



Retraining US Workforce in the Age of Agentic Gen AI: Role of Prompt Engineering and Up-skilling Initiatives

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Abstract: This work reviews U.S. workforce retention, AI upskilling, prompt engineering, workforce development, and automation in the context of recent advancements in agentic generative AI. The rapid integration of artificial intelligence (AI) across industries has raised concerns over potential job displacement within the US workforce. However, targeted upskilling—particularly through training in prompt engineering, a key skill for interacting with large language models—offers promising avenues to empower employees and retain talent. This review paper synthesizes insights from academic research, industry reports, and educational initiatives to examine how prompt engineering training can mitigate the challenges of AI-induced disruption and support workforce resilience. This review article provides a comprehensive overview of the rapidly evolving field of prompt engineering. It examines fundamental techniques for crafting effective prompts, explores the diverse applications of prompt engineering across various sectors, and discusses the challenges and ethical considerations associated with its use. Furthermore, the review identifies potential future research directions and highlights the growing importance of prompt engineering in the age of large language models. This review article provides a comprehensive overview of prompt engineering, with a specific focus on its implications for workforce development and training. It examines prompt engineering techniques, applications across sectors, ethical considerations, and future research directions. A key emphasis is placed on the role of prompt engineering training programs in equipping the workforce with essential skills for the age of large language models.

Keywords: Prompt Engineering, Artificial Intelligence, Gen AI Education, Up-skilling Generative AI

I. INTRODUCTION

Artificial intelligence is revolutionizing business operations worldwide. In the United States, companies increasingly adopt AI-driven processes, sparking concerns over job displacement and the need for continuous workforce development. A critical response to these challenges is upskilling—specifically, training employees in emerging skills such as prompt engineering, which is essential for effectively interacting with modern AI systems [2], [4], [6]. This review examines how such training initiatives can play a pivotal role in retaining the US workforce.

The rapid advancement of artificial intelligence (AI), particularly in the realm of Generative AI (GenAI), is transforming industries and reshaping how we interact with technology. GenAI, with its ability to create novel content ranging from text and images to code and music, holds immense potential to revolutionize various sectors, from healthcare and education to finance and entertainment. However, realizing this potential requires careful consideration of how humans interact with these powerful models. The rise of large language models (LLMs) has led to the emergence of prompt engineering, a crucial skill for effectively interacting with and leveraging these powerful AI systems. This review article examines prompt engineering techniques, applications, and future directions, with a particular focus on how prompt engineering training programs can prepare the workforce for the evolving demands of the digital age.

The burgeoning field of prompt engineering has rapidly gained prominence due to the increasing capabilities of large language models (LLMs). Prompt engineering, at its core, involves the design and refinement of input prompts to elicit