AGR MCP Server

JavaScript Implementation for Genomics Research

JavaScript Implementation

Development Team

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Overview

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AGR MCP Server Features

- **Enhanced Query Capabilities** 🔍
  - Natural language queries
  - Boolean logic (AND, OR, NOT)
  - Species filtering
  - Cross-entity search
- **Robust Architecture** 🔧
  - Node.js implementation
  - Intelligent caching
  - Error recovery with backoff
  - Comprehensive input validation
- **Multiple Interfaces** >_
  - MCP server for Claude Desktop
  - CLI tools for command line
  - Interactive chat interface

JavaScript Implementation

Core Improvements ★

- Node.js async I/O
- Intelligent caching
- Connection pooling
- Exponential backoff

Advanced Features 🪄

- Natural language queries
- Boolean operators
- Multi-entity search
- Real-time monitoring

12 Specialized MCP Tools
for comprehensive genomics research

Key Capabilities

Feature	Implementation
Caching	NodeCache with TTL (5-10 minutes)
Rate Limiting	100 requests/minute per endpoint
Error Handling	Exponential backoff retry
Input Validation	Gene ID and sequence validation
Logging	Structured logging with Pino
Monitoring	Cache hit/miss tracking

Architecture Benefits

- Node.js async I/O with connection pooling for efficient API communication

Natural Language Queries

Boolean Logic Support

```
# Find DNA repair genes excluding p53 in humans
alliance "breast cancer genes in human AND DNA repair NOT p53"
# Result: 6,021 genes (XRCC3, XRCC1, RAD50, ERCC1, etc.)

# Multiple terms with OR
alliance "insulin OR glucose in mouse"
# Result: 28 genes (Insl5, Igfbp7, Irs3, Ide, etc.)

# Species-specific research
alliance "BRCA1 in human"
# Result: 29 human-specific BRCA1-related genes
```

Supported Operators

`AND`, `OR`, `NOT` + Species filters (`in human`, `in mouse`, etc.)

Cross-Entity Search

Multi-Dimensional Queries

```
// Search genes, diseases, and phenotypes simultaneously
{
  "tool": "complex_search",
  "arguments": {
    "query": "insulin resistance genes and diabetes diseases in human",
    "limit": 10
  }
}

// Advanced faceted search with multiple filters
{
  "tool": "faceted_search",
  "arguments": {
    "genes": ["BRCA1", "BRCA2", "TP53"],
    "diseases": ["breast cancer", "ovarian cancer"],
    "processes": ["DNA repair", "apoptosis"],
    "species": "Homo sapiens"
  }
```