



AgentFlow

In-the-Flow Agentic System Optimization for Effective Planning and Tool Use



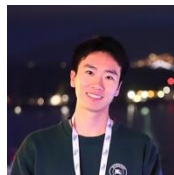
Zhuofeng Li*



Haoxiang Zhang*



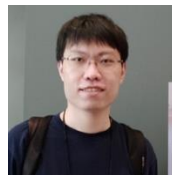
Seungju Han



Sheng Liu



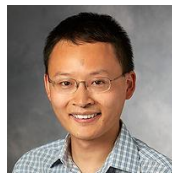
Jianwen Xie



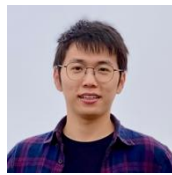
Yu Zhang



Yejin Choi

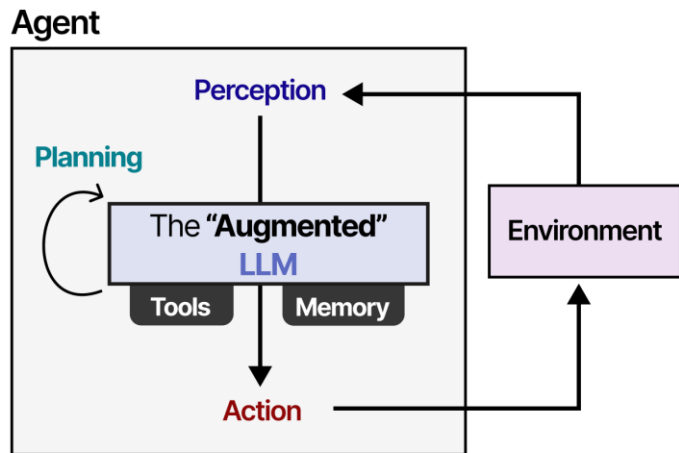


James Zou+



Pan Lu*+

LLM Agents and Agentic Systems

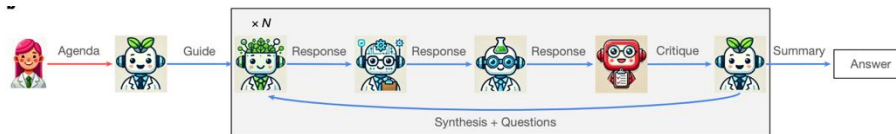


nature

Article | Published: 29 July 2025

The Virtual Lab of AI agents designs new SARS-CoV-2 nanobodies

[Kyle Swanson](#), [Wesley Wu](#), [Nash L. Bulaong](#), [John E. Pak](#) & [James Zou](#)

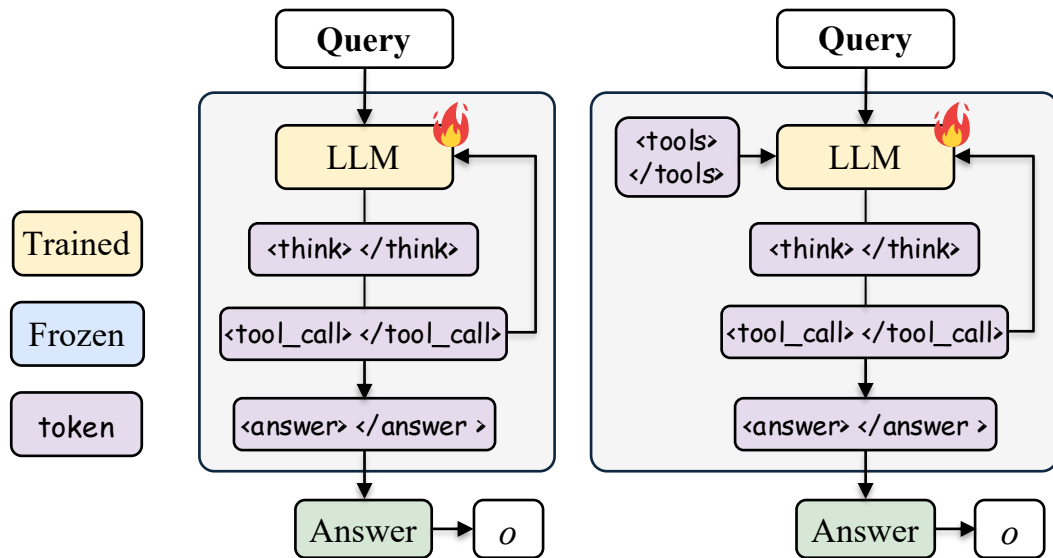


 Biomni

A General-Purpose Biomedical AI Agent

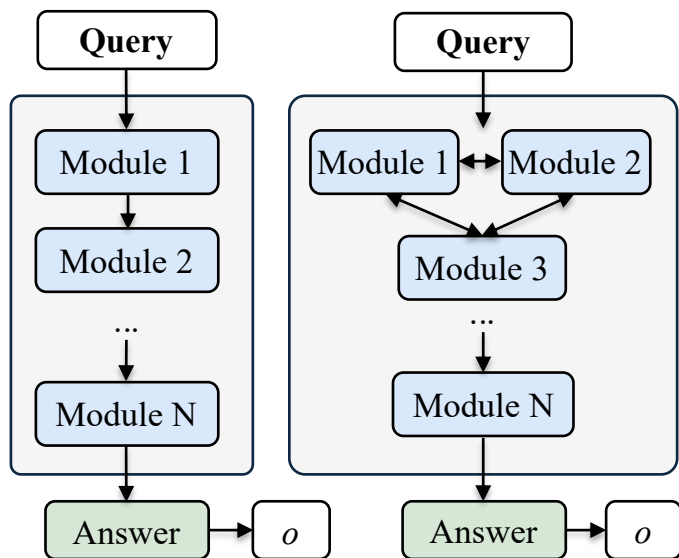
... with 150 specialized tools, 59 databases, and 105 software to automate

Two Paradigms of Tool-use LLMs



(a) Tool-Integrated Reasoning Models (LLM Agents)

