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# Real-world Applications of Multi-Agent Patterns

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# Swarm Robotics in Search and Rescue Operations

## Search and Mapping

GenAI: Multi-sensor data integration

## Initial Deployment

Optimal deployment pattern generation

# Overview: Swarm Robotics in Search and Rescue Operations

## Dynamic Task Allocation

**Mapping**
LIDAR + cameras
Area coverage

**Search**
Thermal Imaging
Survivor detection

**Hazard Detection**
Gas sensors
Risk assessment

**Communication**
Data Relay
Network Coverage

## Collective Decision-Making

**Local Data**
Sensor readings
Individual status

**Shared Knowledge**
Environmental map
Hazard location

**Coordinated Location**
Task execution
Resource allocation

**Adaptive Strategy**
Mission updates
Priority shifts

# Automated Logistics Operations Flow

## Inbound Logistics

- Unloading
- Scanning
- Sorting
- Staging

## Storage Operations

- Put-away
- Replenishment
- Inventory management

# Automated Logistics Operations Flow

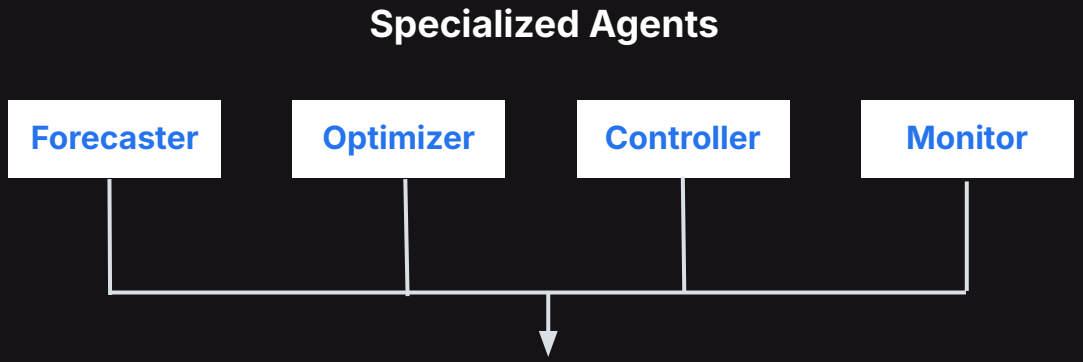
## Order Processing

- Order Receipt
  Order validation
  Priority assignment
- Picking
  Route optimization
  Batch processing
- Sorting
  Order consolidation
  Quality check
- Packing
  Box selection
  Label generation

## Outbound Operations

- **Staging**
  Zone assignment
  Load sequencing
- **Loading**
  Dock assignment
  Load verification
- **Shipping**
  Documentation
  Carrier handoff
- **Tracking**
  Status updates
  Delivery monitoring

# Multi-Agent Architecture for Logistics Operations




**Agent Coordination**

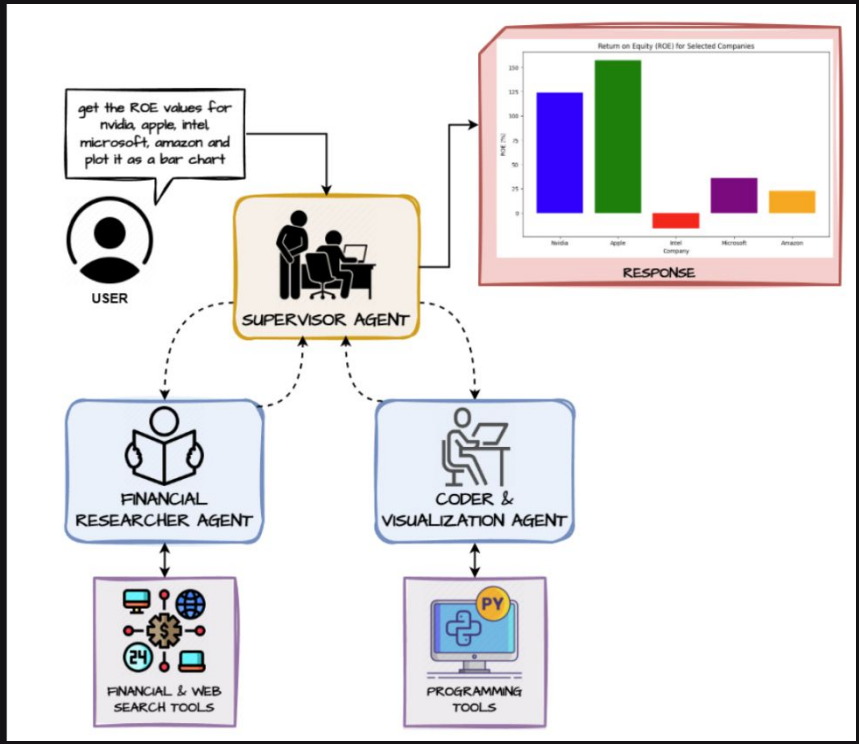
- LLM-based task decomposition
- Chain-of-thought planning
- Context aware decision making

