9313 Assignment

Q1

Initial state
(16, 148) (8, 162) (8, 177) (4, 183) (2, 192) (1, 197) (1, 200)

At time 201, Bit 0 arrives, nothing changes

At time 202, Bit 1 arrives, create new bucket for new 1, merge previous 2 buckets of size 1
(16, 148) (8, 162) (8, 177) (4, 183) (2, 192) (2, 200) (1, 202)

At time 203, Bit 0 arrives, nothing changes

At time 204, Bit 1 arrives, create new bucket for new 1
(16, 148) (8, 162) (8, 177) (4, 183) (2, 192) (2, 200) (1, 202) (1, 204)

At time 205, Bit 0 arrives, nothing changes

At time 206, Bit 1 arrives, create new bucket for new 1, merge previous 2 buckets of size 1, then merge previous 2 buckets of size 2
(16, 148) (8, 162) (8, 177) (4, 183) (4, 200) (2, 204) (1, 206)

At time 207, Bit 0 arrives, nothing changes

At time 208, Bit 1 arrives, create new bucket for new 1,delete the last bucket (16,148) which is out of window
(8, 162) (8, 177) (4, 183) (4, 200) (2, 204) (1, 206) (1, 208)

At time 209, Bit 0 arrives, nothing changes

At time 210, Bit 1 arrives, create new bucket for new 1, merge previous 2 buckets of size 1
(8, 162) (8, 177) (4, 183) (4, 200) (2, 204) (2, 208) (1, 210)

Q2

1.
u1 = (3, 0, 0, -1), u2 = (2, -1, 0, 3), u3 = (3, 0, 3, 1)

cos(u1, u2) = $\frac{u1 \cdot u2}{|u1|\,|u2|} = \frac{3*2+0+0+(-1)*3}{\sqrt{10}*\sqrt{15}} = 0.24$

cos(u1, u3) = $\frac{u1 \cdot u3}{|u1|\,|u3|} = \frac{3*3+0+0+(-1)*1}{\sqrt{10}*\sqrt{19}} = 0.58$

user3 has more similar taste to user 1, compared with user 2.

2.
We take the similarity results from q1

Sim(u1,u2) = 0.24
Sim(u1,u3) = 0.58

Assume N = 2, both user 2 and user 3 are the most two similar users to user 1.

The rating of use1 to movie 2
$r_{u1,m2} = \frac{\sum_{y \in N} Sim(u1,y) * r_{y,m2}}{\sum_{y \in N} Sim(u1,y)} = \frac{0.24*-1+0.58*0}{0.24+0.58} = -0.29 \approx 0$

The rating of use1 to movie 3
$r_{u1,m3} = \frac{\sum_{y \in N} Sim(u1,y) * r_{y,m2}}{\sum_{y \in N} Sim(u1,y)} = \frac{0.24*0+0.58*3}{0.24+0.58} = 2.12 \approx 2$

The calculated rating given by user 1 to movie 2 is less than movie 3. So, we should recommend movie 3 to user1.