Research Document: Agentic AI and Its Applications

Prepared by: Jamila Yaqoob Dhedhi
Roll Number: 00305277

May 29, 2025

Contents

1 Introduction to Agentic AI

Agentic AI refers to artificial intelligence systems that operate autonomously to achieve specific goals. These systems can make decisions, adapt to changing environments, and act proactively without requiring constant human oversight. Agentic AI is ideal for tasks that involve complexity and dynamic interactions, such as managing workflows or coordinating multiple processes.

Key Features:

- *Autonomy:* Functions independently of human input.
- *Goal Orientation:* Works toward predefined objectives.
- *Adaptability:* Adjusts to new conditions.
- *Proactivity:* Takes initiative to solve problems.

graphicx

2 Understanding Large Language Models (LLMs)

Large Language Models (LLMs) are advanced AI systems trained on vast text datasets to comprehend and generate human-like language. They underpin many modern AI applications, from chatbots to content creation tools.

2.1 How LLMs Work

1. **Training:** Exposed to diverse text sources to learn language patterns.
2. **Processing:** Breaks down input into tokens for analysis.
3. **Prediction:** Generates responses by predicting subsequent tokens.
4. **Output:** Produces coherent text based on context.

Examples: OpenAI's GPT models, Google's BERT.

(Image Placeholder: Flowchart of the LLM process from text input to output)

3 What is Generative AI?

Generative AI encompasses AI systems that create new content—text, images, or other media—based on learned patterns. While LLMs are a subset of Generative AI focused on text, the category also includes models for visual and auditory outputs.

3.1 Examples

- **Text Generation:** Writing essays or dialogue.
- **Image Creation:** Producing artwork from prompts (e.g., DALL-E).
- **Audio Synthesis:** Composing music or sound effects.

(Image Placeholder: Examples of Generative AI outputs: text, image, and audio)

4 Difference Between Generative AI and Agentic AI

Generative AI and Agentic AI serve distinct purposes within the AI landscape.

Aspect	Generative AI	Agentic AI
Purpose	Generates content	Executes goal-driven actions
Autonomy	Limited; prompt-dependent	High; self-directed
Output	Creative works (e.g., text, images)	Decisions and task completions
Example	Composing a poem on request	Scheduling a meeting autonomously

Table 1: Comparison of Generative AI and Agentic AI

(Image Placeholder: Table or Venn diagram comparing Generative AI and Agentic AI)

5 Subtopics in Agentic AI

5.1 Swarm

Swarm is an educational framework developed by OpenAI's Solution team to explore ergonomic, lightweight multi-agent orchestration. It enables multiple AI agents to work collaboratively, each tackling specific subtasks to achieve a common goal. This mimics the coordination seen in natural swarms, such as bees or ants, and is designed for simplicity and educational use.

Key Aspects:

- *Ergonomic:* User-friendly and efficient.
- *Lightweight:* Minimal resource demands.
- *Multi-Agent Orchestration:* Coordination of several agents.

Use Case: A teaching tool where agents simulate a supply chain, with each agent managing inventory, orders, or deliveries.

(Image Placeholder: Diagram of Swarm agents collaborating on a task)

5.2 UV

UV is a Python dependency manager that streamlines the management of libraries and packages for Python projects. It ensures compatibility and simplifies environment setup, which is vital for developing robust Agentic AI systems that rely on Python-based tools.

Benefits:

- Resolves dependency conflicts.
- Automates package installation and updates.
- Enhances project reproducibility.

(Image Placeholder: Screenshot of UV managing a Python project's dependencies)

5.3 OpenRouter Using OpenAI SDK

OpenRouter is a platform that optimizes API requests by routing them to various AI models, including OpenAI's, based on factors like cost or performance. When paired with the OpenAI SDK, it allows developers to efficiently leverage multiple models within a single application.

Advantages:

- *Flexibility:* Switches between models seamlessly.
- *Cost Efficiency:* Selects cost-effective options.
- *Reliability:* Provides fallback models if one fails.

(Image Placeholder: Diagram of OpenRouter directing API requests)

5.4 OpenAI SDK

The OpenAI SDK is a toolkit provided by OpenAI for integrating its AI models into applications. It offers a straightforward interface for accessing capabilities like text generation and image creation.

Features:

- Easy API integration.
- Support for diverse AI functionalities.
- Developer-friendly documentation.

(Image Placeholder: Code snippet showing OpenAI SDK usage)

5.5 LiteLLM OpenAI Agent

LiteLLM is a lightweight library that simplifies interactions with large language models, including OpenAI's offerings. A LiteLLM OpenAI Agent is an autonomous entity built with this library, benefiting from reduced complexity and faster implementation.

Strengths:

- Minimizes coding overhead.
- Speeds up agent development.
- Maintains compatibility with OpenAI models.

(Image Placeholder: Code comparison: LiteLLM vs. direct OpenAI SDK)

6 Conclusion

Agentic AI advances the field of artificial intelligence by enabling systems to act autonomously and efficiently. Tools and frameworks like Swarm, UV, OpenRouter, OpenAI SDK, and LiteLLM enhance its development and application, offering diverse solutions for multi-agent coordination, dependency management, and model integration. Understanding LLMs and Generative AI provides a foundation for appreciating Agentic AI's unique capabilities.

Prepared by: Jamila Yaqoob Dhedhi
Roll Number: 00305277