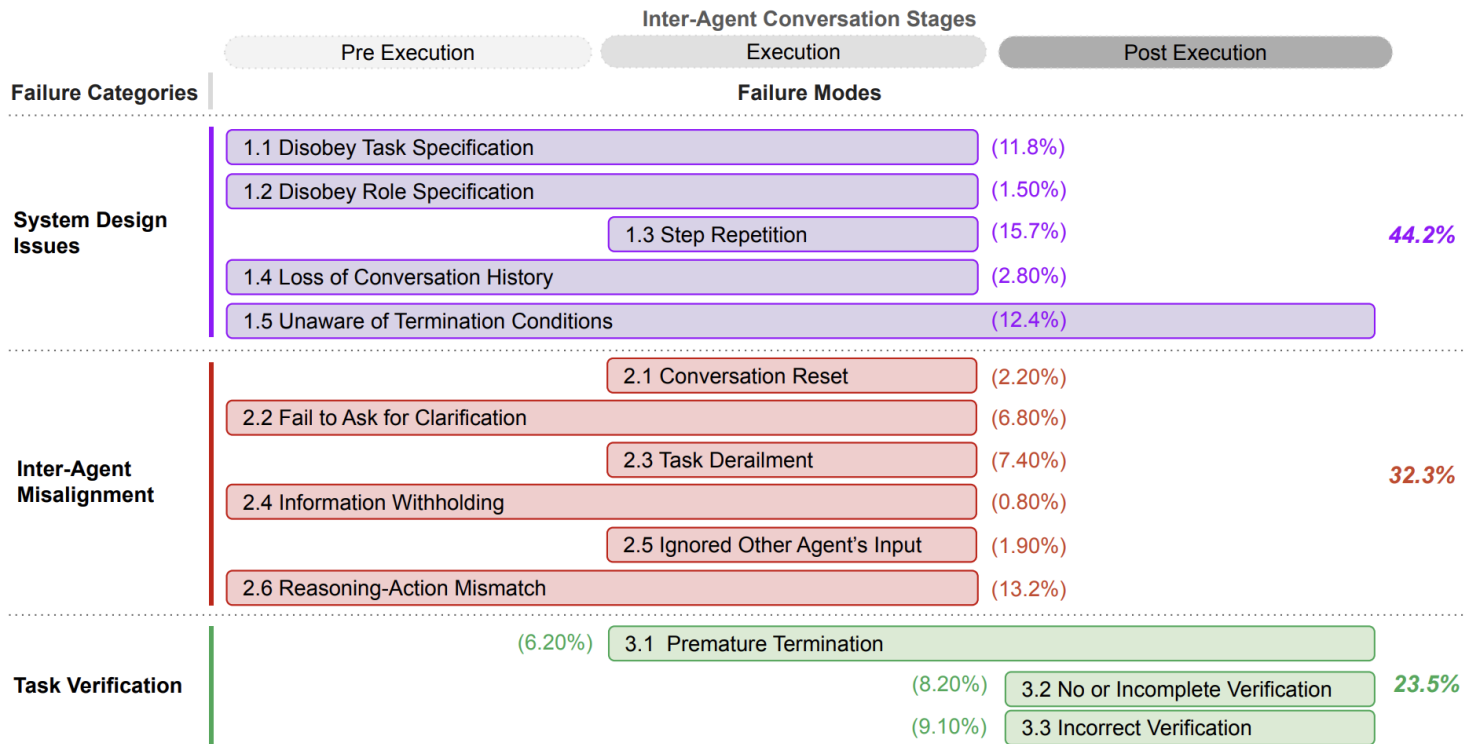
Two Paradigms of Tool-use LLMs



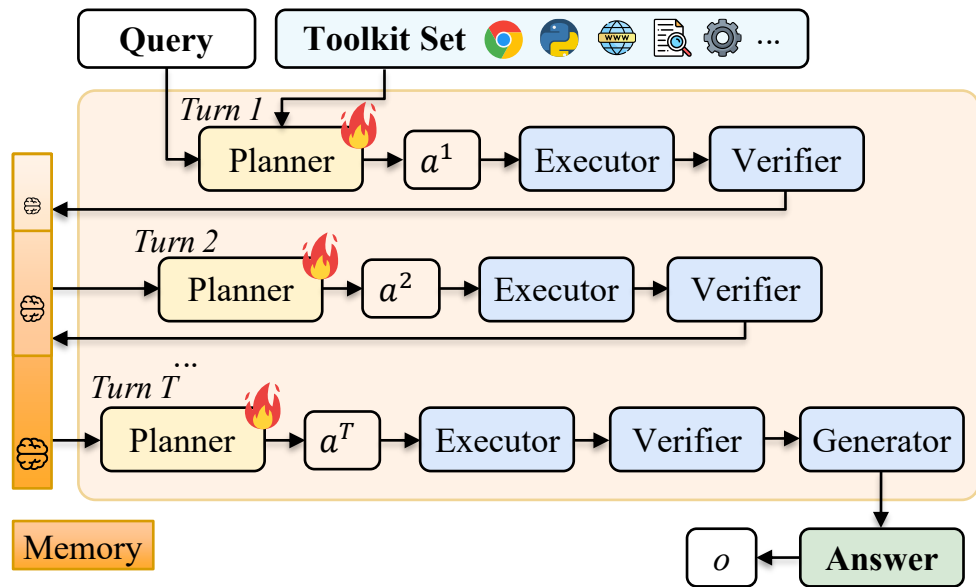
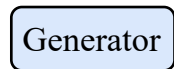
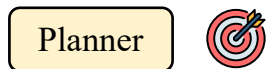
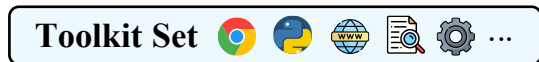
(b) Training-Free Agentic Systems

Why Do Multi-Agent LLM Systems Fail?

