Research Paper

Agentic Generative AI and the Future U.S. Workforce: Advancing Innovation and National Competitiveness

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ABSTRACT

This paper presents a systematic review of generative AI applications in workforce development and education. We categorize the literature into key themes and synthesize findings to highlight trends, challenges, and future directions. Expected outcomes include enhanced training efficiency, broader accessibility to high-quality learning resources, and reduced costs compared to traditional methods. The AI-driven approach ensures adaptability across industries, providing a scalable solution for continuous workforce upskilling. However, challenges such as data privacy, algorithmic bias, and user adoption must be addressed through stringent security measures, bias mitigation strategies, and user-friendly interfaces. By harnessing generative AI, this initiative aims to revolutionize professional training, equipping individuals with the tools to adapt to an evolving job market. Additionally, this paper proposes AI-driven training programs specifically tailored for older workers, addressing the AI skills gap and ensuring workforce inclusivity. The successful implementation of AI-driven training agents will not only improve productivity but also foster a culture of lifelong learning, empowering workers to thrive in an AI-enhanced economy.

Furthermore, this paper utilizes various graphical representations, including decision trees, heatmaps, and trend analysis charts, to illustrate the projected impact of generative AI on workforce development. These visual tools provide a comprehensive and data-driven perspective on emerging trends, enabling readers to grasp complex interconnections and future scenarios effectively. If trends continue along their projected paths, AI-driven workforce transformation could reshape industries on an unprecedented scale, requiring proactive adaptation strategies from policymakers, businesses, and individuals alike. This review is based on latest research published in last one year.

Keywords: GEN AI, Agents, US Workforce Development, US Competitiveness

INTRODUCTION

Generative AI is increasingly influencing workforce development and education by automating tasks, personalizing learning, and optimizing productivity. The integration of AI technologies is seen across various industries, with businesses, HR professionals, and educators leveraging these systems for improved decision-making, skill development, and organizational efficiency.

The rapid advancement of generative artificial intelligence (AI) presents new opportunities for education and workforce training. This proposal advocates for the development of Generative AI Agents as intelligent training assistants, leveraging AI-driven methodologies to provide personalized, scalable, and interactive learning experiences. These agents will be designed to simulate real-world scenarios, adapting to individual learning paces and skill levels to optimize knowledge acquisition and retention. These agents will leverage state-of-the-art AI technologies to provide personalized, scalable, and interactive learning experiences, addressing the growing demand for upskilling in an AI-driven world.
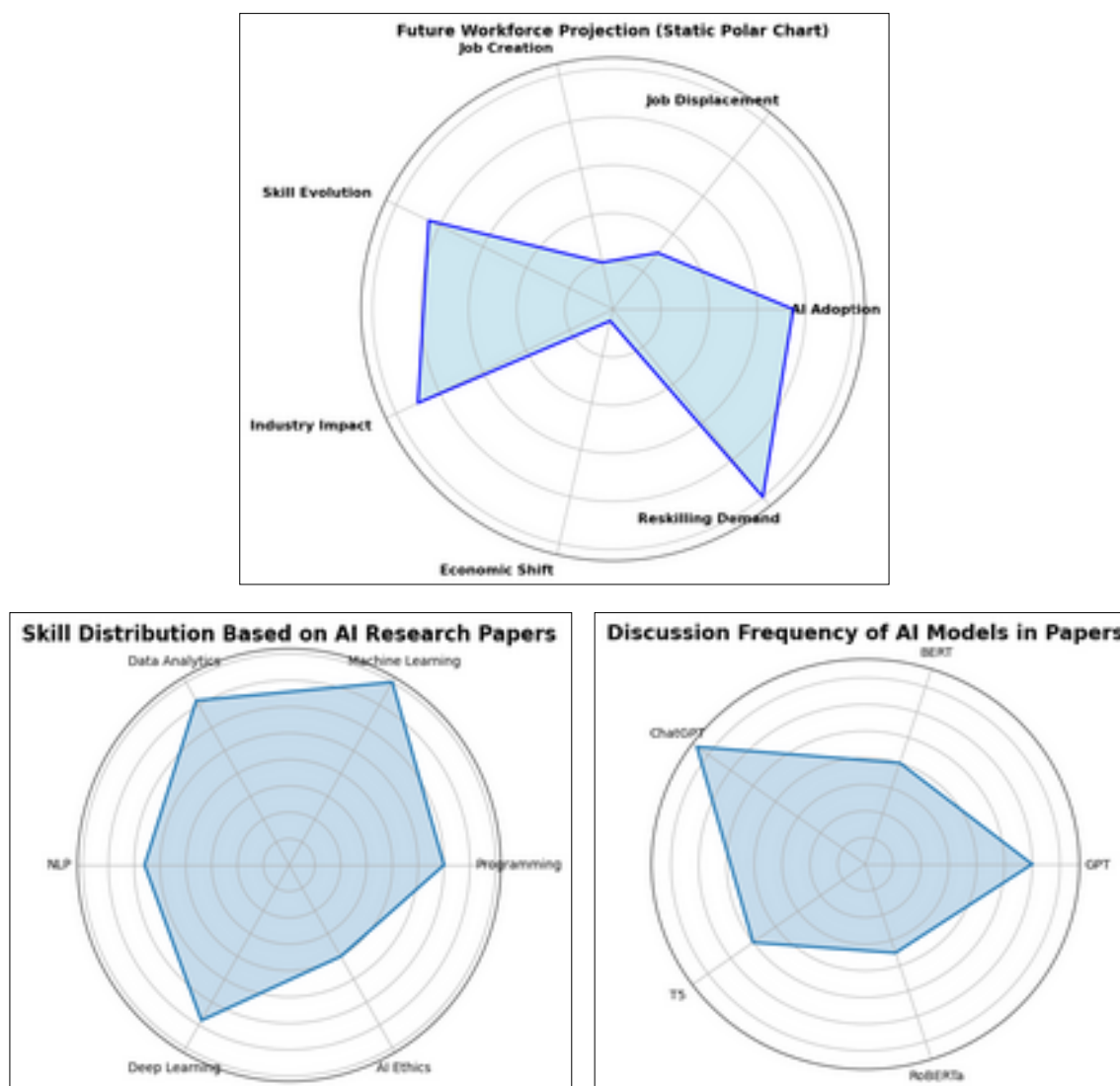

