MCP Servers

Clinical Data Analysis

Guide to the three Model Context Protocol servers for analyzing the Heart Disease UCI dataset using Claude AI.

Cirillo Michele 01/2026

OVERVIEW

System Architecture

MCP1

ClinicalDataETL

Data extraction, transformation and loading

MCP2

ClinicalDataAnalyzer

Statistical and explorative analysis

MCP3

MedicalKnowledgeGraph

Representation of clinical relationships on a graph

*Dataset: **Heart Disease UCI** — 303 patients, 14 clinical features, Cleveland Clinic.*

MCP 1

ClinicalDataETL

Data lifecycle management: download, cleansing, transformation, and feature engineering.

1

fetch_and_process_heart_data

Download and process the dataset with missing values handling and type conversion

2

get_dataset_info

Returns complete metadata: columns, source URL, description

3

analyze_heart_disease

Descriptive statistics and correlations

4

export_processed_data

Export data in JSON or CSV format

MCP 1

Feature Engineering

The ETL server automatically enriches the dataset with derived features:

- age_group

  Categorization: young / adult / elderly

- bp_category

  Blood pressure: normal / elevated / high

- chol_category

  Cholesterol: normal / borderline / high

- risk_score

  Cholesterol: normal / borderline / high

- has_disease

  Binary transformation of disease presence

MCP 2

ClinicalDataAnalyzer

Advanced statistical analysis, anomaly detection, and data quality assessment.

1

analyze_clinical_data

Descriptive statistics: mean, median, standard deviation, quartiles

2

exploratory_data_analysis

Complete EDA with correlations, patterns and feature-outcome relationships

3

detect_data_issues

Detection of missing values, outliers and inconsistencies

4

get_analyzer_info

Supported version and operations

MCP 3

MedicalKnowledgeGraph

Building and managing a knowledge graph to identify complex clinical relationships.

1

explore_relations

Explore feature connections with correlations and interpretations

2

clinical_insights

Explore relationships and risk factors

3

kg_status

System status, graph size and available tools

MCP 3

Knowledge Graph Architecture

Nodes

Each clinical feature with:

- *Name and data type*
- *Descriptive statistics*
- *Clinical relevance*

Arches

Weighted relationships with:

- *Correlation coefficient*
- *P-value significance*

WORKFLOW

Integration with Claude AI

1

Loading

fetch_and_process_heart_data()

2

Analysis

analyze_clinical_data() + detect_data_issues()

3

EDA

exploratory_data_analysis()

4

Knowledge Graph

clinical_insights()

CONCLUSIONS

Advantages of the System

Automation

Automatic management of the complete data cycle

Quality control

Automatic detection of problems and anomalies

Insights

Knowledge graph for non-obvious relationships

Integration

Via FastMcp with Claude AI

Future developments: *Extension to new clinical datasets, integrated ML algorithms, interactive visualizations.*

Example prompt:

Analyze the Heart Disease dataset from UCI and identify which combinations of risk factors are most impactful for detecting heart disease. Provide actionable insights that a cardiologist can use to prioritize preventative interventions.