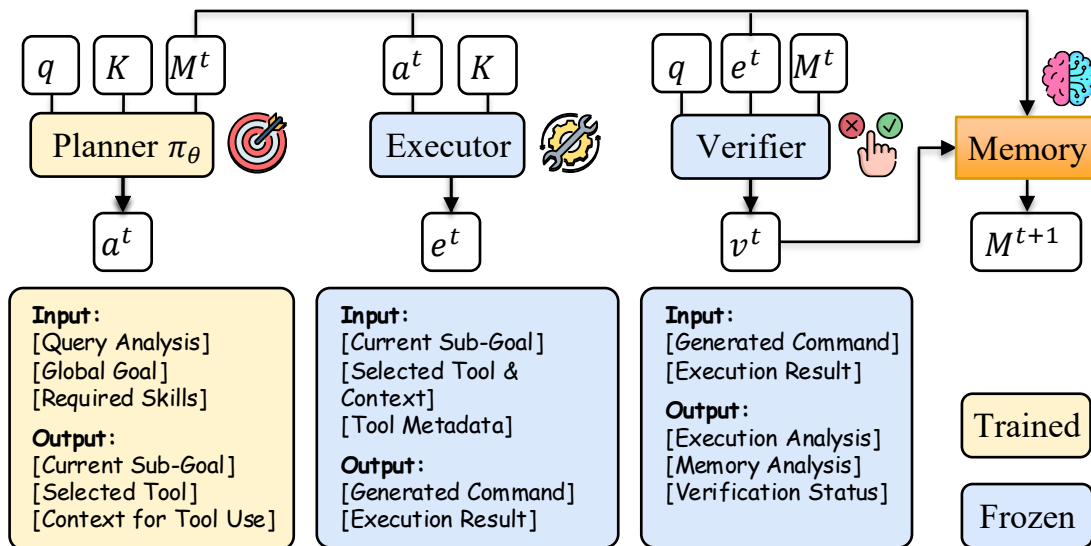
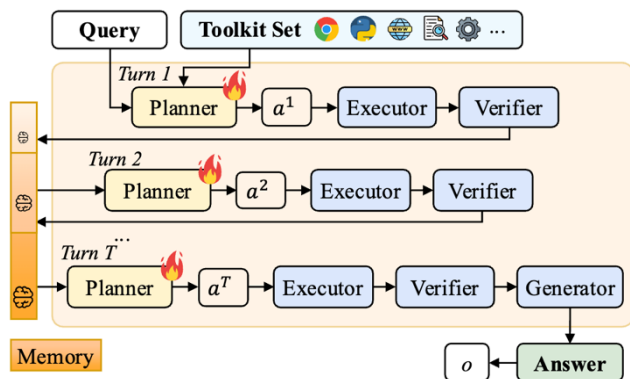
Mert Cemri^{1*} Melissa Z. Pan^{1*} Shuyi Yang^{2*} Lakshya A Agrawal¹ Bhavya Chopra¹
 Rishabh Tiwari¹ Kurt Keutzer¹ Aditya Parameswaran¹ Dan Klein¹
 Kannan Ramchandran¹ Matei Zaharia¹ Joseph E. Gonzalez¹ Ion Stoica¹
¹UC Berkeley ²Intesa Sanpaolo *Equal Contribution



AgentFlow: An In-the-Flow Agentic System



AgentFlow: An In-the-Flow Agentic System



In-the-Flow Rollout at Turn t

Featured Tools

 Base Generator

 Python Coder

 Google Search

 Wikipedia Search

 Web Search

Base Generator

A generalized tool that takes query from the user, and answers the question step by step to the best of its ability. It can also accept an image.

INPUTS

`query` *str* - The query that includes query from the user to guide the agent to generate response.

OUTPUT

str - The generated response to the original query

EXAMPLE USAGE

```
execution = tool.execute(query="Summarize the following text in a few lines")
```

Generate a short summary given the query from the user.

 Metadata

 Code

Featured Tools

 Base Generator

 Python Coder

 Google Search

 Wikipedia Search

 Web Search

 Python Coder

A tool that generates and executes simple Python code snippets for basic arithmetical calculations and math-related problems. The generated code runs in a highly restricted environment with only basic mathematical operations available.

INPUTS

`query` *str* - A clear, specific description of the arithmetic calculation or math problem to be solved, including any necessary numerical inputs.

OUTPUT

`dict` - A dictionary containing the generated code, calculation result, and any error messages.

EXAMPLE USAGE

```
execution = tool.execute(query="Find the sum of prime numbers up to 50")
```

Generate a Python code snippet to find the sum of prime numbers up to 50.

 Metadata

 Code

Featured Tools

 Base Generator

 Python Coder

 Google Search

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 Web Search

 Google Search

A web search tool powered by Google Search that provides real-time information from the internet with citation support.

INPUTS

`query` *str* - The search query to find information on the web.

`add_citations` *bool* - Whether to add citations to the results. If True, the results will be formatted with citations. By default, it is True.

OUTPUT

str - The search results of the query.

EXAMPLE USAGE

```
execution = tool.execute(query="What is the capital of France?")
```

Search for general information about the capital of France with default citations enabled.

 Metadata

 Code

Featured Tools

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Wikipedia Search

A tool that searches Wikipedia and returns relevant pages with their page titles, URLs, abstract, and retrieved information based on a given query.

INPUTS

`query` *str* - The search query for Wikipedia.

OUTPUT

dict - A dictionary containing search results, all matching pages with their content, URLs, and metadata.

EXAMPLE USAGE

```
execution = tool.execute(query="What is the exact mass in kg of the moon")
```

Search Wikipedia and get the information about the mass of the moon.

 Metadata

 Code

Featured Tools

 Base Generator

 Python Coder

 Google Search

 Wikipedia Search

 Web Search

Web Search

A specialized tool for answering questions by retrieving relevant information from a given website using RAG (Retrieval-Augmented Generation).

INPUTS

`query` *str* - The search query for the website.

`url` *str* - The URL of the website to retrieve information from.

OUTPUT

str - The answer to the user's query based on the information gathered from the website.

