

# *Impact of Artificial Intelligence on the Information Technology Industry & Software Engineering Professions*

Chris Regy Vallikunnathu  
Student ID: 40232485

Gina Cody School of Engineering  
Concordia University  
Montreal, Canada  
e-mail:  
[c\\_vallik@live.concordia.ca](mailto:c_vallik@live.concordia.ca)

Harleen Kaur  
Student ID: 40232489

Gina Cody School of Engineering  
Concordia University  
Montreal, Canada  
e-mail:  
[h\\_k44106@live.concordia.ca](mailto:h_k44106@live.concordia.ca)

Mani Vinay Goud  
Student ID: 40219632

Gina Cody School of Engineering  
Concordia University  
Montreal, Canada  
e-mail:  
[m\\_gadda@live.concordia.ca](mailto:m_gadda@live.concordia.ca)

**Abstract—** The integration of Artificial Intelligence (AI) in the Information Technology (IT) industry is reshaping the software engineering landscape. It brings about a significant transformative impact on the industry, affecting job roles, required skills, and development methodologies. This project investigates how AI's capabilities in automating complex software engineering tasks are changing the professional landscape for software engineers.

AI technologies, including machine learning and natural language processing, are increasingly being implemented to automate the software development lifecycle. Tools such as AI-powered code generators and debuggers are not only enhancing productivity but also changing the traditional roles of software engineers. This shift makes a focus on higher-level analytical and creative skills necessary, as routine coding tasks become automated. Our research, guided by surveys and literature reviews, reveals both opportunities and challenges within this transition. While AI promotes efficiency and can potentially reduce errors and operational costs, it also raises concerns about job displacement and the ethical implications of automated decision-making systems. The survey responses indicate mixed feelings among professionals. They acknowledge AI's benefits in enhancing productivity and innovation but also express concerns about long-term job security and the need for upskilling. The future of software engineering will likely see a hybrid model where human creativity and analytical skills work together with AI's computational power. The rapidly evolving landscape underlines the importance of adaptability and continuous learning for software engineers to survive in an industry with strong prevalence of AI tools and technologies. This study aims to provide a balanced view, highlighting both the potential enhancements brought by AI in software development and the significant adjustments required in the professional domain of software engineers.

**Keywords-** *artificial intelligence, software engineering, survey, job security, ethical challenges*

## I. INTRODUCTION

In the ever-evolving landscape of technology, many factors have significantly reshaped industries and professions over the decades. However, none matches the seismic shifts brought about by the emergence of artificial intelligence. As organizations across the world harness AI's capabilities to drive efficiency, productivity, and competitiveness, understanding its implications becomes paramount for professionals navigating this rapidly evolving landscape. A team of researchers from the Oak Ridge National Laboratory of the US Department of Energy predicts that “software development will undergo a radical change in the future: the combination of machine learning, artificial intelligence, natural language processing, and code generation technologies will improve in such a way that machines, instead of humans, will write most of their own code by 2040” [1, p1].

We have witnessed numerous significant technological waves in our lifetime. Some notable ones from the past three decades include Desktop Operating Systems, Web Browsers, Networking, Social Networks, Mobile Apps, Internet of Things and Cloud Computing [2]. In comparison to these waves, the current wave of artificial intelligence is significantly more consequential, to say the least. Many of the technological waves and revolutions of the past primarily automated less-skilled, manual labor. This pattern allowed workers to upskill and move into more complex roles, safeguarding employment. Unlike previous shifts, AI targets both low-skill and high-skill jobs, including decision-

making roles. The scope of AI's impact extends beyond routine tasks to include creative and analytical jobs.

In the initial phase of our research, a detailed literature review was conducted to establish a strong foundation of existing knowledge concerning the integration of Artificial Intelligence (AI) into software engineering. The next phase of our research involves a comprehensive survey aimed at capturing the insights and perspectives of industry professionals regarding the integration of Artificial Intelligence (AI) into software development processes. This survey is designed to gather data on how software engineers, project managers, and other IT professionals perceive the changes brought about by AI technologies in their work environments.

Our primary focus throughout this project is the human and social aspects involved in this matter. However, an extensive understanding of the social aspect of AI requires a basic understanding of its capabilities. As a result, our project begins with a brief exploration of the maturity of artificial intelligence tools currently available in the market at performing common software development and deployment tasks. We then looked at technical, ethical and human challenges involved. We find that the integration of AI into software development processes is leading to a significant transformation in job roles and skill requirements. While AI is enhancing efficiency and productivity, it is also automating tasks that were traditionally performed by humans, leading to concerns about job displacement among professionals. Through this survey, our aim is to address four key research questions that are central to understanding the impact of AI integration in software engineering:

According to software engineers, will artificial intelligence tools be able to aid software development lifecycle and processes?

What do software engineers and industry aspirants feel are the most serious concerns in the industry when it comes to widespread adoption of AI, if any?

What, according to software engineers currently employed in the industry, is the impact of AI tools and technologies to the Information Technology and Software Engineering job market?

What do software engineers think is the future direction of the IT industry in the face of rapidly advancing AI and ML technologies?

## II. LITERATURE REVIEW

The literature review is a crucial part of our project as it not only informs the subsequent survey design but also helps in understanding the broader implications of AI technologies in software development. Following the format of our survey, our literature review is divided into three key stages.

First, we explore the capabilities of AI in the software engineering domain. Second, we explore the various challenges brought about by the integration of AI within the IT industry. Lastly, we investigate the potential impact of AI on the workforce.

### A. Capabilities of AI

Through the literature review, we observed that AI exhibits substantial capabilities across various domains and processes within software engineering. Following is a summary of AI's capabilities in each major stage of the software lifecycle [3].

