Documentation: Sales Insights Automation with n8n + LangChain

Why n8n + LangChain?

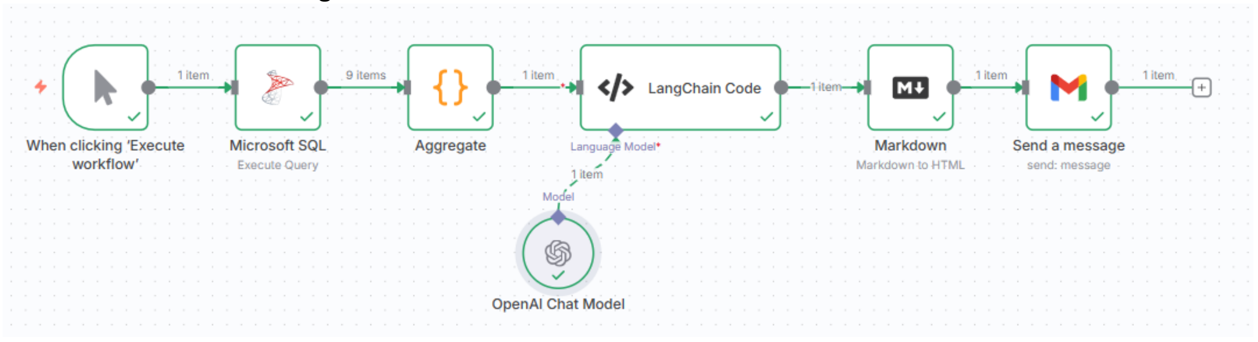
Business users often need quick **executive insights** from raw data, not just numbers, but **summaries, highlights, and trends**.

- **n8n** makes it easy to connect data sources (SQL Server, APIs, CSV, etc.), process data, and automate workflows without heavy coding.
- **LangChain** enables the integration of an **LLM (Large Language Model)** into the workflow to transform raw data into narrative **insights, summaries, and Q&A bots**.

Together, this creates a **no-code + AI-powered data pipeline**:

1. **n8n handles the data extraction and orchestration**
2. **LangChain handles intelligent summarization & reasoning**

Workflow Overview for Sales Insights demo



1. **Trigger Node (Manual / Scheduled)**
   - Start the workflow manually or via a cron schedule.
   - Useful for daily/weekly reporting.
2. **Microsoft SQL Node**
   - Connect to the Sales dataset with 200 rows (via SQL database).
   - Executes the query:

```
SELECT
        Region,
        Product,
        SUM([Revenue]) AS TotalRevenue,
        SUM([Units Sold]) AS TotalUnits
FROM Sales
WHERE Date BETWEEN '2025-01-01' AND '2025-03-31'
GROUP BY Region, Product
ORDER BY TotalRevenue DESC;
```

   - Outputs aggregated metrics by **region** and **product**.
3. **Aggregate Node (Code)**
   - Combine all SQL rows into a **single item** for the AI.
   - Prepare a **datasetText** string that's easy for an LLM to understand.
   - Example code:

```
const allData = items.map(item => ({
 Region: item.json.Region,
 Product: item.json.Product,
 TotalRevenue: parseFloat(item.json.TotalRevenue),
 TotalUnits: parseInt(item.json.TotalUnits)
}));

return [{
 json: {
  completeDataset: allData,
  totalRecords: allData.length,
  datasetText: allData
   .map(row => `${row.Region} | ${row.Product} | Revenue: ${row.TotalRevenue} | Units: ${row.TotalUnits}`)
   .join('\n')
 }
}];
```

   - Instead of 9 separate rows to the AI, **one consolidated input** with structured text is produced.

4. OpenAI Chat Model Node
   - Provide the **LLM** (e.g., GPT-4-mini).
   - Connected to LangChain Code as the “AI engine”.
5. LangChain Code Node
   - This is the module responsible for **intelligence operations**.
   - Uses LangChain’s PromptTemplate + SummarizationChain.
   - Example workflow:

```
// Get aggregated sales data from previous node
const salesData = $input.item.json.completeDataset;

if (!salesData || salesData.length === 0) {
  throw new Error("No sales data provided to the node.");
}

// Convert data into a readable string for the LLM
const salesText = salesData
  .map(row => `${row.Region} | ${row.Product} | Revenue: ${row.TotalRevenue} | Units: ${row.TotalUnits}`).join('\n');

// Prepare summarization prompts
const { PromptTemplate } = require("@langchain/core/prompts");
const { loadSummarizationChain } = require("langchain/chains");

// Get the AI model connected to this LangChain Code node
const llmSummary = await this.getInputConnectionData('ai_languageModel', 0);

const summaryTemplate = `
You are a sales analyst. Analyze the following sales data and write an executive summary for management:
- Highlight top-performing regions by revenue
- Highlight best-selling products by units
- Identify any interesting trends or anomalies

Sales data:
--------
{text}
--------
Provide a concise executive summary and also suggest 2-3 actionable insights or recommendations for the management team.
`;

const SUMMARY_PROMPT = PromptTemplate.fromTemplate(summaryTemplate);

const summaryRefineTemplate = `
You are a sales analyst. You have an existing summary: {existing_answer}
Use the new data below to refine the summary, ensuring the key insights and recommendations are clear and concise.

Sales data:
--------
{text}
--------
If the new data does not change the insights, keep the original summary. Return the refined summary and actionable recommendations.
`;

const SUMMARY_REFINE_PROMPT = PromptTemplate.fromTemplate(summaryRefineTemplate);

// Load summarization chain (refine type)
const summarizeChain = loadSummarizationChain(llmSummary, {
  type: "refine",
  verbose: true,
  questionPrompt: SUMMARY_PROMPT,
  refinePrompt: SUMMARY_REFINE_PROMPT,
});

// Run the chain
const summary = await summarizeChain.run([{ pageContent: salesText }]);

// Return summary
return [{ json: { summary } }];
```

