

CrewAI 101 Building Multi-Agent AI Systems

August 12, 2025

1 CrewAI 101: Building Multi-Agent AI Systems

Estimated time needed: **45** minutes

In this lab, we build a GenAI-powered content creation pipeline designed to transform raw research into polished, insightful blog posts.

We'll build a CrewAI system which uses a sequential process where a Research Analyst agent gathers cutting-edge information from real-time tools like web search, and a Content Strategist agent who rewrites that information into clear, engaging content for a tech-savvy audience. We'll also create a workflow which demonstrates how autonomous agents can collaborate like human teams, moving from knowledge extraction to audience-ready content, without manual intervention.

This project is perfect for beginners who want to learn the fundamentals of multi-agent AI automation using CrewAI. You'll see how roles, tools, and tasks come together to create streamlined, intelligent workflows that save time and enhance content quality.

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1.2 Objectives

After completing this lab, you will be able to:

- Leverage **CrewAI** to automate multi-agent workflows for intelligent content generation.

- Understand the **key components of CrewAI**—agents, tasks, tools, and processes—and how they work together in a sequential pipeline.
- Implement **real-world AI collaboration scenarios**, such as transforming technical research into reader-friendly content.
- Develop foundational skills to **extend and scale CrewAI workflows** across various domains like marketing, education, and research automation.

1.3 Setup

1.4 Required Libraries

For this lab, we will be using the following Python libraries:

- [crewai](#) – The core framework for building collaborative AI workflows using agents, tasks, and process management.
- [crewai-tools](#) – A set of prebuilt tools (like web search, file I/O, and APIs) that can be used by CrewAI agents.
- [langchain](#) – Provides core utilities for working with LLMs, prompts, tools, and memory management (used under the hood by CrewAI).
- [langchain-community](#) – Offers integration with open-source and third-party tools used in the broader LangChain ecosystem.

1.4.1 Installing Required Libraries

The following required libraries are **not** pre-installed in the Skills Network Labs environment. **You will need to run the following cell** to install them:

```
[1]: %pip install langchain==0.3.20 | tail -n 1
      %pip install crewai==0.80.0 | tail -n 1
      %pip install langchain-community==0.3.19 | tail -n 1
      %pip install crewai-tools==0.38.0 | tail -n 1
      %pip install databricks-sdk==0.57.0 | tail -n 1
```

Successfully installed langchain-0.3.20 langchain-core-0.3.74 langchain-text-splitters-0.3.9 langsmith-0.3.45 orjson-3.11.2 requests-toolbelt-1.0.0

Note: you may need to restart the kernel to use updated packages.

Successfully installed appdirs-1.4.4 asgiref-3.9.1 auth0-python-4.10.0 backoff-2.2.1 bcrypt-4.3.0 build-1.3.0 cachetools-5.5.2 certifi-2025.8.3 chroma-hnswlib-0.7.6 chromadb-0.5.23 click-8.2.1 cohere-5.16.3 coloredlogs-15.0.1 crewai-0.80.0 crewai-tools-0.17.0 dataclasses-json-0.6.7 deprecation-2.1.0 diskcache-5.6.3 docker-7.1.0 docstring-parser-0.17.0 docx2txt-0.9 durationpy-0.10 embedchain-0.1.128 fastapi-0.116.1 fastavro-1.12.0 filelock-3.18.0 flatbuffers-25.2.10 fsspec-2025.7.0 google-auth-2.40.3 googleapis-common-protos-1.70.0 gptcache-0.1.44 grpcio-1.74.0 hf-xet-1.1.7 httpx-0.27.0 httpx-sse-0.4.0 huggingface-hub-0.34.4 humanfriendly-10.0 iniconfig-2.1.0 instructor-1.10.0 jiter-0.10.0 json-repair-0.49.0 jsonpickle-4.1.1 jsonref-1.1.0 kubernetes-33.1.0 lancedb-0.24.2 langchain-0.3.27 langchain-cohere-0.3.5 langchain-community-0.3.27 langchain-experimental-0.3.4

```

langchain-openai-0.2.14 litellm-1.75.5.post1 markdown-it-py-4.0.0
marshmallow-3.26.1 mdurl-0.1.2 mem0ai-0.1.115 mmh3-5.2.0 monotonic-1.6
mpmath-1.3.0 mypy-extensions-1.1.0 networkx-3.5 nodeenv-1.9.1 numpy-2.3.2
onnxruntime-1.22.1 openai-1.99.9 opentelemetry-api-1.36.0 opentelemetry-
exporter-otlp-proto-common-1.36.0 opentelemetry-exporter-otlp-proto-grpc-1.36.0
opentelemetry-exporter-otlp-proto-http-1.36.0 opentelemetry-
instrumentation-0.57b0 opentelemetry-instrumentation-asgi-0.57b0 opentelemetry-
instrumentation-fastapi-0.57b0 opentelemetry-proto-1.36.0 opentelemetry-
sdk-1.36.0 opentelemetry-semantic-conventions-0.57b0 opentelemetry-util-
http-0.57b0 outcome-1.3.0.post0 pandas-2.3.1 portalocker-3.2.0 posthog-3.25.0
protobuf-6.31.1 pyarrow-21.0.0 pyasn1-0.6.1 pyasn1-modules-0.4.2 pydantic-
settings-2.10.1 pypdf-5.9.0 pypika-0.48.9 pyproject_hooks-1.2.0 pyright-1.1.403
pysbd-0.3.4 pytest-8.4.1 python-dotenv-1.1.1 pytube-15.0.0 pyvis-0.3.2 qdrant-
client-1.15.1 regex-2025.7.34 requests-oauthlib-2.0.0 rich-13.9.4 rsa-4.9.1
schema-0.7.7 selenium-4.35.0 shellingham-1.5.4 sortedcontainers-2.4.0
starlette-0.47.2 sympy-1.14.0 tabulate-0.9.0 tiktoken-0.11.0 tokenizers-0.20.3
tomli-w-1.2.0 trio-0.30.0 trio-websocket-0.12.2 typer-0.16.0 types-
requests-2.32.4.20250809 typing-extensions-4.14.1 typing-inspect-0.9.0 typing-
inspection-0.4.1 tzdata-2025.2 urllib3-2.5.0 uv-0.8.9 uvicorn-0.35.0
uvloop-0.21.0 watchfiles-1.1.0 websockets-15.0.1 wrapt-1.17.3 wsproto-1.2.0
Note: you may need to restart the kernel to use updated packages.
Successfully installed langchain-community-0.3.19
Note: you may need to restart the kernel to use updated packages.
Successfully installed Pillow-11.3.0 crewai-0.157.0 crewai-tools-0.38.0 et-
xmlfile-2.0.0 json-repair-0.25.2 litellm-1.74.9 onnxruntime-1.22.0
openpyxl-3.1.5 pdfminer.six-20250506 pdfplumber-0.11.7 portalocker-2.7.0
pypdfium2-4.30.0
Note: you may need to restart the kernel to use updated packages.
Successfully installed databricks-sdk-0.57.0
Note: you may need to restart the kernel to use updated packages.

```

```

[2]: import warnings

# Suppress Pydantic and other deprecation/user warnings
warnings.filterwarnings("ignore", category=DeprecationWarning)
warnings.filterwarnings("ignore", category=UserWarning)

```

1.5 What is CrewAI?

CrewAI is a **cutting-edge framework** that empowers us to create and manage teams of **autonomous AI agents** designed to collaborate on complex tasks. Think of it as our ultimate toolkit for assembling a team of virtual experts, where each member plays a **specific role**, uses **unique tools**, and works toward **clear goals**. These agents aren't just working in isolation; they collaborate, communicate, and solve problems as a synchronized team, enabling us to achieve more than ever before.

1.5.1 Why CrewAI?

Imagine you're leading a project. You need specialists—each with unique expertise—who can work together to achieve a common goal. CrewAI replicates this dynamic in the world of AI by:

- Assigning **roles** to agents based on their purpose (e.g., a planner, an executor, or a coordinator).
- Equipping them with **tools** to perform their tasks efficiently.
- Directing them with **goals** to ensure their efforts align with the broader mission.

This collaborative framework ensures that your AI agents can tackle challenges that are too big or too complex for a single agent to handle. Whether it's **automation**, **decision-making**, or **simulating real-world scenarios**, CrewAI empowers you to orchestrate your AI teams like never before.

1.5.2 How CrewAI Works

At its core, CrewAI provides us with a high-level framework to build “crews”—groups of role-playing agents that interact and collaborate to achieve shared objectives. Each agent is:

- **Assigned a Role:** Just like in a real team, every agent has a specialized function, whether it's planning, executing, or coordinating tasks.
- **Equipped with Tools:** Agents are provided with the resources they need to perform their roles effectively.
- **Directed by Goals:** Clear objectives ensure that every agent's efforts align with the crew's mission.

1.6 Setting Up SerperDevTool

What is Serper?

Serper is a real-time Google Search API that allows AI agents to access up-to-date web information—effectively connecting your workflow to the latest content on the internet.

Why are we using Serper in our workflow?

Our research agent needs current, reliable information to uncover trends, breakthroughs, and insights on evolving topics like generative AI, quantum computing, or sustainability. Without web access, the agent would be limited to static, pre-trained knowledge and unable to reflect the latest developments.

To use the SerperDevTool, it requires an **API key**. This key grants access to the web search service and allows our agents to fetch real-time data during execution.

You will need to obtain your API Key from serper.dev.

- Sign up or log in with your email
- Navigate to the **Dashboard**
- Click on **API Keys**
- Copy the key and replace `API_KEY` in your code with the value provided

To learn more about the SerperDevTool and its capabilities, visit the [official documentation](#).

Enter API key

```
[3]: import os
os.environ['SERPER_API_KEY'] = "ef22fe458acb0b727eada730e9826bc3db285c1e"
```

Import SerperDevTool from crewai_tools

```
[4]: from crewai_tools import SerperDevTool
```

```
/opt/conda/lib/python3.12/site-packages/pydantic/_internal/_config.py:295:
PydanticDeprecatedSince20: Support for class-based `config` is deprecated, use
ConfigDict instead. Deprecated in Pydantic V2.0 to be removed in V3.0. See
Pydantic V2 Migration Guide at https://errors.pydantic.dev/2.10/migration/
  warnings.warn(DEPRECATION_MESSAGE, DeprecationWarning)
/opt/conda/lib/python3.12/site-packages/crewai_tools/tools/scrapegraph_scrape_to
ol/scrapegraph_scrape_tool.py:34: PydanticDeprecatedSince20: Pydantic V1 style
`@validator` validators are deprecated. You should migrate to Pydantic V2 style
`@field_validator` validators, see the migration guide for more details.
Deprecated in Pydantic V2.0 to be removed in V3.0. See Pydantic V2 Migration
Guide at https://errors.pydantic.dev/2.10/migration/
  @validator("website_url")
/opt/conda/lib/python3.12/site-
packages/crewai_tools/tools/selenium_scraping_tool/selenium_scraping_tool.py:26:
PydanticDeprecatedSince20: Pydantic V1 style `@validator` validators are
deprecated. You should migrate to Pydantic V2 style `@field_validator`
validators, see the migration guide for more details. Deprecated in Pydantic
V2.0 to be removed in V3.0. See Pydantic V2 Migration Guide at
https://errors.pydantic.dev/2.10/migration/
  @validator("website_url")
/opt/conda/lib/python3.12/site-
packages/crewai_tools/tools/vision_tool/vision_tool.py:15:
PydanticDeprecatedSince20: Pydantic V1 style `@validator` validators are
deprecated. You should migrate to Pydantic V2 style `@field_validator`
validators, see the migration guide for more details. Deprecated in Pydantic
V2.0 to be removed in V3.0. See Pydantic V2 Migration Guide at
https://errors.pydantic.dev/2.10/migration/
  @validator("image_path_url")
```

Initialize the SerperDev search tool object (requires an API key)

```
[5]: search_tool=SerperDevTool()
      print(type(search_tool))
```

```
<class 'crewai_tools.tools.serper_dev_tool.serper_dev_tool.SerperDevTool'>
```

Run a search query

```
[6]: search_query = "Latest Breakthroughs in machine learning"
      search_results =search_tool.run(query=search_query )

      # Print the results
      print(f"Search Results for '{search_results}':\n")
```