In the planning stage, AI aids in optimizing project targets like costs and duration, utilizing tools like search-based software engineering and Bayesian network algorithms to improve project planning and management [4]. Fenton et al. suggest a Bayesian network algorithm for the simultaneous optimization of cost and quality outcomes [5]. During problem analysis, AI analytics and predictive analysis equipment help in defining software development requirements and predicting project success, using big data strategies to enhance decision-making. Elzamly et al. use discriminant analysis to predict and classify risk factors in software development [6]. AI supports the software design phase by simulating playthroughs in game development and aiding in the creation of believable actors and narratives, although the actual design still largely requires human input. Budinsky, F presents Eclipse Model Framework (EMF) as an easy way to define models, from which many common code generation patterns are generated [7]. In software coding, AI assists through neural networks and autoencoding, facilitating code generation from human language and automating debugging processes. Tools like Kite for Python offer automatic documentation and debugging suggestions. Balog et al. develop an approach to solve competition style problems from input-output examples using deep learning [8]. AI leverages pattern recognition and machine learning for automated software testing and error detection, significantly speeding up testing processes and improving software integration with tools like AI Program Browsers. The Commit-Assistant which was developed by Mathieu Nayrolles from Concordia University in partnership with Ubisoft llow teams to save on debugging time and focus on the creation of quality features [9]. AI enhances software maintenance by classifying user queries, supporting self-adaptive systems for real-time application adaptation, and identifying security vulnerabilities through neural network-based assessments [3].

### B. Issues and Challenges

The development of AI technologies are still at a very early stage and there is considerable work to be done yet to perfect these systems. While AI's capabilities to automate various stages of the software lifecycle are evident, these

technologies also bring with them a range of technical issues and challenges that need to be addressed. The unpredictability of AI makes its use in planning, analysis and testing stages challenging. It is unclear how to match what AI can do with what people want from it? For the design stage, we need completely different blueprints. AI behaves differently from regular software, so we need to think carefully about how to build the system so it works well and can be easily updated or changed. When it comes to development, we don't have all the perfect tools and methods yet for creating software with AI. Moreover, the use of AI may even lead to changes in many organizational aspects. It can change how teams are set up, what skills people need, and even the company culture. Everyone needs to adapt to new ways of working with AI [10].

Apart from technical challenges, the integration of AI also presents numerous ethical and societal issues. Key among these is the issue of biases. AI systems can perpetuate or amplify biases present in their training data, leading to unfair or discriminatory outcomes against specific groups of people. Data collection and privacy issues are crucial as well. Gathering data for AI poses ethical issues regarding how consent is obtained, how transparently data use is communicated, and ensuring data collection processes don't marginalize or exclude certain groups. The lack of ethical expertise in AI developers makes it challenging to foresee and address the ethical implications of AI technologies. Integrating ethics into STEM education and fostering interdisciplinary collaboration can help bridge this gap[11].

### C. Impact on Workforce

As AI technologies get better by the day, the software engineering labor market will be significantly disrupted. The OECD 2021 report points out that software engineering as one among the various high-skilled, white-collar occupations that are most exposed to advances in, and automation by, AI [12]. Software developers will need to acquire new skills to stay relevant. Those who adapt successfully will enjoy ample work opportunities, but achieving such mindset might be easier said than done [13]. Some skills and qualities that professionals could acquire in order to keep up with the evolving market is being open continuous learning and upskilling, collaborating with AI systems and specializing in AI fields [14].

## III. METHODOLOGY

### A. Research Design

In this study, we utilized a survey-based research method to gather insights from software engineers about the impact of AI on the IT industry. The primary tool for data collection was Google Forms, a versatile and widely accessible

platform that facilitated the distribution and management of the survey process. The survey was primarily distributed among friends, colleagues, and community groups on campus, leveraging personal and professional networks to reach a diverse group of participants. Additionally, digital platforms such as WhatsApp and LinkedIn were used to extend the reach, ensuring a broader demographic and professional coverage. The design of the survey was structured around the research questions aimed at understanding different aspects of AI's role in the IT industry.

The survey instrument consisted of various question types tailored to gather comprehensive insights. Short Answer Questions allowed participants to provide personal insights and qualitative data on specific topics. Multiple Choice Questions (MCQs) facilitated collection of standardized responses that allowed us to simply data analysis and comparison. Likert scale questions formed the bulk of the survey, enabling participants to express their level of agreement or disagreement on a series of statements regarding AI's role in software development and its broader implications. The survey was designed to be completed in approximately 15-20 minutes. This duration was deemed sufficient to cover the depth of topics necessary without deterring participation.

### B. Survey Participants

A total of 67 participants responded to our survey. Close to 63% of the respondents are employed in a variety of software engineering roles. Approximately one-fifth of the survey respondents are data scientists or analysts. This high representation of data professionals was intentional, as their expertise in data science which fuels machine learning and artificial intelligence provides crucial insights into the future trajectory of AI and its impact on various industries. Other roles that were well-represented among the respondents include system administrators (12.1%), IT security professionals (10.6%), and test engineers (9.1%). 25 of the 60 participants are students and aspire to join the industry soon. Details about the representation of different software engineering roles among survey respondents are available in Table1. This diversity in professional backgrounds ensures a broad spectrum of insights into the impact of AI across different areas of IT.

Approximately 10% of the survey participants have over a decade of professional experience in the field. The rest of the respondents are evenly spread across varying levels of experience ranging from less than a year to 10 years, as shown in Figure 1.

43% of the participants work directly in the IT industry. Others with professional experience work IT roles in different industries.

TABLE I. REPRESENTATION OF SOFTWARE ENGINEERING ROLES AMONG SURVEY RESPONDENTS

Role in the Industry	No. of Respondents	% of All Respondents
Student / Industry Aspirant	25	37.90%
System Administrator	8	12.10%
Data Scientist/Analyst	13	19.70%
Project Manager	5	7.60%
Test Engineer	6	9.10%
IT Security Professional	7	10.60%
DevOps Engineer	6	9.10%
Business Analyst	3	4.50%
Network Engineer	1	1.50%
Dispute/chargeback analyst	1	1.50%
Software developer	1	1.50%

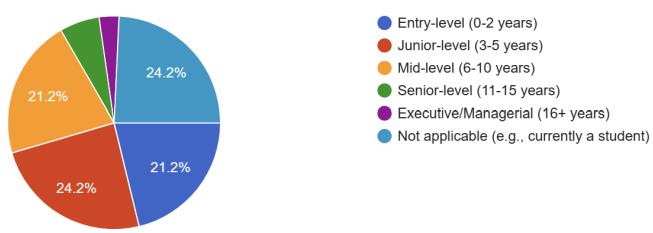


Figure 1. Experience levels of software engineering professionals who participated in the survey

### C. Ethical Considerations

We carefully took into account all ethical considerations relating to this survey and its implications on the participants in order to maintain respect for all participants and uphold the integrity of the research process. An ethics approval was obtained from the relevant department upon submission of a Summary Protocol Form for research intended solely for pedagogical purposes.

