COMP9313 2017s2 Assignment

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Question 1. MapReduce

```
class mapper {
      map (key, record) {
            split_record ⇐ split record with '\s+'
            product ⇐ split_record[1]
            price ⇐ split_record[2]
            EMIT(product, price)
      }
}

class reducer {
      HashMap< String, Integer> myMap
      reducer (key, values) {
            for all value ∈ values
                  myMap.put(key, record)
      }
      cleanup () {
            Map sortedMap = sortByValues(myMap)
            int counter = 0
            for all entry ∈ sortedMap {
                  if counter == 5
                        break
                  EMIT (null, entry's key)
            }
      }
}
```

Question 2. MinHash

Row	C_1	C_2
0	0	1
1	1	0
2	0	1
3	0	0
4	1	1
5	1	1
6	1	0

h1(n) = (3n + 2) mod 7
h2(n) = (2n − 1) mod 7

		Sig1	Sig2	
		∞	∞	
h1(0) =2		∞	2	update Sig2
h2(0) =6		∞	6	update Sig2
h1(1) =5		5	2	update Sig1
h2(1) =1		1	6	update Sig1
h1(2) =1		5	1	update Sig2
h2(2) =3		1	3	update Sig2
h1(3) =4		5	1	no change
h2(3) =5		1	3	no change
h1(4) =0		0	0	update Sig1 Sig2
h2(4) =0		0	0	update Sig1 Sig2
h1(5) =3		0	0	no change
h2(5) =2		0	0	no change
h1(6) =6		0	0	no change
h2(6) =4		0	0	no change

Result

	Sig1	Sig2
h1(n)	0	0
h2(n)	0	0

Question 3. Streaming Data

(16, 148) (8, 162) (8, 177) (4, 183) (2, 192) (1, 197) (1, 200)
Input from 200 to 210: 0101010101

201 Input: 0
(16, 148) (8, 162) (8, 177) (4, 183) (2, 192) (1, 197) (1, 200)

202 Input: 1
(16, 148) (8, 162) (8, 177) (4, 183) (2, 192) (1, 197) (1, 200) (1, 202)
Combine (1, 197) (1, 200)
(16, 148) (8, 162) (8, 177) (4, 183) (2, 192) (2, 200) (1, 202)

203 Input: 0
(16, 148) (8, 162) (8, 177) (4, 183) (2, 192) (2, 200) (1, 202)

204 Input: 1
(16, 148) (8, 162) (8, 177) (4, 183) (2, 192) (2, 200) (1, 202) (1, 204)

205 Input: 0
(16, 148) (8, 162) (8, 177) (4, 183) (2, 192) (2, 200) (1, 202) (1, 204)

206 Input: 1
(16, 148) (8, 162) (8, 177) (4, 183) (2, 192) (2, 200) (1, 202) (1, 204) (1, 206)
Combine (1, 202) (1, 204)
(16, 148) (8, 162) (8, 177) (4, 183) (2, 192) (2, 200) (2, 204) (1, 206)
Combine (2, 192) (2, 200)
(16, 148) (8, 162) (8, 177) (4, 183) (4, 200) (2, 204) (1, 206)

207 Input: 0
(16, 148) (8, 162) (8, 177) (4, 183) (4, 200) (2, 204) (1, 206)

208: Input: 1
(16, 148) (8, 162) (8, 177) (4, 183) (4, 200) (2, 204) (1, 206) (1, 208)

209: Input: 0
(16, 148) (8, 162) (8, 177) (4, 183) (4, 200) (2, 204) (1, 206) (1, 208)

210 Input: 1
(16, 148) (8, 162) (8, 177) (4, 183) (4, 200) (2, 204) (1, 206) (1, 208) (1, 210)

Combine (1, 206) (1, 208)
(16, 148) (8, 162) (8, 177) (4, 183) (4, 200) (2, 204) (2, 208) (1, 210)

The result is
(16, 148) (8, 162) (8, 177) (4, 183) (4, 200) (2, 204) (2, 208) (1, 210)

Question 4. Collaborative Filtering
(a)

	m1	m2	m3
u1	2		3
u2	5	2	
u3	3	3	1
u4		2	2

$$sim(x, y) = \frac{\sum_i r_{xi} \cdot r_{yi}}{\sqrt{\sum_i r_{xi}^2} \cdot \sqrt{\sum_i r_{yi}^2}}$$

sim (u1, u2) = 0.515
sim (u1, u3) = 0.573
sim (u1, u4) = 0.588

Predict u1 to m2 = (0.515*2 + 0.573*3 + 0.588*2) / (0.515 + 0.573 + 0.588)
= 2.34

(b)

	u1	u2	u3	u4
m1	2	5	3	
m2		2	3	2
m3	3		1	2

$$sim(x, y) = \frac{\sum_i r_{xi} \cdot r_{yi}}{\sqrt{\sum_i r_{xi}^2} \cdot \sqrt{\sum_i r_{yi}^2}}$$

sim (m2, m1) = 0.748
sim (m2, m3) = 0.454

Predict u1 to m2 = (0.748*2 + 0.454*3) / (0.748 + 0.454)
= 2.38