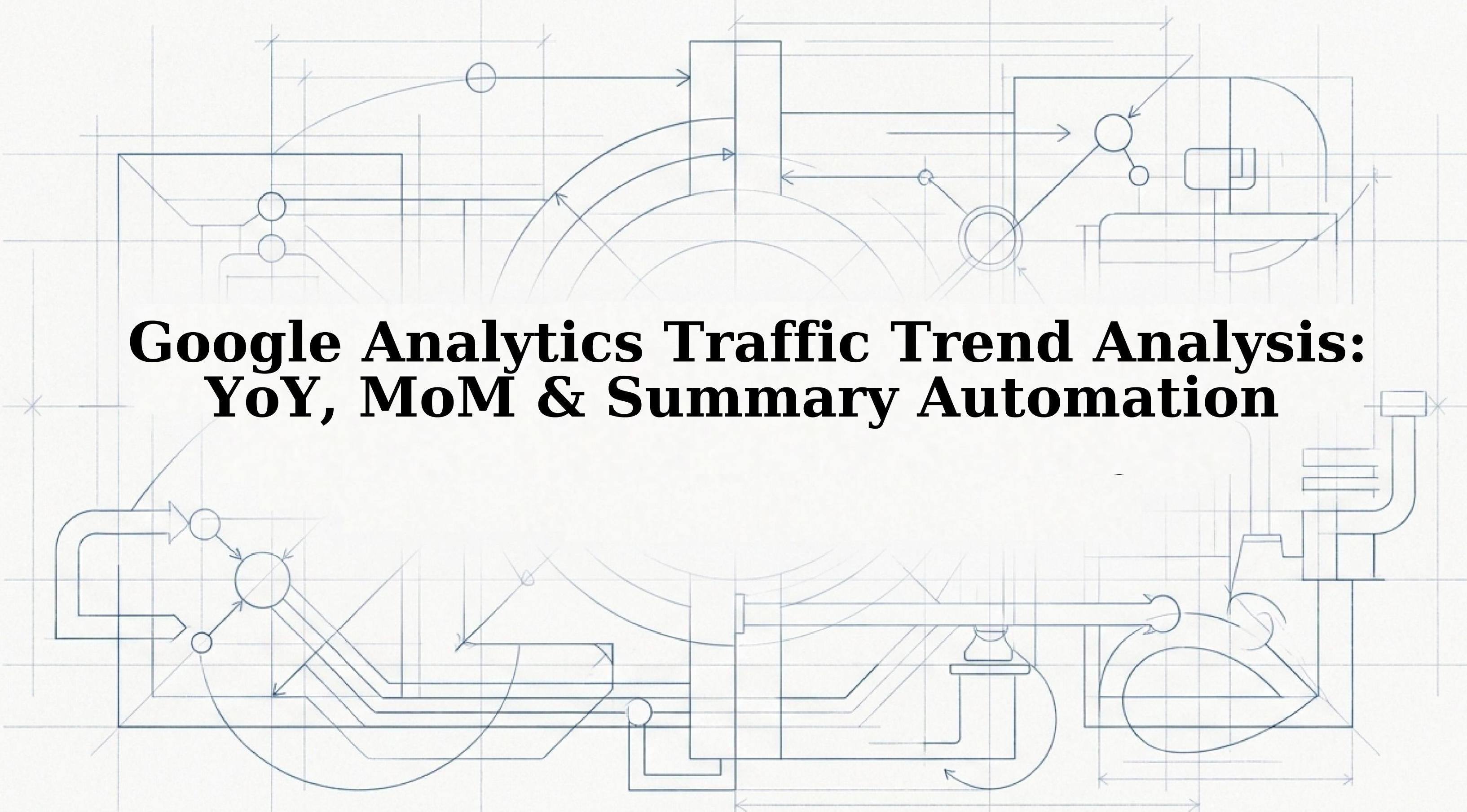


Google Analytics Traffic Trend Analysis: YoY, MoM & Summary Automation



From Raw Data to AI-Powered Insight in Seconds

B1	C	D	E	F	G
1	Sessions (GA4) Year-2024	Sessions (GA4) Year-2025	YOY %	LM %	Executive Summary
2	1,250,000	1,250,000	18.50%	3.22%	Total Visits Summary: The analysis of GA4 sessions shows a significant overall growth of 18.50% year-over-year, driven by strong performance in organic search and direct traffic channels. Key metrics indicate sustained user engagement and improved acquisition efficiency.
3	1,481,250	1,481,250			
4	2,100,500	2,100,500	18.50%	2.50%	
5	2,488,840	2,488,840			
6	850,000	850,000	3.22%	4.50%	
7	877,350	877,350			
8	950,000	950,000	18.50%	1.80%	
9	1,125,750	1,125,750			Referral Traffic Summary: While overall visits increased, referral traffic shows a concerning decline of 3.22% year-over-year, necessitating a review of partner strategies and inbound links to reverse this negative trend.
10	700,250	700,250	-3.22%	0.50%	