Using Tool: Search the internet with Serper

Search Results for '{"searchParameters': {'q': 'Latest Breakthroughs in machine

```

learning', 'type': 'search', 'num': 10, 'engine': 'google'}, 'organic':
[{'title': 'Advancements in AI and Machine Learning', 'link':
'https://ep.jhu.edu/news/advancements-in-ai-and-machine-learning/', 'snippet':
'AI and ML advancements are transforming engineering by automating complex tasks
and enhancing decision-making processes for professionals.', 'position': 1},
{'title': 'Latest AI Breakthroughs and News: June, July, August 2025', 'link':
'https://www.crescendo.ai/news/latest-ai-news-and-updates', 'snippet': 'Summary:
Carnegie Mellon University is launching a new NSF-funded institute to accelerate
mathematical discovery using AI tools. The center will develop models ...',
'position': 2}, {'title': 'Machine learning | MIT News | Massachusetts Institute
of Technology', 'link': 'https://news.mit.edu/topic/machine-learning',
'snippet': 'New algorithms enable efficient machine learning with symmetric
data. This new approach could lead to enhanced AI models for drug and materials
discovery.', 'position': 3}, {'title': 'Artificial Intelligence News -
ScienceDaily', 'link':
'https://www.sciencedaily.com/news/computers_math/artificial_intelligence/',
'snippet': "'Periodic Table of Machine Learning' Could Fuel AI Discovery ·
Generative AI Masters the Art of Scent Creation · New Electronic 'skin' Could
Enable Lightweight ...", 'position': 4}, {'title': 'Projects - Google DeepMind',
'link': 'https://deepmind.google/research/projects/', 'snippet': 'Research
Projects Explore some of the biggest innovations in AI, many of which underpin
the modern AI industry.', 'position': 5}, {'title': '5 Breakthrough Machine
Learning Research Papers Already in 2025', 'link':
'https://machinelearningmastery.com/5-breakthrough-machine-learning-research-
papers-already-in-2025/', 'snippet': 'How computers can now accurately track
objects in videos; What happens inside language models during training; How
researchers are measuring the ...', 'position': 6}, {'title': 'Top Machine
Learning Trends in 2025 - GeeksforGeeks', 'link':
'https://www.geeksforgeeks.org/machine-learning/top-machine-learning-trends/',
'snippet': '1. Digital Data Forgetting (Machine Unlearning) · 2.
Interoperability between Neural Networks · 3. Machine Learning, AutoML · 4.
Convergence of IoT ...', 'position': 7}, {'title': 'Top 13 Machine Learning
Trends CTOs Need to Know in 2025', 'link': 'https://mobidev.biz/blog/future-
machine-learning-trends-impact-business', 'snippet': 'Trend #1. The rise of
generative models for complex content generation · Trend #2. Shifting from LLMs
to SLMs · Trend #3. GPUs for accelerated ...', 'position': 8, 'sitelinks':
[{'title': 'Trend #5. Automated machine...', 'link':
'https://mobidev.biz/blog/future-machine-learning-trends-impact-business#h5'},
{'title': 'Trend #6. Multimodal machine...', 'link':
'https://mobidev.biz/blog/future-machine-learning-trends-impact-business#h6'}]},
{'title': 'Timeline of machine learning - Wikipedia', 'link':
'https://en.wikipedia.org/wiki/Timeline_of_machine_learning', 'snippet': 'This
page is a timeline of machine learning. Major discoveries, achievements,
milestones and other major events in machine learning are included.',
'position': 9, 'sitelinks': [{'title': 'Overview', 'link':
'https://en.wikipedia.org/wiki/Timeline_of_machine_learning#Overview'},
{'title': 'Timeline', 'link':
'https://en.wikipedia.org/wiki/Timeline_of_machine_learning#Timeline'}],

```

```
{'title': 'References', 'link':
'https://en.wikipedia.org/wiki/Timeline_of_machine_learning#References'}]},
{'title': 'Artificial Intelligence Breakthroughs: Key Developments to Expect in
...', 'link': 'https://www.ironhack.com/us/blog/artificial-intelligence-
breakthroughs-a-look-ahead-to-2024', 'snippet': 'Key AI Breakthroughs to Watch
in 2025 · 1. Deep Learning Advancements · 2. Next-Gen Natural Language
Processing (NLP) · 3. Healthcare ...', 'position': 10}], 'relatedSearches':
[{'query': 'top machine learning news'}, {'query': 'machine learning articles
pdf'}, {'query': 'machine learning news articles'}, {'query': 'latest ai
technology news'}, {'query': 'machine learning news reddit'}, {'query': 'recent
developments in ai'}, {'query': 'artificial intelligence latest news'},
{'query': 'latest ai technology 2025'}], 'credits': 1}':
```

The `search_results` dictionary has a lot of info, so here is an overview of what each key contains:

- **searchParameters:** Query metadata (term, engine, result count)
- **organic:** Search results (title, link, snippet, position)
- **peopleAlsoAsk:** Related questions with answers
- **relatedSearches:** Alternative search queries
- **credits:** API usage tracking

```
[7]: print("keys of search_results", search_results.keys())
```

```
keys of search_results dict_keys(['searchParameters', 'organic',
'relatedSearches', 'credits'])
```

1.7 Setting up our LLM

Next, we need to set up our **LLM (Large Language Model)**—this can be **any model** based on our needs. Here, we are going to use **Meta Llama 3.3 70b instruct**. The choice of model depends on factors such as **accuracy, speed, and recipe understanding** for our meal planning tasks.

```
[8]: from crewai import LLM

llm = LLM(
    model="watsonx/meta-llama/llama-3-3-70b-instruct",
    base_url="https://us-south.ml.cloud.ibm.com",
    project_id="skills-network",
    max_tokens=2000,
)
```

1.8 Agents in CrewAI

In CrewAI, **agents** are the foundational units of any multi-agent system. Each agent is designed to perform a specific role, solve tasks autonomously, and collaborate seamlessly with other agents. They're more than mere programs—they are your specialized team members in an AI-powered ecosystem.

A CrewAI agent isn't just a block of code; it's a thoughtfully designed entity with the following parameters:

1. **Role**

An agent's role defines its purpose in the system. Roles are as diverse as your project needs, such as a **“Data Researcher”** hunting for insights or a **“Reporting Analyst”** preparing comprehensive summaries.

2. **Goal**

Each agent operates with a defined goal—a guiding star that shapes its decisions and actions. For instance, an agent with the goal to **“Uncover cutting-edge developments in AI”** will consistently align its behavior to fulfill this objective.

3. **Backstory**

An agent's backstory is like its resume, providing context or personality that influences how it behaves and interacts. For example, a seasoned **“Senior Data Researcher”** with years of experience might approach tasks differently from a **“Junior Analyst”** just starting out. This feature adds depth and relatability to agent interactions, making them more dynamic and tailored.

4. **Tools**

Just like any professional needs the right tools to excel, agents in CrewAI are equipped with specialized tools to boost their performance. Whether it's a **web search utility** for gathering information, a **data analysis engine** for crunching numbers, or an **API connector** to integrate external services, tools expand an agent's capabilities. The right tool can help an agent complete its tasks more efficiently and effectively, enabling it to work smarter, not harder.

5. **Configuration**

Agents in CrewAI are configured using simple YAML files, offering a modular, readable, and scalable approach to defining their attributes. This makes setting up agents intuitive, even for large systems (in this tutroal we will not use a YML files

Defining an Agent Directly as a Python Object For more flexibility or when working in a programmatic environment, you can define agents directly in your code. This approach allows you to quickly integrate dynamic parameters and logic into the agent's setup.

In this section, we're defining the research agent which will gather and analyze information from the web. This “Senior Research Analyst” uses the SerperDevTool to search for relevant content, working independently without delegation. The agent serves as the first step in our workflow, collecting the raw data that other agents will later refine and present.

Example of defining an agent in **Python**:

```
[9]: from crewai import Agent

research_agent = Agent(
    role='Senior Research Analyst',
```



```

goal='Uncover cutting-edge information and insights on any subject with
↳comprehensive analysis',
backstory="""You are an expert researcher with extensive experience in
↳gathering, analyzing, and synthesizing information across multiple domains.
Your analytical skills allow you to quickly identify key trends, separate
↳fact from opinion, and produce insightful reports on any topic.
You excel at finding reliable sources and extracting valuable information
↳efficiently."""
verbose=True,
allow_delegation=False,
llm = llm,
tools=[SerperDevTool()]
)

```

In this Python example, an agent is created with the same role, goal, backstory, and tools as the YAML example. However, this method allows you to easily pass in dynamic variables and parameters at runtime, making it ideal for scenarios where the agent configuration needs to change dynamically.

```
[10]: research_agent
```

```
[10]: Agent(role=Senior Research Analyst, goal=Uncover cutting-edge information and
insights on any subject with comprehensive analysis, backstory=You are an expert
researcher with extensive experience in gathering, analyzing, and synthesizing
information across multiple domains.
Your analytical skills allow you to quickly identify key trends, separate fact
from opinion, and produce insightful reports on any topic.
You excel at finding reliable sources and extracting valuable information
efficiently.)
```

In CrewAI, we use multiple specialized agents to complete complex tasks through collaboration. In our research-report example:

1. We created a **Researcher Agent** that gathers information
2. Now we will create a **Writer Agent** that takes the output from our Researcher Agent
3. The Writer transforms research findings into well-structured content for the target audience

Let's create the writer agent with the following parameters:

- **role:** 'Tech Content Strategist' - Job function within the workflow
- **goal:** 'Craft well-structured and engaging content based on research findings' - The agent's specific objective
- **backstory:** Background that shapes the agent's approach and style
- **verbose:** True - Controls logging detail level
- **allow_delegation:** True - Enables task assignment to other agents

```
[11]: # Define your agents with roles and goals
# Define the Writer Agent
writer_agent = Agent(
```

```

role='Tech Content Strategist',
goal='Craft well-structured and engaging content based on research findings',
backstory="""You are a skilled content strategist known for translating
complex topics into clear and compelling narratives. Your writing makes
information accessible and engaging for a wide audience.""",
verbose=True,
llm = llm,
allow_delegation=True
)

```

```
[12]: writer_agent
```

```
[12]: Agent(role=Tech Content Strategist, goal=Craft well-structured and engaging
content based on research findings, backstory=You are a skilled content
strategist known for translating
complex topics into clear and compelling narratives. Your writing makes
information accessible and engaging for a wide audience.)
```

1.9 Tasks in CrewAI

Tasks are like to-do items for our AI agents. Each task has specific instructions, details, and tools for the agent to follow and complete the job.

For example: - A task could ask an agent to “research the latest AI trends.” - Another task could ask a different agent to “write a detailed report based on the research.”

Here is an outline of the process:

1. **Define agents** with their roles, goals, and tools
2. **Create tasks** and assign them to specific agents
3. **Combine agents and tasks** into a Crew with an execution process

How Tasks Work There are two ways tasks can run:

1. **Sequential:** Tasks are executed one after the other, like following a recipe step-by-step. Each task waits for the previous one to finish.
2. **Hierarchical:** Tasks are assigned based on agent skills or roles, and multiple tasks can run in parallel if they don’t depend on each other.

What Can a Task Include? Each task has these details: - **Description:** What needs to be done. - **Expected Output:** What the result should look like. - **Agent:** Who’s responsible for the task. - **Tools:** The tools the agent can use for this task. - **Context:** Outputs from other tasks that help this task. - **Async Execution:** Whether the task runs in the background or not. - **Output Format:** Whether the results are plain text, JSON, or a structured model.

Here’s how we set up a Crew (our team of agents) and tasks in code `research_task` and `writer_task`.

In this step, we define a Task for the Researcher Agent. This task will involve gathering and analyzing key insights on any topic specified through the `{topic}` parameter. The agent will use

the SerperDevTool to uncover major trends, identify new technologies, and evaluate their effects on the industry. This flexible approach allows us to research different subjects by simply changing the input parameter when kicking off the crew.

```
[13]: from crewai import Task

research_task = Task(
    description="Analyze the major {topic}, identifying key trends and
    ↪technologies. Provide a detailed report on their potential impact.",
    agent=research_agent,
    expected_output="A detailed report on {topic}, including trends, emerging
    ↪technologies, and their impact."
)
```

Now, we will define the task for the Writer Agent, who will take the research findings and transform them into a well-structured article. The Writer Agent will ensure the content is engaging, informative, and easy to understand, making complex topics more accessible.

```
[14]: # Create a task for the Writer Agent
writer_task = Task(
    description="Create an engaging blog post based on the research findings
    ↪about {topic}. Tailor the content for a tech-savvy audience, ensuring
    ↪clarity and interest.",
    agent=writer_agent,
    expected_output="A 4-paragraph blog post on {topic}, written clearly and
    ↪engagingly for tech enthusiasts."
)
```

1.10 CrewAI Workflow

The **Crew** object, which is the central orchestration mechanism in CrewAI. This crew brings together our specialized agents and their assigned tasks into a cohesive workflow.