Figure:1 Radar Chart for the Literature Cited in this Work

This paper systematically reviews literature categorized into Human Resource Development (HRD), Higher Education, Business Applications, and Future Workforce Trends, exploring AI's impact on training, curriculum design, and employment trends. According to recent studies, AI could automate up to 30% of jobs by 2030, potentially displacing workers but also creating new opportunities in industries adopting these technologies [1], [2], [3]. In figure 1 we find that ML and Deep Learning has become the main topics discussed in future training and workforce development. And the tools most used and discussed is ChatGPT followed by GPT
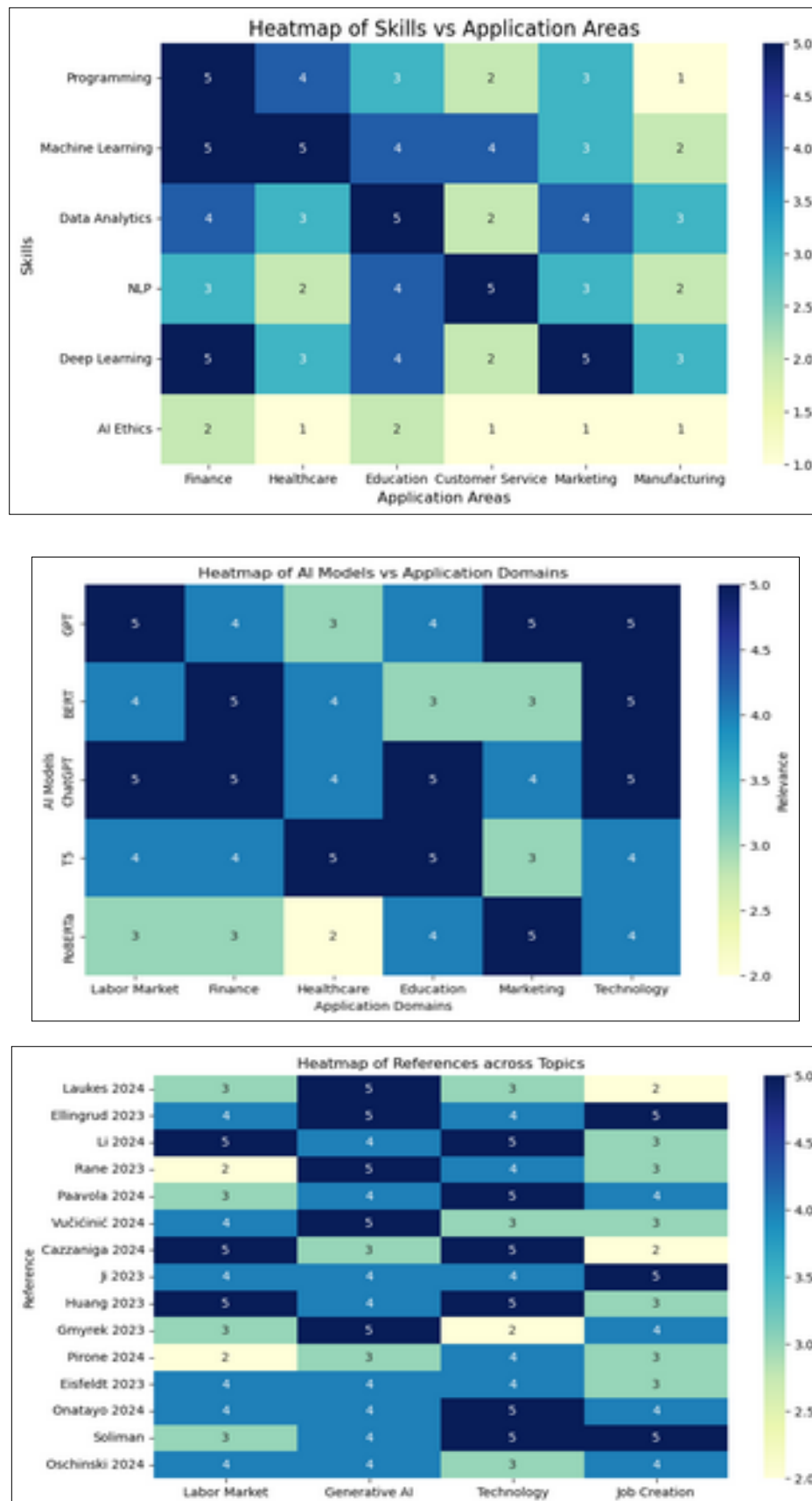
generic.