11	677,920	677,920			
12	1,500,000	1,500,000	18.50%	2.90%	
13	1,777,500	1,777,500			
14	550,000	550,000	-5.00%	1.10%	
15	522,500	522,500			

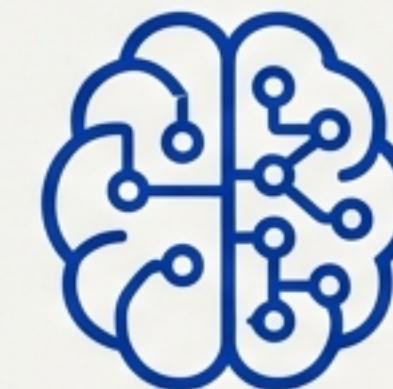
An Agentic AI system that automates GA4 analysis, calculates key metrics, and generates executive summaries directly in Excel.

Automating the Analyst: Core Capabilities



Intelligent Analysis

- YOY & MoM Calculation:** Automatically computes Year-over-Year and Month-over-Month growth.
- Dynamic Section Detection:** Intelligently finds all traffic categories—no hardcoding.



AI-Powered Insights

- LLM-Generated Summaries:** Delivers concise, professional summaries for each traffic section.
- Context-Aware Prompting:** Uses different prompts for active vs. inactive traffic sections.



Production-Ready Output

- Formatted Excel Reports:** Writes metrics and summaries with professional cell merging, alignment, and styling.
- Safe & Robust:** Guarantees no division-by-zero errors, NaN, or Infinity values in the output.

