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Ethical considerations of using generative AI for application development

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Abstract

This research explores the ethical considerations of using generative AI in application development. With the rapid adoption of tools like ChatGPT, GitHub Copilot, and DALL-E, generative AI has shown significant potential to enhance developer productivity and creativity. However, these technologies also raise ethical concerns. Which is including inherent biases, data privacy risks, and the potential negative impact on developer skills and

creativity. This report examines the strengths and weaknesses of generative AI, its implications on software development, and provides recommendations for responsible adoption. Emphasizing a human-in-the-loop approach, transparency, and adherence to ethical guidelines, we aim to balance the benefits and risks of generative AI to support ethical application development.

Keywords: Artificial Intelligence (AI), ChatGPT, Australia

1. Introduction

A. Background and Context

According to S. R Solanki and D. K Khublani^[1], Generative AI has evolved from basic chatbots to advanced models capable of creating realistic content across text, images, and music. With its own capabilities of generating texts, images, and especially code, AI has revolutionized numerous industries while raising ethical concerns. Its development, from the inception of neural networks to breakthroughs like GANs and large language models, has transformed the landscape of AI, showcasing its creative potential and highlighting the need for responsible use. Powerful tools such as ChatGPT, GitHub Copilot and DALL-E have show us the potential of AI in terms of breaking complex tasks into easier ones and boosting user productivity. As we can observe, ChatGPT has the power to support users in their daily tasks and answer questions with low latency accompanied by great citations. Meanwhile, tools like GitHub Copilot show terrific performance in support developers by suggesting code in real-time, thereby speeding up the development process. However, as the rapid rise of generative AI tools, ethical concerns have surfaced, including the risk of inherent biases in AI-generated content which can potentially lead to violation of data privacy. Addressing these concerns is crucial to ensure that the widespread adoption of generative AI is both beneficial and responsible.

B. Research Objectives

With the given problem, the primary objective of this report is: First, the report will comprehensively analyse the strengths, weaknesses and possibilities of AI technologies focusing on the application development field. Second, the report will discuss on future outlook of AI in application development and show recommendations on how to mitigate ethical issues.

C. Scope of the Report

This report focuses on three main areas: first, the development and application of generative AI, second, the ethical considerations surrounding its use, and third, its potential impact on the software development landscape. Finally, I will share my perspective on how AI could shape the culture and future of application development and provide recommendations on how to address and mitigate these ethical issues.

2. Literature Review

A. Overview of Generative AI in Application Development

Generative AI refers to a class of artificial intelligence models designed to create new content by learning patterns from large datasets. It has become a transformative tool in application development due to its ability to automate various aspects of content creation, from text and image generation to code suggestions. Its influence and impact on society are rapidly growing. Hendrik Reese, J.-N. Nieland, and D. Herper^[2] highlight that while it took Netflix 3.5 years to reach one million users, ChatGPT achieved the same milestone in just five days. This figure underscores the demand for generative AI's unique capability to produce diverse and adaptable outputs, which sets it apart from other forms of AI. As a result, there has been a rise in the number of AI tools and an explosive growth in user demand.

B. Strengths and Benefit of Generative AI Platforms in Application Development

N. Marques *et al.*^[5] emphasise that Chat GPT is an example of continuous learning integrated. With the feedback from users, contributes to the overall quality of AI output and enrich ChatGPT's training data. This result in an adaptive generative AI and improve its own accuracy over time. According to Outsystems^[3] generative AI shows its strengths in both its current use and potential future capabilities to the application development process. It offers a significant advantage for software developers by boosting productivity and enhancing creativity. It results in a lower time to take the application from the development stage out to market. N. Marques *et al.*^[5] also point out that AI strength has offered to help developers in numerous aspects including automating repetitive coding tasks, generating new ideas and streamlining complex tasks, making it easier to create unique solutions and minimising human errors.

C. Weaknesses of Generative AI in Application Development

Besides the mentioned strengths, one of the greatest drawbacks is that it can produce incorrect or unreliable code.

