RegNetAgents Multi-Agent Architecture

Input

User Query via MCP Server
(Natural Language)

Initialization & Validation Agent
Gene Symbol → Ensembl ID

ARACNe Networks
(Pre-computed
NetworkX cache)

Network Modeling Agent
• Identify Regulators (upstream)
• Identify Targets (downstream)
• Classify Regulatory Role

Analysis

>5
regulators?

Yes

Perturbation
Analysis
• PageRank
• Centrality
• Target
Ranking

No

Pathway Enrichment Agent
Reactome API Query

Reactome
Database

Parallel Domain Analysis (LLM-Powered)

Domain Insights

NCBI+UniProt
Gene Annotations
(15,347 genes)

Cancer
Biology
Agent

Drug
Discovery
Agent

Clinical
Relevance
Agent

Systems
Biology
Agent

Integration & Reporting Agent
• Synthesize multi-domain insights
• Generate comprehensive JSON report
• Rank therapeutic targets

Output

Comprehensive Analysis Report
(Structured JSON)

Execution Time:
~0.6s (rule-based)
~15s (LLM-powered)

Legend: Required step — Conditional execution