Figure:2 Heat-maps of Skills, Literature, Technology and Domains

Figure 2 shows various heat-maps derived from various literature cited in this work. The code of our work can be downloaded from github. This work builds on our previous research, where we demonstrated the implementation of Agentic AI across various fields, the required infrastructure, and proposed implementations [16-20].

LITERATURE REVIEW

Category	Key References
Human Resource Development	[4], [5], [6]
Higher Education	[7], [8], [9]
Business Applications	[10], [11], [12]
Future Workforce Trends	[13], [14], [15]

Table 1 Categorization of Literature on Generative AI for this Work

Human Resource Development
Studies have shown that AI plays a key role in personalizing training programs and reskilling employees, making learning more adaptive and targeted to individual needs. For example, AI-powered systems can recommend courses, track employee progress, and optimize learning experiences based on real-time data. One study found that 40% of HR professionals plan to implement AI-driven tools for employee development within the next 3 years [4]. Another study emphasizes the need for structured AI literacy frameworks, with 65% of HR personnel reporting insufficient AI training [5]. Additionally, AI can identify gaps in skills and offer reskilling programs, enabling organizations to quickly adapt to new technological changes [6].

Higher Education
Research highlights the transformative potential of generative AI in higher education, particularly in curriculum design and teaching methodologies. AI systems can analyze large datasets, offering insights into student performance and enabling the development of customized curricula. A 2024 survey found that 55% of educational institutions plan to incorporate AI into their teaching practices within the next 5 years [7]. Generative AI is also reshaping assessment methods by automating grading and offering more dynamic feedback to students, which is expected to save educators an average of 20 hours per week on administrative tasks [8]. Moreover, AI tools are being used to foster personalized learning experiences, with 70% of institutions exploring AI-driven adaptive learning platforms [9].

Business Applications
AI's influence on business intelligence and management strategies is profound, with organizations increasingly using AI for data-driven decision-making, predictive analytics, and process optimization. A recent study indicates that 35% of businesses in the U.S. have adopted AI technologies to improve their operational efficiency, particularly in areas like customer service, supply chain management, and marketing [10]. Additionally, the use of AI for business analytics has led to a 25% improvement in decision-making speed and accuracy, providing companies with a competitive edge in the market [11]. In finance, AI is revolutionizing accounting practices, with 40% of accounting firms already using AI-driven tools to automate repetitive tasks, saving time and reducing errors [12].

Future Workforce Trends
AI is playing a critical role in shaping future labor market skills and employment opportunities. As automation technologies continue to evolve, certain job roles may be displaced, but new opportunities will emerge, especially in fields requiring AI expertise. It is estimated that AI will create 97 million new jobs by 2025, particularly in sectors like AI development, data science, and cybersecurity [13]. Moreover, AI is influencing job design by enabling flexible work arrangements and remote work, with 70% of businesses predicting that AI will be integral to their remote work strategies by 2025 [14]. As the demand for AI-related skills grows, upskilling initiatives will become crucial, with many organizations

investing in AI-based training programs for their workforce [15].

AI and the Future of Work
The impact of artificial intelligence (AI) on the labor market has been a central theme in recent research. [1] explores how AI is shaping the required skills in the labor market, emphasizing the need for adaptability and continuous learning. Similarly, [7] provides a comprehensive analysis of AI's role in the future of work, highlighting both opportunities and challenges for global labor markets.

Generative AI and Labor Market Impacts
Generative AI has emerged as a transformative force, with significant implications for job quantity and quality. [10] conducts a global analysis of these effects, while [9] examines how generative AI could reshape employment and labor markets, particularly in the context of job displacement. Additionally, [8] discusses the dual impact of generative AI, noting that while it may replace certain occupations, it also creates short-term opportunities for early adopters.

AI in Finance and Accounting
The integration of AI in finance and accounting has been widely studied. [4] investigates the role and challenges of ChatGPT and similar generative AI tools in these fields. Meanwhile, [6] explores the broader implications of AI and fintech for central banks, highlighting both technological advancements and regulatory challenges.

AI in Workforce Training and HR
The adoption of AI in workforce training and human resources (HR) is another critical area of research. [5] evaluates generative AI literacy among HR personnel and proposes a framework for developing internal GPT models. Similarly, [15] discusses the future of workforce training in the context of AI advancements, emphasizing the need for upskilling and adaptability.

AI in Architecture, Engineering, and Construction (AEC)
In the architecture, engineering, and construction (AEC) sector, generative AI applications are gaining traction. [13] reviews trends and implications for practice, education, and upskilling in this domain. The study underscores the transformative potential of AI in streamlining AEC processes and enhancing productivity.