**Knowledge Integration**:

- Vector store (Domain knowledge)
- RAG for historical patterns

# Multi-Agent Architecture for Financial Research Analysis

- **Supervisor Agent** will analyze the user query and delegate the task to either the researcher or coder sub-agent.
- **Researcher sub-agent** can call web search or financial tools to get relevant data and information for the user question and return back to the Supervisor.
- **Coder sub-agent** can take in data, run Python code, generate visualizations and return back to the Supervisor.
- **Supervisor keeps calling any of these two agents** based on the current agent state and progress till the task is solved.

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# Multi-Agent Utilization Review System

**Objective:** Automate the process of medical utilization review using a modular multi-agent architecture.

**Why It Matters:**

Ensures adherence to medical guidelines

Suggests better care alternatives

Enables explainable final decisions

# Multi-Agent Utilization Review System

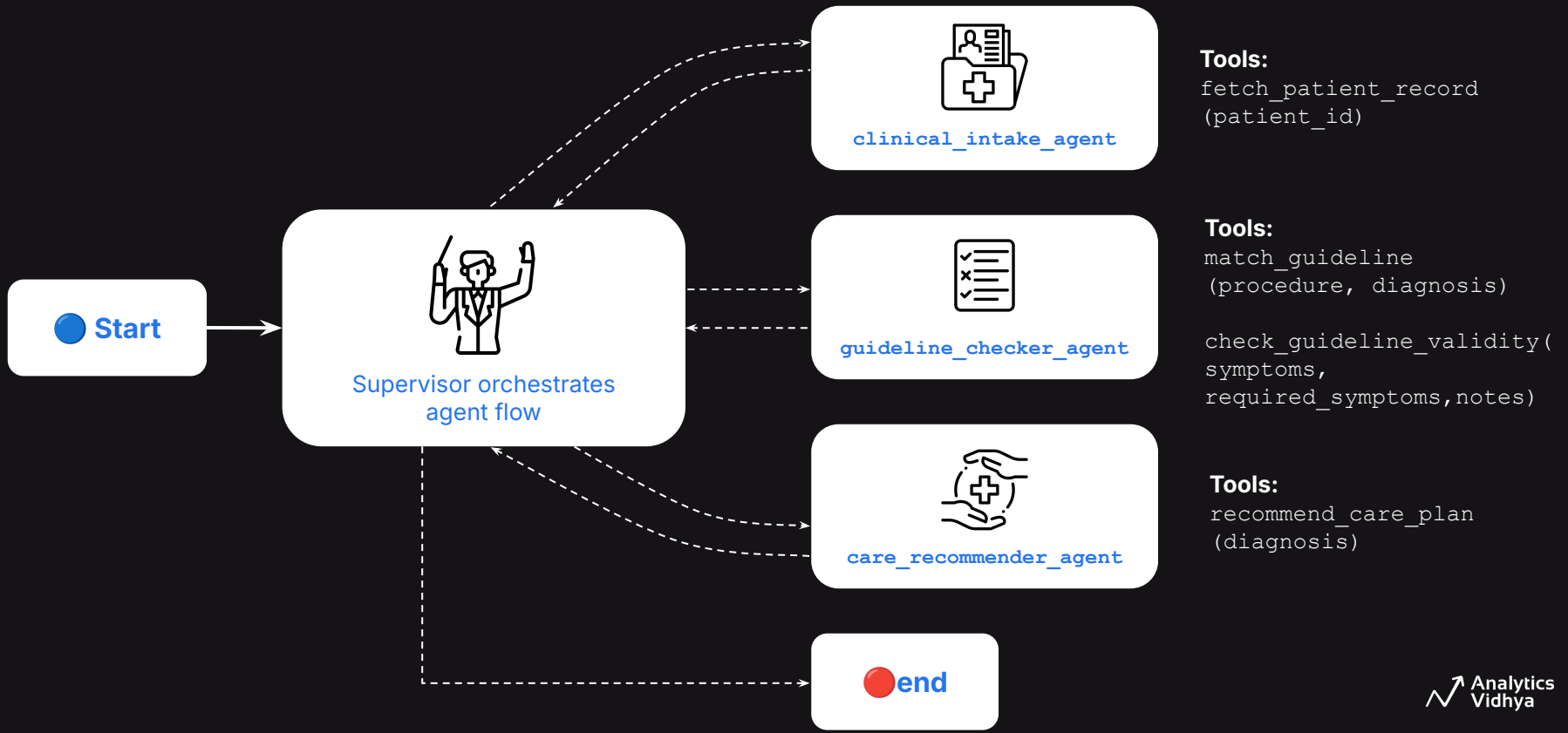
| Agent | Tools Invoked | Actions Performed |
|---|---|---|
| `clinical_intake_agent` | `fetch_patient_record(patient_id)` | Retrieves patient data<br>Summarizes case and rationale |
| `guideline_checker_agent` | `match_guideline(procedure, diagnosis)`<br><br>`check_guideline_validity(symptoms, required_symptoms, notes)` | Finds relevant guideline<br>Validates medical necessity |
| `care_recommender_agent` | `recommend_care_plan(diagnosis)` | Suggests follow-up/alternate care<br>Handles edge/fallback cases |
| `supervisor` | none | Routes execution between agents<br>Checks if task is complete |