EXAMPLE USAGE

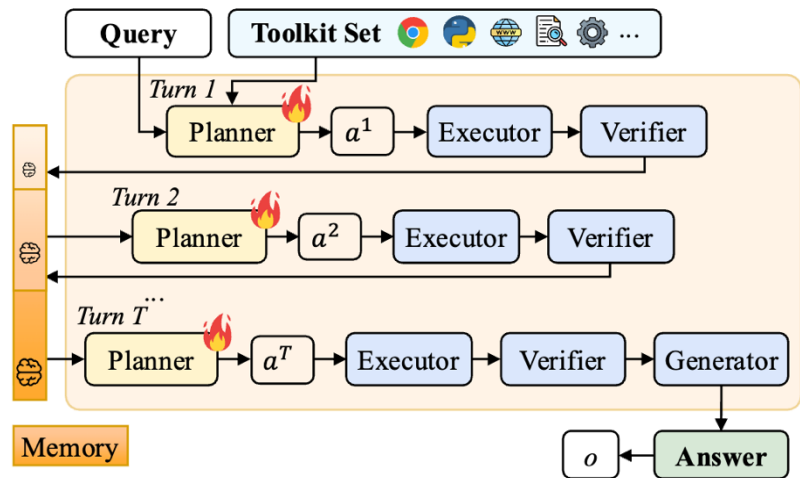
```
execution = tool.execute(query="What is the exact mass in kg of the moon?", url="https://en.wikipedia.org/wiki/Moon")
```




Retrieve information about the moon's mass from Wikipedia.

 Metadata

 Code



AgentFlow: A Glance (w/ Flow-GRPO Tuning)





Question: Compute the check digit the Tropicos ID for the Order Helotiales would have if it were an ISBN-10 number.   

Ground truth answer: 3


①

- **Selected tool:** Wikipedia Search 
- **Sub-goal:** Retrieve Tropicos ID of Order Helotiales from Wikipedia.
- **Tool call:** query="Tropicos ID for the Order Helotiales"
- **Result:** No results found for query: Tropicos ID for Order Helotiales. 


②


- **Selected tool:** Google Search 
- **Sub-goal:** Retrieve the Tropicos ID of the Order.
- **Tool call:** query="Tropicos ID for the Order Helotiales"
- **Result:** The Tropicos ID for the Order Helotiales is 100370510. 

③

- **Selected tool:** Python Coder 
- **Sub-goal:** Calculate the check digit for the Tropicos ID 100370510 if it were an ISBN-10 number.
- **Tool call:** query="Calculate check digit for ISBN-10 number 100370510"
- **Result:** name 'isbn' is not defined.

④-⑨

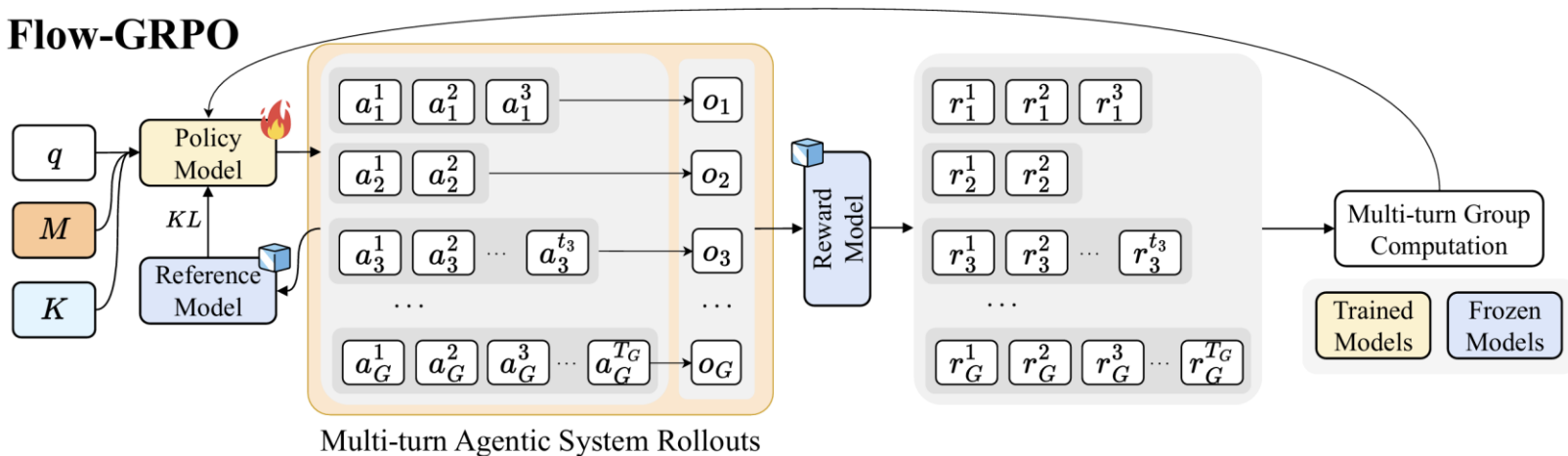
Action steps 3 to 9 have similar sub-goals, commands, and results; the agent is stuck in error loops and unable to fix the naming issue. 

Solution: The Python tool failed repeatedly with the same 'isbn' variable error). The agent failed to calculate the check digit. 