How It Works: An AI Analyst Team Orchestrated by LangGraph

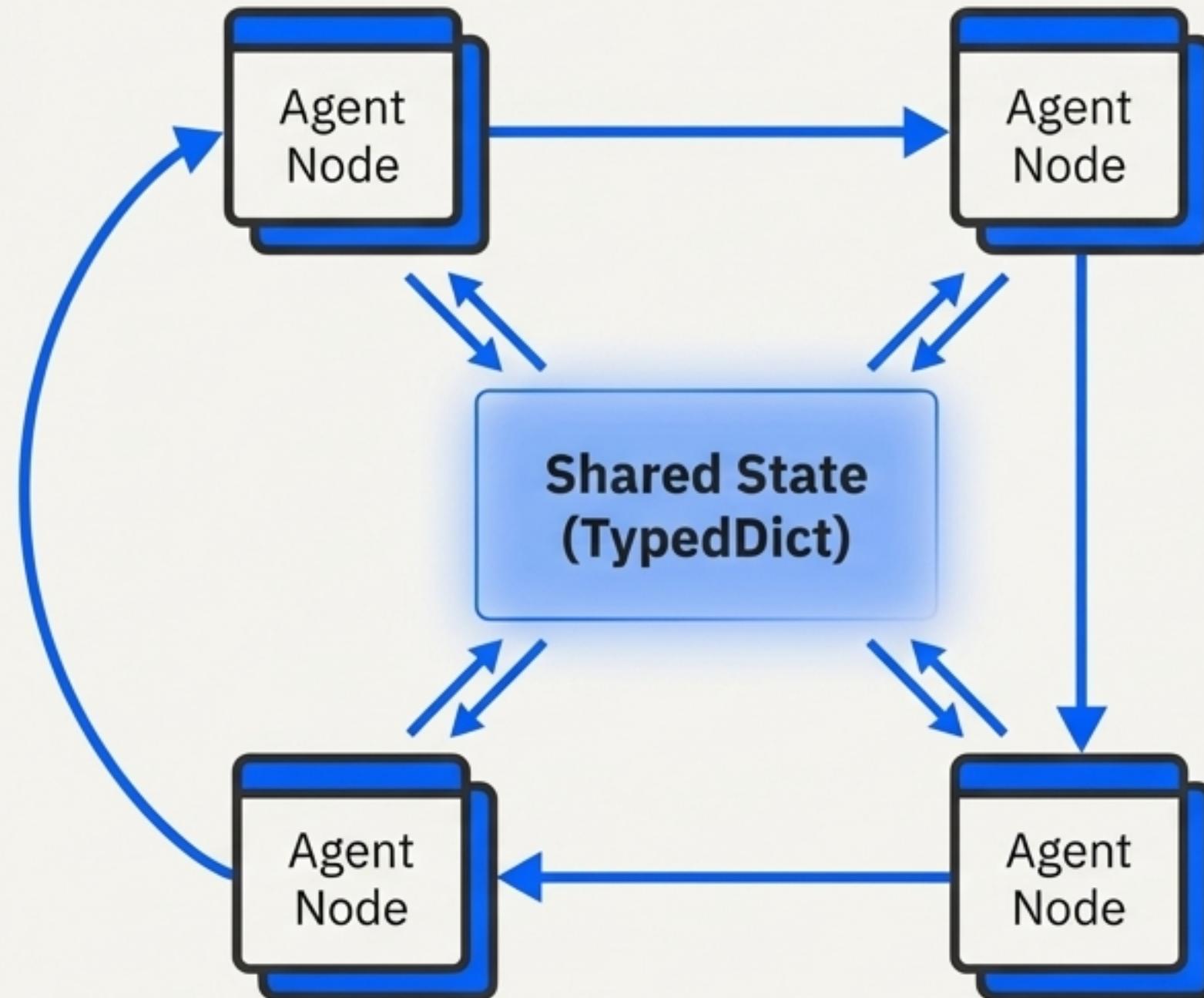


Orchestrator: LangGraph manages the workflow and state.

Specialists: Five distinct agents collaborate, each with a specific role.

Shared State: All agents operate on a unified, evolving state object.

The Engine: LangGraph StateGraph



- 1. Centralized State Management:** A single `TypedDict` holds all data (workbook, sections, metrics), ensuring consistency.
- 2. Sequential Processing with Loops:** The graph defines a clear execution order and uses conditional edges to loop through each detected traffic section.
- 3. Explicit Control Flow:** Provides robust, debuggable, and predictable agentic workflows, moving beyond simple chains.

Meet the Agentic Team



1. The Reader (`ExcelReaderAgent`)

Loads the raw GA4 workbook and prepares it for analysis.



2. The Scout (`SectionDetectorAgent`)

Scans the worksheet to dynamically identify all traffic sections.



3. The Quant (`MetricsCalculatorAgent`)

Executes calculations with production-grade safety checks.



4. The Strategist (`SummaryGeneratorAgent`)

Analyzes metrics and generates an executive summary using an LLM.



5. The Presenter (`ExcelWriterAgent`)

Writes all results back to Excel with professional formatting.