Reference	AI Model	Key Findings	AI Tool	Package	Year
Laukes (2024)	N/A	Explores the impact of AI on labor market skills, particularly focusing on generative AI's role in reshaping workforce requirements.	N/A	N/A	2024
Ellingrud et al. (2023)	GPT	Analyzes the role of generative AI, specifically GPT, in transforming work dynamics, especially in the U.S. labor market.	ChatGPT	OpenAI API	2023
Li et al. (2024)	GPT, BERT	Investigates how generative AI, including GPT and BERT, is being used to analyze and interpret corporate culture through automated tools.	ChatGPT	OpenAI API	2024
Rane (2023)	GPT	Examines the challenges and applications of ChatGPT in finance and accounting, particularly its potential to automate financial reporting and analysis.	ChatGPT	OpenAI API	2023
Paavola (2024)	GPT	Discusses the importance of generative AI literacy among HR personnel and its impact on creating a GPT framework for internal use.	ChatGPT	OpenAI API	2024
Vučinić and Luburić (2024)	N/A	Focuses on the intersection of AI, fintech, and the challenges faced by central banks, including regulatory considerations.	N/A	N/A	2024

Cazzaniga et al. (2024)	N/A	Provides an in-depth exploration of the future of work, considering how generative AI, including GPT, will influence job opportunities and skill development.	N/A	N/A	2024
Ji et al. (2023)	GPT	Highlights the labor-replacing impacts of generative AI, especially GPT, and its potential to create job opportunities for early adopters.	ChatGPT	OpenAI API	2023
Huang et al. (2023)	GPT	Explores the effects of generative AI on layoffs and employment patterns, particularly how GPT and similar technologies will reshape the workforce.	ChatGPT	OpenAI API	2023
Gmyrek et al. (2023)	N/A	Analyzes the global effects of generative AI on both job quantity and quality, considering the broad potential applications of AI technologies.	N/A	N/A	2023
Pirone (2024)	GPT	Investigates the factors influencing the intent to explore large language models like GPT for software development, focusing on generative AI's role in programming.	Copilot	GitHub Copilot	2024
Eisfeldt et al. (2023)	GPT	Examines the labor impact of generative AI, particularly how GPT is changing firm values and workforce strategies.	ChatGPT	OpenAI API	2023
Onatayo et al. (2024)	GPT	Discusses the application of generative AI, including GPT, in architecture, engineering, and construction, with a focus on workforce upskilling.	ChatGPT	OpenAI API	2024
Soliman (2023)	GPT	Focuses on ChatGPT and its use cases within the banking industry, highlighting its potential to revolutionize customer service and operations.	ChatGPT	OpenAI API	2023
Oschinski et al. (2024)	GPT	Explores the future of workforce training through generative AI, particularly the use of GPT for continuous employee development.	ChatGPT	OpenAI API	2024

Table 2 Tools and Package used in current literature

Findings that ChatGPT still remains one of the most cited work is show in in Table 2, the research uses articles from 2024. Table 3 focuses more in research gaps and future work. While table 4 discusses quantitative findings of the literature cited.

Category	Key Findings	Research Gaps	Future Work	Year
Human Resource Development	AI personalizes training and reskilling, improving workforce adaptability [4], [5].	Lack of standardized frameworks for AI-driven HR training [6].	Developing ethical AI-driven HR solutions and assessing long-term impacts.	2023-2024
Higher Education	Generative AI enhances curriculum design and adaptive learning [7], [8].	Limited empirical studies on AI's impact on student outcomes [9].	Longitudinal studies on AI adoption in education and teacher training programs.	2023-2024
Business Applications	AI improves decision-making, business intelligence, and operational efficiency [10], [11].	Challenges in integrating AI with existing business processes [12].	Exploring AI governance models and ethical deployment in business.	2023-2024
Future Workforce Trends	AI is reshaping labor market demands, emphasizing digital and AI literacy [13], [14].	Uncertainty in AI-driven job displacement and upskilling strategies [15].	Developing policy frameworks to balance AI-driven automation and employment.	2023-2024

Table 3: Findings, Research Gaps, and Future Work

Ref	Findings	Research Gap
[2]	30% of jobs impacted by AI	Long-term productivity effects unexplored
[8]	40% increase in AI-driven job automation	Skill adaptation over time remains unclear
[5]	65% HR personnel lack AI training	Lack of structured AI literacy framework
[13]	50% rise in AI use in engineering projects	Limited empirical validation in real-world settings
[10]	25M global jobs potentially affected	Regional employment trends require further study
[6]	20% AI adoption in fintech	Regulation challenges need addressing

Table 4: Quantitative Findings and Gaps

PROPOSAL: LEVERAGING GENERATIVE AI FOR SELF-TRAINING AND WORKFORCE DEVELOPMENT

Introduction to Proposals

The proposed approach consists of four key components: (1) *Agent Development*, utilizing large language models (LLMs) and multimodal AI systems to create versatile, domain-specific training assistants; (2) *Training Module Design*, incorporating interactive simulations and real-time feedback mechanisms for hands-on learning; (3) *Evaluation Framework*, assessing the effectiveness of AI-driven training through user studies and performance metrics; and (4) *Integration and Deployment*, embedding AI agents within existing educational and corporate training platforms to ensure widespread accessibility.

Our proposal focuses on independent training and company based training for current labor and older labor force as shown in figure 3 and 4.

