**Compute Relative Frequencies**

Number of Input-Splits: 2

Number of Reducers: 1

Input Split 0

15 91 80 12 19 80 18

17 15 80 18 19 18

Input Split 1

19 15 80 18 19 18

18 15 18 18 80 18

1. Pair Approach
2. Stripe Approach

**(a): Pair Approach**

|  |  |  |
| --- | --- | --- |
| **0** | **1** | **Input-split (mapper input)** |
| 15 91 80 12 19 80 18  17 15 80 18 19 18 | 19 15 80 18 19 18  18 15 18 18 80 18 |
| **Record 1** | | **Mapper output** |
| ((15,91),1)  ((15,\*),1)  ((15,80),1)  ((15,\*),1)  ((15,12),1)  ((15,\*),1)  ((15,19),1)  ((15,\*),1)  ((15,80),1)  ((15,\*),1)  ((15,18),1)  ((15,\*),1)  ((91,80),1)  ((91,\*),1)  ((91,12),1)  ((91,\*),1)  ((91,19),1)  ((91,\*),1)  ((91,80),1)  ((91,\*),1)  ((91,18),1)  ((91,\*),1)  ((80,12),1)  ((80,\*),1)  ((80,90),1)  ((80,\*),1)  ((12,19),1)  ((12,\*),1)  ((12,80),1)  ((12,\*),1)  ((12,18),1)  ((12,\*),1)  ((19,80),1)  ((19,\*),1)  ((19,18),1)  ((19,\*),1)  ((80,18),1)  (80,\*),1) | ((19,15),1)  ((19,\*),1)  ((19,80),1)  ((19,\*),1)  ((19,18),1)  ((19,\*),1)  ((15,80),1)  ((15,\*),1)  ((15,18),1)  ((15,\*),1)  ((15,19),1)  ((15,\*),1)  ((15,18),1)  ((15,\*),1)  ((80,18),1)  ((80,\*),1)  ((80,19),1)  ((80,\*),1)  ((80,18),1)  ((80,\*),1)  ((18,19),1)  ((18,\*),1)  ((19,18),1)  ((19,\*),1) |
| **Record 2** | |
| ((17,15),1)  ((17,\*),1)  ((17,80),1)  ((17,\*),1)  ((17,18),1)  ((17,\*),1)  ((17,19),1)  ((17,\*),1)  ((17,18),1)  ((17,\*),1)  ((15,80),1)  ((15,\*),1)  ((15,18),1)  ((15,\*),1)  ((15,19),1)  ((15,\*),1)  ((15,18),1)  ((15,\*),1)  ((80,18),1)  ((80,\*),1)  ((80,19),1)  ((80,\*),1)  ((80,18),1)  ((80,\*),1)  ((18,19),1)  ((18,\*),1)  ((19,18),1)  ((19,\*),1) | ((18,15),1)  ((18,\*),1)  ((15,18),1)  ((15,\*),1)  ((15,18),1)  ((15,\*),1)  ((15,80),1)  ((15,\*),1)  ((15,18),1)  ((15,\*),1)  ((18,80),1)  ((18,\*),1)  ((80,18),1)  ((80,\*),1) |
|  |  | **Shuffle & Sort** |
| ((12,\*),[1,1,1])  ((12,18),[1])  ((12,19),[1])  ((12,80),[1])  ((15,\*),[1,1,1,1,1,1])  ((15,12),[1])  ((15,18),[1])  ((15,19),[1])  ((15,80),[1,1])  ((15,91),[1])  ((19,\*),[1,1])  ((19,18),[1])  ((19,80),[1])  ((80,\*),[1,1,1])  ((80,12),[1])  ((80,18),[1])  ((80,19),[1])  ((91,\*),[1])  ((91,12),[1])  ((91,18),[1])  ((91,19),[1])  ((91,80),[1,1]) | ((15,\*),[1,1,1,1])  ((15,18),[1,1])  ((15,19),[1])  ((15,80),[1])  ((18,\*),[1])  ((18,19),[1])  ((19,\*),[1])  ((19,15),[1])  ((19,18),[1,1])  ((19,80),[1])  ((80,\*),[1,1,1])  ((80,18),[1,1])  ((80,19),[1]) |  |
|  | | **Reducer Output** |

**Compute Relative Frequencies:**

Number of Input-Splits: 2

Number of Reducers: 1

Input Split 0

15 91 80 12 19 80

17 15 80 18 91 18

Input Split 1

19 15 80 18 91 18

18 15 18 18 80 18

Assuming following:

Number of Mappers: 2

Neighbour: Let the neighborhood of X, N(X) be set of all term after X and before the next X.

