

## BI / read / 19

|       |           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |             |              |                                                   |
|-------|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|--------------|---------------------------------------------------|
| BI 1  | query     | BI / read / 19                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |             |              |                                                   |
| BI 2  | title     | Interaction path between cities                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |             |              |                                                   |
| BI 3  | pattern   | <p>Find the shortest paths between all pairs of Persons in city1 and city2</p> <p>city1: City<br/>id = \$city1id</p> <p>city2: City<br/>id = \$city2id</p> <p>person1: Person<br/>isLocatedIn</p> <p>person2: Person<br/>isLocatedIn</p> <p>compute weighted shortest paths on knows.weight</p> <p>The weight of a knows edge is based on the number of interactions between its Persons:<br/>knows.weight = 1 / (count(i1)+count(i2))</p> <p>Case i1: Reply from personA to Person B's Message</p> <p>Case i2: Reply from personB to personA's Message</p>                                                                                                                                                                                |             |              |                                                   |
| BI 13 | desc.     | <p>Given two Cities city1, city2, find Persons person1, person2 living in these Cities (respectively) with the shortest <i>interaction path</i> between them. If there are multiple pairs of people with shortest paths having the same total weight, return all of them.</p> <p>The shortest path is computed using a weight between two Persons defined as the reciprocal of the number of interactions (direct reply Comments to a Message by the other Person). Therefore, more interactions imply a smaller weight.</p> <p><i>Note:</i> Interactions are counted both ways, i.e. if Alice writes 2 reply Comments to Bob's Messages and Bob writes 3 reply Comments to Alice's Messages, their total number of interactions is 5.</p> |             |              |                                                   |
| BI 14 | params    | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | city1Id     | ID           | Small Cities within the same Country are selected |
| BI 15 |           | 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | city2Id     | ID           |                                                   |
| BI 16 | result    | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | person1.id  | ID           | R                                                 |
| BI 17 |           | 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | person2.id  | ID           | R                                                 |
| BI 18 |           | 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | totalWeight | 64-bit Float | C                                                 |
| BI 19 | sort      | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | totalWeight | ↑            |                                                   |
| BI 20 |           | 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | person1.id  | ↑            |                                                   |
|       |           | 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | person2.id  | ↑            |                                                   |
|       | limit     | 20                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |             |              |                                                   |
|       | CPs       | 3.3, 7.6, 7.7, 8.4, 8.6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |             |              |                                                   |
|       | relevance | Finding shortest paths between pairs of Persons in Cities can be implemented in theory with an <i>all-pairs shortest paths</i> algorithm. However, this needs to be executed on the whole Person-knows-Person graph (with edge weights derived from the number of interactions) so it is expected to be prohibitively expensive. A better approach is using multiple <i>single-source shortest path algorithms</i> (e.g. from the City with fewer inhabitants).                                                                                                                                                                                                                                                                            |             |              |                                                   |