Dynamic Structure Recognition

Before: Raw Excel Sheet

A	B	C	D	E	F	G	H	I	J	K
Total Visits (Sessions)	Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1303	920	359	380	478	394	273	373	512	378	210
1680	769	760	320	288	382	206	452	361	493	300
Engaged Sessions	Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Ang	Sep
804	246	381	302	217	358	315	373	312	356	113
780	120	162	109	140	250	103	233	106	230	108
Referral Traffic	Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Ang	Sep
103	40	33	38	29	46	28	49	90	36	38
105	70	68	75	76	70	75	70	68	70	68
Paid Traffic	Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Ang	Sep
182	23	34	23	34	39	32	35	39	34	38
102	25	20	26	28	30	42	40	43	30	42
Social Media Traffic	Month	Jan	Feb	Mar	Apr	Moy	Jun	Jul	Aug	Sep
160	120	130	126	158	216	107	105	118	96	32
100	126	130	163	140	168	119	103	100	72	78



After: Analyzed Sheet

A	B	C	D	E	F	G	H	I	J	K
Total Visits (Sessions)	Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Ang	Sep
1382	943	338	350	450	383	273	373	378	210	210
1680	780	700	220	260	202	202	493	300	360	360
Engaged Sessions	Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Ang	Sep
503	203	303	304	365	355	315	272	358	113	113
780	130	158	133	169	200	183	183	230	108	108
Referral Traffic	Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Ang	Sep
105	47	33	33	10	79	15	15	36	38	38
100	70	80	25	79	20	23	70	00	00	00
Paid Traffic	Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Ang	Sep
103	23	33	22	20	32	35	30	34	38	38
122	22	20	20	20	20	33	30	33	42	42
Social Media Traffic	Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Ang	Sep
106	90	62	93	46	35	36	30	56	32	32
105	107	103	100	05	69	72	70	70	78	78

Detected Sections

Total Visits

Engaged Sessions

Referral Traffic

Paid Traffic

Social Media Traffic

Custom sections

`SectionDetectorAgent` Algorithm:

- Scans Column A for headers and Column B for the word "Month".
- Calculates the start and end row for each section.
- Intelligently skips "Total" and "% Change" rows to prevent calculation errors.

Production-Grade Calculations: Never Divide by Zero

$$\text{YOY \%} = \left(\frac{(2025 - 2024)}{2024} \right) * 100$$

Scenario 1 (Safe)	Scenario 2 (Unsafe)
2024 = 15000 2025 = 18000 →  20.00%	2024 = 0 2025 = 500 →  ERROR! → [BLANK]

Only calculates if the denominator (e.g., 2024 value) is greater than zero.
Handles empty cells and non-numeric data gracefully.
Returns a blank value, never `NaN` or `Infinity`.
January LM% is always blank (no previous month).

Generating Insights with Multi-LLM Support



- **Context-Aware Prompts:** Generates trend analysis for active sections and a ‘No measurable traffic...’ summary for empty ones.
- **Provider Flexibility:** Easily switch between providers via ` `.env` configuration.
- **Fallback Logic:** Includes a template summary in case of LLM API failure.

The Final Polish: Professional Excel Formatting

A screenshot of Microsoft Excel demonstrating various professional formatting features. The spreadsheet contains a table with four columns: Metric, 2024 Value, 2025 Value, and YOY %. A fifth column, E, is labeled 'Summary Analysis' and contains two rows of text. The entire table is bordered by a thin black line. The background of the 'Summary Analysis' row is light green, and the text is black. The Excel ribbon at the top shows the Home tab selected. The status bar at the bottom indicates 'Sheet1'.

Metric	2024 Value	2025 Value	YOY %	Summary Analysis
Total Visits (Sessions)	15000	18000	15.25%	Total Visits (Sessions) showed strong Year-over-Year growth of 15.25%, indicating positive seasonal performance and effective marketing initiatives.
Total Visits	5000	8000	15.25%	
Total Sessions	500	600	10.00%	

Writes percentages
as '15.25%'