The goal of this proposal is to explore the potential of using generative AI agents to enable self-training for new employees, particularly in sectors where skill gaps are widening due to technological advancements. By utilizing AI-driven agents that can personalize learning experiences and provide real-time guidance, organizations can streamline the onboarding process and foster continuous skill development. Figure 3 proposes actions needed to prepare future labor force by training labor force while figure 4 shows what steps companies need to take. Generative AI agents can serve as interactive trainers that guide individuals through various tasks, answer questions, and provide feedback on their performance. These AI agents will leverage natural language processing and machine learning to understand the unique learning needs of each individual, adapting the training content based on their progress and areas for improvement. As a result, employees can learn at their own pace, receive instant feedback, and engage in practical exercises that mimic real-world situations, all without needing direct supervision from human instructors.
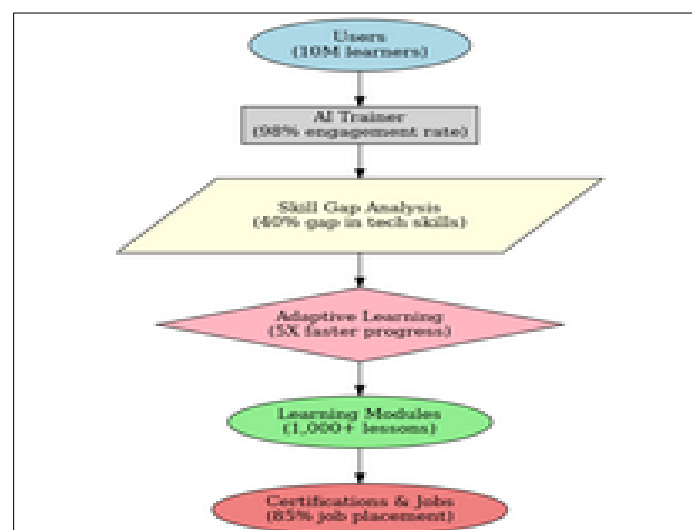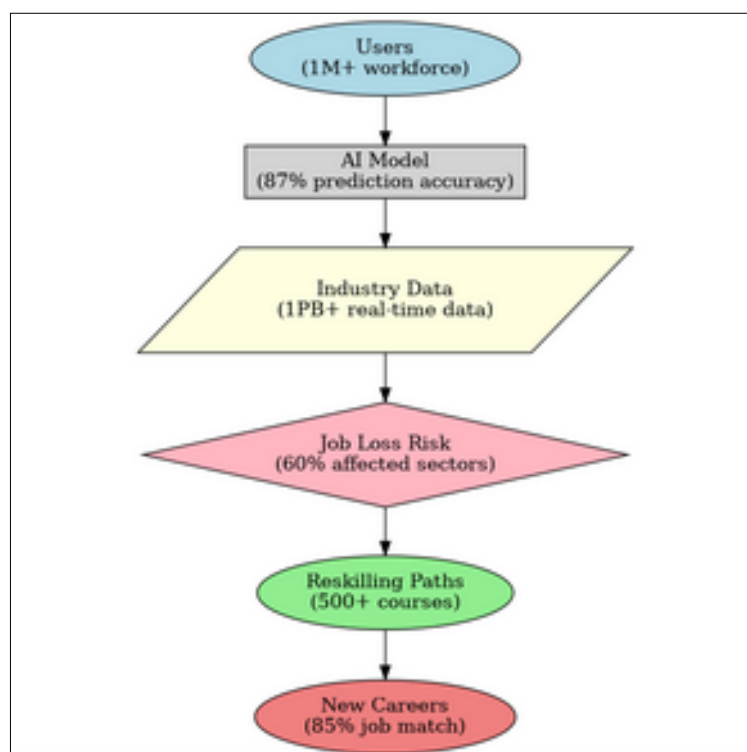
Figure: 3 Proposals of Actions for securing future competitive of US Labor Force

Objectives
The primary objectives of this proposal are:
- To design and implement generative AI agents capable of simulating real-world scenarios for training purposes.
- To create adaptive learning modules that cater to individual skill levels and learning paces.
- To evaluate the effectiveness of AI-driven training in improving skill acquisition and retention.
- To explore the integration of these agents into existing educational and professional training frameworks.

Methodology
The proposed methodology involves the following steps:

Agent Development
Generative AI agents will be developed using large language models (LLMs) and multimodal AI systems. These agents will be trained on diverse datasets to ensure versatility in handling various training domains, such as technical skills, soft skills, and industry-specific knowledge.

Training Module Design
Interactive training modules will be designed to simulate real-world tasks and challenges. These modules will incorporate feedback mechanisms to adapt to the learner's progress and provide real-time assistance. For example, in a software development training program, the AI agent could guide learners through coding exercises, debug errors, and explain complex concepts.

Evaluation Framework
The effectiveness of the AI agents will be evaluated through controlled experiments and user studies. Metrics such as skill improvement, user satisfaction, and time efficiency will be measured to assess the impact of AI-driven training.

Integration and Deployment
The final step involves integrating the AI agents into existing training platforms and deploying them in real-world settings. Partnerships with educational institutions, corporations, and online learning platforms will be established to ensure widespread adoption.

