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)
                        break
        }
        cleanup () {
                Map sortedMap ⇐ sort by values in decreasing order (myMap)
                counter ⇐ 0
                for all entry ∈ sortedMap {
                        if counter == 5
                                break
                        counter++
                        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)
Since 3 buckets of size 1, 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)
Since 3 buckets of size 1, Combine (1, 202) (1, 204)
(16, 148) (8, 162) (8, 177) (4, 183) (2, 192) (2, 200) (2, 204) (1, 206)
Since 3 buckets of size 2, 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)

Since 210 – 148 > 60, drop (16, 148)
(8, 162) (8, 177) (4, 183) (4, 200) (2, 204) (1, 206) (1, 208) (1, 210)

Since 3 buckets of size 1, Combine (1, 206) (1, 208)
(8, 162) (8, 177) (4, 183) (4, 200) (2, 204) (2, 208) (1, 210)

The result is
(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

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

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

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

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