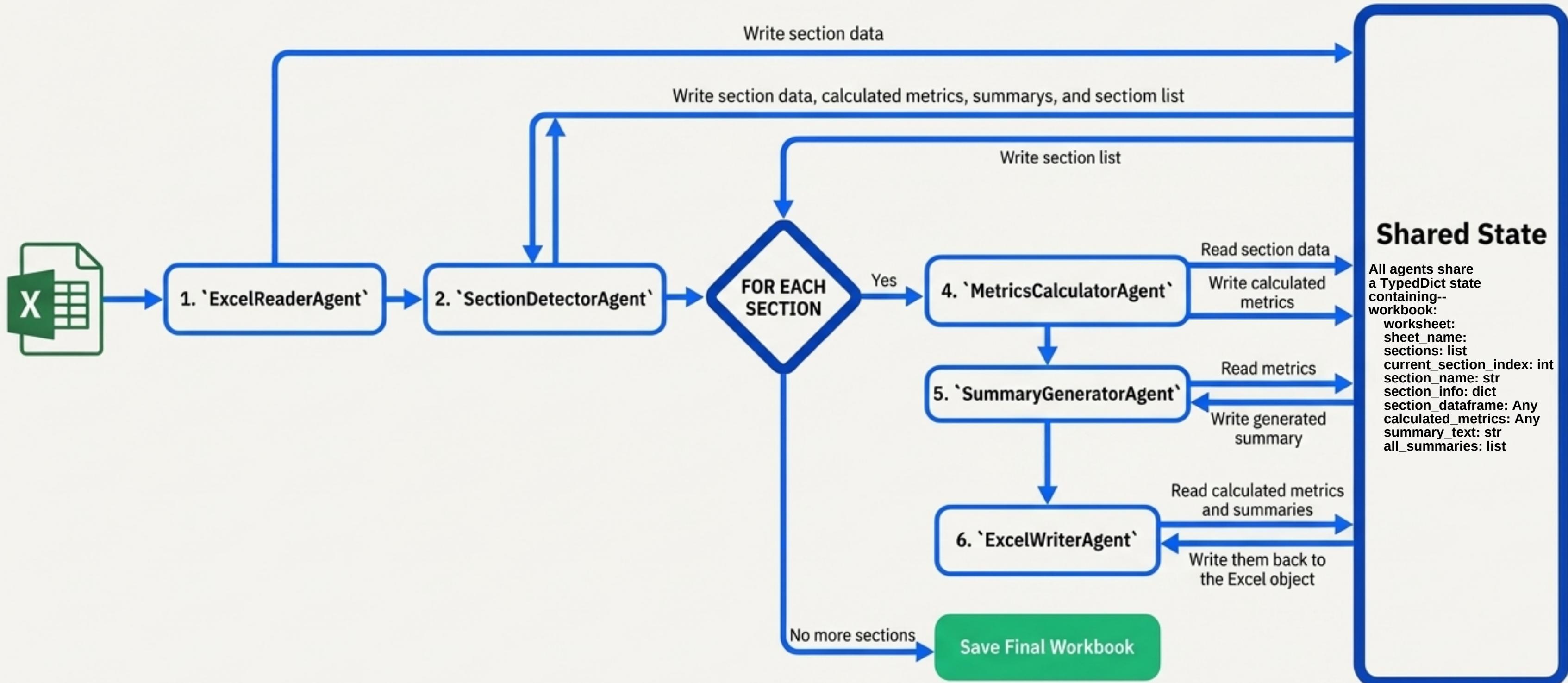
Top-aligned text

Merged cells & text
wrapping for
readability

Conditional color-coding
for trends (Green for
growth, Red for decline)

Annotation

The Complete Agentic Workflow



The Technology Stack: A Blueprint for Production AI

Orchestration



LangGraph: For robust, stateful multi-agent workflows.

AI & Language Models



LangChain: As the unified interface for LLMs.

OpenAI / OpenRouter / Ollama: For flexible, high-quality summary generation.

Data Handling & I/O



Pandas & NumPy: For safe, efficient in-memory data processing.

openpyxl: For direct, low-level Excel read/write control.

Configuration



python-dotenv: For secure and easy management of API keys and paths.

