

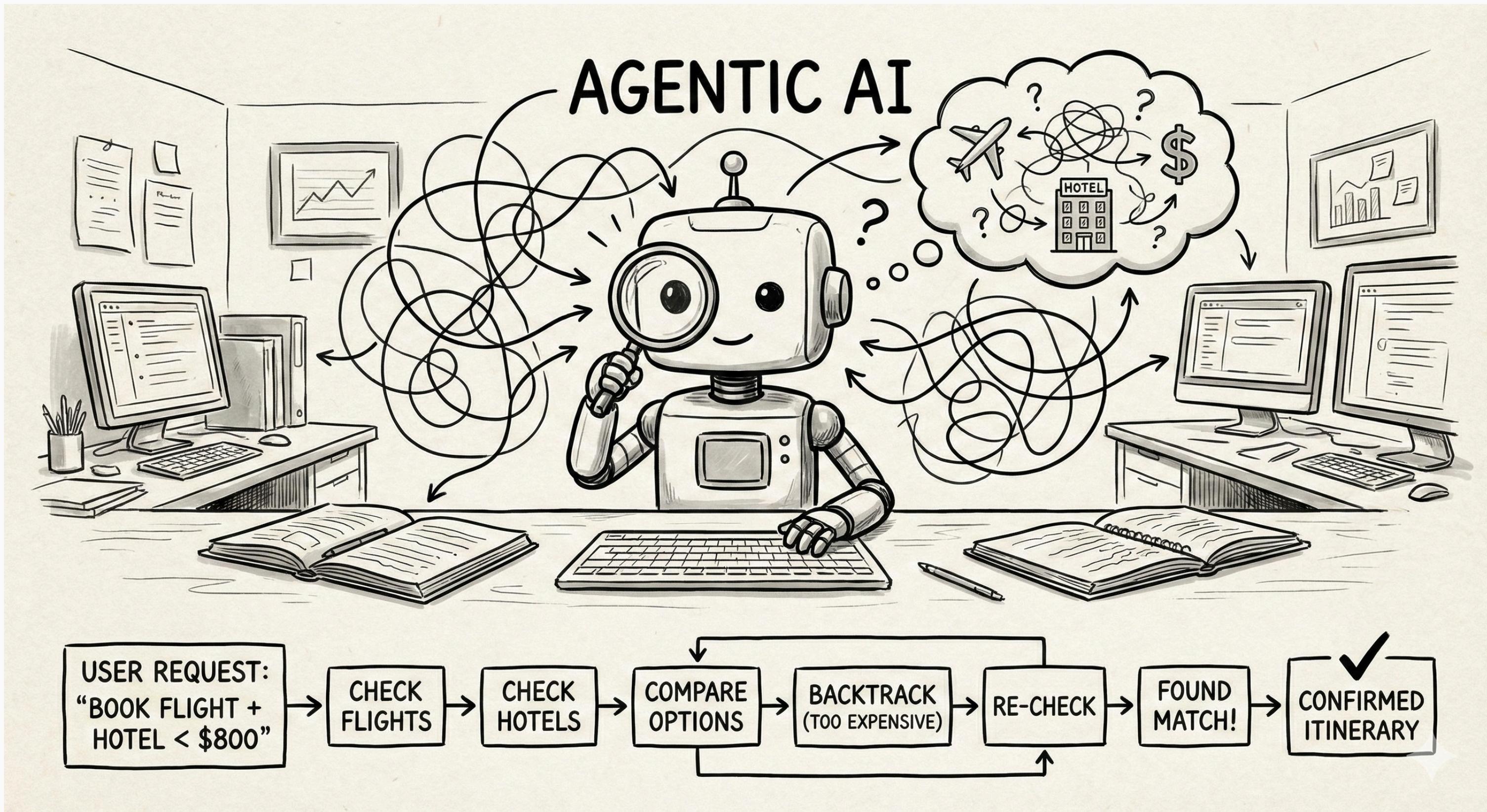
# **Data Science, AI, and Machine Learning in Public Health using R**