The **Crew** constructor takes several important parameters: - **agents**: A list of the AI agents that will be part of this crew **research_agent** and **writer_agent** - **tasks**: A list of specific tasks these agents will perform **research_task** and **writer_task** - **process**: Defines how tasks will be executed - in this case **Process.sequential** means tasks will run one after another in the specified order (research first, then writing) - **verbose**: When set to **True**, this enables detailed logging, making it easier to follow the crew's execution and troubleshoot any issues

Once configured, you can start the entire workflow with a single command: **crew.kickoff()**, which will execute the tasks in sequence and return the final results.

```
[15]: from crewai import Crew, Process

crew = Crew(
    agents=[research_agent, writer_agent],
    tasks=[research_task, writer_task],
    process=Process.sequential,
```

```
        verbose=True
    )
```

The method `kickoff()` sets everything rolling - it starts all your agents working on their tasks and returns the results when they're done. By using `inputs={"topic": "quantum computing breakthroughs of 2024"}`, we can specify exactly what subject our agents should research, making our system flexible enough to analyze any topic without changing the task definitions.

```
[16]: result = crew.kickoff(inputs={"topic": "Latest Generative AI breakthroughs"})
```

Crew Execution Started

```
↳ Crew Execution Started
↳ Name: crew
↳ ID: 6d6db512-1d3e-42f0-ba9b-a54d560eb272
↳ Tool Args:
↳
↳
↳
```

Agent Started

```
↳ Agent: Senior Research Analyst
↳
↳ Task: Analyze the major Latest Generative AI breakthroughs, identifying key
↳ trends and technologies. Provide
↳ a detailed report on their potential impact.
↳
↳
```

Output()

Agent Tool Execution

```
↳
Agent: Senior Research Analyst
↳
↳
Thought: Thought: To analyze the major latest generative AI breakthroughs, I
need to search for the most
recent and relevant information on this topic. I should look for key trends,
emerging technologies, and their
potential impact. The first step is to search the internet for the latest news
and updates on generative AI
breakthroughs.
↳
↳
↳
Using Tool: Search the internet with Serper
↳
↳
```

Tool Input

```
↳
{"search_query": "latest generative AI breakthroughs"}
↳
↳
```

Tool Output

```
↳
{'searchParameters': {'q': 'latest generative AI breakthroughs', 'type':
'search', 'num': 10, 'engine':
'google'}, 'organic': [{'title': 'Latest AI Breakthroughs and News: June,
July, August 2025', 'link':
```

```

    'https://www.crescendo.ai/news/latest-ai-news-and-updates', 'snippet':
↳ 'Summary: Lloyds Bank has introduced
    Athena, a generative AI tool designed to support customer service and internal
↳ operations. Athena helps
    automate responses, ...', 'position': 1}, {'title': 'Advancements in generative
↳ AI - AI, Data & Analytics
    Network', 'link':
↳
    'https://www.aidataanalytics.network/data-science-ai/articles/
↳ advancements-in-generative-ai', 'snippet': 'In
    2024, an AI-generated painting sold at auction for more than US$1 million.
↳ Meanwhile, a novel drug molecule
    discovered by a generative AI ...', 'position': 2}, {'title': 'AI News | Latest
↳ AI News, Analysis & Events',
    'link': 'https://www.artificialintelligence-news.com/', 'snippet': "Generative
↳ AI trends 2025: LLMs, data
    scaling & enterprise adoption. Inside Tim Cook's push to get Apple back in the
↳ AI race. Apple. August 6,
    2025. Inside Tim ...", 'position': 3}, {'title': 'Top 10 Generative AI Trends:
↳ Latest Advancements &
    Developments', 'link': 'https://masterofcode.com/blog/generative-ai-trends',
↳ 'snippet': 'Key Trends in
    Generative AI across Different Functions · Hyper-Personalization · Open Source
↳ in Generative AI · Agentic AI
    · AI Security and the EU AI Act.', 'position': 4}, {'title': 'Top 10
↳ Generative AI Trends in 2025 - SoluLab',
    'link': 'https://www.solulab.com/top-generative-ai-trends/', 'snippet': 'Top
↳ Generative AI Trends For 2025 ·
    1. AI for Creativity · 2. GenAI for Hyper-Personalization · 3. Conversational
↳ AI · 4. Generative AI for
    Scientific Research · 5.', 'position': 5, 'sitelinks': [{'title':
↳ 'Understanding Generative AI', 'link':
    'https://www.solulab.com/top-generative-ai-trends/
↳ #elementor-toc_heading-anchor-0'}], {'title': 'Top
    Generative AI Trends For...', 'link': 'https://www.solulab.com/top-generativ...
↳
↳
↳

```

Output()

Agent Tool Execution

Agent: Senior Research Analyst

Thought: Thought: Based on the search results, I have found several relevant articles and websites that discuss the latest generative AI breakthroughs, trends, and technologies. I will now analyze these results to identify the key trends and technologies and their potential impact.

Using Tool: Search the internet with Serper

Tool Input

```
{\ "search_query\": \ "generative AI trends 2025\ "}
```

Tool Output

```
{'searchParameters': {'q': 'generative AI trends 2025', 'type': 'search',  
'num': 10, 'engine': 'google'},  
'organic': [{ 'title': 'Generative AI trends 2025: LLMs, data scaling &  
enterprise adoption', 'link':  
'https://www.artificialintelligence-news.com/news/  
generative-ai-trends-2025-llms-data-scaling-enterprise-adop  
tion/', 'snippet': 'In 2025, the shift is toward autonomy . Many companies  
already use generative AI across  
core systems, but the focus now is on agentic AI. These are models designed to  
take action, not just generate  
content.', 'position': 1}, { 'title': 'How People Are Really Using Gen AI in  
2025', 'link':
```

```

'https://hbr.org/2025/04/how-people-are-really-using-gen-ai-in-2025',
↳ 'snippet': 'A year ago, I wrote a piece
    here about how people were really using gen AI. That article seemed to hit a
↳ note: It was popular, featured
    in viral posts.', 'position': 2}, {'title': "6 AI trends you'll see more of in
↳ 2025 - Microsoft News",
    'link': 'https://news.microsoft.com/source/features/ai/
↳ 6-ai-trends-youll-see-more-of-in-2025/', 'snippet':
    'In 2025, one trend is certain: AI will continue to drive innovation and
↳ unlock new potential for people and
    organizations around the globe.', 'position': 3}, {'title': 'The 2025 AI Index
↳ Report | Stanford HAI',
    'link': 'https://hai.stanford.edu/ai-index/2025-ai-index-report', 'snippet':
↳ 'Generative AI saw particularly
    strong momentum, attracting $33.9 billion globally in private investment-an 18.
↳ 7% increase from 2023.',
    'position': 4}, {'title': 'Gartner Hype Cycle Identifies Top AI Innovations in
↳ 2025', 'link':
    'https://www.gartner.com/en/newsroom/press-releases/
↳ 2025-08-05-gartner-hype-cycle-identifies-top-ai-innovatio
    ns-in-2025', 'snippet': 'AI agents and AI-ready data are the two fastest
↳ advancing technologies on the 2025
    Gartner Hype Cycle for Artificial Intelligence, according to ...', 'position':
↳ 5}, {'title': 'McKinsey
    technology trends outlook 2025', 'link': 'https://www.mckinsey.com/
↳ capabilities/mckinsey-digital/our-insi...

```

Output()

Agent Final Answer

```

↳
Agent: Senior Research Analyst
↳
↳
Final Answer:
↳

```


The latest generative AI breakthroughs are transforming various industries and aspects of our lives. Some of the key trends and technologies include:

1. ****Autonomy****: The shift is toward autonomy, with many companies using generative AI across core systems, and the focus now is on agentic AI, which are models designed to take action, not just generate content.
2. ****LLMs and Data Scaling****: Large language models (LLMs) and data scaling are becoming increasingly important, with companies investing heavily in these areas to improve the accuracy and efficiency of their AI systems.
3. ****Enterprise Adoption****: Generative AI is being adopted by enterprises across various industries, including healthcare, finance, and education, to improve customer service, automate processes, and enhance decision-making.
4. ****Hyper-Personalization****: Generative AI is enabling hyper-personalization, allowing companies to create customized products and services tailored to individual customers' needs and preferences.
5. ****AI-Ready Data****: AI-ready data is becoming a critical component of generative AI, with companies focusing on creating high-quality, relevant, and well-structured data to feed their AI systems.

Some of the emerging technologies in generative AI include:

1. ****Agentic AI****: Agentic AI is a type of AI that is designed to take action, not just generate content. This technology has the potential to revolutionize various industries, including healthcare, finance, and education.
2. ****Generative Adversarial Networks (GANs)****: GANs are a type of deep learning algorithm that can generate new data samples that are similar to existing data. This technology has the potential to improve the accuracy

and efficiency of AI systems.

3. **Transformers**: Transformers are a type of neural network architecture that is particularly well-suited for natural language processing tasks. This technology has the potential to improve the accuracy and efficiency of language translation, text summarization, and other NLP tasks.

The potential impact of these trends and technologies is significant, with the potential to:

1. **Improve Customer Service**: Generative AI can help companies improve customer service by providing personalized responses to customer inquiries and automating routine tasks.

2. **Enhance Decision-Making**: Generative AI can help companies enhance decision-making by providing accurate and relevant data insights and recommendations.

3. **Increase Efficiency**: Generative AI can help companies increase efficiency by automating routine tasks and improving the accuracy and speed of processes.

4. **Drive Innovation**: Generative AI can help companies drive innovation by providing new and innovative solutions to complex problems.

However, there are also potential challenges and risks associated with generative AI, including:

1. **Job Displacement**: Generative AI has the potential to displace certain jobs, particularly those that involve routine or repetitive tasks.

2. **Bias and Discrimination**: Generative AI can perpetuate bias and discrimination if the data used to train the models is biased or discriminatory.

3. **Cybersecurity Risks**: Generative AI can pose cybersecurity risks if the models are not properly secured

and validated.

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Overall, the latest generative AI breakthroughs have the potential to transform various industries and aspects of our lives, but it is essential to address the potential challenges and risks associated with this technology to ensure that it is developed and used responsibly.

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Task Completion

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Task Completed

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Name: 90ecb714-b450-4a4e-8233-1313b8ef769a

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Agent: Senior Research Analyst

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Tool Args:

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Agent Started

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Agent: Tech Content Strategist

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```
Task: Create an engaging blog post based on the research findings about Latest
Generative AI breakthroughs.
Tailor the content for a tech-savvy audience, ensuring clarity and interest.

```

Output()

```
Agent Started
Agent: Senior Research Analyst
Task: Can you provide more information about the current state of generative
AI, including the latest trends,
technologies, and potential applications?

```

Output()

```
Agent Tool Execution
Agent: Senior Research Analyst
Thought: Thought: To provide the most accurate and up-to-date information
about the current state of
generative AI, including the latest trends, technologies, and potential
applications, I should start by

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    searching the internet for the latest news and developments in this field.
    This will help me understand the
    current landscape and identify key areas of focus.

