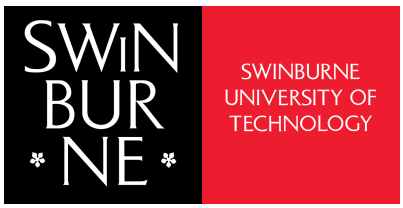


Swinburne University of Technology

# Computing Technology Project A

## COS40005

## Research Report (Topic 1)

Ethical Considerations of Using Generative AI for Application Development

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## Acknowledgement

I begin today by acknowledging the Traditional Custodians of the land on which we gather today and pay my respects to their Elders past and present. I extend that respect to Aboriginal and Torres Strait Islander peoples here today.

## Introduction

The evolution of artificial intelligence (AI) has significantly transformed industries worldwide, with one of the most impactful developments being the rise of generative AI. Generative AI systems use machine learning models to produce new, original content based on patterns discovered in existing data, in contrast to traditional AI systems, which rely on pre-defined algorithms and rule-based logic. This expands the use of AI in a variety of fields by enabling it to generate code, text, images, and even music. Software development processes are beginning to be revolutionised by generative AI, which automates routine coding tasks and gives developers AI-generated suggestions. Two prime examples of these platforms are OpenAI Codex and GitHub Copilot.

However, several ethical issues have been raised by the quick development of generative AI. Important topics that have generated a lot of discussion in both academic and business circles are ownership of AI-generated code, bias in AI-generated content, and transparency in AI decision-making processes. Furthermore, concerns have been raised concerning the role of AI in the future of work due to the possibility that generative AI will replace human workers in the software development industry.

The goal of this paper is to review the body of research on generative AI, looking at its benefits and drawbacks as well as the moral pitfalls of using it to create applications. It will also offer recommendations on how to mitigate ethical challenges to ensure responsible AI use, as well as predictive insights into how generative AI may shape software development in the future.

## Literature Review

### Strengths and Possibilities of Generative AI

Generative AI holds immense promise for the field of application development, offering significant efficiency gains and opportunities for innovation. One of the key strengths of generative AI lies in its ability to automate repetitive tasks. For example, developers often spend a considerable amount of time writing boilerplate code or troubleshooting bugs. Generative AI tools like GitHub Copilot have been designed to handle such tasks by suggesting relevant code snippets or even generating entire functions based on minimal developer input. This not only saves time but also allows developers to focus on more complex and creative aspects of the development process.

Moreover, by letting programmers try out novel strategies they might not have thought of, generative AI has the potential to spur innovation in software development. According to the study Generative AI for Emerging Researchers: The Promises, Ethics, and Risks (Mhlanga, 2024), AI models trained on vast datasets can identify patterns and propose solutions that human developers might overlook. This creates new opportunities for developing applications that are safer, scalable, and more effective. AI, for example, can assist in performance code

optimisation or make recommendations for upgrades to current systems that improve their functionality.

Another strength of generative AI is its ability to perform predictive analysis. By analysing large datasets and identifying patterns, AI can anticipate potential problems in the code, such as bugs or security vulnerabilities, before they manifest. This capability can lead to more robust software solutions, especially in industries where security and reliability are critical, such as finance or healthcare. The Ethics of Generative AI (Ligot, 2023) highlights how AI-driven predictive analysis could help prevent costly software failures by identifying vulnerabilities during the development stage.

Furthermore, generative AI encourages developers and AI systems to work together, increasing productivity while preserving the creative input of human developers. According to Ethical AI Development: Mitigating Bias in Generative Models (Aryan Jadon, 2024), AI systems can make recommendations for better code or alternative approaches to problems, but they never make the final decision; instead, human developers make these recommendations. AI and developers working together could result in very creative solutions that neither technology nor people could come up with on their own.

## Weaknesses and Threats

While the benefits of generative AI are evident, there are several weaknesses and threats that must be considered. One of the most prominent concerns is the lack of transparency in how AI models generate their outputs. Generative AI systems, such as those used by GitHub Copilot, rely on complex algorithms and deep learning models that are often described as "black boxes" due to their opaque nature. Developers using these systems may not fully understand the decision-making processes behind the AI-generated code, which raises concerns about the reliability of such outputs. According to Ethical Considerations of Generative AI-Enabled Human Resource Management (Andrieux et al., 2024), the lack of transparency in AI decision-making can lead to errors or unintended consequences in the final product, particularly in high-risk industries such as healthcare, where the consequences of flawed code can be severe.

Another significant weakness of generative AI is the inherent biases that can be present in the outputs. Since these models are trained on vast datasets that reflect human biases, generative AI systems may inadvertently perpetuate discriminatory practices in their code suggestions. For example, AI-generated software used in hiring processes may unfairly favour certain demographics if trained on biased data. Ethical AI Development: Mitigating Bias in Generative Models (Aryan Jadon, 2024) points out that without proper oversight and intervention, generative AI systems may reinforce existing inequalities in society, particularly when used in sectors like education or employment.

Generative AI also presents a threat to data privacy. AI models are trained on large datasets, some of which may contain sensitive or proprietary information. The unintentional inclusion of such data in AI-generated outputs could lead to data breaches or violations of privacy laws. As noted by (Ligot, 2023), organizations using generative AI must ensure that the data used to train these models is handled responsibly and complies with data protection regulations like the General Data Protection Regulation (GDPR) in Europe.