## **Agentic AI**

December 2025

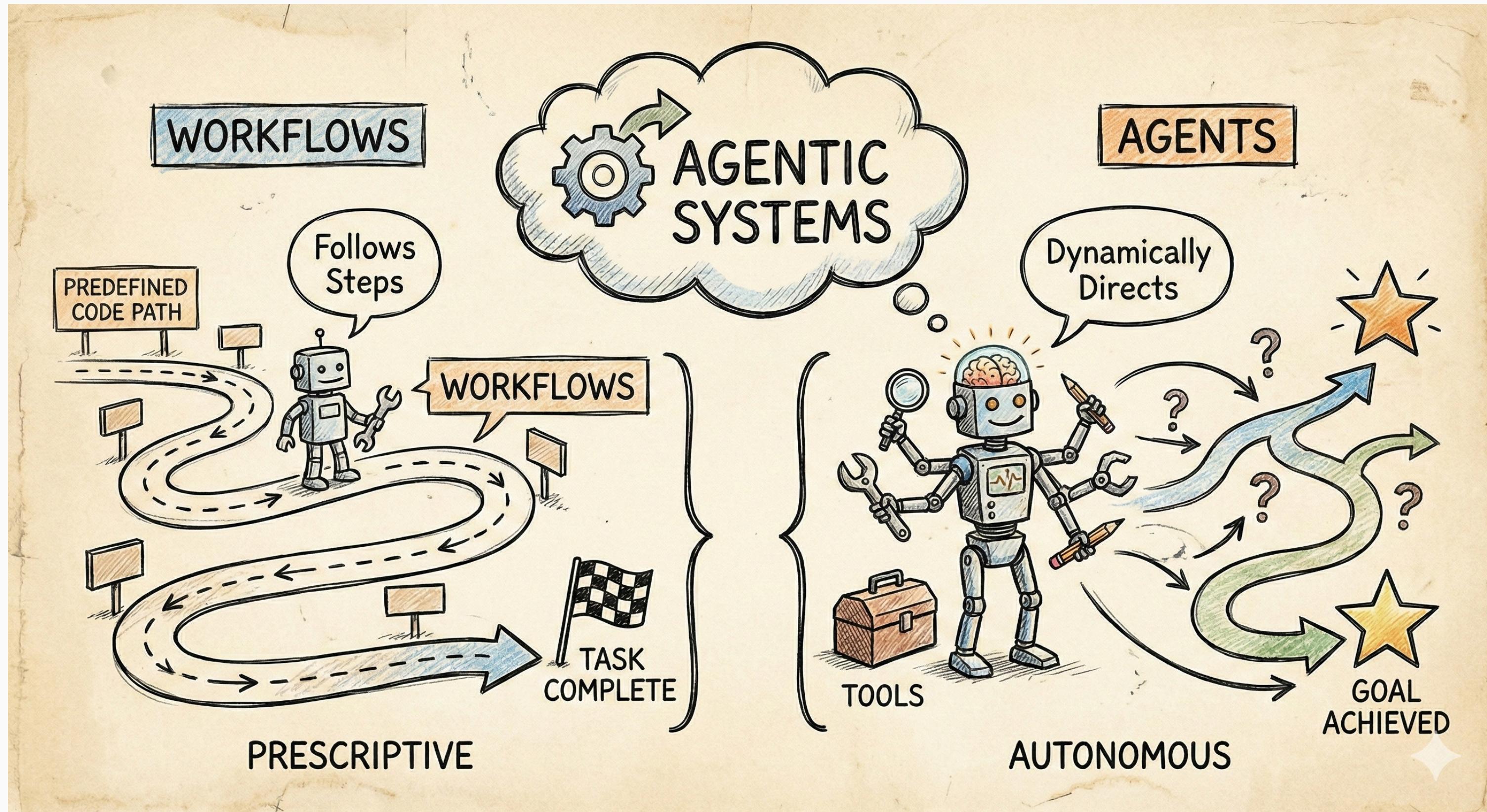
Presented By: Wronski Associates

# Agentic Agents



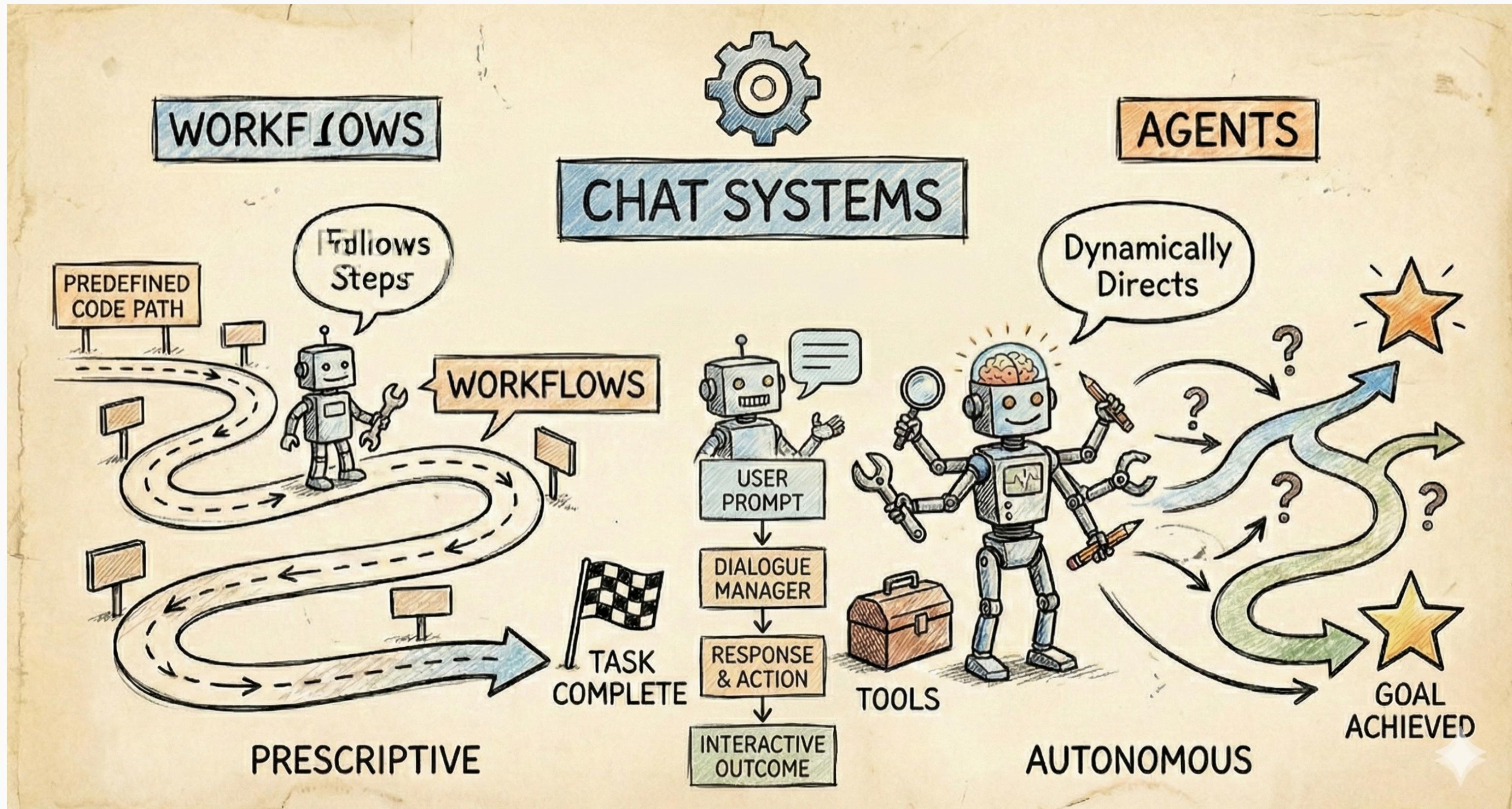
An agent works autonomously in deciding what to do next. It observes results, decides what action to take, executes, observes again, and loops—without requiring pre-definition of every branch (that's a workflow).