B. Technologies^[4] point out that AI can be biased and inaccuracy. N. Marques *et al.*^[5] refer to this phenomenon as Information Hallucination. Due to the way, it works, how we trained them and the result of the data AI trained on. The generative model normally predicting the most likely pattern rather than understanding the programming logic. It may give us the code that looks correct but in fact it can potentially contain errors and inefficiencies. This can result in bugs and potential security vulnerabilities if the developer heavily relies on generative AI and is poorly reviewed.

D. Threats and Challenges in Using Generative AI

Relying heavily on generative AI can pose significant threats to growth and innovation within the software development industry. B. Technologies^[4] also mentioned that the dependence on generative AI can lead young software engineers and experienced engineers to lack imagination, and lose their critical thinking skills. This could result in less creativity and innovation in software development as developers may become accustomed to accepting AI-suggested solutions without fully understanding the underlying logic or exploring alternative approaches. This would lower the program's overall quality which is a long-term impact on the industry if future genera-

tions of engineers grow reliant on AI without honing their own expertise. What's even more alarming is that it could block the expansion and advancement of the software development industry as a whole.

3. Ethical Considerations in Using Generative AI

A. Concerns of Data Privacy and Security

M. Van Rijmenam^[6] highlights concerns regarding data privacy and security in relation to AI technologies. When misused, AI can pose serious risks, such as creating highly convincing imitation applications that can be exploited in phishing attacks, and tricking users into revealing sensitive information—an example of a security breach. Additionally, as we explore how AI functions, M. Van Rijmenam^[6] emphasizes the issue of bias in training datasets, which can cause AI systems to perpetuate existing injustices and discrimination. In addition, it is unclear for an individual to understand how their data is being processed. Personal data contained in the datasets raises significant privacy and transparency concerns, as data is often used without consent.

B. Impact on Employment and Developer Roles

Another aspect of concern is the impact on employment and developer roles. Alonsagay^[8] mentioned a survey performed by Even Data Crops that 29% of software developers questioned show the greatest concern of their careers is artificial intelligence's potential to replace them. However, these impacts are based on various factors. M. Saam^[7] indeed agrees that AI can potentially have employment effects on firms. With those companies investing in AI can replace workers but gain market share through cost reduction or innovation, potentially increasing employment. Conversely, firms that lag behind may lose market share and reduce employment. The overall employment impact depends on how increased productivity influences product demand.

C. Intellectual Property Issues and Application Creation

AI-generated code presents complex issues around ownership and accountability, particularly when bugs arise or when legal conflicts over copyright infringement occur. G. Appel *et al.*^[9] point out unresolved legal issues such as intellectual property infringement, ownership rights, and unlicensed use of copyrighted material. Current lawsuits, like Andersen v. Stability AI mentioned in^[8] highlight the need for clarity around whether AI-generated works are unauthorized derivatives. This could lead to significant legal repercussions. Determining who owns the code—the developer using the tool, the company that created it, or the AI itself—remains unclear, creating the potential for disputes. Additionally, over-reliance on AI may reduce creativity, as developers could become accustomed to using standard AI-generated solutions rather than exploring new ideas. This could lead to more formulaic and less innovative software. AI should be viewed as a collaborative tool that supports human creativity while ensuring clear guidelines and strong ethical oversight are in place.

4. Discussion on Future Outlook of AI in Application Development

A. Potential Impact of Generative AI on the Software Development Industry

The industry is undergoing significant continuous changes. The way the industry operates is evolving, affecting how code is written, tested, and maintained. We have explored

both the negative and positive impacts of generative AI on the industry. While AI is replacing certain jobs, it is simultaneously creating new ones, which raises concerns about the future roles within the industry. For example, entry-level developer positions may become less common as AI tools take over these tasks. With the help of generative AI, productivity has increased, and development time has been reduced. However, this evolution also presents new opportunities in AI supervision and human-AI collaboration. AI is excellent at automating tasks, but its output requires constant monitoring and human oversight to ensure quality and maintain ethical standards. As a result, roles like prompt engineer and AI quality analyst may emerge. The industry may introduce entirely new roles or job categories focused on integrating human intuition and creativity with AI capabilities to ensure that software aligns with a company's goals.