**Pair Approach:**

|  |  |
| --- | --- |
| Mapper 1 | Mapper 2 |
| ((12, 0), 2)  ((12, 19), 1)  ((12, 80), 1)    ((15, 0), 9)  ((15, 12), 1)  ((15, 18), 2)  ((15, 19), 1)  ((15, 80), 3)  ((15, 91), 2)    ((17, 0), 5)  ((17, 15), 1)  ((17, 18), 2)  ((17, 80), 1)  ((17, 91), 1)    ((18, 0), 1)  ((18, 91), 1)    ((19, 0), 1)  ((19, 80), 1)    ((80, 0), 5)  ((80, 12), 1)  ((80, 18), 2)  ((80, 19), 1)  ((80, 91), 1)    ((91, 0), 4)  ((91, 12), 1)  ((91, 18), 1)  ((91, 19), 1)  ((91, 80), 1) | ((15, 0), 8)  ((15, 18), 5)  ((15, 80), 2)  ((15, 91), 1)    ((18, 0), 3)  ((18, 15), 1)  ((18, 80), 1)  ((18, 91), 1)    ((19, 0), 5)  ((19, 15), 1)  ((19, 18), 2)  ((19, 80), 1)  ((19, 91), 1)    ((80, 0), 4)  ((80, 18), 3)  ((80, 91), 1)    ((91, 0), 1)  ((91, 18), 1) |

|  |
| --- |
| Shuffle-Sort |

|  |
| --- |
| Reducer 1 input: |
| ((12, 0), [2])  ((12, 19), [1])  ((12, 80), [1])    ((15, 0), [8, 9])  ((15, 12), [1])  ((15, 18), [5, 2])  ((15, 19), [1])  ((15, 80), [2, 3])  ((15, 91), [1, 2])    ((17, 0), [5])  ((17, 15), [1])  ((17, 18), [2])  ((17, 80), [1])  ((17, 91), [1])    ((18, 0), [1, 3])  ((18, 15), [1])  ((18, 80), [1])  ((18, 91), [1, 1])    ((19, 0), [1, 5])  ((19, 15), [1])  ((19, 18), [2])  ((19, 80), [1, 1])  ((19, 91), [1])    ((80, 0), [5, 4])  ((80, 12), [1])  ((80, 18), [2, 3])  ((80, 19), [1])  ((80, 91), [1, 1])    ((91, 0), [4, 1])  ((91, 12), [1])  ((91, 18), [1, 1])  ((91, 19), [1])  ((91, 80), [1]) |

|  |
| --- |
| Reducer 2 Output: |
| ((12, 19), 1/2)  ((12, 80), 1/2)    ((15, 12), 1/17)  ((15, 18), 7/17)  ((15, 19), 1/17)  ((15, 80), 5/17)  ((15, 91), 3/17)    ((17, 15), 1/5)  ((17, 18), 2/5)  ((17, 80), 1/5)  ((17, 91), 1/5)    ((18, 15), 1/4)  ((18, 80), 1/4)  ((18, 91), 2/4)    ((19, 15), 1/6)  ((19, 18), 2/6)  ((19, 80), 2/6)  ((19, 91), 1/6)    ((80, 12), 1/9)  ((80, 18), 5/9)  ((80, 19), 1/9)  ((80, 91), 2/9)    ((91, 12), 1/5)  ((91, 18), 2/5)  ((91, 19), 1/5)  ((91, 80), 1/5) |

class Reducer

total=0;

method reduce(Pair p, Counts [c1, c2, …, cn])

sum=0;

For all Count c in [c1, c2, …, cn] do

sum = sum + c;

if(p.right == 0) total = sum;

Else Emit(Pair p, Count sum/total)

**Stripe Approach:** Seeattached pdf file