# Workflow vs. Agent



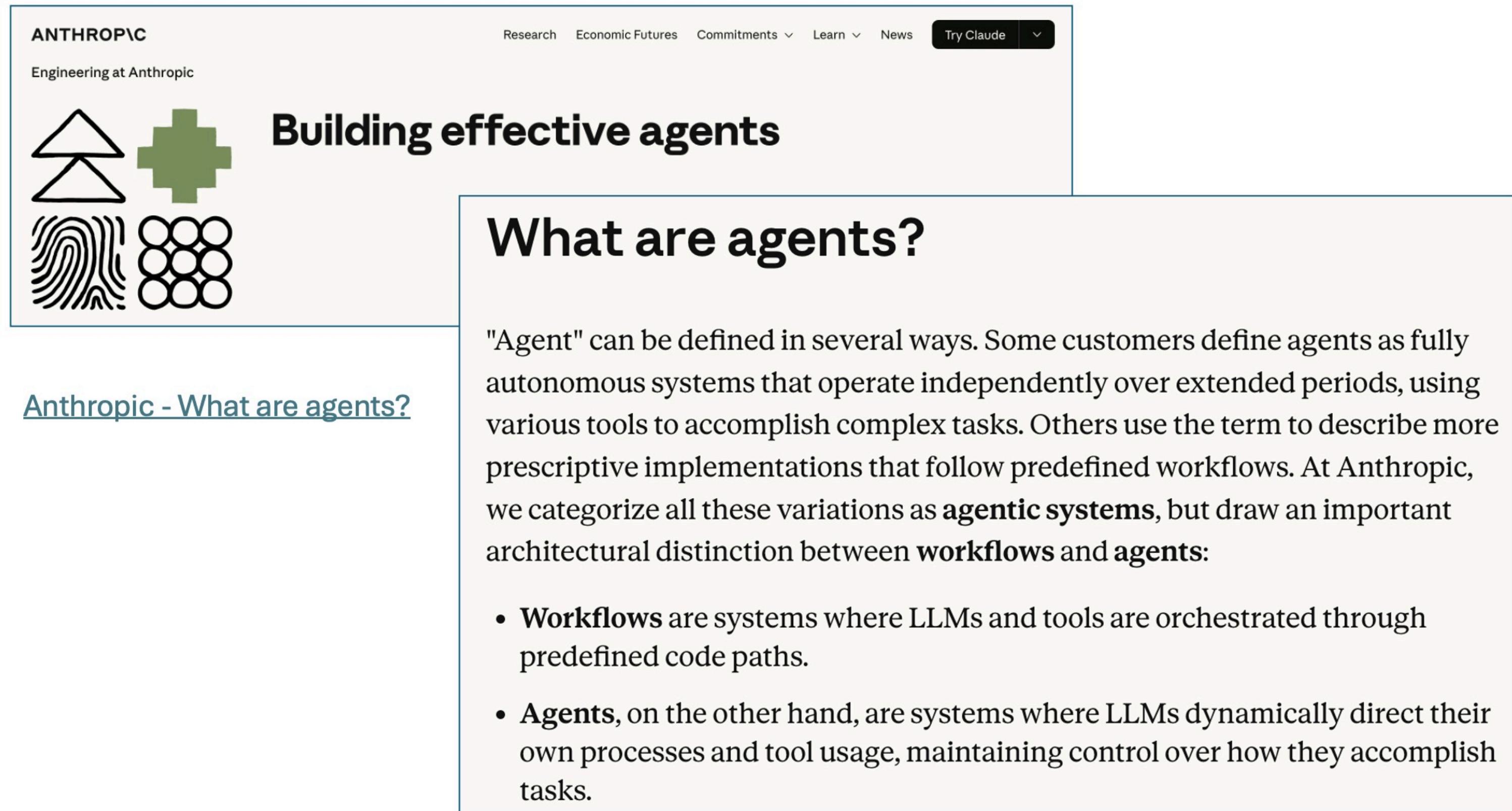
- *Workflow: A predefined sequence of steps that executes the same way every time, regardless of the data or intermediate results.*
- *Agent: A system that perceives its environment, makes decisions, and chooses actions dynamically to achieve a goal.*

# Where does Claude fit?



*Claude (or any chat tool) can be thought of as a little of both. Some chat statements are very prescribed - "Calculate the standard deviation". Other statements require the tool to make its own decisions - "Tell me what people are currently thinking about Agentic AI".*

# Further information from Anthropic



The screenshot shows the Anthropic website's navigation bar at the top, featuring links for Research, Economic Futures, Commitments, Learn, News, and a button to "Try Claude". Below the navigation is the "Engineering at Anthropic" section, which includes the Anthropic logo (a stylized triangle and cross) and a "Building effective agents" section. The main content area is titled "What are agents?" and contains text explaining the definition of agents and the distinction between workflows and agents.