    Using Tool: Search the internet with Serper

```

Tool Input

```

{"search_query": "latest generative AI trends and technologies"}

```

Tool Output

```

{'searchParameters': {'q': 'latest generative AI trends and technologies',
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'engine': 'google'}, 'organic': [{'title': '6 AI trends you'll see more of in
2025 - Microsoft News', 'link':
'https://news.microsoft.com/source/features/ai/
6-ai-trends-youll-see-more-of-in-2025/', 'snippet': 'In the
last year alone, generative AI usage jumped from 55% to 75% among business
leaders and AI decisionmakers. New
AI tools will bring even ...', 'position': 1}, {'title': 'Generative AI Trends
For All Facets of Business -
Forrester', 'link': 'https://www.forrester.com/technology/generative-ai/',
'snippet': 'Generative AI (genAI)
is changing how business users interact with technology. Stay updated on the
latest generative AI trends with
Forrester.', 'position': 2}, {'title': 'McKinsey technology trends outlook
2025', 'link':
'https://www.mckinsey.com/capabilities/mckinsey-digital/our-insights/
the-top-trends-in-tech', 'snippet': 'An
overarching artificial intelligence category replaces these four trends:
applied AI, generative AI,

```

```

    industrializing machine learning, and ...', 'position': 3}, {'title': '5
↳Generative AI Trends To Watch Out
For In 2025 - Forbes', 'link':
↳
    'https://www.forbes.com/sites/janakirammsv/2025/01/12/
↳5-generative-ai-trends-to-watch-out-for-in-2025/',
    'snippet': '5 Generative AI Trends To Watch Out For In 2025 · 1. From
↳AI-Infused to AI-First Applications ·
    2. The Rise of Service as Software · 3. Inclusion ...', 'position': 4}, {'title':
↳ 'Top 10 GenAI Trends to
Watch in Technology in 2025 and Beyond', 'link':
↳
    'https://www.ciklum.com/resources/blog/top-10-genai-trends-2025', 'snippet':
↳'1. Hyper-Personalization · 2.
    Conversational AI · 3. Multi-Modal AI · 4. AI for Creative Industries · 5. AI
↳Ethics and Regulation · 6.
    Intelligent ...', 'position': 5}, {'title': 'Five Trends in AI and Data Science
↳for 2025', 'link':
    'https://sloanreview.mit.edu/article/
↳five-trends-in-ai-and-data-science-for-2025/', 'snippet': 'From agentic
    AI to unstruc...
↳
↳
↳

```

Output()

Agent Final Answer

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↳
Agent: Senior Research Analyst
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↳
↳
Final Answer:
↳
    The current state of generative AI is characterized by significant
↳advancements and trends that are
    transforming various industries and aspects of our lives. Some of the key
↳trends and technologies include

```

autonomy, LLMs and data scaling, enterprise adoption, hyper-personalization, and AI-ready data. Emerging technologies in generative AI include agentic AI, GANs, and transformers.

According to recent reports and articles, the top trends in generative AI for 2025 include:

1. Hyper-Personalization: Generative AI is being used to create personalized experiences for customers, such as tailored product recommendations and customized content.
2. Conversational AI: Conversational AI is becoming increasingly popular, with applications in customer service, language translation, and voice assistants.
3. Multi-Modal AI: Multi-modal AI refers to the ability of AI systems to understand and generate multiple forms of data, such as text, images, and audio.
4. AI for Creative Industries: Generative AI is being used in creative industries such as art, music, and writing to generate new and innovative content.
5. AI Ethics and Regulation: As generative AI becomes more prevalent, there is a growing need for ethics and regulation to ensure that AI systems are used responsibly and transparently.

Other trends and technologies that are expected to shape the future of generative AI include:

- * Autonomy: Autonomous systems that can operate independently and make decisions without human intervention.
- * LLMs and Data Scaling: Large language models and data scaling are enabling generative AI systems to process and generate vast amounts of data.
- * Enterprise Adoption: Generative AI is being adopted by enterprises across various industries, including healthcare, finance, and retail.

* AI-Ready Data: The availability of high-quality, AI-ready data is crucial for the development and deployment of generative AI systems.

Overall, the current state of generative AI is characterized by rapid advancements and innovations, and it is expected to continue to shape and transform various industries and aspects of our lives in the coming years.

Some of the top resources for learning more about generative AI trends and technologies include:

- * McKinsey: McKinsey provides insights and reports on the latest trends and technologies in generative AI, including its annual State of AI report.

- * Forrester: Forrester provides research and analysis on the latest trends and technologies in generative AI, including its report on Generative AI Trends For All Facets of Business.

- * Coursera: Coursera offers courses and specializations on generative AI and related topics, including its Top 5 AI Trends to Watch in 2025 article.

- * eWEEK: eWEEK provides news and analysis on the latest trends and technologies in generative AI, including its article on The Future of Generative AI: 8 Predictions to Watch.

These resources provide a wealth of information and insights on the current state of generative AI and its future directions, and can be useful for anyone looking to learn more about this rapidly evolving field.

Agent Tool Execution

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Agent: Tech Content Strategist

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Thought: Thought: To create an engaging blog post based on the research findings about the latest generative AI breakthroughs, I need to first understand the key trends and technologies in this field, as well as their potential impact and challenges.

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Using Tool: Ask question to coworker

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Tool Input

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{\ "question\": \ "Can you provide more information about the current state of generative AI, including the latest trends, technologies, and potential applications?\ ", \ "context\": \ "I am writing a blog post about the latest generative AI breakthroughs and need to ensure that my content is accurate and up-to-date. The latest generative AI breakthroughs are transforming various industries and aspects of our lives. Some of the key trends and technologies include autonomy, LLMs and data scaling, enterprise adoption, hyper-personalization, and AI-ready data. Emerging technologies in generative AI include agentic AI, GANs, and transformers.\ ", \ "coworker\": \ "Senior Research Analyst\ "}

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Tool Output

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↳

The current state of generative AI is characterized by significant advancements and trends that are transforming various industries and aspects of our lives. Some of the key trends and technologies include autonomy, LLMs and data scaling, enterprise adoption, hyper-personalization, and AI-ready data. Emerging technologies in generative AI include agentic AI, GANs, and transformers.

According to recent reports and articles, the top trends in generative AI for 2025 include:

1. Hyper-Personalization: Generative AI is being used to create personalized experiences for customers, such as tailored product recommendations and customized content.
2. Conversational AI: Conversational AI is becoming increasingly popular, with applications in customer service, language translation, and voice assistants.
3. Multi-Modal AI: Multi-modal AI refers to the ability of AI systems to understand and generate multiple forms of data, such as text, images, and audio.
4. AI for Creative Industries: Generative AI is being used in creative industries such as art, music, and writing to generate new and innovative content.
5. AI Ethics and Regulation: As generative AI becomes more prevalent, there is a growing need for ethics and regulation to ensure that AI systems are used responsibly and transparently.

Other trends and technologies that are expected to shape the future of generative AI include:

- * Autonomy: Autonomous systems that can operate independently and make decisions without human intervention.
- * LLMs and Data Scaling: Large language models and data scaling are enabling generative AI systems to process and generate vast amounts of data.

```
* Enterprise Adoption: Generative AI is being adopted by enterprises across
↳ various industries, including
healthcare, finance, and retail.
↳
* AI-Ready Data: The availability of high-quality, AI-ready data is crucial
↳ for the development and
deployment of generative AI systems.
↳
↳
Overall, the current state of generative AI is characterized by rapid a...
↳
↳
↳
```

Output()

```
Agent Started
↳
Agent: Senior Research Analyst
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↳
Task: Write a 4-paragraph blog post based on the research findings about the
↳ latest generative AI
breakthroughs, tailored for a tech-savvy audience
↳
↳
↳
```

Output()

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Agent Tool Execution
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Agent: Senior Research Analyst

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Thought: Thought: To write a comprehensive 4-paragraph blog post about the latest generative AI breakthroughs, I need to gather more information about the current state of generative AI, its applications, and the potential impact on various industries. I should start by searching for the latest news and research findings on generative AI.

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Using Tool: Search the internet with Serper

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Tool Input

↩

{"search_query": "latest generative AI breakthroughs"}

↩

↩

Tool Output

↩

```
{'searchParameters': {'q': 'latest generative AI breakthroughs', 'type':  
'search', 'num': 10, 'engine':  
'google'}, 'organic': [{'title': 'Latest AI Breakthroughs and News: June,  
July, August 2025', 'link':  
'https://www.crescendo.ai/news/latest-ai-news-and-updates', 'snippet':  
'Summary: Lloyds Bank has introduced  
Athena, a generative AI tool designed to support customer service and internal  
operations. Athena helps  
automate responses, ...', 'position': 1}, {'title': 'Advancements in generative  
AI - AI, Data & Analytics  
Network', 'link':
```

↩

Thought: Thought: Based on the search results, I have found several relevant articles and websites that discuss the latest generative AI breakthroughs, including trends, technologies, and applications. I can now use this information to write a comprehensive 4-paragraph blog post.

Using Tool: Search the internet with Serper

Tool Input

```
{"search_query": "generative AI applications and trends"}
```

Tool Output

```
{'searchParameters': {'q': 'generative AI applications and trends', 'type': 'search', 'num': 10, 'engine': 'google'}, 'organic': [{'title': '20 Examples of Generative AI Applications Across Industries', 'link': 'https://www.coursera.org/articles/generative-ai-applications', 'snippet': 'Some of the applications of generative AI in the financial services industry include artificial intelligence investment strategies, drafting documentation and monitoring regulatory changes, and using generative AI as an interpreter to facilitate communications between clients and investors.', 'position': 1}, {'title': '6 AI trends you'll see more of in 2025 - Microsoft News', 'link': 'https://news.microsoft.com/source/features/ai/6-ai-trends-youll-see-more-of-in-2025/', 'snippet': 'In the last year alone, generative AI usage jumped from 55% to 75% among business leaders and AI decisionmakers. New
```

```

AI tools will bring ...', 'position': 2}, {'title': "Real-world gen AI use cases
↳from the world's leading
organizations", 'link':
↳
'https://cloud.google.com/transform/
↳101-real-world-generative-ai-use-cases-from-industry-leaders', 'snippet':
  '*The Colombian Security Council developed a generative AI-based chatbot to
↳improve data analysis and its
chemical emergency management processes ...', 'position': 3}, {'title':
↳'Generative AI: Current Trends and
Applications - SpringerLink', 'link': 'https://link.springer.com/book/10.1007/
↳978-981-97-8460-8', 'snippet':
  'This comprehensive volume focuses on the latest advancements in Generative
↳AI, including state-of-the-art
techniques and models that are pushing the boundaries ...', 'position': 4},
↳{'title': 'Generative AI Trends
For All Facets of Business - Forrester', 'link': 'https://www.forrester.com/
↳technology/generative-ai/',
'snippet': 'Generative AI refers to a set of technologies that generate new
↳content - text, images, video,
code, and more - from existing data using techniques such as ...', 'position':
↳5}, {'title': 'The Top
Artificial Intel...
↳
↳
↳

```

Output()

Agent Final Answer

```

↳
Agent: Senior Research Analyst
↳
↳
Final Answer:
↳
The latest generative AI breakthroughs are transforming various industries and
↳aspects of our lives. Some of

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the key trends and technologies include autonomy, LLMs and data scaling,
enterprise adoption,
hyper-personalization, and AI-ready data. Emerging technologies in generative
AI include agentic AI, GANs,
and transformers. The potential impact of these trends and technologies is
significant, with the potential to
improve customer service, enhance decision-making, increase efficiency, and
drive innovation. For instance,
generative AI can be used to generate new forms of creative content, such as
audio, code, images, text,
simulations, and videos. It can also be used to automate routine tasks, such
as the reorganization and
classification of data.

Generative AI has numerous applications across various industries, including
financial services, healthcare,
and education. In the financial services industry, generative AI can be used
to develop artificial
intelligence investment strategies, draft documentation, and monitor
regulatory changes. It can also be used
to facilitate communications between clients and investors. In healthcare,
generative AI can be used to
analyze medical images, diagnose diseases, and develop personalized treatment
plans. In education, generative
AI can be used to create personalized learning plans, develop interactive
learning materials, and automate
grading. Additionally, generative AI can be used to generate new proteins,
engineer synthetic cells, and
fast-track scientific discovery.

The use of generative AI is expected to continue growing in the coming years,
with more businesses and
organizations adopting this technology to improve their operations and
services. According to a recent
survey, generative AI usage jumped from 55% to 75% among business leaders and
AI decision-makers in the last
year alone. New AI tools will bring more advanced capabilities, such as the
ability to generate human-like
text, images, and videos. However, there are also potential challenges and
risks associated with generative
AI, including job displacement, bias and discrimination, and cybersecurity
risks. Therefore, it is essential

to develop and implement responsible AI practices, such as ensuring
↳ transparency, accountability, and
fairness in AI decision-making. ↳

↳

↳

In conclusion, the latest generative AI breakthroughs are transforming various ↳
↳ industries and aspects of our
lives. With its numerous applications and potential to improve customer ↳
↳ service, enhance decision-making,
increase efficiency, and drive innovation, generative AI is expected to ↳
↳ continue growing in the coming years.

However, it is crucial to address the potential challenges and risks ↳
↳ associated with this technology, such as
job displacement, bias and discrimination, and cybersecurity risks. By ↳
↳ developing and implementing
responsible AI practices, we can ensure that generative AI is used in a way ↳
↳ that benefits society as a whole.

As we move forward, it will be exciting to see the new advancements and ↳
↳ applications of generative AI, and
how it will continue to shape and transform our world. ↳

↳

↳

Agent Tool Execution

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Agent: Tech Content Strategist ↳

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Thought: Thought: I have gathered enough information about the current state ↳
↳ of generative AI, including the
latest trends, technologies, and potential applications. Now, I need to create ↳
↳ a 4-paragraph blog post based
on this information, tailored for a tech-savvy audience. ↳

↳

↳

Using Tool: Delegate work to coworker ↳

↳

Tool Input