Participants were informed about the nature of the study, its purpose, and their role within it. They were provided with a detailed consent form which articulated participants' right to withdraw from the study at any point without any adverse consequences. Participants were assured of their right to discontinue participation at any time. They were informed of the intent to publish the data, although in a manner that would not compromise their anonymity or confidentiality. To ensure the privacy and confidentiality of participants, the survey did not collect any personal identifiers such as names or contact information. The respondents were informed that any published material would not be traceable to their identity. Participants were provided with contact information for the research team and the faculty supervisor, should they have any questions or concerns about the research or their rights as participants.

### D. Limitations

One notable limitation of our survey was its limited reach, which could potentially influence the generalizability of the findings. The majority of survey participants were based in Montreal, Canada, which may not be representative of the global software engineering community. The findings of this survey may reflect local industry conditions, educational backgrounds, and cultural attitudes that are specific to the region. Caution must be exercised when applying the research findings to other contexts or regions.

Given that a significant number of participants were affiliated with the university and organizations within Montreal, the sample may not accurately reflect the wider professional community. Additionally, the distribution of the survey primarily through LinkedIn and WhatsApp could have further narrowed the demographic, favoring individuals who are active on these platforms and perhaps more inclined towards technological advancements, including AI. Furthermore, the fact that the survey was exclusively available in English, despite French being the predominant language in Montreal, could have excluded non-English-speaking professionals.

Response bias could be a significant constraint in our survey results, which might stem from several factors. The duration of the survey, while relatively short at 15-20 minutes, could still influence participants to rush through the questions without giving them thoughtful consideration, especially given that no remuneration was offered for their time. Without a tangible incentive, respondents may have been less motivated to engage deeply with the survey, potentially leading to a higher incidence of cursory or indifferent responses.

## IV. RESULTS

The analysis of the survey data was conducted with our research questions in mind. We have structured the presentation of our findings such that they correspond directly with these research questions.

### A. According to software engineers, will artificial intelligence tools be able to aid software development lifecycle and processes?

The respondents overwhelmingly believe that AI tools are capable in effectively implementing software engineering processes. 100% of respondents believe that AI has some level of capability in automating code generation and optimization (Figure. 2) as well as software testing and bug detection (Figure. 3). Interestingly, not even a single respondent thinks that AI is not effective at all in automating software engineering processes.

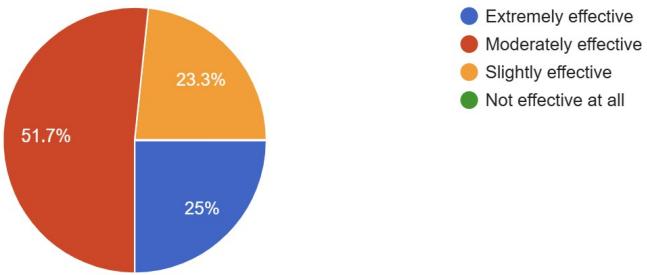


Figure 2. Effectiveness of AI in automating code generation and optimization according to the survey respondents

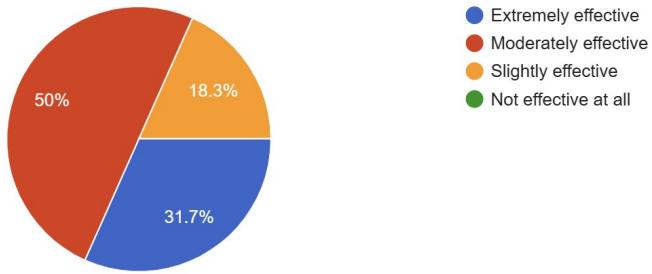


Figure 3. Effectiveness of AI in automating software testing and bug detection according to the survey respondents

According to the survey respondents, the biggest advantages of integrating AI in software engineering are faster development cycles and increased productivity.

In short, all respondents unanimously agree that AI possesses considerable capabilities when it comes to automating software engineering processes.

#### *B. What do software engineers and industry aspirants feel are the most serious concerns in the industry when it comes to widespread adoption of AI, if any?*

In accordance with our understanding from the literature review that AI integration brings along a wide range of issues and challenges, we asked the participants what they thought are the biggest challenges involved. When it comes to technical challenges, an overwhelming 73% of participants believe that the biggest challenge is integrating AI tools into already well-established workflows. This, however, is one among many technical challenges as shown in Figure 4.

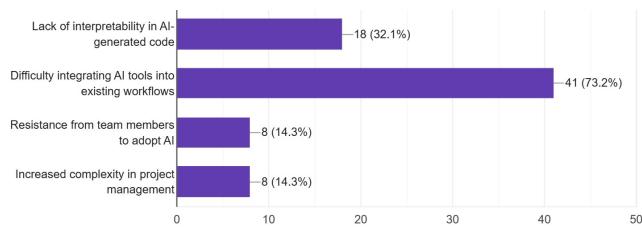


Figure 4. Most concerning technical challenges in the integration of AI into software engineering, according to participants

When it comes to ethical and societal challenges, most respondents believe that AI tools will negatively impact workplace inclusivity by reducing the need for diverse skill sets. Moreover, most respondents agree that AI tools may inadvertently introduce biases inherited from training data. For worse or for good, most respondents agree that AI tools will make software engineering concepts more accessible to the general public.

#### *C. What, according to software engineers currently employed in the industry, is the impact of AI tools and technologies to the Information Technology and Software Engineering job market?*

More than half of the survey respondents expressed concerns about their long-term job security. However, it was notable that a substantial portion (45%) felt confident about their long-term employment prospects. This finding was particularly intriguing, as we had anticipated nearly unanimous concern regarding job security, based on both our literature review and personal expectations.