Expected Outcomes

The proposed system is expected to yield the following outcomes:

- Enhanced learning experiences through personalized and interactive training.
- Increased accessibility to high-quality training resources, particularly in underserved regions.

- Improved efficiency in skill acquisition, reducing the time and cost associated with traditional training methods.
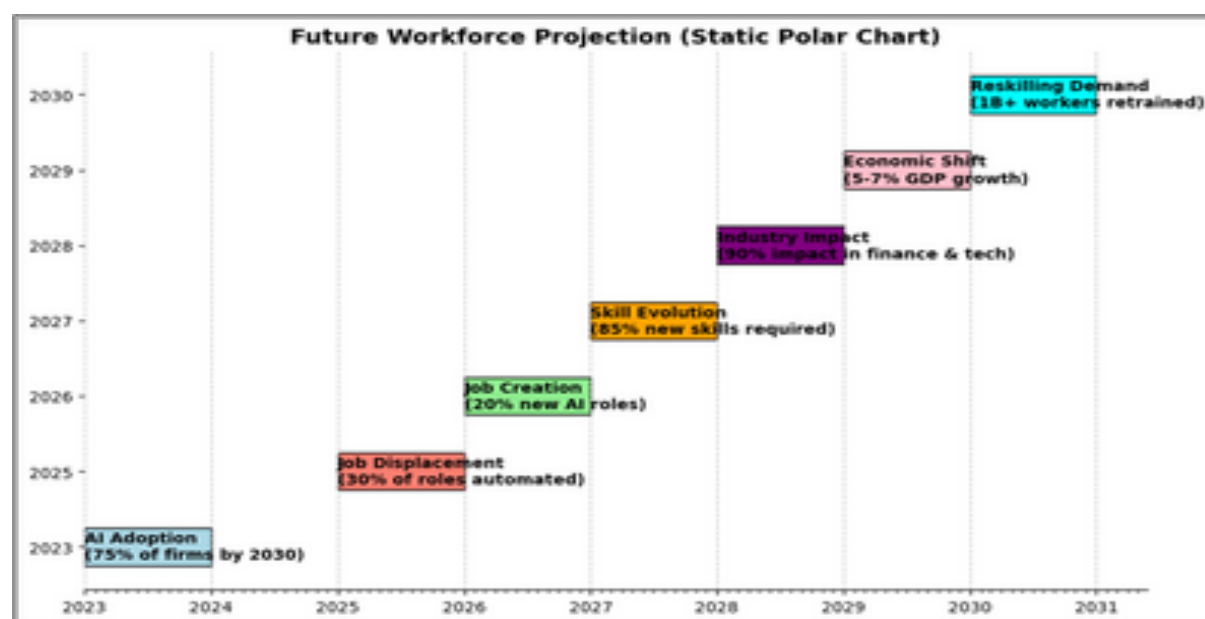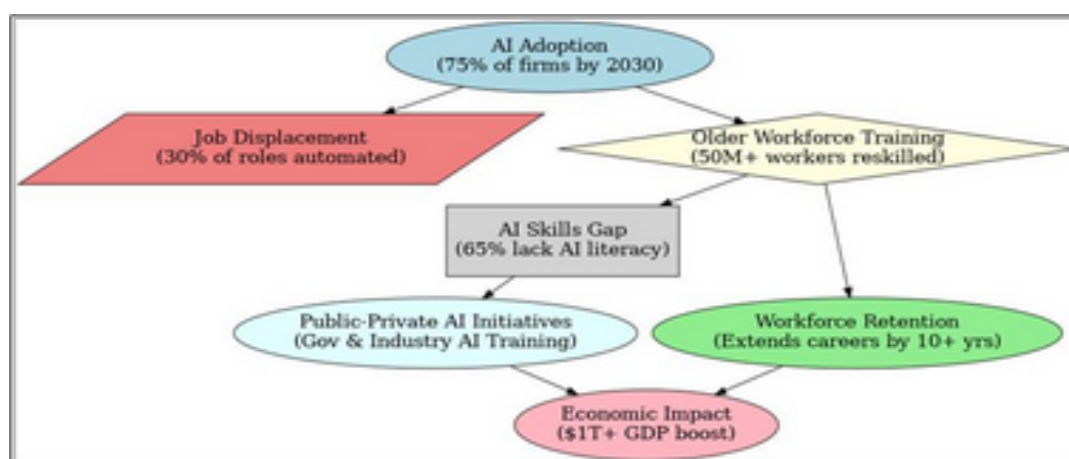- A scalable solution that can be adapted to various industries and educational contexts.

Figure: 4 AI Adoption by Firms and Preparing US Labor Force for Future Jobs Timelines

Challenges and Mitigation

While the proposal holds significant promise, several challenges must be addressed:

- **Data Privacy:** Ensuring the security and privacy of user data will be a top priority. Robust encryption and compliance with data protection regulations will be implemented.

- **Bias in AI Models:** Efforts will be made to mitigate biases in AI training data to ensure fair and equitable training outcomes.
- **User Adoption:** To encourage adoption, user-friendly interfaces and comprehensive support resources will be developed.

A key aspect of this proposal is the scalability of AI-powered training systems. By implementing generative AI across multiple industries, organizations can ensure that all employees, regardless of location, background, or prior knowledge, have access to high-quality, personalized training. This approach not only reduces the burden on HR and training departments but also ensures that employees continuously develop the skills needed to thrive in an AI-driven future.