**ANTHROPIC**

Engineering at Anthropic

Research Economic Futures Commitments ▾ Learn ▾ News Try Claude ▾

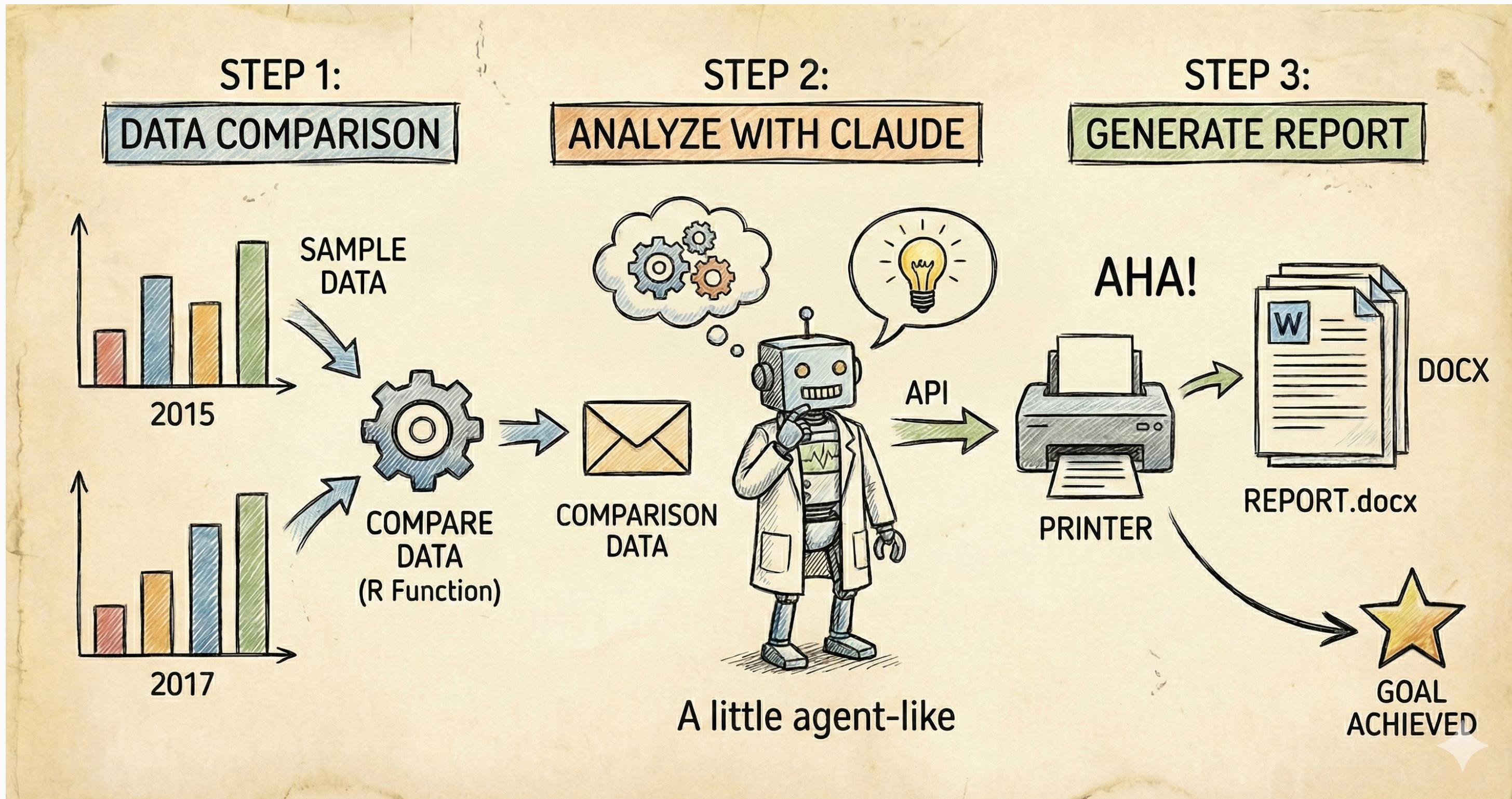
**Building effective agents**

## What are agents?

"Agent" can be defined in several ways. Some customers define agents as fully autonomous systems that operate independently over extended periods, using various tools to accomplish complex tasks. Others use the term to describe more prescriptive implementations that follow predefined workflows. At Anthropic, we categorize all these variations as **agentic systems**, but draw an important architectural distinction between **workflows** and **agents**:

- **Workflows** are systems where LLMs and tools are orchestrated through predefined code paths.
- **Agents**, on the other hand, are systems where LLMs dynamically direct their own processes and tool usage, maintaining control over how they accomplish tasks.

# Example 1 - agent-demo-backup.R



*It's “agent-like” because it behaves like a junior analyst who can complete a small workflow end-to-end: collects/structures data, gets an interpretation, and produces a polished deliverable. But it's still a bounded workflow (it always does these steps in this order; it isn't “free roaming” on its own).*

# Example 1 - agent-demo-backup.R output

## Youth Risk Behavior Report

Week 2015 → Week 2017 | Boston, MA

Youth marijuana use in Boston increased 1.4 percentage points week-over-week, driven primarily by a 2.7 point surge among females and 2.3 point increase among Hispanic/Latino students.

