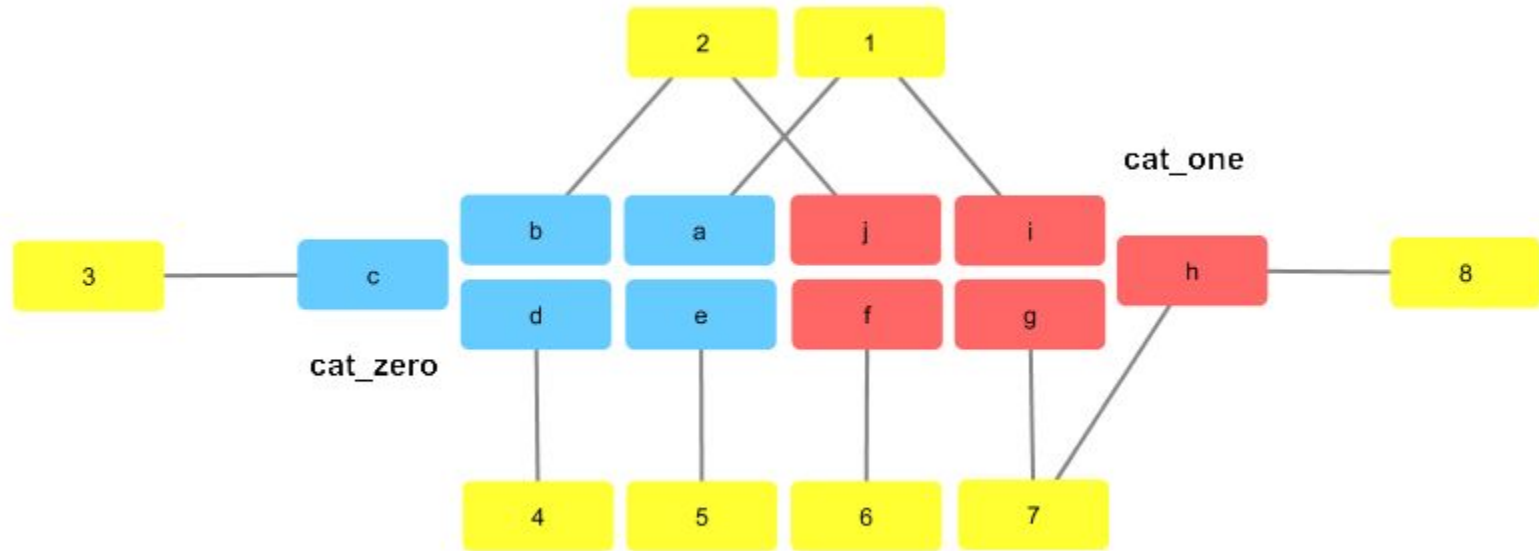


# Simple Test Case:





# The Script : Usage

network\_analysis.py

-node {PATH to NODE FILE}

-edge {PATH to EDGE FILE}

[-o {PATH to OUTPUT DIRECTORY}]

-f {FEATURE COLUMN for comparison}

-c {CATEGORY of FEATURE} {CATEGORY of FEATURE}

[-n {N\_ITERATIONS for Monte Carlo Simulation}]