To further understand this anomaly, we dug deeper by correlating the level of confidence in job security with the respondents' experience levels and their levels of familiarity with AI tools. We noticed that close to 50% of the respondents who expressed a lack of confidence in long-term job security are students and industry aspirants. We observed a general trend indicating that participants with more years of experience tend to have greater confidence in their long-term job security in the face of AI advancements. Additionally, we found that over 65% of the participants who expressed some level of confidence in their job security also reported having some familiarity with AI tools and technologies. The higher confidence levels among more experienced professionals could be a result of their skills and insights, which they think are valuable. Familiarity with AI tools and technologies likely increases confidence in job security as it equips individuals with the necessary competencies to adapt and thrive in an AI-influenced job market. These factors suggest that both experience in the field and practical knowledge of AI are key to maintaining relevance and job security as the industry transforms.

In accordance with findings from our literature review, more than 85% respondents believe that that skills requirements for software engineering positions will change due to AI adoption and 75% respondents agree that upskilling efforts are necessary for software engineers to remain competitive in an AI-driven job market.

#### *D. What do software engineers think is the future direction of the IT industry in the face of rapidly advancing AI and ML technologies?*

When asked about the future direction of the IT industry, we received some interesting responses from some of the participants. To summarize the responses, software engineers anticipate AI to become increasingly prevalent, necessitating continuous upskilling for humans. A common concern is the potential for significant job loss as AI advances, with fears that AI could outperform human capabilities in many domains. There's an expectation that dependency on technology will grow, which could lead to varied outcomes, from improved software quality to increased workplace surveillance and privacy erosion. While some believe AI will not completely replace human contributions, they are also concerned about economic disparities, suggesting that businesses may profit significantly while widespread job losses could occur. Overall, the responses reflect a mix of optimism for technological progress and concern for its broader implications on employment and society.

## V. DISCUSSION

The survey results offer a comprehensive insight into the varying perspectives held by software engineers on the role of AI in the IT industry. Notably, there is a clear acknowledgment of the inevitability of AI's influence on software development processes. However, the participants appear to be divided on the implications this has for job security and industry dynamics. While a significant proportion of software engineers, particularly those with substantial experience and familiarity with AI, express confidence in their job security, the large majority of them expressed serious concerns about their ability to thrive in the industry.

These opposing beliefs lead us to a larger conversation about the need for continued education and training in the face of an evolving technological landscape. The worry about jobs being replaced is balanced by the belief that learning new skills is both a necessity and an opportunity. While some view AI as a disruptive force that could lead to negative outcomes like privacy infringement and creative stifling, others see its potential to aid human capabilities and drive productivity.

This survey highlights the importance of strategic planning within the industry to navigate the transition AI brings. It suggests that fostering an environment that emphasizes lifelong learning and adaptability may be key in preparing the workforce for the imminent changes. Furthermore, there is an imminent need for policies and frameworks that address ethical concerns and support workforce transition in the AI era.

## VI. REFLECTION

Reflecting personally on the experience of conducting this survey project, there was something new to learn at every

stage of the process. One of the key challenges that we faced was recruiting professionals from diverse sets of industries, roles and experience levels. The most easily accessible set of participants was university students pursuing programs related to software engineering. However, overrepresentation of students might have negatively affected the accuracy of the results since they might not be fully up-to-date with the latest developments in the industry. After receiving only about 20 responses, mostly from students, at the half-way stage, we had to step up our efforts by meeting more professionals one-on-one and over social media platforms. Community groups on platforms like WhatsApp were extremely useful in reaching out to a large number of professionals simultaneously.

At the early stages of the project, we were not even sure how to begin. Guidance from the professor, discussions and conversations with classmates, and the literature review all combined helped us develop confidence in our abilities. The process of formulating the survey, reaching out to participants, and delving into the analysis was both rigorous and rewarding.

At the end of this journey, I am happy about the valuable insights we were able to generate. The experience has not only deepened my understanding of AI's impact on the IT industry but also highlighted the diversity of thought among its professionals. It's rewarding to have contributed to a body of knowledge that could help guide the industry's approach to integrating AI in the years to come.

## ACKNOWLEDGMENT

We would like to extend our sincere gratitude to our course instructor, Dr. Tanja Tajmel for her invaluable guidance and support throughout the duration of this project. We are also immensely thankful to TA, Ms. Sharon Chee Yin Ho for her assistance and constructive feedback that greatly enriched our project. Their insights and dedication were instrumental in refining our research and analysis.

We extend our heartfelt appreciation to all the participants who generously shared their time and insights in our survey. Their contributions were crucial in providing real-world understanding and fulfilling the purpose of our research survey. Furthermore, we would like to express our gratitude to our fellow classmates who provided valuable discussions, feedback, and encouragement throughout the project. The class participation was an added flair as it was always a pleasure to see a valuable perspective. This project would not have been possible without the collective effort and support of all those mentioned above. Thank you for being an integral part of our journey.

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**Appendix A: Abbreviated Summary Protocol Form for Academic Department Review**



## **Abbreviated Summary Protocol Form for Academic Department Review For Minimal Risk Student Course Related Research Intended Solely for Pedagogical Purposes**

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Office of Research – Research Ethics and Compliance Unit: GM 900– 514.848.2424 ex. 7481  
[oor.ethics@concordia.ca](mailto:oor.ethics@concordia.ca)

**This form is recommended for student research projects conducted as part of course requirements.**

This form should only be used for research involving minimal or less risk to the participants. It may be completed either:

- By the instructors who will describe the research carried out by their students.
- By the students themselves. In this case, the form may be reviewed by the instructor and then transmitted to the appropriate Departmental representative responsible for the review of minimal risk course related research intended for pedagogical purposes.