Overall Marijuana Use Rate

Previous Week	Current Week	Change
11.2%	12.6%	+1.4 pts

**Key Findings**

- Female students showed the largest increase at +2.7 percentage points (12.1% to 14.8%), while male students remained relatively stable at +0.3 points
- Hispanic/Latino students experienced the second-largest increase at +2.3 percentage points (14.5% to 16.8%), maintaining the highest usage rate among racial/ethnic groups
- Usage rates consistently increase with grade level, with 8th graders at 16.5% compared to 6th graders at 9.0%, though all grades showed similar week-over-week increases of 1.2-1.6 points

**Watch List**

- Widening gender gap as female usage rates (14.8%) now significantly exceed male rates (10.5%) and are accelerating faster
- Persistent racial disparities with Hispanic/Latino students showing both the highest usage rates and largest increases, while Asian students remain at lowest rates (5.3%)

**Breakdown by Grade**

Category	Previous	Current	Change	N
7th	11.1%	12.7%	+1.6	504
8th	14.9%	16.5%	+1.6	490
6th	7.8%	9.0%	+1.2	394

**Breakdown by Sex**

Category	Previous	Current	Change	N
Female	12.1%	14.8%	+2.7	703
Male	10.2%	10.5%	+0.3	694

**Breakdown by Race/Ethnicity**

Category	Previous	Current	Change	N
Hispanic or Latino	14.5%	16.8%	+2.3	638
Black or African American	10.8%	11.9%	+1.1	312
Asian	4.9%	5.3%	+0.4	123
White	7.2%	6.8%	-0.4	155

**Data Quality Notes**

Week-over-week comparison may reflect normal statistical variation rather than true behavioral changes - monthly or quarterly trends would provide more reliable insights into actual usage patterns

**Suggested Visualization**

Side-by-side bar chart comparing current vs. previous week usage rates by demographic subgroups (grade, sex, race/ethnicity), with percentage point changes labeled and confidence intervals if available to distinguish meaningful trends from statistical noise

Console Terminal × Background Jobs ×

R 4.5.2 · /cloud/project/ ↗

```
> source("/cloud/project/agent-demo-backup.R")
```

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WEEKLY REPORT AGENT (R Demo)

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STEP 1: Loading and comparing data

Comparing periods using sample data...  
Overall change: 11.2% → 12.6% (+1.4 pts)

STEP 2: Analyzing with Claude

Sending data to Claude for analysis...  
✓ Analysis complete  
Headline: "Youth marijuana use in Boston increased 1.4 percentage points week-over-week, driven primarily by a 2.7 point surge among females and 2.3 point increase among Hispanic/Latino students."

