. Testing supports software developers in confirming that the developed software fulfills its planned function, as well as determining whether or not the identified problems have been resolved. Since the software growth life-cycle is an intricate process with a crucial need to deliver a new product within the assigned time, the software testing process should be well-organized and real.

In the software business, automation plays a serious role in increasing testing performance. There are different automation tools present to support the testing activity. Newer skills like Artificial Intelligence (AI) and Machine Learning (ML) are continually being used to speed up the software development process. With the progression of AI technologies, different business domains are tolerant and using AI based software. AI systems are established dependent on machine learning copies and methods. AI is used to indorse automation and reduce the number of routine doings to create testing phases by smearing logic, problem solving, and ML. The aim is to show the application of AI techniques in computerization of software testing and the influences. The paper is having a viewpoint of future effort to enhance the real-world aspects of the AI automation tool.

[1]

Artificial intelligence (AI) in trial automation is a type of software testing that usages AI to enhance and rationalize the testing process. Artificial Intelligence, or AI, is related to computer systems calculated to perform tasks that typically need human intelligence like visual perception, speech recognition, choice making, and translation among languages. Fundamentally, AI encompasses a choice of techniques that allow computers to mimic human cognitive skills.

AI in automation testing is quicker at identifying errors and main reason, recommending fixes, and linking a series of linked tests. This not only hurries up test automation but also improves its correctness. AI can unavoidably retrieve data, conduct tests, and notice bugs and other affected tests. When it originates to software testing, AI practices machine learning and deep learning algorithms for code checking, user behavior, and test outcomes. AI can improve test automation in several key behaviors:

- AI can examine massive amounts of data to show patterns and generate improved test cases. This aids emphasis testing labors on crucial areas.
- AI can inevitably generate realistic test data, removing the need for manual data creation to enlarge the possibility of testing scenarios within an application.

• AI systems can acclimate and update tests as products modification to ensure unremitting testing coverage. They can adjust tests based on updates to submissions under test

AI can investigate how real users intermingle with an application to make tests that simulate common user journeys and plans. This helps safeguard key user paths are well-tested.

- AI can hurry the development of automated tests through “low-code” platforms that kind test creation more instinctive and nearby to non-engineers. This expands the possibility of possible testing. [2]

II. LITERATURE SURVEY

Testing is an action takes place through the software development life cycle. The main goal of the software testing is trace out the related errors and to check that the developed system mollifies the wants of concern customers. Software testing a way of assessing a system by realizing the differences among the identified requirements at the obligation engineering activity and the archived results. There are different techniques used for check a software to ensure quality. Testing can be performed as manual or automated with the use of specific tools [20] [7]. In the situation of manual testing, the software tester roads a test plan and sufficient a set of test cases physically. Manual testing is time overriding and cost operative. Whereas in manual testing the automated execution in which a software package runs a pre-defined test cases and displays and saves the results. Automatic testing performs the test-case automation, test-case generation and result confirmation. [2]. Automation testing tools are basically used in automatic software testing and the reliability as well as recital are more than manual testing [10] [19]. Software testing is basically making use of AI techniques has been accepted by software development companies all over the world. The bid of AI is wide-ranging branch of computer science that pacts with building smart machines which are skilled of performing smart tasks with help of human intelligence [3]



Fig. 1 Benefits of AI

Automating the implementation process of the software testing cycle is the most basic approach in the automation field. Automated software testing is significant and adding more toolkits to create testing phases fully automated by creating test scripts are also equally significant. Fig. 1 shows the concern benefits of AI. Test cases can be created to complete the automated testing [22]. The test execution speed will be enhanced by this tool and the testing process can be applied frequently. In the case of manual testing developing test

scripts is a time overwhelming process but if the test cases are ready the human tester can complete the testing process quickly [27] [25]. In physical testing, code conspicuousness will not touch test code handling and fault checking rate [12]. Fig. 2 shows the use of AI in the field of software testing. It is conceivable to facilitate a method for eliciting testing necessities and creating test-suites [1]. Various algorithms are castoff in AI tools. By using Bayesian probabilistic cerebral to model software reliability is an example probabilistic AI method. This is basically used in the castigation of Software Engineering [18] [5] [21]. AI methods can be applied in supporting automation and lessening the amount tedious tasks in the software growth and testing phase [4].

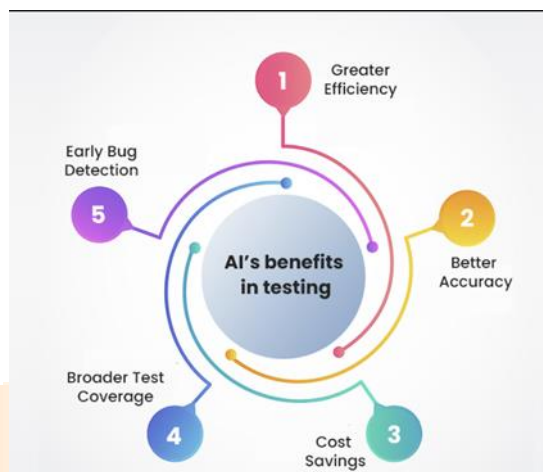


Fig. 2 Use of AI in software testing field

The major aim of AI consists of software testing which is basically, a serious step in ensuring the application's customers is fulfilled. AI is also making the subtleties of software testing in which Extreme use of AI to make the concern submissions to the best safe as the concern test to AI is automatic. [5] AI tools for the used software improvement are achieved by Model-Inference driven testing (MINTest), AimDroid which is basically, a GUI testing platform for Android apps formed by Google.[6].

III. PROBLEM STATEMENT

In today's fast-paced digital environment, software systems are becoming increasingly complex and require rapid development and deployment without compromising security. Traditional software automation techniques often lack adaptability, scalability, and proactive security mechanisms. At the same time, the growing sophistication of cyber threats demands more intelligent, real-time, and context-aware security solutions. The main problem which is being engrossed in this concern paper is automatic software testing. Which is mainly being accrued due to astuteness and human immersion in early stage.

Key Security Features Enabled by AI and ML in Software Automation are Anomaly Detection and Threat Prediction, Automated Vulnerability Detection and Patching, Dynamic Risk Assessment, Intelligent Access Control and Authentication, Security Testing Automation (AI-Driven Penetration Testing), Intrusion Detection and Prevention Systems (IDPS) and Data Privacy and Encryption Automation.

IV. FUTURE SCOPE

The potential of AI and ML in software automation and security is vast and continues to evolve with technological advancements. In the near future, deeper integration of AI-driven DevSecOps practices will enable continuous, intelligent security assessments throughout the software development lifecycle. The development of explainable and interpretable AI models will enhance trust and transparency in automation systems, especially in critical applications such as finance, healthcare, and defense.

V. CONCLUSION

The integration of Artificial Intelligence (AI) and Machine Learning (ML) in software automation marks a significant advancement in enhancing both efficiency and security within the software development lifecycle. This review highlights the transformative role of AI/ML in automating repetitive tasks, predicting system anomalies, improving testing strategies, and enabling real-time threat detection. By leveraging intelligent models, organizations can not only accelerate development and deployment processes but also proactively mitigate security vulnerabilities. This concern review shows AI involvement in software testing using its related test with industry testing tools.

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