- **Step-by-step breakdown:**
    1. Import LangChain chain & prompt tools.
        - const { PromptTemplate } = require("@langchain/core/prompts");
        - const { loadSummarizationChain } = require("langchain/chains");

    2. Access the LLM connection from the OpenAI node.
        - const llmSummary = await this.getInputConnectionData('ai_languageModel', 0);

    3. Define a **prompt template** with clear business instructions.
        - const summaryTemplate = ` ... `;
        - const SUMMARY_PROMPT = PromptTemplate.fromTemplate(summaryTemplate);

        - const summaryRefineTemplate = ` ... `;
        - const SUMMARY_REFINE_PROMPT = PromptTemplate.fromTemplate(summaryRefineTemplate);

    4. Run the summarization chain on the aggregated dataset.

        -
          ```
          const summarizeChain = loadSummarizationChain(llmSummary, {
            type: "refine",
            verbose: true,
            questionPrompt: SUMMARY_PROMPT,
            refinePrompt: SUMMARY_REFINE_PROMPT,
            });
          ```

        - const summary = await summarizeChain.run([{ pageContent: salesText }]);

    5. Return the structured summary as JSON.
        - return [{ json: { summary } }];

Thus, the whole flow:

1. Take sales data in JSON.
2. Convert it to readable text.
3. Pass it through a summarization chain with a detailed prompt.
4. Return an executive summary + insights.

6. **Markdown & Email Nodes**
    - Convert output from LangChain Code node to HTML to send via **Gmail**.

Key Takeaways

- **n8n** automates the pipeline (data → processing → AI → delivery).
- **LangChain** turns structured numbers into **business insights & narratives**.
- This setup is reusable for:
    - Sales reports
    - Customer support insights
    - Operational dashboards

Example: AI Output

Executive Summary

1. Top Region–Product Revenue Generators
   • EMEA – Widget C: $113,081 (3,580 units)
   • Americas – Widget A: $108,757 (3,177 units)
   • APAC – Widget B: $ 90,208 (2,722 units)

2. Overall Best-Selling Products (Units)
   • Widget A: 8,167 units
   • Widget C: 8,114 units
   • Widget B: 6,967 units

3. Regional Revenue Rankings (all products)
   • Americas: $249.8 K
   • EMEA: $247.4 K
   • APAC: $235.1 K

Key Trends & Anomalies
– Product–Region Affinities: EMEA strongly favors Widget C, APAC favors Widget B, and Americas favors Widget A.
– Price Variance: Average revenue per unit ranges from ~$27.8 (Widget B in EMEA) up to ~$34.2 (Widget A in Americas), suggesting uneven pricing or discounting strategies.
– High-Margin, Low-Volume: Widget B commands above-average unit prices but trails in volume—an opportunity to boost sales through targeted promotions.

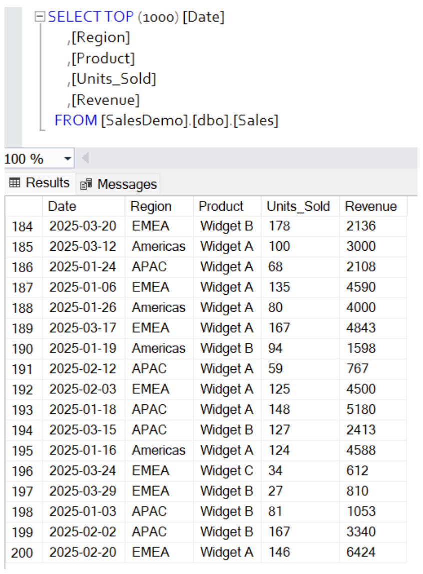
Actionable Recommendations

1. Regional Marketing Focus
   • EMEA: Double down on Widget C with loyalty programs and upsell bundles.
   • APAC: Invest in demand generation for Widget B through localized campaigns.
   • Americas: Leverage Widget A's popularity to cross-sell Widget C (combine high-margin with high-volume appeal).

2. Price Optimization & Promotions
   • Evaluate pricing structure for low-price, high-volume combos (e.g., Widget B in EMEA) to better align margins.
   • Deploy time-limited discounts on underperforming region–product pairings to stimulate incremental units without eroding brand value.