```
{\task\: \"Write a 4-paragraph blog post based on the research findings
about the latest generative AI
breakthroughs, tailored for a tech-savvy audience\", \"context\: \"The latest
generative AI breakthroughs
are transforming various industries and aspects of our lives. Some of the key
trends and technologies include
autonomy, LLMs and data scaling, enterprise adoption, hyper-personalization,
and AI-ready data. Emerging
technologies in generative AI include agentic AI, GANs, and transformers. The
potential impact of these
trends and technologies is significant, with the potential to improve customer
service, enhance
decision-making, increase efficiency, and drive innovation. However, there are
also potential challenges and
risks associated with generative AI, including job displacement, bias and
discrimination, and cybersecurity
risks.\", \"coworker\: \"Senior Research Analyst\"}
```

Tool Output

```
The latest generative AI breakthroughs are transforming various industries and
aspects of our lives. Some of
the key trends and technologies include autonomy, LLMs and data scaling,
enterprise adoption,
hyper-personalization, and AI-ready data. Emerging technologies in generative
AI include agentic AI, GANs,
and transformers. The potential impact of these trends and technologies is
significant, with the potential to
improve customer service, enhance decision-making, increase efficiency, and
drive innovation. For instance,
generative AI can be used to generate new forms of creative content, such as
audio, code, images, text,
```

simulations, and videos. It can also be used to automate routine tasks, such as the reorganization and classification of data.

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Generative AI has numerous applications across various industries, including financial services, healthcare, and education. In the financial services industry, generative AI can be used to develop artificial intelligence investment strategies, draft documentation, and monitor regulatory changes. It can also be used to facilitate communications between clients and investors. In healthcare, generative AI can be used to analyze medical images, diagnose diseases, and develop personalized treatment plans. In education, generative AI can be used to create personalized learning plans, develop interactive learning materials, and automate grading. Additionally, generative AI can be used to generate new proteins, engineer synthetic cells, and fast-track scientific discovery.

↪

↪

The use of generative AI is expected to continue growing in the coming years, with more businesses and organizations adopting this technology to improve their operations and services. According to a recent survey, generative AI usage jumped from 55% to 75% among business leaders and AI decision-makers in the last year alone. New AI tools will bring more advanced capabilities, such as the ability to generate human-like text, images, and videos. However, the...

↪

↪

Output()

Agent Final Answer

Agent: Tech Content Strategist

Final Answer:

The latest generative AI breakthroughs are transforming various industries and aspects of our lives. Some of the key trends and technologies include autonomy, LLMs and data scaling, enterprise adoption, hyper-personalization, and AI-ready data. Emerging technologies in generative AI include agentic AI, GANs, and transformers. The potential impact of these trends and technologies is significant, with the potential to improve customer service, enhance decision-making, increase efficiency, and drive innovation. For instance, generative AI can be used to generate new forms of creative content, such as audio, code, images, text, simulations, and videos. It can also be used to automate routine tasks, such as the reorganization and classification of data.

Generative AI has numerous applications across various industries, including financial services, healthcare, and education. In the financial services industry, generative AI can be used to develop artificial intelligence investment strategies, draft documentation, and monitor regulatory changes. It can also be used to facilitate communications between clients and investors. In healthcare, generative AI can be used to analyze medical images, diagnose diseases, and develop personalized treatment plans. In education, generative AI can be used to create personalized learning plans, develop interactive learning materials, and automate grading. Additionally, generative AI can be used to generate new proteins, engineer synthetic cells, and fast-track scientific discovery.

The use of generative AI is expected to continue growing in the coming years, with more businesses and

organizations adopting this technology to improve their operations and services. According to a recent survey, generative AI usage jumped from 55% to 75% among business leaders and AI decision-makers in the last year alone. New AI tools will bring more advanced capabilities, such as the ability to generate human-like text, images, and videos. However, there are also potential challenges and risks associated with generative AI, including job displacement, bias and discrimination, and cybersecurity risks. Therefore, it is essential to develop and implement responsible AI practices, such as ensuring transparency, accountability, and fairness in AI decision-making.

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In conclusion, the latest generative AI breakthroughs are transforming various industries and aspects of our lives. With its numerous applications and potential to improve customer service, enhance decision-making, increase efficiency, and drive innovation, generative AI is expected to continue growing in the coming years.

However, it is crucial to address the potential challenges and risks associated with this technology, such as job displacement, bias and discrimination, and cybersecurity risks. By developing and implementing responsible AI practices, we can ensure that generative AI is used in a way that benefits society as a whole.

As we move forward, it will be exciting to see the new advancements and applications of generative AI, and how it will continue to shape and transform our world.

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Task Completion

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Task Completed

↪

Name: 45be27b5-2038-4d72-a49d-eb7e4579acd5

Agent: Tech Content Strategist

Tool Args:

Crew Completion

Crew Execution Completed

Name: crew

ID: 6d6db512-1d3e-42f0-ba9b-a54d560eb272

Tool Args:

Final Output: The latest generative AI breakthroughs are transforming various industries and aspects of our lives. Some of the key trends and technologies include autonomy, LLMs and data scaling, enterprise adoption, hyper-personalization, and AI-ready data. Emerging technologies in generative AI include agentic AI, GANs, and transformers. The potential impact of these trends and technologies is significant, with the potential to improve customer service, enhance decision-making, increase efficiency, and drive innovation. For instance, generative AI can be used to generate new forms of creative content, such as audio, code, images, text, simulations, and videos. It can also be used to automate routine tasks, such as the reorganization and classification of data.

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```
As we move forward, it will be exciting to see the new advancements and
↳ applications of generative AI, and
how it will continue to shape and transform our world.
↳
↳
↳
↳
```

The result is a `crew_output`

```
[17]: type(result)
```

```
[17]: crewai.crews.crew_output.CrewOutput
```

```
[18]: result
```

```
[18]: CrewOutput(raw='The latest generative AI breakthroughs are transforming various
industries and aspects of our lives. Some of the key trends and technologies
include autonomy, LLMs and data scaling, enterprise adoption, hyper-
personalization, and AI-ready data. Emerging technologies in generative AI
include agentic AI, GANs, and transformers. The potential impact of these trends
and technologies is significant, with the potential to improve customer service,
enhance decision-making, increase efficiency, and drive innovation. For
instance, generative AI can be used to generate new forms of creative content,
such as audio, code, images, text, simulations, and videos. It can also be used
to automate routine tasks, such as the reorganization and classification of
data.\n\nGenerative AI has numerous applications across various industries,
including financial services, healthcare, and education. In the financial
services industry, generative AI can be used to develop artificial intelligence
investment strategies, draft documentation, and monitor regulatory changes. It
can also be used to facilitate communications between clients and investors. In
healthcare, generative AI can be used to analyze medical images, diagnose
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AI usage jumped from 55% to 75% among business leaders and AI decision-makers in
the last year alone. New AI tools will bring more advanced capabilities, such as
the ability to generate human-like text, images, and videos. However, there are
```


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```
pydantic=None, json_dict=None,
tasks_output=[TaskOutput(description='Analyze the major Latest Generative AI
breakthroughs, identifying key trends and technologies. Provide a detailed
report on their potential impact.', name=None, expected_output='A detailed
report on Latest Generative AI breakthroughs, including trends, emerging
technologies, and their impact.', summary='Analyze the major Latest Generative
AI breakthroughs, identifying key trends...', raw="The latest generative AI
breakthroughs are transforming various industries and aspects of our lives. Some
of the key trends and technologies include:

1. Autonomy: The shift is
toward autonomy, with many companies using generative AI across core systems,
and the focus now is on agentic AI, which are models designed to take action,
not just generate content.

2. LLMs and Data Scaling: Large language models
(LLMs) and data scaling are becoming increasingly important, with companies
investing heavily in these areas to improve the accuracy and efficiency of their
AI systems.

3. Enterprise Adoption: Generative AI is being adopted by
enterprises across various industries, including healthcare, finance, and
education, to improve customer service, automate processes, and enhance
decision-making.

4. Hyper-Personalization: Generative AI is enabling hyper-
personalization, allowing companies to create customized products and services
tailored to individual customers' needs and preferences.

5. AI-Ready Data:
AI-ready data is becoming a critical component of generative AI, with companies
focusing on creating high-quality, relevant, and well-structured data to feed
their AI systems.

Some of the emerging technologies in generative AI
include:

1. Agentic AI: Agentic AI is a type of AI that is designed to
take action, not just generate content. This technology has the potential to
revolutionize various industries, including healthcare, finance, and
education.

2. Generative Adversarial Networks (GANs): GANs are a type of
deep learning algorithm that can generate new data samples that are similar to
existing data. This technology has the potential to improve the accuracy and
efficiency of AI systems.

3. Transformers: Transformers are a type of
neural network architecture that is particularly well-suited for natural
language processing tasks. This technology has the potential to improve the
accuracy and efficiency of language translation, text summarization, and other
```

NLP tasks.\n\nThe potential impact of these trends and technologies is significant, with the potential to:\n\n1. ****Improve Customer Service****: Generative AI can help companies improve customer service by providing personalized responses to customer inquiries and automating routine tasks.\n2. ****Enhance Decision-Making****: Generative AI can help companies enhance decision-making by providing accurate and relevant data insights and recommendations.\n3. ****Increase Efficiency****: Generative AI can help companies increase efficiency by automating routine tasks and improving the accuracy and speed of processes.\n4. ****Drive Innovation****: Generative AI can help companies drive innovation by providing new and innovative solutions to complex problems.\n\nHowever, there are also potential challenges and risks associated with generative AI, including:\n\n1. ****Job Displacement****: Generative AI has the potential to displace certain jobs, particularly those that involve routine or repetitive tasks.\n2. ****Bias and Discrimination****: Generative AI can perpetuate bias and discrimination if the data used to train the models is biased or discriminatory.\n3. ****Cybersecurity Risks****: Generative AI can pose cybersecurity risks if the models are not properly secured and validated.\n\nOverall, the latest generative AI breakthroughs have the potential to transform various industries and aspects of our lives, but it is essential to address the potential challenges and risks associated with this technology to ensure that it is developed and used responsibly.", pydantic=None, json_dict=None, agent='Senior Research Analyst', output_format=OutputFormat.RAW: 'raw'), TaskOutput(description='Create an engaging blog post based on the research findings about Latest Generative AI breakthroughs. Tailor the content for a tech-savvy audience, ensuring clarity and interest.', name=None, expected_output='A 4-paragraph blog post on Latest Generative AI breakthroughs, written clearly and engagingly for tech enthusiasts.', summary='Create an engaging blog post based on the research findings...', raw='The latest generative AI breakthroughs are transforming various industries and aspects of our lives. Some of the key trends and technologies include autonomy, LLMs and data scaling, enterprise adoption, hyper-personalization, and AI-ready data. Emerging technologies in generative AI include agentic AI, GANs, and transformers. The potential impact of these trends and technologies is significant, with the potential to improve customer service, enhance decision-making, increase efficiency, and drive innovation. For instance, generative AI can be used to generate new forms of creative content, such as audio, code, images, text, simulations, and videos. It can also be used to automate routine tasks, such as the reorganization and classification of data.\n\nGenerative AI has numerous applications across various industries, including financial services, healthcare, and education. In the financial services industry, generative AI can be used to develop artificial intelligence investment strategies, draft documentation, and monitor regulatory changes. It can also be used to facilitate communications between clients and investors. In healthcare, generative AI can be used to analyze medical images, diagnose diseases, and develop personalized treatment plans. In education, generative AI can be used to create personalized learning plans, develop interactive learning materials, and automate grading. Additionally, generative AI can be used to

generate new proteins, engineer synthetic cells, and fast-track scientific discovery.\n\nThe use of generative AI is expected to continue growing in the coming years, with more businesses and organizations adopting this technology to improve their operations and services. According to a recent survey, generative AI usage jumped from 55% to 75% among business leaders and AI decision-makers in the last year alone. New AI tools will bring more advanced capabilities, such as the ability to generate human-like text, images, and videos. However, there are also potential challenges and risks associated with generative AI, including job displacement, bias and discrimination, and cybersecurity risks. Therefore, it is essential to develop and implement responsible AI practices, such as ensuring transparency, accountability, and fairness in AI decision-making.\n\nIn conclusion, the latest generative AI breakthroughs are transforming various industries and aspects of our lives. With its numerous applications and potential to improve customer service, enhance decision-making, increase efficiency, and drive innovation, generative AI is expected to continue growing in the coming years. However, it is crucial to address the potential challenges and risks associated with this technology, such as job displacement, bias and discrimination, and cybersecurity risks. By developing and implementing responsible AI practices, we can ensure that generative AI is used in a way that benefits society as a whole. As we move forward, it will be exciting to see the new advancements and applications of generative AI, and how it will continue to shape and transform our world.', pydantic=None, json_dict=None, agent='Tech Content Strategist', output_format=OutputFormat.RAW: 'raw')], token_usage=UsageMetrics(total_tokens=22904, prompt_tokens=19001, cached_prompt_tokens=0, completion_tokens=3903, successful_requests=11))

The `result.raw` output text contains the final content produced by our last agent in the workflow. We can easily access this text to see the complete results:

```
[19]: final_output = result.raw
      print("Final output:", final_output)
```

Final output: The latest generative AI breakthroughs are transforming various industries and aspects of our lives. Some of the key trends and technologies include autonomy, LLMs and data scaling, enterprise adoption, hyper-personalization, and AI-ready data. Emerging technologies in generative AI include agentic AI, GANs, and transformers. The potential impact of these trends and technologies is significant, with the potential to improve customer service, enhance decision-making, increase efficiency, and drive innovation. For instance, generative AI can be used to generate new forms of creative content, such as audio, code, images, text, simulations, and videos. It can also be used to automate routine tasks, such as the reorganization and classification of data.

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The `tasks_output` list gives us access to outputs from each task in the order they were executed:

```
[20]: tasks_outputs = result.tasks_output
```

We see the output of the research task object. This lets us access both the task description and the content the agent produced:

```
[21]: print("Task Description", tasks_outputs[0].description)
      print("Output of research task ", tasks_outputs[0])
```

Task Description Analyze the major Latest Generative AI breakthroughs, identifying key trends and technologies. Provide a detailed report on their potential impact.

Output of research task The latest generative AI breakthroughs are transforming various industries and aspects of our lives. Some of the key trends and technologies include:

1. **Autonomy**: The shift is toward autonomy, with many companies using

generative AI across core systems, and the focus now is on agentic AI, which are models designed to take action, not just generate content.

2. ****LLMs and Data Scaling****: Large language models (LLMs) and data scaling are becoming increasingly important, with companies investing heavily in these areas to improve the accuracy and efficiency of their AI systems.
3. ****Enterprise Adoption****: Generative AI is being adopted by enterprises across various industries, including healthcare, finance, and education, to improve customer service, automate processes, and enhance decision-making.
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3. ****Increase Efficiency****: Generative AI can help companies increase efficiency by automating routine tasks and improving the accuracy and speed of processes.
4. ****Drive Innovation****: Generative AI can help companies drive innovation by providing new and innovative solutions to complex problems.

However, there are also potential challenges and risks associated with generative AI, including:

1. ****Job Displacement****: Generative AI has the potential to displace certain jobs, particularly those that involve routine or repetitive tasks.

2. ****Bias and Discrimination****: Generative AI can perpetuate bias and discrimination if the data used to train the models is biased or discriminatory.
3. ****Cybersecurity Risks****: Generative AI can pose cybersecurity risks if the models are not properly secured and validated.

Overall, the latest generative AI breakthroughs have the potential to transform various industries and aspects of our lives, but it is essential to address the potential challenges and risks associated with this technology to ensure that it is developed and used responsibly.

We also have the description and output for the writer task using the raw property:

```
[22]: print("Writer task description:", tasks_outputs[1].description)
      print("\nOutput of writer task:", tasks_outputs[1].raw)
```

Writer task description: Create an engaging blog post based on the research findings about Latest Generative AI breakthroughs. Tailor the content for a tech-savvy audience, ensuring clarity and interest.

Output of writer task: The latest generative AI breakthroughs are transforming various industries and aspects of our lives. Some of the key trends and technologies include autonomy, LLMs and data scaling, enterprise adoption, hyper-personalization, and AI-ready data. Emerging technologies in generative AI include agentic AI, GANs, and transformers. The potential impact of these trends and technologies is significant, with the potential to improve customer service, enhance decision-making, increase efficiency, and drive innovation. For instance, generative AI can be used to generate new forms of creative content, such as audio, code, images, text, simulations, and videos. It can also be used to automate routine tasks, such as the reorganization and classification of data.

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In addition to the task output, we can access the agent that performed each task:

```
[23]: print("We can get the agent for researcher task: ",tasks_outputs[0].agent)
      print("We can get the agent for the writer task: ",tasks_outputs[1].agent)
```

```
We can get the agent for researcher task:   Senior Research Analyst
We can get the agent for the writer task:   Tech Content Strategist
```

After your agents complete their tasks, CrewAI provides detailed performance metrics that help you monitor resource usage and optimize your multi-agent systems. Token usage analytics are particularly important as they directly impact operational costs and system efficiency.

```
[24]: token_count = result.token_usage.total_tokens
      prompt_tokens = result.token_usage.prompt_tokens
      completion_tokens = result.token_usage.completion_tokens

      print(f"Total tokens used: {token_count}")
      print(f"Prompt tokens: {prompt_tokens} (used for instructions to the model)")
      print(f"Completion tokens: {completion_tokens} (generated in response)")
```

```
Total tokens used: 22904
Prompt tokens: 19001 (used for instructions to the model)
Completion tokens: 3903 (generated in response)
```

1.11 Exercises

In these exercises, you will create a web publishing component for your fact-checking application by implementing a web designer agent and task. This final piece will transform the analyzed and written content into a professional webpage that presents verification results clearly to users.

1.11.1 Exercise 1: Create a Social Media Strategist Agent

Create a Social Media Agent which curates a summary and a short-form version (such as tweets or LinkedIn posts).

```
[25]: #TODO
social_agent = Agent(
    role='Social Media Strategist',
    goal='Generate engaging social media snippets based on the full article',
    backstory="A digital storyteller who excels at crafting compelling posts to
    ↪drive engagement and traffic.",
    verbose=True
)
```

[Click here for the solution](#)

```
social_agent = Agent(
    role='Social Media Strategist',
    goal='Generate engaging social media snippets based on the full article',
    backstory="A digital storyteller who excels at crafting compelling posts to drive engagement",
    verbose=True
)
```

1.11.2 Exercise 2: Defining a Social Media Strategy Task

Create a task for the Social Media Strategist agent to generate engaging and platform-specific posts (such as LinkedIn or X/Twitter) based on the research and blog content. This agent will help amplify the reach of your content by distilling key insights into short, compelling messages.

```
[26]: #TODO
social_task = Task(
    description=(
        "Summarize the blog post about {topic} into 2-3 engaging social media
        ↪posts "
        "suitable for platforms like LinkedIn or Twitter. Make sure the tone is
        ↪informative, "
        "professional, and encourages further reading."
    ),
    agent=social_agent,
    expected_output="A series of 2-3 well-written social posts highlighting the
    ↪key insights from the blog content."
)
```

[Click here for the solution](#)

```
social_task = Task(
    description=(
        "Summarize the blog post about {topic} into 2-3 engaging social media posts "
```



```

        "suitable for platforms like LinkedIn or Twitter. Make sure the tone is informative, "
        "professional, and encourages further reading."
    ),
    agent=social_agent,
    expected_output="A series of 2-3 well-written social posts highlighting the key insights f
)

```

1.11.3 Exercise 3: Create a Complete Crew Object

Include research, writing, and social media agents along with their tasks, configured for sequential processing with verbose output and apply the method `kickoff()` method.

```

[27]: #TODO
crew = Crew(
    agents=[research_agent, writer_agent, social_agent],
    tasks=[research_task, writer_task, social_task],
    process=Process.sequential, # Tasks will be executed one after another
    verbose=True
)

# Run the crew and capture the final output (includes research, blog post, and
↳social media content)
result = crew.kickoff(inputs={"topic": "Latest Generative AI breakthroughs"})

```

Crew Execution Started

↳

Crew Execution Started

↳

Name: crew

↳

ID: b82403f1-2648-4807-a575-7d2abefea0e6

↳

Tool Args:

↳

↳

↳

Agent Started

↳

Agent: Senior Research Analyst

↩

↩

Task: Analyze the major Latest Generative AI breakthroughs, identifying key trends and technologies. Provide a detailed report on their potential impact.

↩

↩

Output()

Agent Tool Execution

↩

Agent: Senior Research Analyst

↩

↩

Thought: Thought: To analyze the major latest generative AI breakthroughs and identify key trends and technologies, I need to search for the most recent and relevant information on this topic. I should start by searching the internet for the latest news and updates on generative AI.

↩

↩

Using Tool: Search the internet with Serper

↩

↩

Tool Input

↩

{"search_query": "latest generative AI breakthroughs"}

↩

↩

Tool Output

```
↳  
{'searchParameters': {'q': 'latest generative AI breakthroughs', 'type':  
↳ 'search', 'num': 10, 'engine':  
  'google'}, 'organic': [{'title': 'Latest AI Breakthroughs and News: June,  
↳ July, August 2025', 'link':  
  'https://www.crescendo.ai/news/latest-ai-news-and-updates', 'snippet':  
↳ 'Summary: Lloyds Bank has introduced  
  Athena, a generative AI tool designed to support customer service and internal  
↳ operations. Athena helps  
  automate responses, ...', 'position': 1}, {'title': 'Advancements in generative  
↳ AI - AI, Data & Analytics  
  Network', 'link':  
↳ 'https://www.aidataanalytics.network/data-science-ai/articles/  
↳ advancements-in-generative-ai', 'snippet': 'In  
  2024, an AI-generated painting sold at auction for more than US$1 million.  
↳ Meanwhile, a novel drug molecule  
  discovered by a generative AI ...', 'position': 2}, {'title': 'AI News | Latest  
↳ AI News, Analysis & Events',  
  'link': 'https://www.artificialintelligence-news.com/', 'snippet': "Generative  
↳ AI trends 2025: LLMs, data  
  scaling & enterprise adoption. Inside Tim Cook's push to get Apple back in the  
↳ AI race. Apple. August 6,  
  2025. Inside Tim ...", 'position': 3}, {'title': 'Top 10 Generative AI Trends:  
↳ Latest Advancements &  
  Developments', 'link': 'https://masterofcode.com/blog/generative-ai-trends',  
↳ 'snippet': 'Key Trends in  
  Generative AI across Different Functions · Hyper-Personalization · Open Source  
↳ in Generative AI · Agentic AI  
  · AI Security and the EU AI Act.', 'position': 4}, {'title': 'Artificial  
↳ Intelligence News - ScienceDaily',  
  'link': 'https://www.sciencedaily.com/news/computers_math/  
↳ artificial_intelligence/', 'snippet': 'Researchers  
  have created a revolutionary robotic skin that brings machines closer to  
↳ human-like touch.', 'position': 5},  
  {'title': 'Top 10 Generative AI Trends in 2025 - SoluLab', 'link':  
↳ 'https://www.solulab.com/top-generative-ai-trends/', 'snippet': 'Top  
↳ Generative AI Trends For 2025 · 1. AI  
  for Creativity · 2. GenAI for Hyper-Personalization · 3. Conversational AI · 4.  
↳ Generative AI for Scienti...
```

Output()

Agent Tool Execution

Agent: Senior Research Analyst

Thought: Thought: I have gathered a list of recent news articles and websites related to the latest generative AI breakthroughs. To further analyze the key trends and technologies, I should search for more specific information on emerging technologies in generative AI.

Using Tool: Search the internet with Serper

Tool Input

```
{"search_query": "emerging technologies in generative AI"}
```

Tool Output

```
{'searchParameters': {'q': 'emerging technologies in generative AI', 'type': 'search', 'num': 10, 'engine': 'serper'}}
```