MDP Process Form

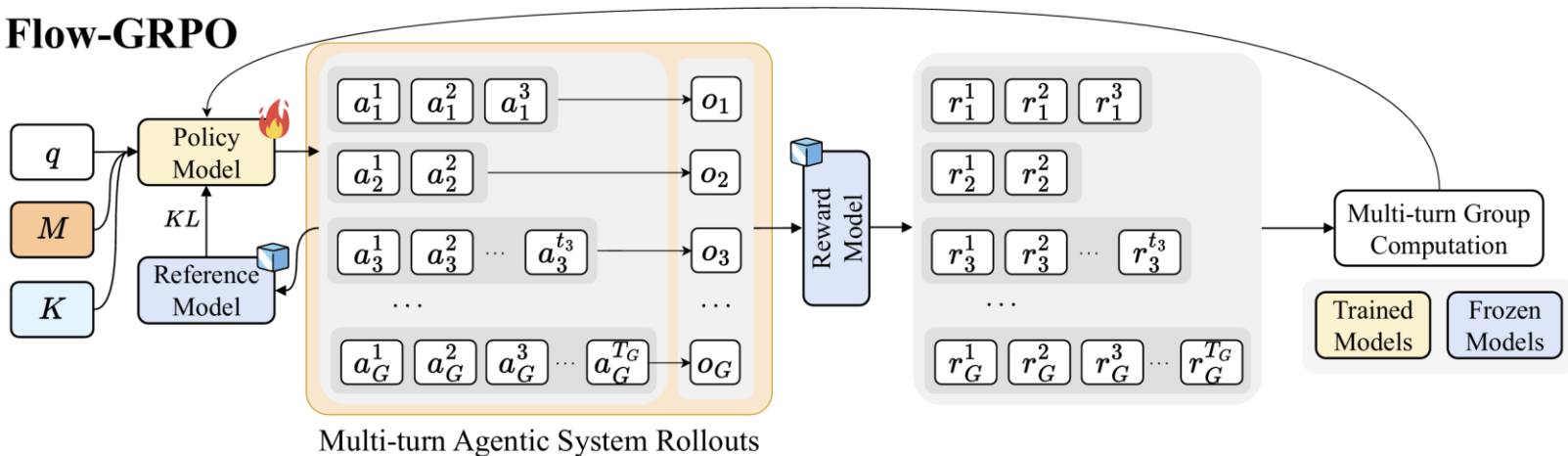
Flow-GRPO



$$p_{\theta}(\{a^t, e^t, v^t\}_{t=1}^T, o | q) = \left[\prod_{t=1}^T \pi_{\theta}(a^t | q, K, M^t) \mathcal{E}(e^t | a^t, K) \mathcal{V}(v^t | q, e^t, M^t) \right] \mathcal{G}(o | q, M^T)$$

In-the-Flow Group Relative Policy Optimisation

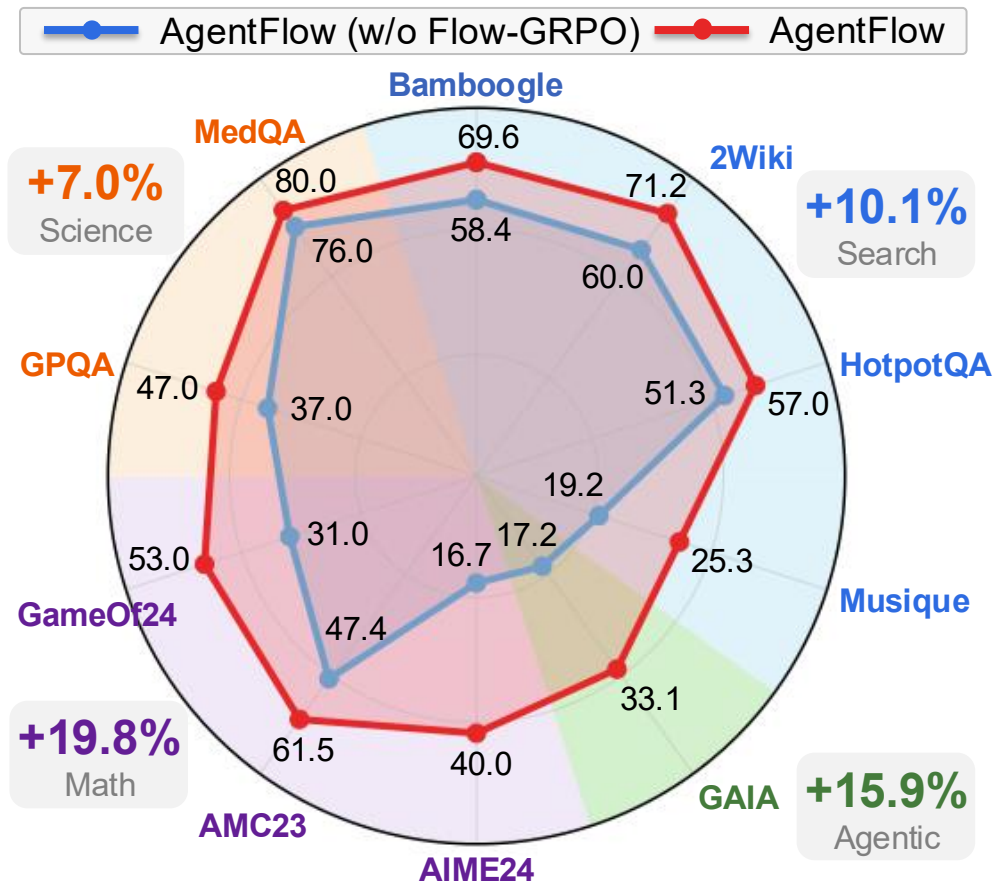
Flow-GRPO



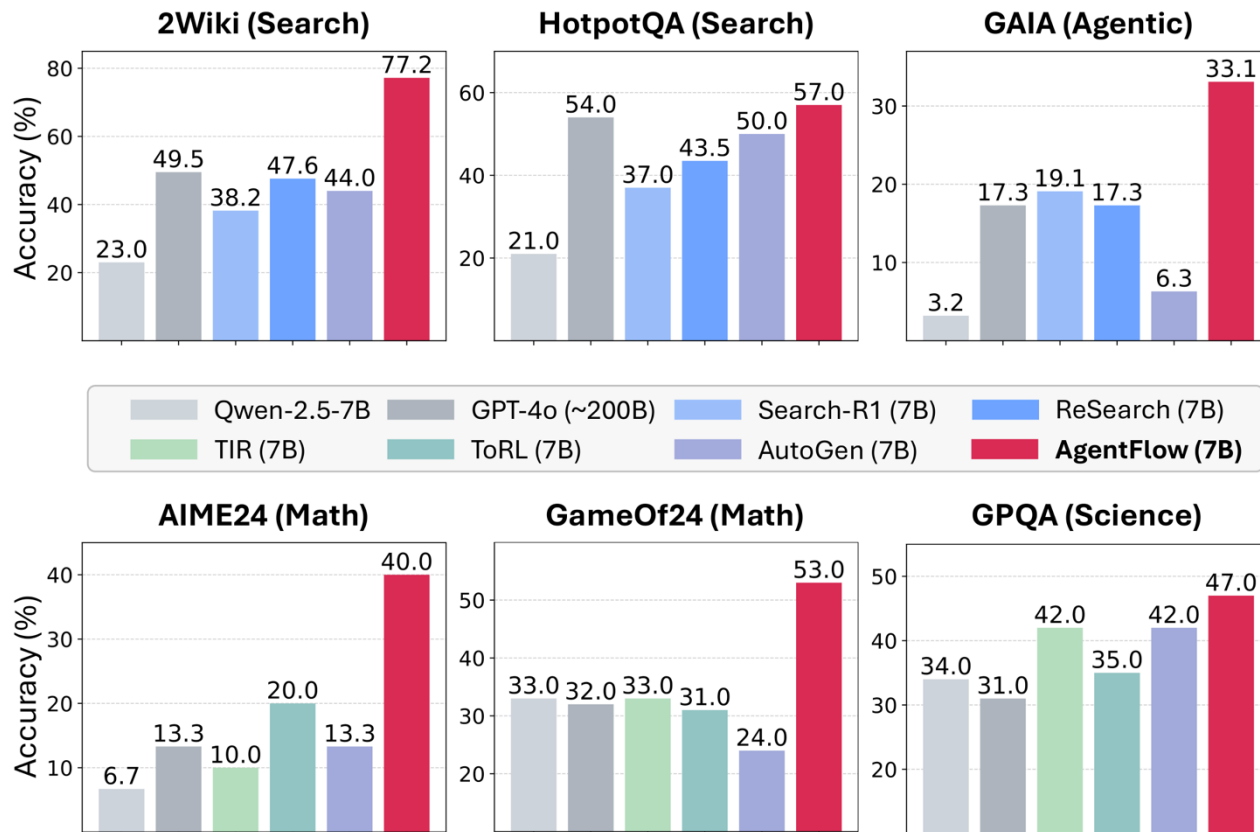
$$\mathcal{J}_{\text{Flow-GRPO}}(\theta) = \mathbb{E}_{(q, y^*) \sim \mathcal{D}, \{\tau_i\}_{i=1}^G \sim \pi_{\theta_{\text{old}}}}$$