3. Inventory & Supply Chain Alignment
   • Rebalance stock allocations toward high-demand products in each region to prevent stockouts (e.g., Widget A in Americas, Widget B in APAC).
   • Monitor lead times for high-margin SKUs and ensure on-time replenishment to capture full market potential.

Dataset & SQL Results

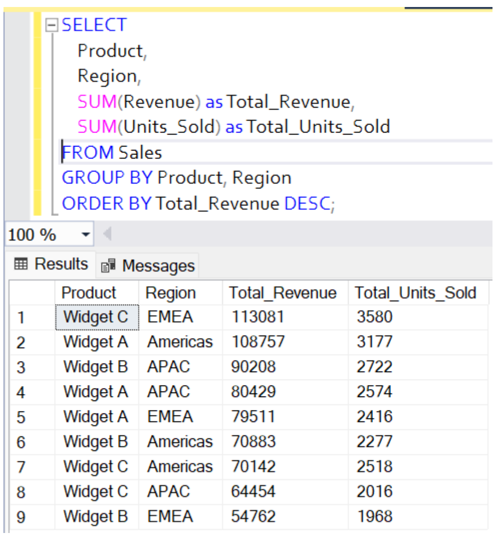


```sql
SELECT TOP (1000) [Date]
      ,[Region]
      ,[Product]
      ,[Units_Sold]
      ,[Revenue]
  FROM [SalesDemo].[dbo].[Sales]
```

100 %

Results | Messages

	Date	Region	Product	Units_Sold	Revenue
184	2025-03-20	EMEA	Widget B	178	2136
185	2025-03-12	Americas	Widget A	100	3000
186	2025-01-24	APAC	Widget A	68	2108
187	2025-01-06	EMEA	Widget A	135	4590
188	2025-01-26	Americas	Widget A	80	4000
189	2025-03-17	EMEA	Widget A	167	4843
190	2025-01-19	Americas	Widget B	94	1598
191	2025-02-12	APAC	Widget A	59	767
192	2025-02-03	EMEA	Widget A	125	4500
193	2025-01-18	APAC	Widget A	148	5180
194	2025-03-15	APAC	Widget B	127	2413
195	2025-01-16	Americas	Widget A	124	4588
196	2025-03-24	EMEA	Widget C	34	612
197	2025-03-29	EMEA	Widget B	27	810
198	2025-01-03	APAC	Widget B	81	1053
199	2025-02-02	APAC	Widget B	167	3340
200	2025-02-20	EMEA	Widget A	146	6424

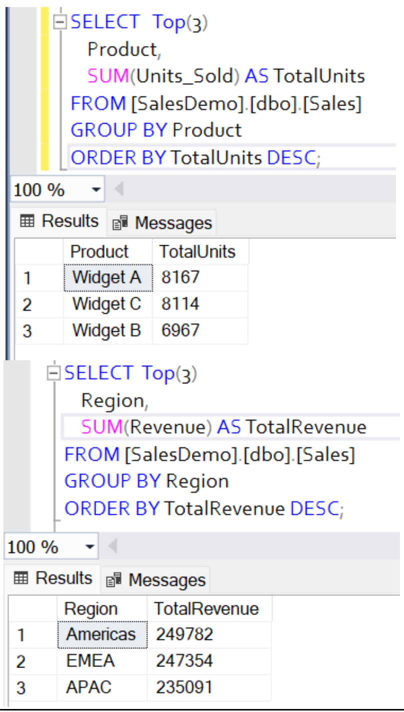


```sql
SELECT
    Product,
    Region,
    SUM(Revenue) as Total_Revenue,
    SUM(Units_Sold) as Total_Units_Sold
FROM Sales
GROUP BY Product, Region
ORDER BY Total_Revenue DESC;
```

100 %

Results | Messages

	Product	Region	Total_Revenue	Total_Units_Sold
1	Widget C	EMEA	113081	3580
2	Widget A	Americas	108757	3177
3	Widget B	APAC	90208	2722
4	Widget A	APAC	80429	2574
5	Widget A	EMEA	79511	2416
6	Widget B	Americas	70883	2277
7	Widget C	Americas	70142	2518
8	Widget C	APAC	64454	2016
9	Widget B	EMEA	54762	1968



```sql
SELECT  Top(3)
    Product,
    SUM(Units_Sold) AS TotalUnits
FROM [SalesDemo].[dbo].[Sales]
GROUP BY Product
ORDER BY TotalUnits DESC;
```

100 %

Results | Messages

	Product	TotalUnits
1	Widget A	8167
2	Widget C	8114
3	Widget B	6967

```sql
SELECT  Top(3)
    Region,
    SUM(Revenue) AS TotalRevenue
FROM [SalesDemo].[dbo].[Sales]
GROUP BY Region
ORDER BY TotalRevenue DESC;
```

100 %

Results | Messages

	Region	TotalRevenue
1	Americas	249782
2	EMEA	247354
3	APAC	235091