

Curtin University

AI in Research Examples: Autonomous agents



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In December 2023, researchers were able to create Co-scientist, an autonomous AI agent capable of researching, designing, executing, and analysing chemical research experiments. Researchers can simply give the Co-scientist a prompt, such as “perform multiple Suzuki reactions”, and the Co-scientist will begin planning experiments. Co-scientist is capable of browsing the web, interacting directly with lab machinery, and can even execute Python code to analyse results.

Autonomous agents such as Co-scientist represent enormous potential benefits for researchers in all fields, who can now develop their own agents to have additional researchers who work 24/7 and are able to handle experiments from the initial planning to helping present final reports.

Link to research paper: <https://www.nature.com/articles/s41586-023-06792-0>



Figure 1: AI generated image of an AI chemical research agent

How did they achieve this?

Co-scientist is not a singular AI, but rather a collection of AI agents who interface with each other to research and execute experiments.

The core of Co-scientist is the **PLANNER** module, a language model (GPT-4) which serves as the brain of Co-scientist, deciding which other agents to call.

There are 4 primary commands Co-scientist can execute:

- **GOOGLE** – Uses a web searcher language model.
- **DOCUMENTATION** – How to interact with lab equipment.
- **PYTHON** – Executes python code for analysis.
- **EXPERIMENT** – Execute experiments on physical lab equipment over the internet.

Why was this not possible previously?

Recent breakthroughs with Large Language Models such as ChatGPT, allow an AI to understand plain English text and follow complicated instructions.

Researchers no longer need to be technical to work alongside AI and can simply instruct it in plain English.

How is this applicable to you?

The LLM's used in this project are not specifically trained for chemical research and a similar approach could be used for nearly any research field.

Autonomous agents are capable of planning, researching, and analysing results that can be beneficial to nearly every research field.

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