$$\left[\frac{1}{G} \sum_{i=1}^G \frac{1}{T_i} \sum_{t=1}^{T_i} \frac{1}{|a_i^t|} \sum_{j=1}^{|a_i^t|} \min \left\{ \rho_{i,j}^t A_i^t, \text{clip}(\rho_{i,j}^t, 1 - \epsilon, 1 + \epsilon) A_i^t \right\} - \beta \mathbb{D}_{\text{KL}}(\pi_{\theta} \parallel \pi_{\text{ref}}) \right]$$

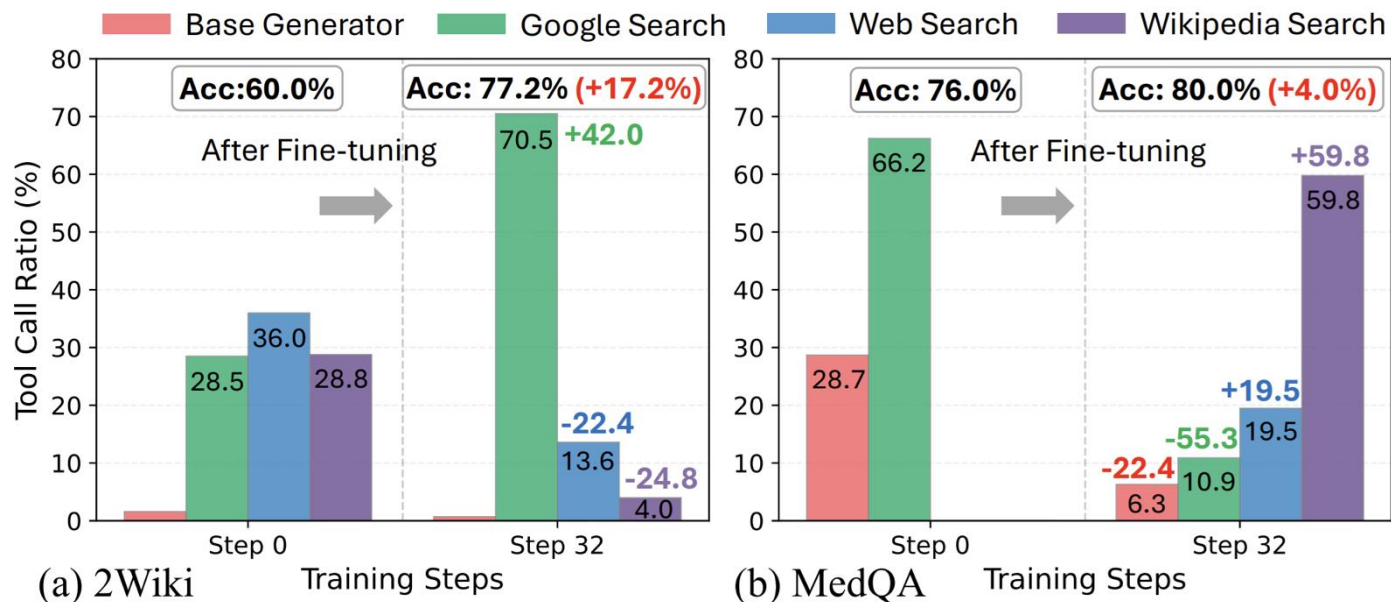
Highlight Results



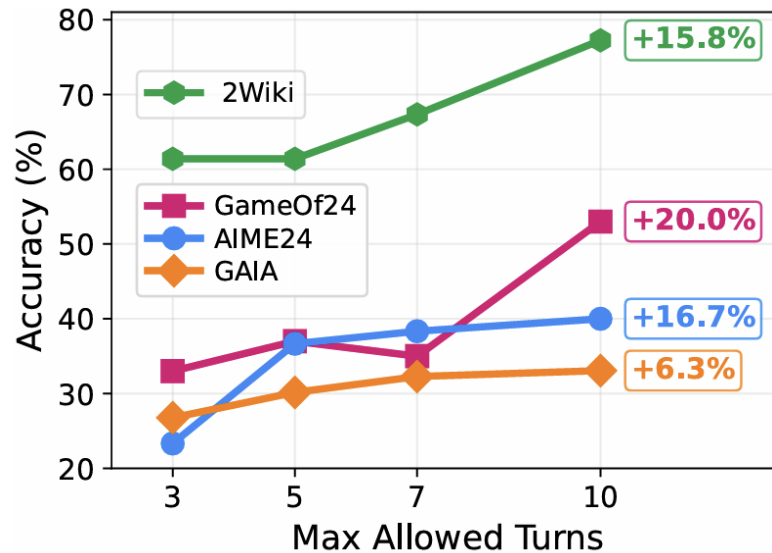
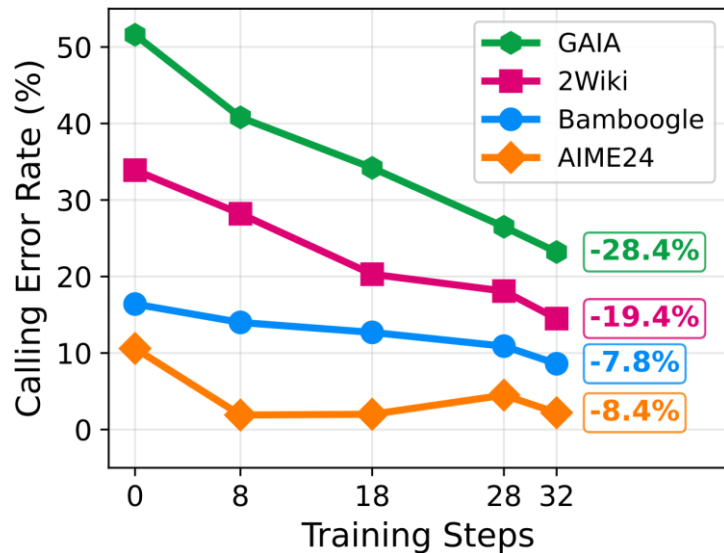
Highlighted Main Results