Get Started in 3 Steps



1. Create Virtual Environment & Install

```
python -m venv venv  
source venv/bin/activate  
pip install -r requirements.txt
```



2. Configure Your Environment

```
# .env  
LLM_PROVIDER="OPENAI" # or  
OPENROUTER, OLLAMA  
OPENAI_API_KEY="sk-..."  
INPUT_EXCEL_PATH="data/  
input_report.xlsx"
```



3. Run the Analysis

```
python main.py
```

AI-Powered GA4 Traffic Analysis: From Raw Data to Actionable Insights

Input: The Raw GA4 Excel Report

A Standard Excel File is All You Need

The system starts with a raw GA4 traffic report in an Excel file, organized by month.

	A	B	C	D
1	Month	Sections (GA4) Year-2023	Sections (GA4) Year-2023	Sections (GA4) Year-2023
2	January	15000	10500	10000
3	February	15000	16500	15000
4	March	14000	16500	16000
5	April	12000	16500	16000
6	May	15000	10500	18000
7	June			
8	July			
9	August			
10	September			
11	October			
12	November			
13	December			
15				

Auto-Detects All Traffic Sections

The system intelligently identifies all categories within the report, such as Total Visits, Engaged Sessions, Referral, Paid, and Social Media Traffic, without any hardcoding.

The Multi-Agent Workflow (Powered by LangGraph)

Key Calculation Rules

$$\text{Year-over-Year (YoY)} \% = \left(\frac{2025 - 2024}{2024} \right) \times 100$$

Only calculated if both years have valid, positive data.

$$(\text{LM}) \% = \left(\frac{\text{Current Month} - \text{Previous Month}}{\text{Previous Month}} \right) \times 100$$

January is always blank.

Skips calculation if previous month's data is zero or null.

Month-over-Month (LM)

Handles Empty Sections Intelligently

If a section has no traffic, calculations are skipped and the AI generates a summary stating "No measurable traffic was recorded."



Output: The AI-Enhanced Report

An Actionable, Formatted Excel Report

Original file now enriched with new columns for YoY and LM percentages and a dedicated panel for executive summaries.

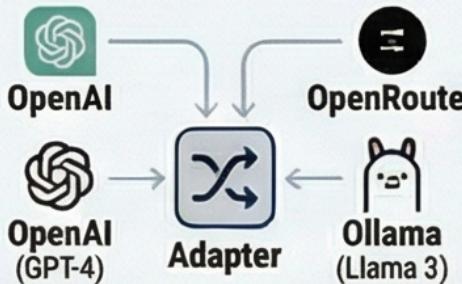
	A	B	C	D
1	Month	Sections (GA4) Year-2024	Total Visit (Sessions) Year-2024	
2	January	+12.2%	+12.2%	
3	February	+10.9%	+18.2%	
4	March	+17.5%	-2.1%	
5	April	+18.5%		
6	May	+10.6%		
7	June	+10.4%		
8	July	+10.0%		
9	August	+4.2%		
10	September	18.6%	-2.1%	
11	October	+5.5%	-2.1%	
12	November	18.6%	+4.1%	
13	December	+0.9%	-2.1%	

Example AI-Generated Summary
Total Visits (Sessions) showed strong Year-over-Year growth, year-over-year growth... with an average increase of 18.5% across all months...
...the upward trajectory demonstrates positive user engagement trends...

Color-Coded Summaries for At-a-Glance Insights

AI-generated summaries are automatically given background for positive growth trends and a red background for declines.

Technology Stack & Features



Multi-LLM Support for Flexibility

Compatible with OpenAI for production, OpenRouter for cost-effective, and Ollama for private, local use.



Orchestrated with LangGraph

Multi-agent workflow is managed by LangGraph, ensuring agents execute in a coordinated and sequential manner.



Built on a Production-Ready Python Stack

Utilizes powerful libraries including Pandas for data processing, OpenPyXL for Excel I/O, and NumPy for safe numerical calculations.

Explore the Architecture

LangGraph Documentation
langchain-ai.github.io/langgraph



View the Source Code



github.com/itsnaveenkroy/Agentic_Monthly_Traffic_Report



Core Concepts Deep Dive
See ARCHITECTURE.md in
the repository



Built with Agentic AI principles for robust, automated analysis.