```

    'google'}, 'organic': [{ 'title': 'Top 10 Generative AI Trends: Latest
↳Advancements & Developments', 'link':
    'https://masterofcode.com/blog/generative-ai-trends', 'snippet': 'Explore
↳Generative AI trends for 2025 and
    beyond - from AI-driven creativity to edge computing. Stay ahead with this
↳generative AI advancements!',
    'position': 1}, { 'title': 'Emerging Tech: Top Use Cases for Generative AI -
↳Gartner', 'link':
    'https://www.gartner.com/en/doc/
↳779868-emerging-tech-top-use-cases-for-generative-ai', 'snippet': 'To achieve
↳
    early success, product leaders with GenAI-aligned offerings should prioritize
↳use cases that result in sales
    enablement and operational efficiency.', 'position': 2}, { 'title': 'McKinsey
↳technology trends outlook 2025',
    'link': 'https://www.mckinsey.com/capabilities/mckinsey-digital/our-insights/
↳the-top-trends-in-tech',
    'snippet': 'An overarching artificial intelligence category replaces these
↳four trends: applied AI,
    generative AI, industrializing machine learning, and ...', 'position': 3},
↳{ 'title': 'Top 10 Generative AI
    Trends in 2025 - SoluLab', 'link': 'https://www.solulab.com/
↳top-generative-ai-trends/', 'snippet': '1. AI for
    Creativity · 2. GenAI for Hyper-Personalization · 3. Conversational AI · 4.
↳Generative AI for Scientific
    Research · 5. Human in the Generative AI Loop · 6.', 'position': 4,
↳'sitelinks': [{ 'title': 'Understanding
    Generative AI', 'link': 'https://www.solulab.com/top-generative-ai-trends/
↳#elementor-toc__heading-anchor-0'},
    { 'title': 'Top Generative AI Trends For...', 'link':
↳
    'https://www.solulab.com/top-generative-ai-trends/
↳#elementor-toc__heading-anchor-1'}, { 'title': 'Conclusion',
    'link': 'https://www.solulab.com/top-generative-ai-trends/
↳#elementor-toc__heading-anchor-12'}, { 'title':
    'FAQs', 'link': 'https://www.solulab.com/top-generative-ai-trends/
↳#elementor-toc__heading-anchor-13'}}],
    { 'title': 'Generative AI, Emerg...
↳
↳
↳

```

Output()

Agent Tool Execution

Agent: Senior Research Analyst

Thought: Thought: I have gathered information on the latest generative AI breakthroughs and emerging technologies. To further analyze the potential impact of these technologies, I should search for information on the applications and use cases of generative AI.

Using Tool: Search the internet with Serper

Tool Input

```
{"search_query": "applications and use cases of generative AI"}
```

Tool Output

```
{'searchParameters': {'q': 'applications and use cases of generative AI',  
'type': 'search', 'num': 10,  
'engine': 'google'}, 'organic': [{'title': 'Generative AI Use Cases and  
Resources - AWS', 'link':  
'https://aws.amazon.com/ai/generative-ai/use-cases/', 'snippet': 'Top  
generative AI use cases', 'position':  
1}, {'title': 'Real-world gen AI use cases from the world's leading  
organizations', 'link':
```

```

'https://cloud.google.com/transform/
↳101-real-world-generative-ai-use-cases-from-industry-leaders', 'snippet':
  'Data Agents. *The Colombian Security Council developed a generative AI-based
↳chatbot to improve data
  analysis and its chemical emergency ...', 'position': 2}, {'title': '20 Examples
↳of Generative AI
  Applications Across Industries', 'link': 'https://www.coursera.org/articles/
↳generative-ai-applications',
  'snippet': 'What are the applications of generative AI? · 1. Health care and
↳pharmaceuticals · 2. Advertising
  and marketing · 3. Manufacturing · 4. Software ...', 'position': 3}, {'title':
↳'What is Generative AI?
  Examples & Use Cases - Google Cloud', 'link': 'https://cloud.google.com/
↳use-cases/generative-ai', 'snippet':
  'Generative AI use cases and definition ; Modernize customer service · Improve
↳employee productivity,
  customer analytics, and deflection rates with AI · Chatbot ...', 'position': 4},
↳{'title': 'Generative AI:
  Applications, Use Cases, and Examples - Quantiphi', 'link': 'https://quantiphi.
↳com/blog/generative-ai',
  'snippet': 'Generative AI applications include personalized content creation,
↳dynamic marketing strategies,
  and innovative data analysis techniques.', 'position': 5, 'sitelinks':
↳[{'title': 'What is Generative AI?',
  'link': 'https://quantiphi.com/blog/generative-ai#what-is-generative-ai-'},
↳{'title': 'Generative AI Services
  by...', 'link': 'https://quantiphi.com/blog/
↳generative-ai#generative-ai-services-by-quantiphi'}, {'title':
  'Generative AI Video', 'link': 'https://quantiphi.com/blog/
↳generative-ai#generative-ai-video'}}], {'title':
  'Gene...
↳
↳
↳

```

Output()

Agent Final Answer

↳

Agent: Senior Research Analyst

Final Answer:

The latest generative AI breakthroughs have the potential to revolutionize various industries and aspects of our lives. Some of the key trends and technologies in generative AI include:

1. **Hyper-Personalization**: Generative AI can be used to create personalized content, such as product recommendations, tailored to individual users' preferences and behaviors.
2. **Open Source in Generative AI**: Open-source generative AI models and tools are becoming increasingly popular, allowing developers to build and customize their own AI applications.
3. **Agentic AI**: Agentic AI refers to the use of generative AI to create autonomous agents that can interact with humans and other systems.
4. **AI Security and the EU AI Act**: The EU AI Act is a regulatory framework that aims to ensure the safe and responsible development of AI, including generative AI.
5. **Conversational AI**: Generative AI can be used to create conversational AI systems that can engage in natural-sounding conversations with humans.
6. **Generative AI for Scientific Research**: Generative AI can be used to accelerate scientific discovery and innovation, such as in the fields of biology, chemistry, and materials science.
7. **Human in the Generative AI Loop**: Human-in-the-loop generative AI refers to the use of human feedback and oversight to improve the performance and accuracy of generative AI systems.

Some of the emerging technologies in generative AI include:

1. **Edge Computing**: Edge computing refers to the use of generative AI on edge devices, such as smartphones and smart home devices, to reduce latency and improve real-time processing.
2. **Quantum Computing**: Quantum computing has the potential to significantly accelerate the processing of generative AI workloads, enabling faster and more efficient training of AI models.
3. **Explainable AI**: Explainable AI refers to the use of techniques, such as saliency maps and feature importance, to provide insights into the decision-making processes of generative AI systems.

The applications and use cases of generative AI are diverse and widespread, including:

1. **Healthcare**: Generative AI can be used to analyze medical images, predict patient outcomes, and develop personalized treatment plans.
2. **Finance**: Generative AI can be used to detect financial anomalies, predict stock prices, and optimize investment portfolios.
3. **Marketing**: Generative AI can be used to create personalized marketing campaigns, predict customer behavior, and optimize advertising spend.
4. **Education**: Generative AI can be used to create personalized learning plans, predict student outcomes, and optimize educational resources.
5. **Art and Entertainment**: Generative AI can be used to create new forms of art, music, and entertainment, such as generative music and generative video.

Overall, the latest generative AI breakthroughs have the potential to transform various industries and aspects of our lives, enabling new forms of creativity, innovation, and productivity. However, it is essential to address the challenges and risks associated with generative AI, such as bias, fairness, and

transparency, to ensure that these technologies are developed and used responsibly.

Task Completion

Task Completed

Name: 90ecb714-b450-4a4e-8233-1313b8ef769a

Agent: Senior Research Analyst

Tool Args:

Agent Started

Agent: Tech Content Strategist

Task: Create an engaging blog post based on the research findings about Latest Generative AI breakthroughs.

Tailor the content for a tech-savvy audience, ensuring clarity and interest.

Output()

Agent Started

```
↪
Agent: Senior Research Analyst
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↪
Task: Research the latest developments in generative AI
↪
↪
```

Output()

Agent Tool Execution

```
↪
Agent: Senior Research Analyst
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↪
Thought: Thought: To research the latest developments in generative AI, I need
↪to gather information on the
current trends, technologies, and applications in this field. I'll start by
↪searching the internet for the
latest news and updates on generative AI.
↪
↪
↪
Using Tool: Search the internet with Serper
↪
↪
```

Tool Input

```
↪  
{"search_query": "latest developments in generative AI"}  
↪  
↪
```

Tool Output

```
↪  
{'searchParameters': {'q': 'latest developments in generative AI', 'type':  
↪ 'search', 'num': 10, 'engine':  
  'google'}, 'organic': [{'title': 'Generative AI trends 2025: LLMs, data  
↪ scaling & enterprise ...', 'link':  
  'https://www.artificialintelligence-news.com/news/  
↪ generative-ai-trends-2025-llms-data-scaling-enterprise-adop  
  tion/', 'snippet': 'Generative AI is entering a more mature phase in 2025.  
↪ Models are being refined for  
  accuracy and efficiency, and enterprises are embedding them into everyday ...',  
↪ 'position': 1}, {'title':  
  'The Future of Generative AI: Trends to Watch in 2025 and ...', 'link':  
↪  
  'https://www.eimt.edu.eu/  
↪ the-future-of-generative-ai-trends-to-watch-in-2025-and-beyond', 'snippet':  
↪  
  'Discover the future of generative AI in 2025, focusing on multimodal models,  
↪ hyper-personalization, ethical  
  AI, sustainability, and creative collaboration.', 'position': 2}, {'title':  
↪ 'Generative AI news and  
  analysis', 'link': 'https://techcrunch.com/tag/generative-ai/', 'snippet':  
↪ 'TechCrunch covers the latest news  
  and analysis in Generative AI (GenAI). Read the latest on startups and  
↪ founders building artificial  
  intelligence tools.', 'position': 3}, {'title': '5 Generative AI Trends To  
↪ Watch Out For In 2025', 'link':  
  'https://www.forbes.com/sites/janakirammsv/2025/01/12/  
↪ 5-generative-ai-trends-to-watch-out-for-in-2025/',  
  'snippet': '1. From AI-Infused to AI-First Applications · 2. The Rise of  
↪ Service as Software · 3. Inclusion  
  of Speech and Real-Time Interaction · 4. Generative ...', 'position': 4},  
↪ {'title': 'Generative AI: Here's
```

```

    the latest research from the Forum", 'link':
↳
    'https://www.weforum.org/stories/2024/10/generative-ai-impact-latest-research/
↳', 'snippet': "This piece
    rounds up some of the World Economic Forum's research in these areas, from
↳governing genAI to how it's
    transforming areas such as education, health ...", 'position': 5}, {'title':
↳'Top 10 GenAI Trends to Watch in
    Technology in 2025 and ...', 'link': 'https://www.ciklum.com/resources/blog/
↳top-10-g...
↳
↳

```

Output()

Agent Tool Execution

```

↳
Agent: Senior Research Analyst
↳
↳
↳
Thought: Thought: I have gathered a list of search results that provide
↳information on the latest
    developments in generative AI. The results include articles and research
↳papers from various sources,
    including news websites, academic journals, and industry reports. I will now
↳analyze the results to identify
    the key trends and technologies in generative AI.
↳
↳
↳
Using Tool: Search the internet with Serper
↳
↳
↳

```

Tool Input

```

↳

```

```
"{\\"search_query\\": \\"generative AI trends 2025\\"}"
```

Tool Output

```
{'searchParameters': {'q': 'generative AI trends 2025', 'type': 'search',  
'num': 10, 'engine': 'google'},  
'organic': [{ 'title': 'Generative AI trends 2025: LLMs, data scaling &  
enterprise adoption', 'link':  
'https://www.artificialintelligence-news.com/news/  
generative-ai-trends-2025-llms-data-scaling-enterprise-adop  
tion/', 'snippet': 'In 2025, the shift is toward autonomy . Many companies  
already use generative AI across  
core systems, but the focus now is on agentic AI. These are models designed to  
take action, not just generate  
content.', 'position': 1}, { 'title': 'How People Are Really Using Gen AI in  
2025', 'link':  
'https://hbr.org/2025/04/how-people-are-really-using-gen-ai-in-2025',  
'snippet': 'A year ago, I wrote a piece  
here about how people were really using gen AI. That article seemed to hit a  
note: It was popular, featured  
in viral posts.', 'position': 2}, { 'title': '6 AI trends you'll see more of in  
2025 - Microsoft News',  
'link': 'https://news.microsoft.com/source/features/ai/  
6-ai-trends-youll-see-more-of-in-2025/', 'snippet':  
'In 2025, one trend is certain: AI will continue to drive innovation and  
unlock new potential for people and  
organizations around the globe.', 'position': 3}, { 'title': 'The 2025 AI Index  
Report | Stanford HAI',  
'link': 'https://hai.stanford.edu/ai-index/2025-ai-index-report', 'snippet':  
'Generative AI saw particularly  
strong momentum, attracting $33.9 billion globally in private investment-an 18.  
7% increase from 2023.',  
'position': 4}, { 'title': 'Gartner Hype Cycle Identifies Top AI Innovations in  
2025', 'link':  
'https://www.gartner.com/en/newsroom/press-releases/  
2025-08-05-gartner-hype-cycle-identifies-top-ai-innovatio  
ns-in-2025', 'snippet': 'AI agents and AI-ready data are the two fastest  
advancing technologies on the 2025  
Gartner Hype Cycle for Artificial Intelligence, according to ...', 'position':  
5}, { 'title': 'McKinsey
```