### Ethical Concerns

The use of generative AI in application development has many complex and wide-ranging ethical implications. The topic of intellectual property is among the most important ethical dilemmas. The ownership of code generated by AI that is derived from pre-existing data can be ambiguous. Does the AI platform itself own the rights, or does the developer using the AI own the code? As noted in The Ethics of Generative AI (Ligot, 2023), companies have already argued over who owns AI-generated content in the creative industries, a result of this ambiguity. Clear legal frameworks will need to be established as generative AI develops, especially in commercial software development, to establish ownership of AI-generated code.

The possibility of bias in outputs produced by AI raises additional ethical questions. As was previously mentioned, generative AI systems may produce biassed results because they are trained on datasets that may contain human biases. Aryan Jadon's book Ethical AI Development: Mitigating Bias in Generative Models (2024) issues a warning that unchecked bias in software produced by AI could continue disparities in employment, education, and the criminal justice system. An AI system may continue to favour some demographics over others if it is trained on data that represents past biases in hiring practices, for instance, perpetuating already-existing societal inequalities.

There are also serious ethical issues with AI decision-making processes being opaque. Because generative AI systems function as "black boxes," it is frequently challenging to comprehend how they arrive at their conclusions. Concerns concerning accountability are raised by this lack of transparency: who bears responsibility if an AI-generated application malfunctions or causes harm? Andrieux et al. (2024) claim that because AI systems are opaque, it can be challenging to determine who is to blame when something goes wrong, especially in high-stakes industries like finance or healthcare.

Apart from these worries, the emergence of generative AI could jeopardise the job security of software developers, especially those working in entry-level roles. It's feared that human developers may become obsolete in some areas as AI systems become more adept at automating coding tasks. In Mhlanga's 2024 book Generative AI for Emerging Researchers: The Promises, Ethics, and Risks, the possibility of AI replacing human labour in the software development industry is discussed, especially regarding lower-level positions. This poses significant moral dilemmas regarding how society should manage the shift to AI-driven development and the steps that ought to be done to guarantee that workers are not left behind.

## Predictive Analysis and Recommendations

As generative AI continues to advance, its role in software development will likely grow, with AI taking on more complex tasks alongside human developers. Soon, we can expect generative AI to move beyond simple code generation and begin tackling entire development cycles, from design to testing. However, this shift brings the challenge of ensuring human oversight and accountability for AI-driven decisions. While AI can handle repetitive tasks, there must always be human involvement to manage the creative and ethical aspects of development.

One likely outcome is the rise of hybrid development models, where AI assists developers by generating code and identifying problems, but human developers remain in control of decision-making. This partnership between humans and AI could lead to faster and more efficient

software creation, especially in areas that require heavy data analysis or predictive modelling. However, it will be critical to establish guidelines for when human oversight is necessary to ensure AI-generated outputs remain reliable and ethical.

To mitigate risks, organizations should implement auditing systems that track AI-generated code to detect potential biases or errors. According to Ethical AI Development: Mitigating Bias in Generative Models (Kumar et al., 2023), regular audits can help developers maintain accountability and ensure the AI is functioning fairly and transparently.

On a broader level, legal and regulatory frameworks will be essential in addressing issues such as intellectual property and data privacy. Right now, the question of who owns AI-generated content remains unresolved. Laws must evolve to clarify ownership rights for both developers and organizations. Moreover, data privacy must be a priority, as AI systems often rely on large datasets that may include sensitive information. Ensuring compliance with regulations, such as the General Data Protection Regulation (GDPR) in Europe, will be necessary to protect user privacy.

Education is another key area. Developers should be trained in AI ethics to ensure they understand the impact of generative AI on society. This education should emphasize bias detection, algorithmic transparency, and ethical decision-making. Institutions and training programs must incorporate AI ethics into computer science curricula to prepare the next generation of developers for the challenges ahead.

Open-source collaboration offers a promising way to address some of the ethical concerns associated with AI. By making AI models open for peer review, developers worldwide can help improve transparency, identify flaws, and ensure AI tools are designed with fairness and accountability in mind. This collective effort can drive innovation while reducing risks.

Finally, it's important to view AI as a tool that augments human creativity, not one that replaces it. The future of software development will likely involve a close partnership between humans and AI, where each complements the strengths of the other. By embracing this collaborative approach and ensuring robust ethical guidelines are in place, we can unlock the full potential of generative AI while safeguarding against its risks.

## Conclusion

In conclusion, generative AI presents both exciting opportunities and significant ethical challenges for the future of application development. The ability of AI to automate routine coding tasks and enhance innovation has the potential to revolutionize the software industry. However, the risks associated with bias, intellectual property, data privacy, and accountability must be carefully managed to ensure that the benefits of AI are realized in a responsible and ethical manner.

By establishing ethical guidelines, developing legal frameworks, and promoting human-AI collaboration, the software development community can harness the power of generative AI while mitigating its risks. The future of application development will likely be shaped by the co-evolution of AI and human developers, where AI tools assist rather than replace human creativity. It is essential that developers, regulators, and educators work together to ensure that AI-driven development remains transparent, accountable, and equitable.

Ultimately, the ethical use of generative AI will depend on the ongoing dialogue between stakeholders in the tech industry, academia, and government. As AI continues to evolve, this dialogue will play a crucial role in shaping the future of software development, ensuring that AI is used to create applications that are not only innovative but also ethical and socially responsible.

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