# Multi-Agent Utilization Review System

1. 🧑‍💼 **supervisor** starts execution.
2. ➡️ Calls **clinical_intake_agent** to retrieve and summarize patient record.
3. ➡️ Calls **guideline_checker_agent** to validate against medical policy.
4. ➡️ If necessary, calls **care_recommender_agent** for alternate plans.
5. 🔁 Repeats loop until enough reasoning has been accumulated.
6. ✅ Once completed, the flow terminates.

*All outputs (messages) are accumulated in state and passed along with each step for full transparency and traceability.*

# Multi-Agent Utilization Review System

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# Thanks!

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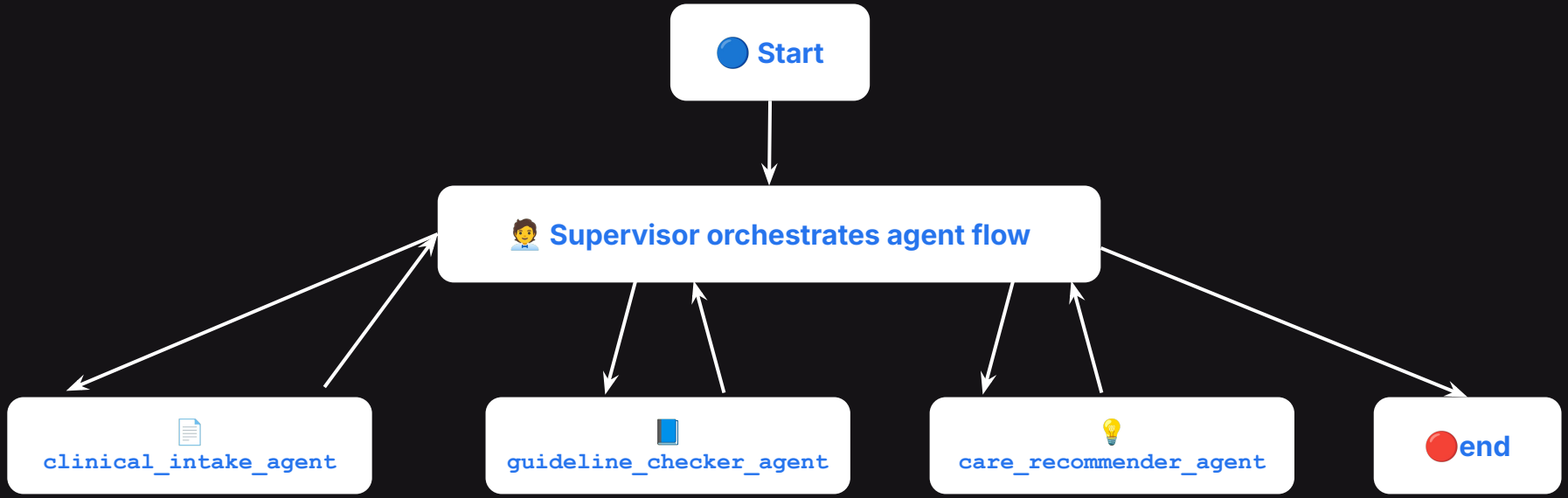
# Multi-Agent Utilization Review System

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