API Interface Documentation

1. Get Historical Budget Data

This API retrieves historical budget data with a time dimension. The `cash_flows` represent the cash flow data for each year, and the `year` indicates the corresponding year.

- **Route**: `http://59.65.191.49:9090/history`
- **Method**: `GET`
- **Input**: None
- **Output**:

```
{
    "historical": [
        {
            "cash_flows": [
                -300000,
                120000,
                150000
            ],
            "year": 2025
        },
        {
            "cash_flows": [
                -250000,
                120000,
                150000
            ],
            "year": 2024
        },
        {
            "cash_flows": [
                -200000,
                120000,
                150000
            ],
            "year": 2023
        }
    ]
}
```

2. Perform Full Analysis

This API performs a comprehensive analysis of a project, including COCOMO calculation, financial metric calculation, resource allocation analysis, and risk analysis. The input includes COCOMO parameters, a discount rate, and resource allocation information. The output provides detailed results in multiple categories, such as COCOMO output, financial metrics, resource scheduling, and risk analysis.

- **Route**: `http://59.65.191.49:9090/analyze`
- **Method**: `POST`
- **Input**:

```
{
    "cocomo": {
        "sloc": 15000,
        "project_class": "S",
        "eaf": 1.1
    },
    "discount_rate": 0.07,
    "resource_allocation_inputs": {
        "tasks": [
            {
                "id": "T1",
                "name": "Requirement Analysis",
                "duration": 5,
                "dependencies": []
            },
            {
                "id": "T2",
                "name": "System Design",
                "duration": 8,
                "dependencies": ["T1"]
            },
            {
                "id": "T3",
                "name": "Development Implementation",
                "duration": 20,
                "dependencies": ["T2"]
            },
            {
                "id": "T4",
                "name": "Testing Verification",
                "duration": 7,
                "dependencies": ["T3"]
            }
        }
```

```
        ],
        "resource_capacity": {
            "developers": 6,
            "testers": 3
        }
    }
}
```

- **Output**:

```
{
    "cocomo": {
        "D": 10.272607456387178,
        "E": 41.21991232716921,
        "P": 4.012604638322863,
        "cost_USD": 164879.65,
        "input_parameters": {
            "eaf": 1.0,
            "project_class": "O",
            "sloc": 15000
        }
    },
    "financial": {
        "budgetTracking": {
            "actual": [
                -164879.65,
                165000.0,
                180000.0,
                195000.0
            ],
            "planned": [
                164879.65,
                0,
                0,
                0
            ],
            "variance": [
                -329759.3,
                165000.0,
                180000.0,
                195000.0
            ]
        },
        "cashFlowAnalysis": [
            {
```

```json
            "cashFlow": -164879.65,
            "period": "Period 0"
        },
        {

            "cashFlow": 165000.0,
            "period": "Period 1"
        },
        {

            "cashFlow": 180000.0,
            "period": "Period 2"
        },
        {

            "cashFlow": 195000.0,
            "period": "Period 3"
        }
    ],
    "discount_rate": 0.07,
    "irr": 90.18,
    "npv": 305723.01,
    "payback_period": 1.0,
    "roi": 127.51
},
"resource_schedule": {
    "criticalPath": [
        "T4"
    ],
    "optimization": {
        "current": {
            "cost": 164879.65,
            "duration": 40
        },
        "optimized": {
            "cost": 156635.66749999998,
            "duration": 36.0
        },
        "savings": {
            "cost": 8243.9825,
            "time": 4.0
        }
    },
    "projectDuration": 40,
    "resourceUtilization": [
        {
            "name": "developers",
            "utilization": 0.47
        },
```

```json
            {
                "name": "testers",
                "utilization": 0.4
            }
        ],
        "totalCost": 164879.65
    },
    "risk_analysis": {
        "monteCarloResults": {
            "confidenceInterval": {
                "lower": 114559.88,
                "upper": 220179.38
            },
            "distribution": [
                {
                    "frequency": 4,
                    "value": 57995.84508259606
                },
                {
                    "frequency": 22,
                    "value": 81388.96596879902
                },
                {
                    "frequency": 96,
                    "value": 104782.086855002
                },
                {
                    "frequency": 228,
                    "value": 128175.20774120497
                },
                {
                    "frequency": 272,
                    "value": 151568.32862740793
                },
                {
                    "frequency": 226,
                    "value": 174961.4495136109
                },
                {
                    "frequency": 104,
                    "value": 198354.57039981388
                },
                {
                    "frequency": 38,
                    "value": 221747.69128601684
                },
```

```json
            {
                "frequency": 9,
                "value": 245140.8121722198
            },
            {
                "frequency": 1,
                "value": 268533.93305842276
            }
        ],
        "expectedValue": 165517.14,
        "standardDeviation": 32274.41
    },
    "riskMatrix": [
        {
            "impact": 0.8,
            "name": "Technical Complexity Risk",
            "probability": 0.3,
            "score": 0.24
        },
        {
            "impact": 0.6,
            "name": "Human Resource Risk",
            "probability": 0.2,
            "score": 0.12
        },
        {
            "impact": 0.9,
            "name": "Budget Overrun Risk",
            "probability": 0.4,
            "score": 0.36
        }
    ],
    "sensitivityAnalysis": [
        {
            "impact": -2.85,
            "variable": "discount_rate"
        },
        {
            "impact": 10.0,
            "variable": "development_cost"
        },
        {
            "impact": 20.0,
            "variable": "project_scale"
        }
    ],
```

```
        "totalRiskScore": 0.72
    }
}
```