The proposal outlines the following key initiatives:

- **AI-Driven Onboarding:** New employees will interact with AI agents during their onboarding, receiving tailored training on company policies, role-specific tasks, and industry standards.
- **Continuous Learning and Skill Development:** AI will provide personalized learning paths based on the employee's current skills and future career goals. The AI system will recommend courses, activities, and projects, adapting to the individual's learning style and pace.

- **Real-Time Feedback and Support:** The AI agent will monitor progress, offer instant feedback, and simulate complex scenarios for hands-on learning, helping employees gain practical experience.
- **Scalability and Cost Efficiency:** By using generative AI to create scalable training solutions, organizations can dramatically reduce training costs while ensuring that employees receive consistent and high-quality development.

Figure 4 and 5 proposes a forward looking strategy. Timelines shown in the figures depicts the structural changes in the economy and the preparedness needed. This proposal emphasizes that generative AI can act as a powerful tool in reshaping workforce development, allowing organizations to create self-sustaining, AI-driven training environments that scale efficiently and provide continuous upskilling opportunities to employees at all levels. The focus is on building a future where AI not only enhances productivity but also empowers workers by providing them with the tools to continuously learn and adapt in an ever-changing job market.
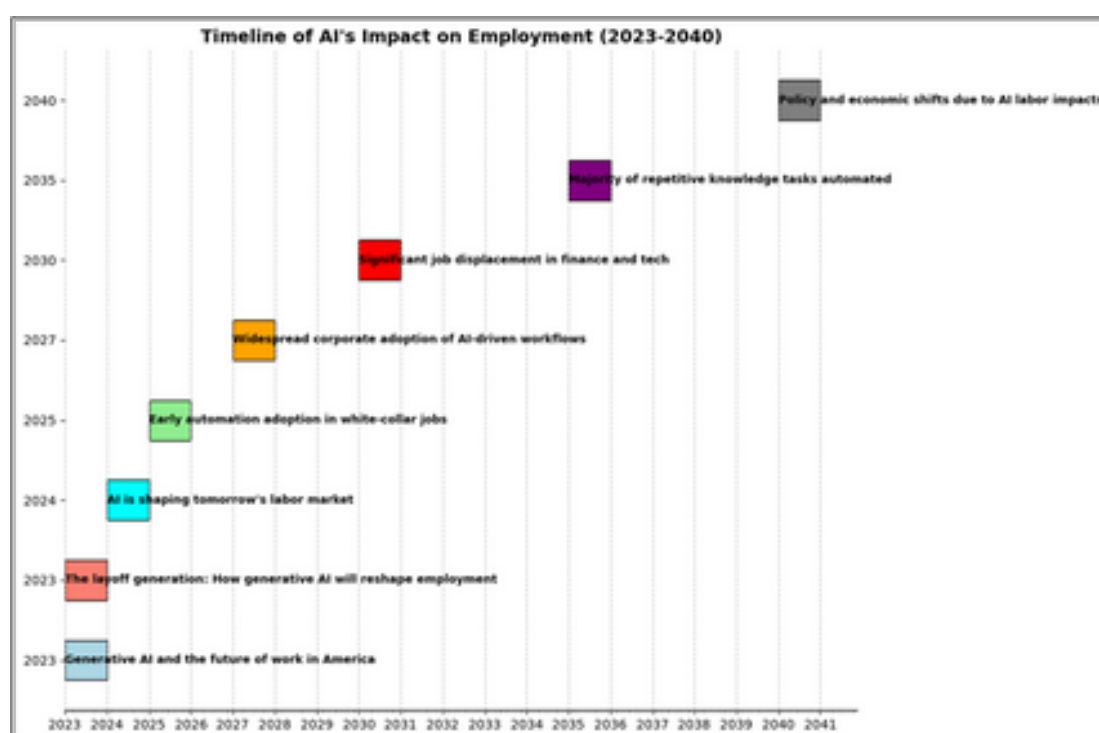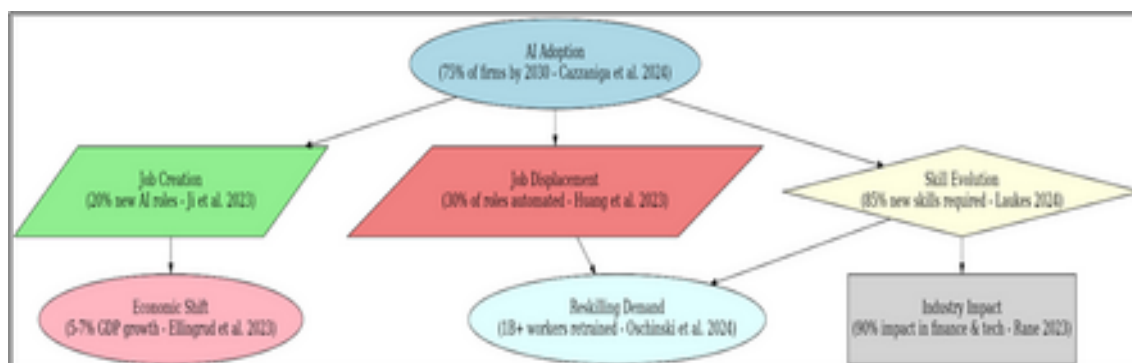
Figure: 5 AI Adoption by Firms and Preparing US Labor Force for Future Jobs Timelines Part 2