# Under the Hood

## Node File

| node_name | node_display | node_type | degree | weighted | a_1       | a_2      | a_3       | a_4         | a_5         | a_6    | a_7  | a_8  | a_9   | a_10  | a_11      | feature  | a_12  | a_13     | a_14    |
|-----------|--------------|-----------|--------|----------|-----------|----------|-----------|-------------|-------------|--------|------|------|-------|-------|-----------|----------|-------|----------|---------|
| 1         | otu_node     | 18        | 2      | kpcofg   | otu       | otu      | otu       | otu         | otu         | otu    | otu  | otu  | otu   | otu   | otu       | otu      | otu   | otu      | otu     |
| 2         | otu_node     | 0         | 2      | kpcofg   | otu       | otu      | otu       | otu         | otu         | otu    | otu  | otu  | otu   | otu   | otu       | otu      | otu   | otu      | otu     |
| 3         | otu_node     | 3         | 1      | kpcofg   | otu       | otu      | otu       | otu         | otu         | otu    | otu  | otu  | otu   | otu   | otu       | otu      | otu   | otu      | otu     |
| 4         | otu_node     | 1         | 1      | kpcofg   | otu       | otu      | otu       | otu         | otu         | otu    | otu  | otu  | otu   | otu   | otu       | otu      | otu   | otu      | otu     |
| 5         | otu_node     | 4         | 1      | kpcofg   | otu       | otu      | otu       | otu         | otu         | otu    | otu  | otu  | otu   | otu   | otu       | otu      | otu   | otu      | otu     |
| 6         | otu_node     | 1         | 1      | kpcofg   | otu       | otu      | otu       | otu         | otu         | otu    | otu  | otu  | otu   | otu   | otu       | otu      | otu   | otu      | otu     |
| 7         | otu_node     | 3         | 2      | kpcofg   | otu       | otu      | otu       | otu         | otu         | otu    | otu  | otu  | otu   | otu   | otu       | otu      | otu   | otu      | otu     |
| 8         | otu_node     | 3         | 1      | kpcofg   | otu       | otu      | otu       | otu         | otu         | otu    | otu  | otu  | otu   | otu   | otu       | otu      | otu   | otu      | otu     |
| a         | a            | user_node | 1      | 1000     | gibberish | nonsense | arbitrary | meaningless | unnecessary | number | zero | name | stuff | value | something | cat_zero | goods | services | pickles |
| b         | b            | user_node | 1      | 1000     | gibberish | nonsense | arbitrary | meaningless | unnecessary | number | one  | name | stuff | value | something | cat_zero | goods | services | pickles |
| c         | c            | user_node | 1      | 1000     | gibberish | nonsense | arbitrary | meaningless | unnecessary | number | zero | name | stuff | value | something | cat_zero | goods | services | pickles |
| d         | d            | user_node | 1      | 1000     | gibberish | nonsense | arbitrary | meaningless | unnecessary | number | one  | name | stuff | value | something | cat_zero | goods | services | pickles |
| e         | e            | user_node | 1      | 1000     | gibberish | nonsense | arbitrary | meaningless | unnecessary | number | zero | name | stuff | value | something | cat_zero | goods | services | pickles |
| f         | f            | user_node | 1      | 1000     | gibberish | nonsense | arbitrary | meaningless | unnecessary | number | one  | name | stuff | value | something | cat_one  | goods | services | pickles |
| g         | g            | user_node | 1      | 1000     | gibberish | nonsense | arbitrary | meaningless | unnecessary | number | zero | name | stuff | value | something | cat_one  | goods | services | pickles |
| h         | h            | user_node | 2      | 1000     | gibberish | nonsense | arbitrary | meaningless | unnecessary | number | one  | name | stuff | value | something | cat_one  | goods | services | pickles |
| i         | i            | user_node | 1      | 1000     | gibberish | nonsense | arbitrary | meaningless | unnecessary | number | zero | name | stuff | value | something | cat_one  | goods | services | pickles |
| j         | j            | user_node | 1      | 1000     | gibberish | nonsense | arbitrary | meaningless | unnecessary | number | one  | name | stuff | value | something | cat_one  | goods | services | pickles |

# Under the Hood

## Edge File

| from | to | weight | a_1       | a_2      | a_3       | a_4         | a_5         | a_6    | a_7  | a_8  | a_9   | a_10  | a_11      | feature  | a_12  | a_13     | a_14    |
|------|----|--------|-----------|----------|-----------|-------------|-------------|--------|------|------|-------|-------|-----------|----------|-------|----------|---------|
| a    | 1  | 1      | gibberish | nonsense | arbitrary | meaningless | unnecessary | number | zero | name | stuff | value | something | cat_zero | goods | services | pickles |
| b    | 2  | 1      | gibberish | nonsense | arbitrary | meaningless | unnecessary | number | one  | name | stuff | value | something | cat_zero | goods | services | pickles |
| c    | 3  | 1      | gibberish | nonsense | arbitrary | meaningless | unnecessary | number | zero | name | stuff | value | something | cat_zero | goods | services | pickles |
| d    | 4  | 1      | gibberish | nonsense | arbitrary | meaningless | unnecessary | number | one  | name | stuff | value | something | cat_zero | goods | services | pickles |
| e    | 5  | 1      | gibberish | nonsense | arbitrary | meaningless | unnecessary | number | zero | name | stuff | value | something | cat_zero | goods | services | pickles |
| f    | 6  | 1      | gibberish | nonsense | arbitrary | meaningless | unnecessary | number | one  | name | stuff | value | something | cat_one  | goods | services | pickles |
| g    | 7  | 1      | gibberish | nonsense | arbitrary | meaningless | unnecessary | number | zero | name | stuff | value | something | cat_one  | goods | services | pickles |
| h    | 8  | 1      | gibberish | nonsense | arbitrary | meaningless | unnecessary | number | one  | name | stuff | value | something | cat_one  | goods | services | pickles |
| i    | 1  | 1      | gibberish | nonsense | arbitrary | meaningless | unnecessary | number | zero | name | stuff | value | something | cat_one  | goods | services | pickles |
| j    | 2  | 1      | gibberish | nonsense | arbitrary | meaningless | unnecessary | number | one  | name | stuff | value | something | cat_one  | goods | services | pickles |
| h    | 7  | 1      | gibberish | nonsense | arbitrary | meaningless | unnecessary | number | one  | name | stuff | value | something | cat_one  | goods | services | pickles |