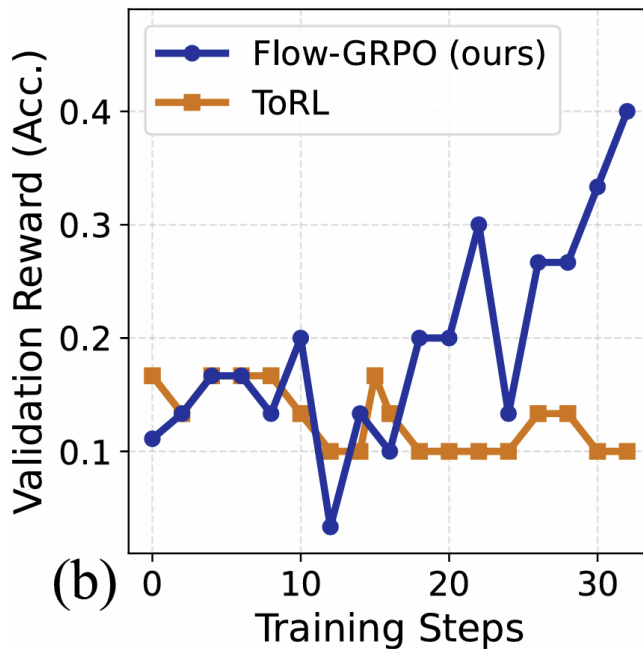
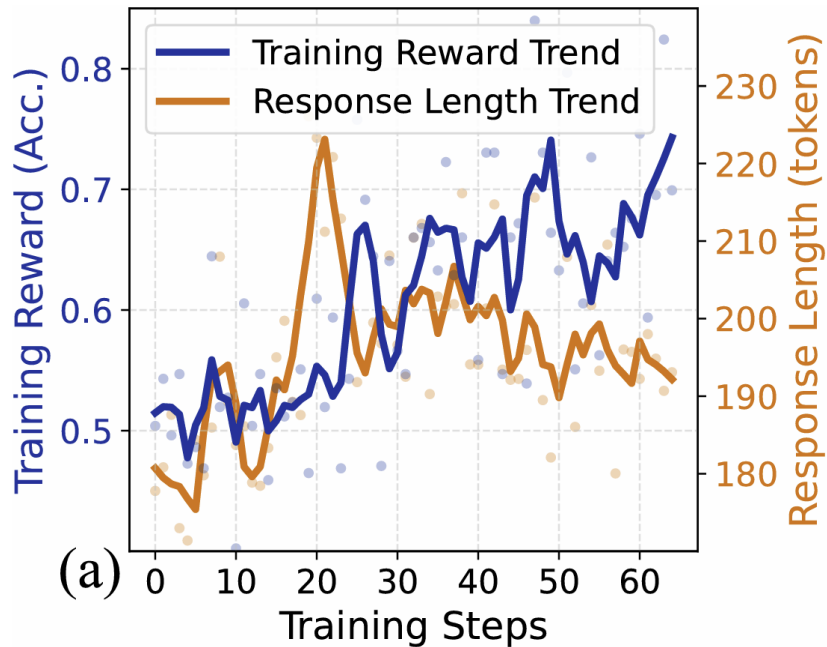
Autonomy new tool usage distribution



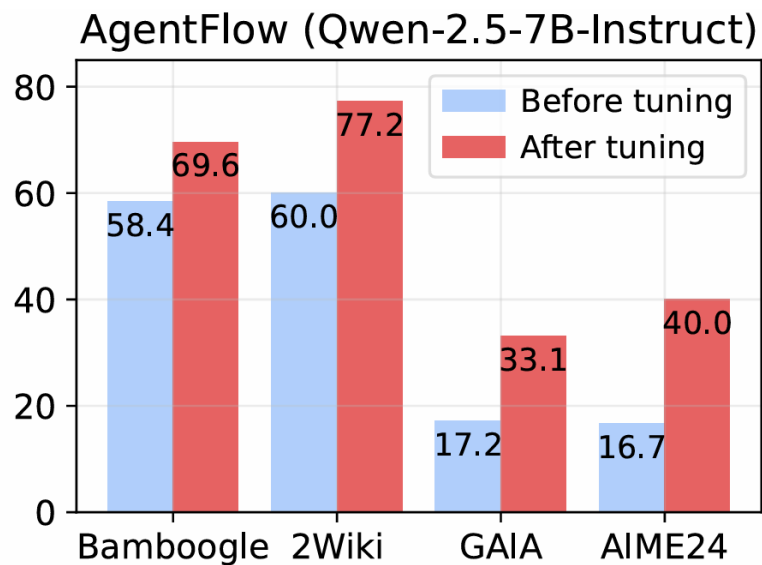
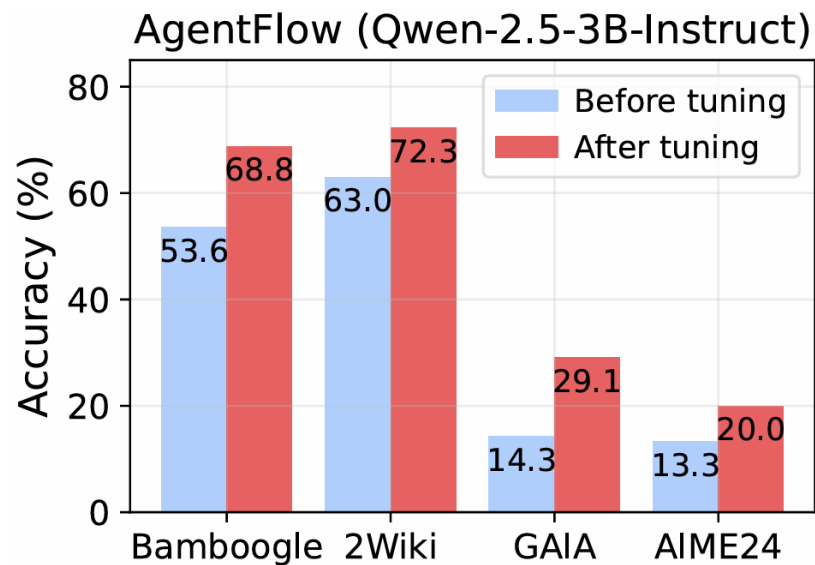
Scale with turns, refine with tuning