B. Transformation of Developer Skills

With the introduction of AI tools such as Cursor or GitHub copilot, AI can certainly become a crucial part of software development. Developer will need to equip themselves with the needed skills to effectively utilize the tools. Basic programming logic and knowledge are strongly required and emphasise that ever. It has become the most valuable part but new competencies will be crucial. Developers will need to adapt at working with prompt and AI to ensure the AI systems behave as intended. AI tools will handle repetitive and time-consuming tasks, such as code generation, debugging, and documentation, while developers focus on high-level design and strategic decision-making. This hybrid approach can enhance overall productivity by enabling developers to tackle more complex and creative problems, reducing the time spent on mundane tasks. AI-assisted code review tools can provide real-time suggestions, identify potential bugs, and recommend optimizations, making the development process more efficient and reliable.

5. Recommendations to Mitigate Ethical Concerns

Overall, the development of generative AI technologies brings great benefits but still raises the fact that ethical challenges require careful and human oversight. This report includes recommendations from my perspective to exploit generative AI responsive way during the application development process. The following recommendations are proposed:

1. **Ensuring Transparency and Explainability:** One of the most interesting about AI is the decision-making process. It mostly comes with a lack of transparency and explainability. Future AI models should be designed to integrate with border datasets and it should review and compare their own output with reliable data sources. Giving the user a reasonable explanation from that source. AI developers can introduce features that help user understand how AI come to that decision, especially during the application development process. This can build up trust within users and ensure accountability.
2. **Data Privacy and Security Compliance:** The priority when training AI is to protect the user data privacy and security. This helps the user remain anonymous whenever it possible. Also, transparency in the terms

and conditions of usage of generative AI applications is crucial which increases transparency.

3. **Human-in-the-Loop (HITL) Approach:** With the human-in-the-loop approach, its can minimise the risk of automated decision-making entirely performed by AI. Incorporating human oversight is crucial as it ensures that the AI-generated code is reviewed by humans before they are implemented. This hybrid approach combines the efficiency of AI with the expertise and ethical judgment of human operators.
4. **Ethical Guidelines and Law integration:** Establishing ethical guidelines for AI development and use is essential. Organizations should create a framework that defines acceptable AI practices, considering the potential social impacts of their applications. Additionally, integrating these guidelines with existing legal frameworks can ensure that AI systems comply with both ethical standards and legal requirements. Regular ethical audits can be conducted to ensure compliance and address any emerging concerns.
5. **Continuous Education and Awareness:** Last but not least, raising developer knowledge and awareness about AI and its potential capability should be done in undergraduate education and continuously in industry firms is encouraged. Understanding the pros and cons of generative AI is crucial to mitigate the misuse of AI tools and resources needed to utilise effectively AI systems, including ethical use guidelines and potential risks.

6. Summary and Conclusion

1.) **Summary of Findings:** The report has provided a comprehensive analysis of the potential of generative AI in application development, covering its strengths, weaknesses, and ethical implications. Key areas explored include the benefits of increased productivity and creative support for developers, the risks of unreliable or biased AI-generated code, and the ethical challenges related to data privacy, employment, and intellectual property. Generative AI has proven to be a powerful tool that enhances software development efficiency. However, its dependence on potentially biased training data and the risk of limiting developer creativity underscore the need for responsible use.

2.) Key Takeaways:

- **Strengths:** Generative AI offers significant benefits in productivity and efficiency by automating coding tasks, reducing development time, and providing adaptive learning features. These strengths highlight its transformative potential in application development
- **Weaknesses and Challenges:** AI's inability to understand programming logic can lead to the generation of incorrect or insecure code. The reliance on generative AI may also negatively impact developer skills, creativity, and the overall quality of software development
- **Ethical Considerations:** Ethical challenges in using generative AI include data privacy concerns, biases in training datasets, intellectual property issues, and the impact on employment. Addressing these concerns through transparency, human oversight, and ethical guidelines is critical for responsible adoption.

3.) *Conclusion:* Generative AI represents the greatest advancement of the whole industry. It gives us powerful tools to boost productivity, efficiency and creativity. However generative AI is a double-edged sword, we need to have a balanced approach to maximize its benefits meanwhile reducing its own risk. Humans still play a crucial role in supervise make sure that we align with ethical standards while collaborating effectively with AI to contribute positively to the software development landscape.

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