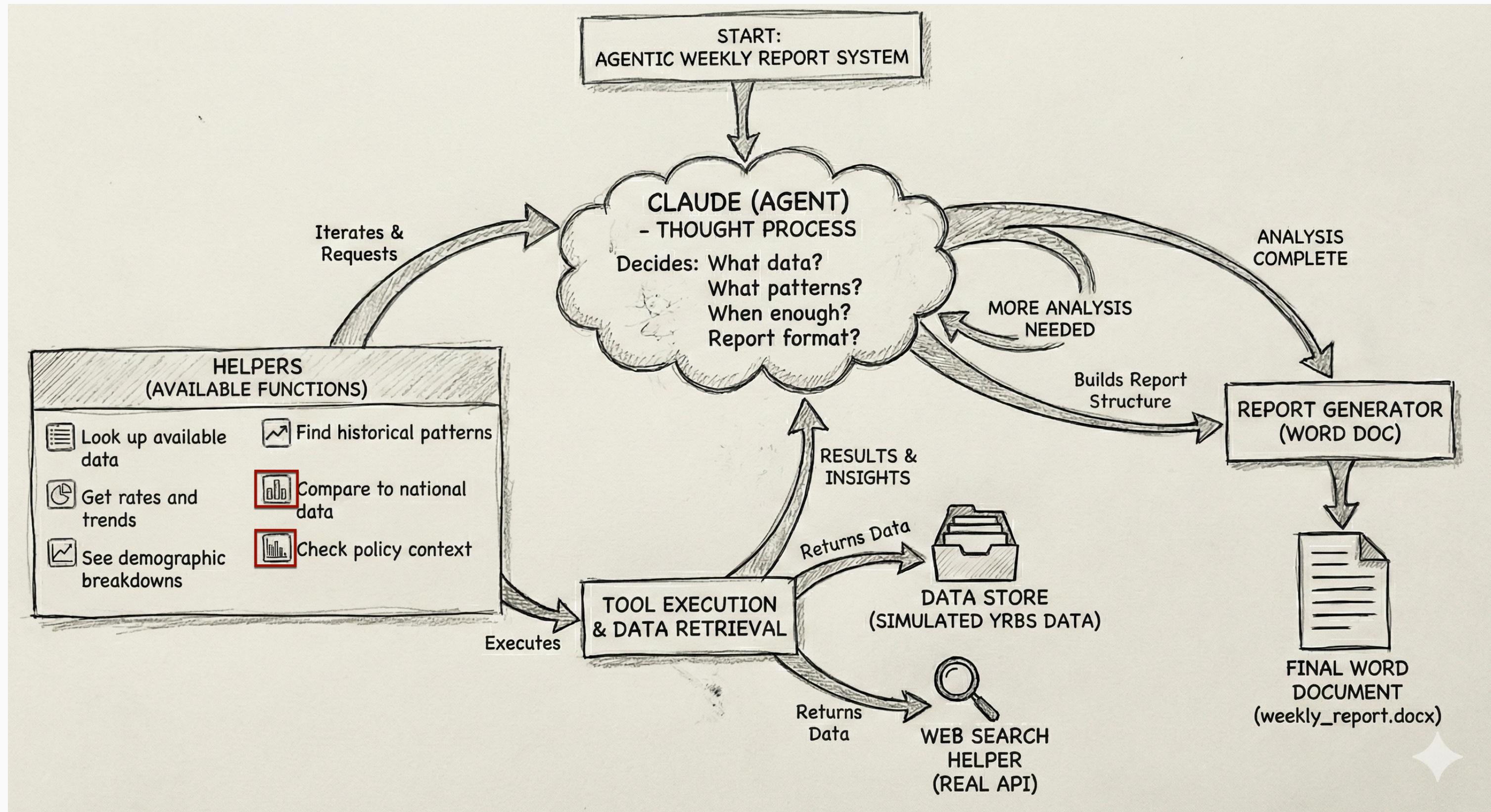
STEP 3: Generating report

Generating Word document...

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✓ Report generated: weekly\_report.docx

## Example 2 - really-agentic.R



*This is more agentic because the AI is no longer just writing a summary of data already selected. Instead, AI is allowed to plan, ask for information, follow up, and decide when it's done, using tool calls inside a loop.*

## Example 2 - really-agentic.R output

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AGENTIC WEEKLY REPORT SYSTEM Claude drives the analysis through autonomous tool use

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- Agent Iteration 1 — 🌐 I'll analyze the youth marijuana use data for Boston, MA and create a comprehensive report. Let me start. Executing: get\_available\_data
- Agent Iteration 2 — 🌐 Good, I have YRBS data for Boston from 2011-2019 covering lifetime marijuana use across different demographic groups. Executing: get\_historical\_trend
- Agent Iteration 3 — 🌐 This is concerning - there's a consistent upward trend with marijuana use rates increasing from 8.4% to 18.1%. Executing: get\_breakdown
- Agent Iteration 4 — 🔧 Executing: get\_breakdown
- Agent Iteration 5 — 🔧 Executing: get\_breakdown
- Agent Iteration 6 — 🌐 Several concerning patterns emerge: 8th graders have the highest rate (18.1%), females have higher rates than males. Executing: get\_subgroup\_trend
- Agent Iteration 7 — 🔧 Executing: get\_subgroup\_trend
- Agent Iteration 8 — 🌐 Both trends are alarming - 8th grade usage increased by 50% and Hispanic/Latino youth usage increased by 20%. Executing: get\_national\_comparison 🌐 Searching: "youth marijuana use rate national average United States 2019 YRBS CDC statistics"
- Agent Iteration 9 — 🔧 Executing: get\_policy\_context 🌐 Searching: "marijuana cannabis legalization law history timeline Boston, MA state"
- Agent Iteration 10 — 🌐 Now I have a comprehensive view of the data and context. The policy timeline is particularly relevant. Executing: generate\_report 📄 Building Word document with agent-specified structure...

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Report generated: weekly\_report.docx 🕒 Total time: 92.1 seconds

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# Example 2 - really-agentic.R output

## Youth Marijuana Use Analysis: Boston Public Schools

Trends and Disparities Analysis, 2011-2019 | Boston, Massachusetts

### Executive Summary

Youth marijuana use in Boston has increased dramatically over the past decade, rising 67% from 8.4% in 2011 to 14.1% in 2019. The data reveals concerning disparities, with 8th graders and Hispanic/Latino students showing the highest usage rates and steepest increases, coinciding with Massachusetts's marijuana legalization timeline.

**Overall Trend: Steady Increase Across All Years**

**⚠️ WARNING:**  
Lifetime marijuana use among Boston youth has shown a consistent upward trajectory across the entire study period. Starting at 8.4% in 2011, usage rates have increased steadily every survey cycle, reaching 14.1% by 2019. This represents a total increase of 5.7 percentage points over eight years, with the steepest increases occurring after 2015. The consistency of this trend across multiple survey cycles indicates a persistent and growing public health concern rather than statistical variation.