Controllable Planner Output & Training efficiency



Scale with planner size



AgentFlow: Accessible Resources



In-the-Flow Agentic System Optimization

Zhuofeng Li^{*1,2}, Haoxiang Zhang^{*1,3}, Seungju Han¹, Sheng Liu¹, Jianwen Xie⁴,
Yu Zhang², Yejin Choi¹, James Zou^{†1}, Pan Lu^{†1}

¹ Stanford University, ² Texas A&M University, ³ UC San Diego, ⁴ Lambda,
* Equal Contribution † Co-senior authors



Spaces AgentFlow agentflow like 167 Running on A10G

Chat with AgentFlow: A Trainable Agentic Framework for Complex Reasoning

AgentFlow is a trainable, tool-integrated agentic framework designed to overcome the scalability and generalization limits of today's tool-augmented reasoning approaches. It introduces a modular agentic system (Planner, Executor, Verifier, and Generator) and an in-the-flow RL algorithm (Flow-GRPO) to optimize the agent within the system for effective planning and tool use.

[Website](#) | [HF Paper](#) | [GitHub](#) | [Medel](#) | [YouTube](#) | [X \(Twitter\)](#) | [Slack](#)

Note: The first query may take ~20 seconds to initialize AgentFlow. Subsequent queries will be super fast.

Tip: If the wait time is too long, please try again later.

Planner Model

vllm-AgentFlow/agentflow-planner-7b

Executor, Verifier, and Generator Model

Qwen2.5-7B-Instruct

Question (Required)

How many r letters are in the word strawberry?

Submit and Run

DeepWiki lupantech/AgentFlow

Index your code with Devin

Edit Wiki

Share

Last indexed: 29 November 2025 (9e6919)

Overview

Getting Started

Installation

Configuration

Quick Start Example

Testing Your Setup

Core Architecture

System Overview

Solver Orchestration

Planner Agent

Executor Agent

Verifier and Gene

Overview

> Relevant source files

This document introduces the AgentFlow repository, explaining its purpose, architecture, and core components. AgentFlow is a trainable, tool-integrated agentic framework designed to solve complex reasoning tasks through a modular multi-agent system optimized with Flow-based Group Refined Policy Optimization (Flow-GRPO).

For installation and initial setup instructions, see [Getting Started](#). For detailed architecture documentation, see [Core Architecture](#). For training the system, see [Training System](#).

What is AgentFlow?

AgentFlow is an agentic framework that addresses scalability and generalization limitations of LLM to m with four I toolkit across

Ask Devin about lupantech/AgentFlow

Fast

https://deepwiki.com/lupantech/AgentFlow/2.2-configuration...

AgentFlow: Broad Impacts



YouTube (14K views)

Daily Papers

+ Submit a paper

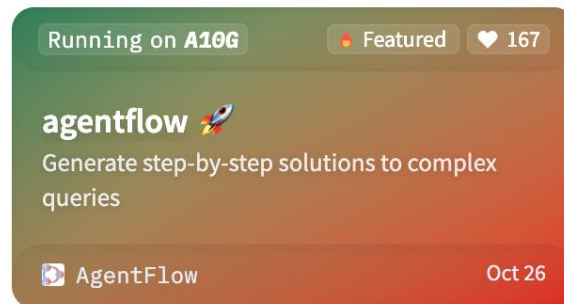
by AK and the research community

Oct 8

#2 Paper of the day

Stanford AI

#2 Paper of the day



Spaces of the week

HuggingFace Demo (47K visits)

AgentFlow: Takeaways

- **AgentFlow:** In-the-flow agentic system, coordinated by four specialized modules, diverse toolset, and evolving memory.
- Flow-GRPO: in-the-flow RL tuning, which cover



Website



Slack

Website: <https://agentflow.stanford.edu>

Paper: <https://arxiv.org/abs/2510.05592>

Code: <https://github.com/lupantech/AgentFlow>

Model: <https://huggingface.co/AgentFlow>

Demo: <https://huggingface.co/spaces/AgentFlow/agentflow>

YouTube: <https://www.youtube.com/watch?v=klQbCQIH1SI>

Thanks!

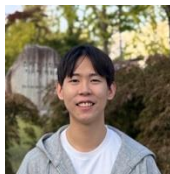
Q/A



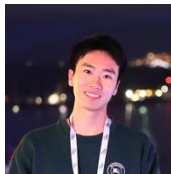
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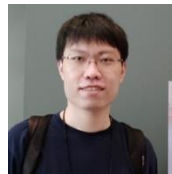
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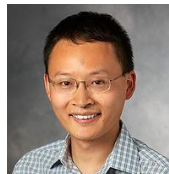
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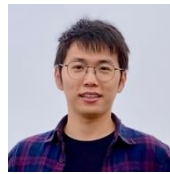
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AgentFlow

Stanford



TEXAS A&M
UNIVERSITY

UC San Diego



Lambda