# Under the Hood

Join, and separate

| from | to | feature  | degree |
|------|----|----------|--------|
| a    | 1  | cat_zero | 2      |
| i    | 1  | cat_one  | 2      |
| b    | 2  | cat_zero | 2      |
| j    | 2  | cat_one  | 2      |
| c    | 3  | cat_zero | 1      |
| d    | 4  | cat_zero | 1      |
| e    | 5  | cat_zero | 1      |
| f    | 6  | cat_one  | 1      |
| g    | 7  | cat_one  | 2      |
| h    | 7  | cat_one  | 2      |
| h    | 8  | cat_one  | 1      |

| from | to | feature  | degree |
|------|----|----------|--------|
| a    | 1  | cat_zero | 2      |
| b    | 2  | cat_zero | 2      |
| c    | 3  | cat_zero | 1      |
| d    | 4  | cat_zero | 1      |
| e    | 5  | cat_zero | 1      |

- cat\_zero\_table

| from | to | feature | degree |
|------|----|---------|--------|
| i    | 1  | cat_one | 2      |
| j    | 2  | cat_one | 2      |
| f    | 6  | cat_one | 1      |
| g    | 7  | cat_one | 2      |
| h    | 7  | cat_one | 2      |
| h    | 8  | cat_one | 1      |

- cat\_one\_table

- df\_union

# Under the Hood

## Further Separation

| from | to | feature  | degree |
|------|----|----------|--------|
| a    | 1  | cat_zero | 2      |
| i    | 1  | cat_one  | 2      |
| b    | 2  | cat_zero | 2      |
| j    | 2  | cat_one  | 2      |
| c    | 3  | cat_zero | 1      |
| d    | 4  | cat_zero | 1      |
| e    | 5  | cat_zero | 1      |
| f    | 6  | cat_one  | 1      |
| g    | 7  | cat_one  | 2      |
| h    | 7  | cat_one  | 2      |
| h    | 8  | cat_one  | 1      |

- df\_union

| from | to | feature  | degree |
|------|----|----------|--------|
| c    | 3  | cat_zero | 1      |
| d    | 4  | cat_zero | 1      |
| e    | 5  | cat_zero | 1      |

- otu\_zero\_only

| from | to | feature | degree |
|------|----|---------|--------|
| h    | 6  | cat_one | 1      |
| i    | 7  | cat_one | 1      |
| j    | 8  | cat_one | 1      |

- otu\_one\_only

| from | to | feature  | degree |
|------|----|----------|--------|
| a    | 1  | cat_zero | 2      |
| b    | 2  | cat_zero | 2      |
| f    | 1  | cat_one  | 2      |
| g    | 2  | cat_one  | 2      |

- otu\_both

# Under the Hood

## Reduction

otu\_zero\_only

| from | to | feature  | degree |
|------|----|----------|--------|
| c    | 3  | cat_zero | 1      |
| d    | 4  | cat_zero | 1      |
| e    | 5  | cat_zero | 1      |

| from | to | feature  | degree |
|------|----|----------|--------|
| c    | 3  | cat_zero | 1      |
| d    | 4  | cat_zero | 1      |
| e    | 5  | cat_zero | 1      |

otu\_zero\_only

otu\_one\_only

| from | to | feature | degree |
|------|----|---------|--------|
| h    | 6  | cat_one | 1      |
| i    | 7  | cat_one | 1      |
| j    | 8  | cat_one | 1      |

| from | to | feature | degree |
|------|----|---------|--------|
| h    | 6  | cat_one | 1      |
| i    | 7  | cat_one | 1      |
| j    | 8  | cat_one | 1      |

otu\_one\_only

otu\_both

| from | to | feature  | degree |
|------|----|----------|--------|
| a    | 1  | cat_zero | 2      |
| b    | 2  | cat_zero | 2      |
| f    | 1  | cat_one  | 2      |
| g    | 2  | cat_one  | 2      |

| from | to | feature  | degree |
|------|----|----------|--------|
| a    | 1  | cat_zero | 2      |
| b    | 2  | cat_zero | 2      |

otu\_both

# Under the Hood

## Sample Node Degree Stats

cat\_zero\_table

| from | to | feature  | degree |
|------|----|----------|--------|
| a    | 1  | cat_zero | 2      |
| b    | 2  | cat_zero | 2      |
| c    | 3  | cat_zero | 1      |
| d    | 4  | cat_zero | 1      |
| e    | 5  | cat_zero | 1      |

cat\_one\_table

| from | to | feature | degree |
|------|----|---------|--------|
| i    | 1  | cat_one | 2      |
| j    | 2  | cat_one | 2      |
| f    | 6  | cat_one | 1      |
| g    | 7  | cat_one | 2      |
| h    | 7  | cat_one | 2      |
| h    | 8  | cat_one | 1      |