```
technology trends outlook 2025', 'link': 'https://www.mckinsey.com/
capabilities/mckinsey-digital/our-insi...
```

Output()

Agent Final Answer

Agent: Senior Research Analyst

Final Answer:

The latest developments in generative AI include trends such as hyper-personalization, open source in generative AI, agentic AI, AI security and the EU AI Act, conversational AI, generative AI for scientific research, and human in the generative AI loop. Emerging technologies in generative AI include edge computing, quantum computing, and explainable AI. The applications and use cases of generative AI are diverse and widespread, including healthcare, finance, marketing, education, and art and entertainment.

According to recent research and reports, some of the top generative AI trends in 2025 include:

1. Autonomy: Many companies are already using generative AI across core systems, but the focus now is on agentic AI, which are models designed to take action, not just generate content.
2. AI agents: AI agents and AI-ready data are the two fastest advancing technologies on the 2025 Gartner Hype Cycle for Artificial Intelligence.

3. Generative AI for scientific research: Generative AI can improve the accuracy and efficiency of searching vast datasets, which can be useful in scientific research.
4. Hyper-personalization: Generative AI can be used to create personalized content, such as product recommendations and customized marketing messages.
5. Conversational AI: Conversational AI is becoming increasingly popular, with many companies using chatbots and virtual assistants to interact with customers.
6. Edge computing: Edge computing is emerging as a key technology in generative AI, as it allows for faster and more efficient processing of data.
7. Quantum computing: Quantum computing is also being explored as a potential technology for generative AI, as it has the potential to solve complex problems that are currently unsolvable with traditional computers.
8. Explainable AI: Explainable AI is becoming increasingly important, as it allows for greater transparency and understanding of how generative AI models work.
- Overall, generative AI is a rapidly evolving field, with new trends and technologies emerging all the time. As the field continues to grow and develop, we can expect to see even more innovative applications and use cases for generative AI in the future.
- The search results provided a list of articles and research papers from various sources, including news websites, academic journals, and industry reports. These results included information on the current state of generative AI, as well as future trends and predictions. Some of the key findings from the search results include:
- * Generative AI is entering a more mature phase in 2025, with models being refined for accuracy and

efficiency, and enterprises embedding them into everyday applications.

↳

* The shift is toward autonomy, with many companies already using generative AI across core systems, but the focus now is on agentic AI.

↳

* Generative AI saw particularly strong momentum, attracting \$33.9 billion globally in private investment—an 18.7% increase from 2023.

↳

* AI agents and AI-ready data are the two fastest advancing technologies on the 2025 Gartner Hype Cycle for Artificial Intelligence.

↳

* Generative AI can improve the accuracy and efficiency of searching vast datasets, which can be useful in scientific research.

↳

* Hyper-personalization, conversational AI, edge computing, quantum computing, and explainable AI are all emerging as key trends and technologies in generative AI.

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Overall, the search results provided a comprehensive overview of the current state of generative AI, as well as future trends and predictions. They highlighted the growing importance of autonomy, AI agents, and explainable AI, and demonstrated the potential for generative AI to revolutionize various industries and aspects of our lives.

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Agent Tool Execution

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Agent: Tech Content Strategist

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Thought: Thought: To create an engaging blog post on the latest generative AI breakthroughs, I need to gather more information about the current trends and technologies in this field, as well as the potential applications and use cases. I should delegate the task of researching the latest developments in generative AI to a Senior Research Analyst, who can provide me with the most up-to-date information.

Using Tool: Delegate work to coworker

Tool Input

```
{\ "task\": \ "Research the latest developments in generative AI\ ", \ "context\ ": \ "The latest generative AI breakthroughs have the potential to revolutionize various industries and aspects of our lives. Some of the key trends and technologies in generative AI include hyper-personalization, open source in generative AI, agentic AI, AI security and the EU AI Act, conversational AI, generative AI for scientific research, and human in the generative AI loop. Emerging technologies in generative AI include edge computing, quantum computing, and explainable AI. The applications and use cases of generative AI are diverse and widespread, including healthcare, finance, marketing, education, and art and entertainment. \ ", \ "coworker\ ": \ "Senior Research Analyst\ }" }
```

Tool Output

The latest developments in generative AI include trends such as hyper-personalization, open source in

generative AI, agentic AI, AI security and the EU AI Act, conversational AI, generative AI for scientific research, and human in the generative AI loop. Emerging technologies in generative AI include edge computing, quantum computing, and explainable AI. The applications and use cases of generative AI are diverse and widespread, including healthcare, finance, marketing, education, and art and entertainment.

According to recent research and reports, some of the top generative AI trends in 2025 include:

1. Autonomy: Many companies are already using generative AI across core systems, but the focus now is on agentic AI, which are models designed to take action, not just generate content.
2. AI agents: AI agents and AI-ready data are the two fastest advancing technologies on the 2025 Gartner Hype Cycle for Artificial Intelligence.
3. Generative AI for scientific research: Generative AI can improve the accuracy and efficiency of searching vast datasets, which can be useful in scientific research.
4. Hyper-personalization: Generative AI can be used to create personalized content, such as product recommendations and customized marketing messages.
5. Conversational AI: Conversational AI is becoming increasingly popular, with many companies using chatbots and virtual assistants to interact with customers.
6. Edge computing: Edge computing is emerging as a key technology in generative AI, as it allows for faster and more efficient processing of data.
7. Quantum computing: Quantum computing is also being explored as a potential technology for generative AI, as it has the potential to solve complex problems that are currently unsolvable with traditional computers.
8. Explainable AI: Explainable AI is becoming increasingly important, as it allows for greater transparency and understanding of how generative AI models work.

↪

Overall, generative AI is a rapidly evolving field, ...

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↪

Output()

Agent Final Answer

↪

Agent: Tech Content Strategist

↪

↪

Final Answer:

↪

The latest generative AI breakthroughs have the potential to revolutionize various industries and aspects of our lives. Some of the key trends and technologies in generative AI include hyper-personalization, open source in generative AI, agentic AI, AI security and the EU AI Act, conversational AI, generative AI for scientific research, and human in the generative AI loop. Emerging technologies in generative AI include edge computing, quantum computing, and explainable AI. The applications and use cases of generative AI are diverse and widespread, including healthcare, finance, marketing, education, and art and entertainment.

↪

Generative AI is entering a more mature phase, with models being refined for accuracy and efficiency, and enterprises embedding them into everyday applications. The shift is toward autonomy, with many companies already using generative AI across core systems, but the focus now is on agentic AI. Generative AI saw particularly strong momentum, attracting \$33.9 billion globally in private investment—an 18.7% increase from

2023. AI agents and AI-ready data are the two fastest advancing technologies on the 2025 Gartner Hype Cycle for Artificial Intelligence. Generative AI can improve the accuracy and efficiency of searching vast datasets, which can be useful in scientific research. Hyper-personalization, conversational AI, edge computing, quantum computing, and explainable AI are all emerging as key trends and technologies in generative AI.

The potential applications of generative AI are vast and varied. In healthcare, generative AI can be used to analyze medical images, predict patient outcomes, and develop personalized treatment plans. In finance, generative AI can be used to detect financial anomalies, predict stock prices, and optimize investment portfolios. In marketing, generative AI can be used to create personalized marketing campaigns, predict customer behavior, and optimize advertising spend. In education, generative AI can be used to create personalized learning plans, predict student outcomes, and optimize educational resources. In art and entertainment, generative AI can be used to create new forms of art, music, and entertainment, such as generative music and generative video.

Overall, the latest generative AI breakthroughs have the potential to transform various industries and aspects of our lives, enabling new forms of creativity, innovation, and productivity. As the field continues to grow and develop, we can expect to see even more innovative applications and use cases for generative AI in the future. With its potential to revolutionize various industries and aspects of our lives, generative AI is an exciting and rapidly evolving field that is worth keeping an eye on. Whether you're a tech enthusiast, a business leader, or simply someone interested in the latest advancements in AI, generative AI is definitely worth exploring further.

Task Completion

↳

Task Completed

↳

Name: 45be27b5-2038-4d72-a49d-eb7e4579acd5

↳

Agent: Tech Content Strategist

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Tool Args:

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Agent Started

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Agent: Social Media Strategist

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↳

Task: Summarize the blog post about Latest Generative AI breakthroughs into 2-3 engaging social media posts suitable for platforms like LinkedIn or Twitter. Make sure the tone is

↳informative, professional, and encourages further reading.

↳

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Output()

Agent Final Answer

↪

Agent: Social Media Strategist

↪

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Final Answer:

↪

Exciting breakthroughs in generative AI are reshaping industries! From hyper-personalization to agentic AI, these innovations hold the promise of revolutionizing how we engage with technology. Discover how generative AI is accelerating scientific research, enhancing healthcare, and transforming marketing strategies in my latest blog! Dive in! #GenerativeAI #Innovation #TechTrends [Link to the blog]

↪

The future is here with the rise of generative AI! Emerging trends like open-source tools and edge computing are making AI more accessible and efficient. As businesses increasingly integrate these technologies, what will this mean for productivity and creativity across sectors? Read more to explore the potential of generative AI! #AI #FutureOfWork #TechNews [Link to the blog]

↪

↪

Navigating the challenges of generative AI is crucial! As the EU AI Act aims to ensure safety and responsibility in AI development, it's essential to address issues like bias and transparency. Join the conversation on our blog about the revolutionary potential of generative AI and the importance of ethical considerations. #EthicalAI #GenerativeAI #Innovation [Link to the blog]

↪

↪

Task Completion

Task Completed

Name: ac17a34c-6e1d-4070-b7ac-7593ceaa9e08

Agent: Social Media Strategist

Tool Args:

Crew Completion

Crew Execution Completed

Name: crew

ID: b82403f1-2648-4807-a575-7d2abefea0e6

Tool Args:

Final Output: Exciting breakthroughs in generative AI are reshaping industries! From hyper-personalization to agentic AI, these innovations hold the promise of revolutionizing how we engage with technology. Discover how generative AI is accelerating scientific research, enhancing healthcare, and transforming marketing strategies in my latest blog! Dive in! #GenerativeAI #Innovation #TechTrends [Link to the blog]


```

    The future is here with the rise of generative AI! Emerging trends like
↳open-source tools and edge
    computing are making AI more accessible and efficient. As businesses
↳increasingly integrate these
    technologies, what will this mean for productivity and creativity across
↳sectors? Read more to explore the
    potential of generative AI! #AI #FutureOfWork #TechNews [Link to the blog]
↳
↳
    Navigating the challenges of generative AI is crucial! As the EU AI Act aims
↳to ensure safety and
    responsibility in AI development, it's essential to address issues like bias
↳and transparency. Join the
    conversation on our blog about the revolutionary potential of generative AI
↳and the importance of ethical
    considerations. #EthicalAI #GenerativeAI #Innovation [Link to the blog]
↳
↳
↳
↳

```

Click here for the solution

```

crew = Crew(
    agents=[research_agent, writer_agent, social_agent],
    tasks=[research_task, writer_task, social_task],
    process=Process.sequential, # Tasks will be executed one after another
    verbose=True
)

# Run the crew and capture the final output (includes research, blog post, and social media content)
result = crew.kickoff(inputs={"topic": "Latest Generative AI breakthroughs"})

```

1.12 Authors

[Karan Goswami](#)

[Kunal Makwana](#)

1.13 Change Log

Click here for the changelog

Date (YYYY-MM-DD)	Version	Changed By	Change Description
2025-07-17	0.1	Karan Goswami	Initial version created
2025-07-22	0.2	Steve Ryan	ID review

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