### **Part One: Basic Information**

Date: **Feb 7,2024**

1. Name and Department/Program of Researcher:

Researcher Name: **Chris V, Harleen Kaur, Vinay Goud**

Department/Program: **Gina Cody School of Engineering**

Telephone number: **450-751-1568** E-mail address: **chrisregy97@gmail.com**

2. Title of Research Project or Activity:

**Impact of AI on IT Industry and Software Engineering Professions**

3. Name and Number of Course:

**ENCS 691-AI: Social Aspects of AI**

4. Type of Research:

- a.  Survey Forms
- b.  Interviews
- c.  Lab experiment
- d.  Anthropological Observations
- e.  Other (**explain below**):  
\_\_\_\_\_

**Part Two: Research Participants**

5. Characteristics: How many participants are involved in this study? **20-25**

Are they primarily:

- a.  College/University Students
- b.  Other adults
- c.  Other (**specify**): **Software Engineers**

**Part Three: Ethical Concerns**

6. Informed Consent:

Have you developed a means to gain participants informed consent?

Yes       No

Will researchers be using a written form or an oral protocol?

Written       Oral

7. Freedom to Discontinue:

Will you inform participants of their right to discontinue?

Yes       No

8. Confidentiality or Anonymity or Alternatives:

Will your research offer participants anonymity (you will not be able to identify them)?

Yes  No

Will your research offer participants confidentiality (you will know who they are but their identities will not be evident in the research reports)?

Yes  No

Will the identities of participants be evident in your research reports?

Yes  No

If yes, have you informed them of this fact?

Yes  No

9. Deception:

Are you in any way deceiving participants about the nature of your research?

Yes  No

If yes, please describe below the nature of the deception and how you will de-brief participants. *Please attach any relevant information.*

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10. Managing Risky Situations:

If as a result of your research, you discover that a participant(s) is at risk in some way(s) (psychological, physical, reputational), do you know someone to contact to help advise you how to respond?

Yes  No

11. Coercion:

Is there a potential for participants to perceive they are being coerced into participating in this study?

Yes  No

If yes, do you have a written plan to prevent this perception?

Yes  No, I will have it on (give a date):

12. Signatures:

Researcher(s): **Chris V (40232485), Harleen Kaur (40232489), Vinay Goud (40219632)** Date: **Feb 7, 2024**

Instructor: \_\_\_\_\_ Date: \_\_\_\_\_

## **Appendix B: Research Instrument**

# **Impact of AI on Information Technology Industry and Software Engineering Professions**

## **CONSENT TO PARTICIPATE IN A SURVEY TO ANALYZE THE IMPACT OF ARTIFICIAL INTELLIGENCE ON INFORMATION TECHNOLOGY AND SOFTWARE ENGINEERING PROFESSIONS**

The primary purpose of this survey is to analyze what software engineers and IT industry aspirants feel about the impact of the widespread adoption of AI in the IT industry. I understand that I have been asked to participate in a research project being conducted by Chris Regy Vallikunnathu, Harleen Kaur and Vinay Goud of Gina Cody School of Engineering at Concordia University under the supervision of Dr. Tanja Tajmel of Centre for Engineering in Society at Concordia University.

### **A. PURPOSE**

This research aims to analyze what software engineers currently working in the industry and aspirants who wish to pursue software engineering think is the impact of artificial intelligence on software engineering professions and information technology industry in general. It also analyzes the utilization of common AI tools (like ChatGPT) in day-to-day work tasks, assesses concerns about job displacement by AI, and explores the skills software engineers think is necessary to secure their roles. The research findings are a result of a pedagogical exercise for the "ENCS691: Social Aspects of AI" course at Concordia University. We may publish and present the research process and what has been learned from the research data at a future conference but we will not publish any empirical data obtained from participants.

### **B. PROCEDURES**

I understand that the research will be conducted through an online survey using Google Forms distributed primarily

over

Whatsapp and other social media platforms. Participants will be asked to provide their insights on the impact of artificial intelligence on the field of software engineering by answering questions related to the discussed subject. The survey will consist of multiple-choice questions, Yes/No inquiries, and short response queries. The estimated time required for completion is approximately 15-20 minutes. To safeguard confidentiality, participants will not be required to provide their names or contact information.

The information collected will include details such as job title, job level (Entry/Associate/Senior), years of experience, type of organization they work for, and career objectives. Participants have the option to skip specific questions, to exit the survey at any time or request that their responses not be included in the analysis after completion.

### C. RISKS AND BENEFITS

I understand that participation in this research involves answering questions directly related to job safety, job market conditions and career objectives that might cause uneasiness or anxiety.

### D. CONDITIONS OF PARTICIPATION

- I understand that I am free to withdraw my consent and discontinue my participation at anytime without negative consequences.
- I understand that my participation in this study is **confidential**. While the research team may know my identity, it will not be disclosed in the survey results or any associated publications.
- I understand that the research findings of this study may be published.

I HAVE CAREFULLY STUDIED THE ABOVE AND UNDERSTAND THIS AGREEMENT. I FREELY CONSENT AND VOLUNTARILY AGREE TO PARTICIPATE IN THIS STUDY.

If at any time you have questions about the proposed research, please contact the study's Principal Investigator.

**Research Team:**

- Mr. Chris Regy Vallikunnathu, Gina Cody School of Engineering, Concordia University  
Email: chrisregy97@gmail.com; Mob: +1 (450) 751-1568
- Ms. Harleen Kaur, Gina Cody School of Engineering, Concordia University  
Email: harleen2506@gmail.com; Mob: +1 (905) 783-8360
- Mr. Vinay Goud, Gina Cody School of Engineering, Concordia University  
Email: vinaygoud.gaddameedi@gmail.com; Mob: +1 (514) 568-9961

**Faculty Supervisor:**

- Dr. Tanja Tajmel, Centre for Engineering in Society, Concordia University  
Email: [tanja.tajmel@concordia.ca](mailto:tanja.tajmel@concordia.ca)

If at any time you  
have questions about your rights as a research participant, please contact the  
Manager, Research Ethics, Concordia University, 514.848.2424 ex. 7481  
[oor.ethics@concordia.ca](mailto:oor.ethics@concordia.ca).

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\* Indicates required question

1. I have carefully studied the above and understand this agreement. I freely consent \* and voluntarily agree to participate in this study.

Mark only one oval.

Yes, I agree.      *Skip to question 29*

No, I do not agree.      *Skip to section 6 (Declined Consent)*

2. I have carefully studied the above and understand this agreement. I freely consent \* and voluntarily agree to participate in this study.