## Degree Statistics Dataframe

Sample, Calculate Summary, Append

1000 iterations



# Under the Hood

## OTU Node Degree Stats

otu\_zero\_only

| from | to | feature    | degree |
|------|----|------------|--------|
| c    |    | 3 cat_zero | 1      |
| d    |    | 4 cat_zero | 1      |
| e    |    | 5 cat_zero | 1      |

otu\_one\_only

| from | to | feature   | degree |
|------|----|-----------|--------|
| h    |    | 6 cat_one | 1      |
| i    |    | 7 cat_one | 1      |
| j    |    | 8 cat_one | 1      |

otu\_both

| from | to | feature    | degree |
|------|----|------------|--------|
| a    |    | 1 cat_zero | 2      |
| b    |    | 2 cat_zero | 2      |

## Degree Statistics Dataframe

Sample, Calculate Summary, Append

1000 iterations



# Under the Hood

## Degree Statistics Dataframe



Sample, Calculate Summary, Append

1000 iterations



`column.mean()`

## Output Statistics

*Minimum*

*Q1*

*Mean*

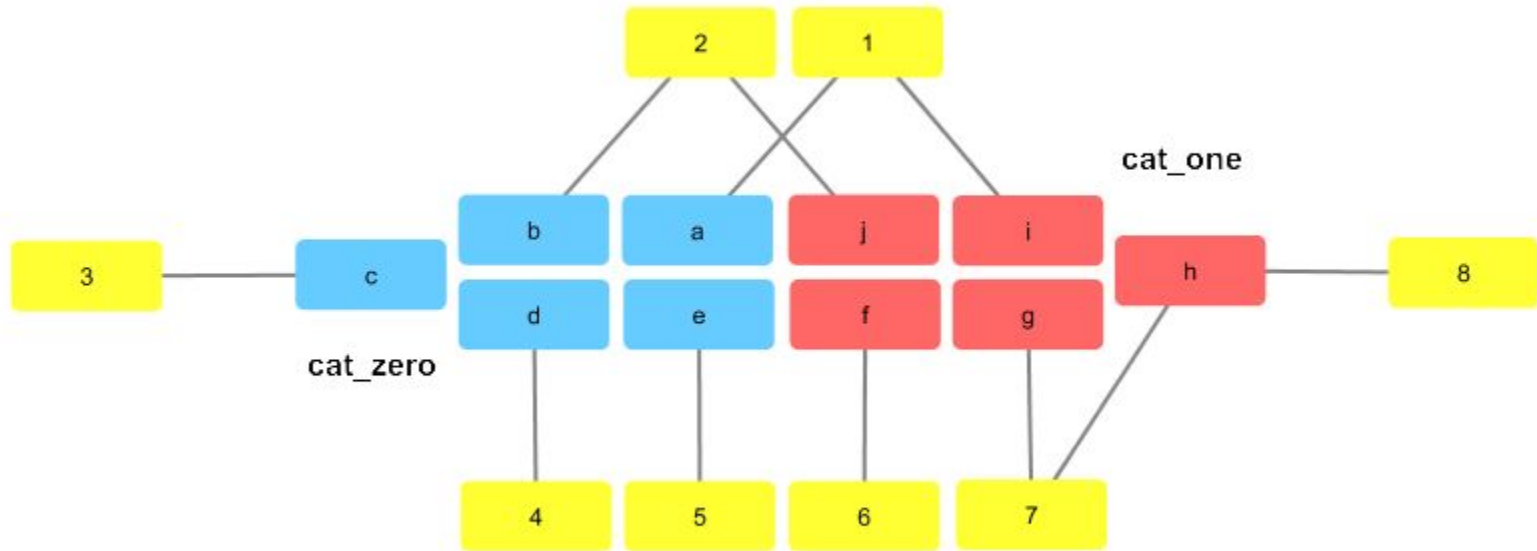
*Median*

*Q3*

*Max*

*Std Dev*

# Test Case Network





# Under the Hood

## Output statistics

|          | Minimum | Q1    | Mean  | Median | Q3    | Max | Std Dev |
|----------|---------|-------|-------|--------|-------|-----|---------|
| cat_zero | 1.0     | 1.0   | 1.396 | 1.095  | 1.967 | 2.0 | 0.489   |
| cat_one  | 1.0     | 1.155 | 1.669 | 1.981  | 2.0   | 2.0 | 0.47    |
| otu_zero | 1.0     | 1.0   | 1.0   | 1.0    | 1.0   | 1.0 | 0.0     |
| otu_one  | 1.0     | 1.0   | 1.331 | 1.015  | 1.841 | 2.0 | 0.47    |
| otu_both | 2.0     | 2.0   | 2.0   | 2.0    | 2.0   | 2.0 | 0.0     |