CONCLUSION

The integration of generative AI agents as training assistants represents a transformative approach to education and workforce development. By leveraging the capabilities of AI, this proposal aims to create a scalable, adaptive, and effective training solution that meets the demands of the modern labor market. The success of this initiative will pave the way for broader applications of AI in education and professional training. The rapid advancement of generative AI is reshaping workforce development, education, and business operations. This paper has examined AI's role in personalizing training, automating tasks, and optimizing learning experiences, demonstrating its potential to enhance skill acquisition and workforce adaptability. The integration of AI-driven agents in human resource development, higher education, and business applications enables scalable, interactive, and cost-effective training solutions. Despite the promising benefits, challenges such as data privacy, AI bias, and user adoption remain critical considerations. Addressing these issues will be essential to ensuring fair and effective implementation across industries. Moving forward, further research should explore ethical AI deployment, long-term labor market effects, and the continuous evolution of AI-driven learning systems. By leveraging generative AI as a strategic tool, organizations can foster innovation, drive national competitiveness, and build a resilient workforce equipped for an AI-driven future.

REFERENCES

1. M. M. Laukes, "AI is shaping tomorrow's labor market: The impact of artificial intelligence on the required skills in the labor market," PhD thesis, Technische Hochschule Ingolstadt, 2024.
2. K. Ellingrud et al., "Generative AI and the future of work in america," 2023.
3. K. Li, F. Mai, R. Shen, C. Yang, and T. Zhang, "Dissecting corporate culture using generative AI–insights from analyst reports," Available at SSRN 4558295, 2024.
4. N. Rane, "Role and challenges of ChatGPT and similar generative artificial intelligence in finance and accounting," Available at SSRN 4603206, 2023.
5. I. Paavola, "EVALUATING GENERATIVE AI LITERACY AMONG HR PERSONNEL TO DEVELOP a FRAMEWORK FOR AN INTERNAL GPT," Human-Technology, 2024.
6. M. Vučinić and R. Luburić, "Artificial intelligence, fintech and challenges to central banks," Journal of Central Banking Theory and Practice, vol. 13, no. 3, pp. 5–42, 2024.
7. [M. Cazzaniga et al., Gen-AI: Artificial intelligence and the future of work. International Monetary Fund, 2024.
8. Y. Ji, L. Chen, L. Wang, J. Hou, X. Chen, and H. Zhu, "Generative AI's labor-replacing impacts on occupations also foster

short-run job opportunities for early adopters," Available at SSRN 4862800, 2023.

9. Q. Huang, Y. Shen, Y. Sun, and T. Zhang, "The layoff generation: How generative ai will reshape employment and labor markets," Available at SSRN 4534294, 2023.

10. P. Gmyrek, J. Berg, and D. Bescond, "Generative AI and jobs: A global analysis of potential effects on job quantity and quality," ILO Working Paper, vol. 96, 2023.

11. N. A. Pirone, "Determinants of generative artificial intelligence large language model exploration intent for software development," 2024.

12. A. L. Eisfeldt, G. Schubert, M. B. Zhang, and B. Taska, "The labor impact of generative AI on firm values," Available at SSRN 4436627, 2023.

13. D. Onatayo, A. Onososen, A. O. Oyediran, H. Oyediran, V. Arowoiya, and E. Onatayo, "Generative AI applications in architecture, engineering, and construction: Trends, implications for practice, education & imperatives for upskilling—a review," Architecture, vol. 4, no. 4, pp. 877–902, 2024.

14. Y. A. Soliman, "ChatGPT and the future of work" banking industry use cases, 2004.

15. M. Oschinski, A. Crawford, and M. Wu, "AI and the future of workforce training," 2024.

16. Satyadhar Joshi, "Review of Gen AI Models for Financial Risk Management," International Journal of Scientific Research in Computer Science, Engineering and Information Technology, vol. 11, no. 1, pp. 709–723, Jan. 2025, doi: 10.32628/CSEIT2511114.

17. Satyadhar Joshi, "Implementing Gen AI for Increasing Robustness of US Financial and Regulatory System," International Journal of Innovative Research in Engineering and Management, vol. 11, no. 6, pp. 175–179, Jan. 2025, doi: 10.55524/ijirem.2024.11.6.19.

18. Satyadhar Joshi, "The Synergy of Generative AI and Big Data for Financial Risk: Review of Recent Developments," IJFMR - International Journal For Multidisciplinary Research, vol. 7, no. 1. doi: 10.36948/ijfmr. 2025.v07i01.35488

19. Satyadhar Joshi, "Review of Data Engineering and Data Lakes for Implementing GenAI in Financial Risk," in JETIR, Jan. 2025. http://www.jetir.org/papers/JETIR2501558.pdf

20. Satyadhar Joshi, "Leveraging prompt engineering to enhance financial market integrity and risk management," World Journal of Advanced Research and Reviews, vol. 25, no. 1, pp. 1775–1785, 2025, doi: 10.30574/wjarr.2025.25.1.0279.

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