*Mark only one oval.*

Yes, I agree.

No, I do not agree.

## Impact of AI on Information Technology Industry and Software Engineering Professions

This research aims to analyze the impact of artificial intelligence on software engineering professions and information technology industry in general. It also analyzes the utilization of common AI tools in day-to-day work tasks, assesses concerns about job displacement by AI, and explores the skills software engineers think is necessary to secure their roles. The research findings are a result of a pedagogical exercise for the "ENCS691: Social Aspects of AI" course at Concordia University. We may publish and present the research process and what has been learned from the research data at a future conference but we will not publish any empirical data obtained from participants.

3. **What is your role or specialization in the IT industry?** (If you are currently a student, but have previous work experience in the IT industry or have experiences in more than one domain, please select all applicable options. ) \*

*Check all that apply.*

- Student / Industry Aspirant
- System Administrator
- Data Scientist/Analyst
- Project Manager
- Quality Assurance/Test Engineer
- IT Security Professional
- DevOps Engineer
- Business Analyst
- Other: \_\_\_\_\_

**4. What is your level of experience in the IT industry? \***

*Mark only one oval.*

- Entry-level (0-2 years)
- Junior-level (3-5 years)
- Mid-level (6-10 years)
- Senior-level (11-15 years)
- Executive/Managerial (16+ years)
- Not applicable (e.g., currently a student)

**5. What industry or sector is your organization primarily focused on?**

*Mark only one oval.*

- Finance
- Healthcare
- E-commerce/Retail
- Technology/IT Services
- Manufacturing
- Telecommunications
- Energy/Utilities
- Education
- Government/Public Sector
- Other: \_\_\_\_\_

**6. Are you familiar with the use of artificial intelligence tools and technologies in software engineering?**

*Mark only one oval.*

- I am fully fluent with the use of artificial intelligence in software engineering.
- I somewhat know about it, I am not fully sure about my skills.
- I am not familiar at all.

**7. Has your organization implemented any AI-based solutions in your software development lifecycle?**

*Mark only one oval.*

- Yes
- No
- Not yet, but in the planning stage.
- Not Applicable

**8. If your organization has implemented any AI-based solutions in your software development processes or planning to do so, can you please describe what tools you may be using and what processes could be aided by AI?**

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9. **Have you heard of the following AI tools commonly used in software engineering? (Select all that apply)**

*Check all that apply.*

TensorFlow

PyTorch

Scikit-learn

None

Other: \_\_\_\_\_

10. **To what extent do you believe AI tools are capable of implementing software engineering processes independently without human intervention?**

*Mark only one oval.*

Extremely capable

Moderately capable

Slightly capable

Not capable at all

11. **In your experience, to what extent do you think AI tools are effective at automating code generation and optimization?**

*Mark only one oval.*

Extremely effective

Moderately effective

Slightly effective

Not effective at all

12. **In your experience, to what extent do you think AI tools are effective at software testing and bug detection?**

*Mark only one oval.*

- Extremely effective
- Moderately effective
- Slightly effective
- Not effective at all

13. **In your opinion, what is the primary advantage of using AI tools in software engineering? (Select all that apply)**

*Check all that apply.*

- Increased productivity
- Improved code quality
- Faster development cycles
- Enhanced problem-solving capabilities
- Other: \_\_\_\_\_

14. **How confident are you in the ability of AI tools to adapt to rapidly evolving software development trends and technologies?**

*Mark only one oval.*

- Very confident
- Somewhat confident
- Not very confident
- Not confident at all

**15. To what extent do you think the integration of AI tools affects the creativity of software engineers in the development process?**

*Mark only one oval.*

- Significantly enhances creativity
- Slightly enhances creativity
- No impact on creativity
- Slightly hinders creativity
- Significantly hinders creativity

**16. What challenges, if any, have you faced in collaborating with AI tools within your software development team? (Select all that apply)**

*Check all that apply.*

- Lack of interpretability in AI-generated code
- Difficulty integrating AI tools into existing workflows
- Resistance from team members to adopt AI
- Increased complexity in project management
- Other: \_\_\_\_\_

**17. How can AI contribute to promoting diversity of thought within software development teams? (Select all that apply)**

*Check all that apply.*

- Facilitating diverse perspectives in problem-solving
- Minimizing unconscious biases in decision-making
- Encouraging inclusive collaboration in code reviews
- No significant contribution to promoting diversity of thought
- Introduces machine bias which are hard to detect
- Other: \_\_\_\_\_

18. **Do you believe that AI-driven tools and automation in software engineering can lead to a more inclusive work environment?**

*Mark only one oval.*

- Yes, by promoting collaboration and equal participation
- No, as automation may reduce the need for diverse skill sets
- Not sure

19. **In your view, can AI tools contribute to reducing biases in code development that may affect different demographic groups?**

*Mark only one oval.*

- Yes, AI can effectively identify and mitigate biases
- No, AI may inadvertently introduce biases
- Not sure

20. **In your opinion, how has the integration of artificial intelligence impacted job roles in software engineering? (Select all that apply)**

*Check all that apply.*

- Created new job opportunities
- Enhanced existing job roles
- No significant impact
- Led to job role changes
- Resulted in job redundancies

**21. Have you personally experienced any changes in your job responsibilities as a software engineer due to the adoption of AI?**

*Mark only one oval.*

- Yes, significant changes
- Yes, minor changes
- Negligible changes
- No changes at all

**22. Do you believe that the use of AI tools will make software engineering concepts more accessible and understandable to the general public?**

*Mark only one oval.*

- Yes, AI tools can simplify complex concepts and make them more accessible
- No, AI tools may still require a certain level of technical understanding
- Not sure, it depends on the specific AI tools and applications
- AI tools may have a limited impact on the accessibility of software engineering concepts
- I'm unsure about the role of AI in this context

**23. How confident are you in the long-term job security of software engineers with the increasing prevalence of AI in the industry?**

*Mark only one oval.*

- Very confident
- Somewhat confident
- Not very confident
- Not confident at all

24. Please rate the extent to which you agree with the following statement:

**Skills requirements for software engineering positions will change due to AI adoption.**

*Mark only one oval.*

- Strongly Agree
- Agree
- Neither Agree nor Disagree
- Disagree
- Strongly Disagree

25. Please rate the extent to which you agree with the following statement:

**Ongoing education and upskilling efforts are necessary for software engineers to remain competitive in an AI-driven job market.**

*Mark only one oval.*

- Strongly Agree
- Agree
- Neither Agree nor Disagree
- Disagree
- Strongly Disagree

26. Are there any specific skills that you think could protect software engineering professions from being taken over by AI?