Year	Usage Rate (%)	Sample Size	Confidence Interval
2011	8.4%	1,180	7.2% - 9.6%
2013	9.8%	1,250	8.5% - 11.1%
2015	11.2%	1,350	9.8% - 12.6%
2017	12.6%	1,403	11.1% - 14.1%
2019	14.1%	1,520	12.5% - 15.7%

**Grade-Level Analysis: 8th Graders at Highest Risk**

**⚠️ CRITICAL:**  
The 2019 data reveals a concerning pattern across grade levels, with marijuana use increasing significantly with age. Sixth graders report a 10.2% lifetime usage rate, which jumps to 14% for seventh graders and peaks at 18.1% for eighth graders. Historical analysis shows 8th graders have experienced a 50% increase in usage rates from 12.1% in 2011 to 18.1% in 2019. This pattern suggests that prevention efforts must begin early, ideally in elementary school, and be intensified during the critical middle school transition period.

Grade	2019 Usage Rate	Sample Size
6th Grade	10.2%	420
7th Grade	14.0%	540
8th Grade	18.1%	550

**Racial and Ethnic Disparities: Hispanic/Latino Youth Disproportionately Affected**

**⚠️ CRITICAL:**  
The data reveals significant disparities in marijuana use across racial and ethnic groups. Hispanic/Latino students show the highest usage rate at 18.5% in 2019, more than double the rate of White students (8.1%) and significantly higher than Black/African American students (13.2%). Trend analysis reveals that Hispanic/Latino youth have experienced a 65% increase in usage from 11.2% in 2011 to 18.5% in 2019. These disparities likely reflect broader social determinants of health and may require culturally targeted intervention approaches.

Race/Ethnicity	2019 Usage Rate	Sample Size
Hispanic or Latino	18.5%	680
Black or African American	13.2%	340
White	8.1%	170
Asian	6.0%	135

**Gender Differences: Higher Rates Among Females**

Female students report higher lifetime marijuana use rates than their male counterparts, with 16.2% of females reporting usage compared to 12% of males in 2019. This 4.2 percentage point difference represents a notable gender gap that warrants attention in prevention programming. Traditional substance abuse prevention programs have often focused more heavily on male risk factors, but these data suggest that prevention efforts must equally address risk factors specific to female adolescents.

Gender	2019 Usage Rate	Sample Size
Female	16.2%	760
Male	12.0%	755

**Policy Context: Legalization Timeline and Youth Access**

The observed increases in youth marijuana use coincide with Massachusetts's marijuana policy changes. The state decriminalized marijuana in 2008, legalized medical marijuana in 2012, approved recreational legalization in 2016, and opened the first dispensaries in 2018. While correlation does not prove causation, the acceleration in youth usage rates after 2015 aligns with the period of recreational legalization debate and implementation. This timeline underscores the importance of robust youth prevention measures accompanying any adult marijuana policy changes.

**Recommendations**

1. Implement comprehensive prevention programs starting in elementary school, with intensified interventions during middle school transition periods
2. Develop culturally responsive prevention strategies specifically targeting Hispanic/Latino communities, addressing underlying social determinants
3. Create gender-specific prevention components that address risk factors for both male and female adolescents
4. Establish regular monitoring and evaluation systems to track intervention effectiveness across demographic subgroups

# Code review

```
1 # -----
2 # Weekly Report Agent - TRUE AGENTIC VERSION
3 #
4 # This version implements real agentic behavior:
5 #   - Claude decides what data to request via tool calls
6 #   - Claude can iterate and request more data based on findings
7 #   - Claude chooses the report format based on analysis
8 #   - Multi-turn conversation loop with tool execution
9 #
10 # Usage:
11 # Sys.setenv(ANTHROPIC_API_KEY = "your-key")
12 # source("agentic_report_agent.R")
13 #
14 # Required packages: httr, jsonlite, officer
15 # -----
```

# Making it even more useful

**Weekly Reports Analysis**  
Configure parameters for data queries

- [get\\_overall\\_rate](#)  
Get the overall marijuana use rate for a specific year.  
**year**  
Year to query (e.g., '2017')  
Enter year...
- [get\\_breakdown](#)  
Get marijuana use rates broken down by a demographic dimension for a specific year.  
**year**  
Year to query  
Enter year...  
**dimension**  
Dimension to break down by: 'grade', 'sex', or 'race'  
Select dimension... ▾