

# Neo4j / Cypher 快速参考

图数据库查询、节点、关系、模式匹配

## Cypher 基础

### 查询结构

|                               |         |
|-------------------------------|---------|
| <b>MATCH</b>                  | 在图中查找模式 |
| <b>WHERE</b>                  | 过滤结果    |
| <b>RETURN</b>                 | 指定输出列   |
| <b>CREATE</b>                 | 创建节点和关系 |
| <b>SET / REMOVE</b>           | 更新属性和标签 |
| <b>DELETE / DETACH DELETE</b> | 删除节点和关系 |

### 运行查询

```
// Neo4j Browser: paste and run with Ctrl+Enter
// cypher-shell:
cypher-shell -u neo4j -p secret "MATCH (n) RETURN n LIMIT 5"
```

## 节点与标签

### 节点语法

```
(n) // anonymous node
(p:Person) // node with label
(p:Person:Employee) // multiple labels
(p:Person {name: "Alice", age: 30})
```

### 标签操作

```
SET n:Active // add label
REMOVE n:Active // remove label
MATCH (n) RETURN labels(n) // list labels
```

### 约束与索引

```
CREATE CONSTRAINT FOR (p:Person)
  REQUIRE p.email IS UNIQUE
CREATE INDEX FOR (p:Person) ON (p.name)
SHOW INDEXES
```

## 关系

### 关系语法

```
-[r]-> // directed (outgoing)
<-[r]- // directed (incoming)
-[r]- // undirected
-[:KNOWS]-> // typed relationship
-[r:KNOWS {since: 2020}]-> // with properties
```

### 可变长路径

```
-[:KNOWS*2]-> // exactly 2 hops
-[:KNOWS*1..3]-> // 1 to 3 hops
-[:KNOWS*]-> // any number of hops
shortestPath((a)-[*]-(b)) // shortest path
```

## CREATE

### 创建节点

```
CREATE (p:Person {name: "Alice", age: 30})
CREATE (p:Person {name: "Bob"})
RETURN p
```

### 创建关系

```
MATCH (a:Person {name: "Alice"})
MATCH (b:Person {name: "Bob"})
CREATE (a)-[:KNOWS {since: 2020}]->(b)
```

### MERGE (Upsert)

```
MERGE (p:Person {email: "alice@example.com"})
ON CREATE SET p.name = "Alice", p.created = date()
ON MATCH SET p.lastSeen = date()
```

## MATCH

### 基本模式

```
MATCH (p:Person) RETURN p
MATCH (p:Person)-[:KNOWS]->(f) RETURN p, f
MATCH (a)-[r]->(b) RETURN type(r), a, b
```

### OPTIONAL MATCH

```
// Returns null for missing matches (like LEFT JOIN)
MATCH (p:Person)
OPTIONAL MATCH (p)-[:OWNS]->(c:Car)
RETURN p.name, c.model
```

### 模式推导式

```
MATCH (p:Person)
RETURN p.name,
  [(p)-[:KNOWS]->(f) | f.name] AS friends
```

## WHERE

### 比较与逻辑

```
WHERE p.age > 25
WHERE p.age >= 18 AND p.active = true
WHERE p.name <> "Bob" OR p.role = "admin"
WHERE NOT (p)-[:BLOCKED]->()
```

### 字符串与列表谓词

```
WHERE p.name STARTS WITH "Al"
WHERE p.name CONTAINS "ice"
WHERE p.name =~ "(?)alice.*" // regex
WHERE p.age IN [25, 30, 35]
```

### NULL 与存在性检查

```
WHERE p.email IS NOT NULL
WHERE p.phone IS NULL
WHERE EXISTS { (p)-[:KNOWS]->(:Person) }
```

## RETURN

### 输出选项

```
RETURN p.name AS name, p.age AS age
RETURN DISTINCT p.city
RETURN p, collect(f) AS friends
RETURN count(*) AS total
```

### 排序与分页

```
RETURN p.name ORDER BY p.age DESC
RETURN p SKIP 10 LIMIT 5
```

## UNWIND

```
// Expand a list into rows
UNWIND [1, 2, 3] AS x RETURN x
UNWIND $names AS name
MERGE (p:Person {name: name})
```

## 更新与删除

### SET 属性

```
MATCH (p:Person {name: "Alice"})
SET p.age = 31, p.updated = date()
SET p += {city: "NYC", active: true}
```

## REMOVE

```
MATCH (p:Person {name: "Alice"})
REMOVE p.temp_field // remove property
REMOVE p:Inactive // remove label
```

## DELETE

```
MATCH (p:Person {name: "Bob"})
DETACH DELETE p // delete node + all rels
// DELETE p // fails if node has rels
MATCH ()-[r:OLD_REL]->() DELETE r // delete rel
```

## 聚合

### 聚合函数

|                               |           |
|-------------------------------|-----------|
| <b>count(x)</b>               | 非空值的数量    |
| <b>sum(x)</b>                 | 数值之和      |
| <b>avg(x)</b>                 | 数值平均值     |
| <b>min(x) / max(x)</b>        | 最小值 / 最大值 |
| <b>collect(x)</b>             | 将值聚合为列表   |
| <b>percentileCont(x, 0.5)</b> | 连续百分位数    |

### 隐式 GROUP BY

```
// Non-aggregated columns become grouping keys
MATCH (p:Person)-[:LIVES_IN]->(c:City)
RETURN c.name, count(p) AS population
ORDER BY population DESC
```

### WITH (链式聚合)

```
MATCH (p:Person)-[:KNOWS]->(f)
WITH p, count(f) AS friendCount
WHERE friendCount > 5
RETURN p.name, friendCount
```

## 常见模式

### 查找共同好友

```
MATCH (a:Person {name: "Alice"})-[:KNOWS]->(m)-[:KNOWS]->(b:Person
{name: "Bob"})
RETURN m.name AS mutualFriend
```

### 推荐 (好友的好友)

```
MATCH (p:Person {name: "Alice"})-[:KNOWS*2]-(fof)
WHERE NOT (p)-[:KNOWS]-(fof) AND p <> fof
RETURN DISTINCT fof.name
```

### 导入 CSV 数据

```
LOAD CSV WITH HEADERS FROM 'file:///people.csv' AS row
MERGE (p:Person {id: row.id})
SET p.name = row.name, p.age = toInteger(row.age)
```

### 数据库信息

```
CALL db.labels() // list all labels
CALL db.relationshipTypes() // list rel types
CALL db.schema.visualization()
```