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27. If you have any additional comments or observations related to the impact of AI on the IT industry or software engineering professions, feel free to mention it below.
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28. What do you think is the future direction of the IT industry in the face of rapidly advancing AI and ML technologies?
- 

#### Declined Consent

We're sorry to hear that you have concerns regarding the consent form. Please understand that providing consent is mandatory to continue with the survey. If you wish to review the consent form again, please feel free to go back and read it thoroughly. However, if you decide not to provide consent, we respect your decision, and you can exit the survey at any time. Thank you for considering participating and for your time.

#### Impact of AI on Information Technology Industry and Software Engineering Professions

This research aims to analyze the impact of artificial intelligence on software engineering professions and information technology industry in general. It also analyzes the utilization of common AI tools in day-to-day work tasks, assesses concerns about job displacement by AI, and explores the skills software engineers think is necessary to secure their roles. The research findings are a result of a pedagogical exercise for the "ENCS691: Social Aspects of AI" course at Concordia University. We may publish and present the research process and what has been learned from the research data at a future conference but we will not publish any empirical data obtained from participants.

29. **What is your role or specialization in the IT industry?** (If you are currently a student, but have previous work experience in the IT industry or have experiences in more than one domain, please select all applicable options. ) \*

*Check all that apply.*

- Student / Industry Aspirant
- System Administrator
- Data Scientist/Analyst
- Project Manager
- Quality Assurance/Test Engineer
- IT Security Professional
- DevOps Engineer
- Business Analyst
- Other: \_\_\_\_\_

30. **What is your level of experience in the IT industry? \***

*Mark only one oval.*

- Entry-level (0-2 years)
- Junior-level (3-5 years)
- Mid-level (6-10 years)
- Senior-level (11-15 years)
- Executive/Managerial (16+ years)
- Not applicable (e.g., currently a student)

**31. What industry or sector is your organization primarily focused on?**

*Mark only one oval.*

- Finance
- Healthcare
- E-commerce/Retail
- Technology/IT Services
- Manufacturing
- Telecommunications
- Energy/Utilities
- Education
- Government/Public Sector
- Other: \_\_\_\_\_

**32. Are you familiar with the use of artificial intelligence tools and technologies in software engineering?**

*Mark only one oval.*

- I am fully fluent with the use of artificial intelligence in software engineering.
- I somewhat know about it, I am not fully sure about my skills.
- I am not familiar at all.

**33. Has your organization implemented any AI-based solutions in your software development lifecycle?**

*Mark only one oval.*

- Yes
- No
- Not yet, but in the planning stage.
- Not Applicable

34. If your organization has implemented any AI-based solutions in your software development processes or planning to do so, can you please describe what tools you may be using and what processes could be aided by AI?

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35. Have you heard of the following AI tools commonly used in software engineering? (Select all that apply)

*Check all that apply.*

- TensorFlow
- PyTorch
- Scikit-learn
- None
- Other: \_\_\_\_\_

36. To what extent do you believe AI tools are capable of implementing software engineering processes independently without human intervention?

*Mark only one oval.*

- Extremely capable
- Moderately capable
- Slightly capable
- Not capable at all

37. **In your experience, to what extent do you think AI tools are effective at automating code generation and optimization?**

*Mark only one oval.*

- Extremely effective
- Moderately effective
- Slightly effective
- Not effective at all

38. **In your experience, to what extent do you think AI tools are effective at software testing and bug detection?**

*Mark only one oval.*

- Extremely effective
- Moderately effective
- Slightly effective
- Not effective at all

39. **In your opinion, what is the primary advantage of using AI tools in software engineering? (Select all that apply)**

*Check all that apply.*

- Increased productivity
- Improved code quality
- Faster development cycles
- Enhanced problem-solving capabilities
- Other: \_\_\_\_\_

40. **How confident are you in the ability of AI tools to adapt to rapidly evolving software development trends and technologies?**

*Mark only one oval.*

- Very confident
- Somewhat confident
- Not very confident
- Not confident at all

41. **To what extent do you think the integration of AI tools affects the creativity of software engineers in the development process?**

*Mark only one oval.*

- Significantly enhances creativity
- Slightly enhances creativity
- No impact on creativity
- Slightly hinders creativity
- Significantly hinders creativity

42. **What challenges, if any, have you faced in collaborating with AI tools within your software development team? (Select all that apply)**

*Check all that apply.*

- Lack of interpretability in AI-generated code
- Difficulty integrating AI tools into existing workflows
- Resistance from team members to adopt AI
- Increased complexity in project management
- Other: \_\_\_\_\_

**43. How can AI contribute to promoting diversity of thought within software development teams? (Select all that apply)**

*Check all that apply.*

- Facilitating diverse perspectives in problem-solving
- Minimizing unconscious biases in decision-making
- Encouraging inclusive collaboration in code reviews
- No significant contribution to promoting diversity of thought
- Introduces machine bias which are hard to detect
- Other: \_\_\_\_\_

**44. Do you believe that AI-driven tools and automation in software engineering can lead to a more inclusive work environment?**

*Mark only one oval.*

- Yes, by promoting collaboration and equal participation
- No, as automation may reduce the need for diverse skill sets
- Not sure

**45. In your view, can AI tools contribute to reducing biases in code development that may affect different demographic groups?**

*Mark only one oval.*

- Yes, AI can effectively identify and mitigate biases
- No, AI may inadvertently introduce biases
- Not sure

**46. In your opinion, how has the integration of artificial intelligence impacted job roles in software engineering? (Select all that apply)**

*Check all that apply.*

- Created new job opportunities
- Enhanced existing job roles
- No significant impact
- Led to job role changes
- Resulted in job redundancies

**47. Have you personally experienced any changes in your job responsibilities as a software engineer due to the adoption of AI?**

*Mark only one oval.*

- Yes, significant changes
- Yes, minor changes
- Negligible changes
- No changes at all

**48. Do you believe that the use of AI tools will make software engineering concepts more accessible and understandable to the general public?**

*Mark only one oval.*

- Yes, AI tools can simplify complex concepts and make them more accessible
- No, AI tools may still require a certain level of technical understanding
- Not sure, it depends on the specific AI tools and applications
- AI tools may have a limited impact on the accessibility of software engineering concepts
- I'm unsure about the role of AI in this context

49. How confident are you in the long-term job security of software engineers with the increasing prevalence of AI in the industry?

*Mark only one oval.*

- Very confident
- Somewhat confident
- Not very confident
- Not confident at all

50. Please rate the extent to which you agree with the following statement:

**Skills requirements for software engineering positions will change due to AI adoption.**

*Mark only one oval.*

- Strongly Agree
- Agree
- Neither Agree nor Disagree
- Disagree
- Strongly Disagree

51. Please rate the extent to which you agree with the following statement:

**Ongoing education and upskilling efforts are necessary for software engineers to remain competitive in an AI-driven job market.**

*Mark only one oval.*

- Strongly Agree
- Agree
- Neither Agree nor Disagree
- Disagree
- Strongly Disagree

52. **Are there any specific skills that you think could protect software engineering professions from being taken over by AI?**
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53. **If you have any additional comments or observations related to the impact of AI on the IT industry or software engineering professions, feel free to mention it below.**
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54. **What do you think is the future direction of the IT industry in the face of rapidly advancing AI and ML technologies?**
- 

#### Declined Consent

We're sorry to hear that you have concerns regarding the consent form. Please understand that providing consent is mandatory to continue with the survey. If you wish to review the consent form again, please feel free to go back and read it thoroughly. However, if you decide not to provide consent, we respect your decision, and you can exit the survey at any time. Thank you for considering participating and for your time.

# Google Forms

## **Appendix C: Participant Consent Form**

## **CONSENT TO PARTICIPATE IN A SURVEY TO ANALYZE THE IMPACT OF ARTIFICIAL INTELLIGENCE ON INFORMATION TECHNOLOGY AND SOFTWARE ENGINEERING PROFESSIONS**

The primary purpose of this survey is to analyze what software engineers and IT industry aspirants feel about the impact of the widespread adoption of AI in the IT industry. I understand that I have been asked to participate in a research project being conducted by Chris Regy Vallikunnathu, Harleen Kaur and Vinay Goud of Gina Cody School of Engineering at Concordia University under the supervision of Dr. Tanja Tajmel of Centre for Engineering in Society at Concordia University.

### **A. PURPOSE**

This research aims to analyze what software engineers currently working in the industry and aspirants who wish to pursue software engineering think is the impact of artificial intelligence on software engineering professions and information technology industry in general. It also analyzes the utilization of common AI tools in day-to-day work tasks, assesses concerns about job displacement by AI, and explores the skills software engineers think is necessary to secure their roles. The research findings are a result of a pedagogical exercise for the "ENCS691: Social Aspects of AI" course at Concordia University. We may publish and present the research process and what has been learned from the research data at a future conference but we will not publish any empirical data obtained from participants.

### **B. PROCEDURES**

I understand that the research will be conducted through an online survey using Google Forms distributed primarily over Whatsapp and other social media platforms. Participants will be asked to provide their insights on the impact of artificial intelligence on the field of software engineering by answering questions related to the discussed subject. The survey will consist of multiple-choice questions, Yes/No inquiries, and short response queries. The estimated time required for completion is approximately 15-20 minutes. To safeguard confidentiality, participants will not be required to provide their names or contact information. The information collected may be published in the report (without correlating to any personally identifiable information) will include details such as job title, job level (Entry/Associate/Senior), years of experience, type of organization they work for, and career objectives. Participants have the option to skip specific questions, to exit the survey at any time or request that their responses not be included in the analysis after completion.

### **C. RISKS AND BENEFITS**

I understand that participation in this research involves answering questions directly related to job safety, job market conditions and career objectives that might cause uneasiness or anxiety.

### **D. CONDITIONS OF PARTICIPATION**

- I understand that I am free to withdraw my consent and discontinue my participation at anytime without negative consequences.
- I understand that my participation in this study is **confidential**. While the research team may know my identity, it will not be disclosed in the survey results or any associated publications.
- I understand that the data from this study may be published.

I HAVE CAREFULLY STUDIED THE ABOVE AND UNDERSTAND THIS AGREEMENT. I FREELY CONSENT AND VOLUNTARILY AGREE TO PARTICIPATE IN THIS STUDY.

If at any time you have questions about the proposed research, please contact the study's Principal Investigator.

**Research Team:**

- **Mr. Chris Regy Vallikunnathu**, Gina Cody School of Engineering, Concordia University  
Email: [chrisregy97@gmail.com](mailto:chrisregy97@gmail.com); Mob: +1 (450) 751-1568
- **Ms. Harleen Kaur**, Gina Cody School of Engineering, Concordia University  
Email: [harleen2506@gmail.com](mailto:harleen2506@gmail.com); Mob: +1 (905) 783-8360
- **Mr. Vinay Goud**, Gina Cody School of Engineering, Concordia University  
Email: [vinaygoud.gaddameedi@gmail.com](mailto:vinaygoud.gaddameedi@gmail.com); Mob: +1 (514) 568-9961

**Faculty Supervisor:**

- **Dr. Tanja Tajmel**, Centre for Engineering in Society, Concordia University  
Email: [tanja.tajmel@concordia.ca](mailto:tanja.tajmel@concordia.ca)

If at any time you have questions about your rights as a research participant, please contact the Manager, Research Ethics, Concordia University, 514.848.2424 ex. 7481 [oor.ethics@concordia.ca](mailto:oor.ethics@concordia.ca)