Exercise 7

T1: {P1,P2,P3,P5,P7}
T2: {P1,P4,P5,P6,P7}
T3: {P1,P4,P6}
T4: {P1,P4,P5,P6,P7}
T5: {P3,P5}
T6: {P1,P2,P3,P7}
T7: {P2,P7}
T8: {P1,P2,P3,P4,P6,P7}

Min_Support = 3
Min_Confidence = 70%

Definition: An association rule is strong if it satisfies **both** a minimum support threshold and a minimum confidence threshold.

Find strong association rules

- Find all frequent itemsets
- Generate strong association rules from the frequent itemsets

$$\text{confidence}(A \Rightarrow B) = P(B \mid A) = \frac{\text{support\_count}(A \cup B)}{\text{support\_count}(A)}$$

P1, P2
Confidence(P1 ➔ P2) = 3 / 6 = 0.5
Confidence(P2 ➔ P1) = 3 / 4 = 0.75 (Accept)

P1, P3
Confidence(P1 ➔ P3) = 3 / 6 = 0.5
Confidence(P3 ➔ P1) = 3 / 4 = 0.75 (Accept)

P1, P4
Confidence(P1 ➔ P4) = 4 / 6 = 0.667
Confidence(P4 ➔ P1) = 4 / 4 = 1.0 (Accept)

P1, P5
Confidence(P1 ➔ P5) = 3 / 6 = 0.5
Confidence(P5 ➔ P1) = 3 / 4 = 0.75 (Accept)

P1, P6
Confidence(P1 ➔ P6) = 4 / 6 = 0.667
Confidence(P6 ➔ P1) = 4 / 4 = 1.0 (Accept)

P1, P7
Confidence(P1 ➔ P7) = 5 / 6 = 0.83 (Accept)
Confidence(P7 ➔ P1) = 5 / 6 = 0.83 (Accept)

P2, P3
Confidence(P2 ➔ P3) = 3 / 4 = 0.75 (Accept)
Confidence(P3 ➔ P2) = 3 / 4 = 0.75 (Accept)

P2, P7
Confidence(P2 ➔ P7) = 4 / 4 = 1.0 (Accept)
Confidence(P7 ➔ P2) = 4 / 6 = 0.667

P3, P7
Confidence(P3 ➔ P7) = 3 / 4 = 0.75 (Accept)
Confidence(P7 ➔ P3) = 3 / 6 = 0.5

P4, P6
Confidence(P4 ➔ P6) = 4 / 4 = 1.0 (Accept)
Confidence(P6 ➔ P4) = 4 / 4 = 1.0 (Accept)

P4, P7
Confidence(P4 ➔ P7) = 3 / 4 = 0.75 (Accept)
Confidence(P7 ➔ P4) = 3 / 6 = 0.5

P5, P7
Confidence(P5 ➔ P7) = 3 / 4 = 0.75 (Accept)
Confidence(P7 ➔ P5) = 3 / 6 = 0.5

P6, P7
Confidence(P6 ➔ P7) = 3 / 4 = 0.75 (Accept)
Confidence(P7 ➔ P6) = 3 / 6 = 0.5

P1, P2, P3
Confidence(P1 ➔ P2, P3) = 3 / 6 = 0.5
Confidence(P2, P3 ➔ P1) = 3 / 3 = 1.0 (Accept)
Confidence(P2 ➔ P1, P3) = 3 / 4 = 0.75 (Accept)
Confidence(P1, P3 ➔ P2) = 3 / 3 = 1.0 (Accept)
Confidence(P3 ➔ P1, P2) = 3 / 4 = 0.75 (Accept)
Confidence(P1, P2 ➔ P3) = 3 / 3 = 1.0 (Accept)

P1, P2, P7
Confidence(P1 ➔ P2, P7) = 3 / 6 = 0.5
Confidence(P2, P7 ➔ P1) = 3 / 4 = 0.75 (Accept)
Confidence(P2 ➔ P1, P7) = 3 / 4 = 0.75 (Accept)
Confidence(P1, P7 ➔ P2) = 3 / 5 = 0.6
Confidence(P7 ➔ P1, P2) = 3 / 6 = 0.5
Confidence(P1, P2 ➔ P7) = 3 / 3 = 1.0 (Accept)

P1, P3, P7
Confidence(P1 ➔ P3, P7) = 3 / 6 = 0.5
Confidence(P3, P7 ➔ P1) = 3 / 3 = 1.0 (Accept)
Confidence(P3 ➔ P1, P7) = 3 / 4 = 0.75 (Accept)
Confidence(P1, P7 ➔ P3) = 3 / 5 = 0.6
Confidence(P7 ➔ P1, P3) = 3 / 6 = 0.5
Confidence(P1, P3 ➔ P7) = 3 / 3 = 1.0 (Accept)

P1, P4, P6
Confidence(P1 ➔ P4, P6) = 4 / 6 = 0.5
Confidence(P4, P6 ➔ P1) = 4 / 4 = 1.0 (Accept)
Confidence(P4 ➔ P1, P6) = 4 / 4 = 1.0 (Accept)
Confidence(P1, P6 ➔ P4) = 4 / 4 = 1.0 (Accept)
Confidence(P6 ➔ P1, P4) = 4 / 4 = 1.0 (Accept)
Confidence(P1, P4 ➔ P6) = 4 / 4 = 1.0 (Accept)

P1, P4, P7
Confidence(P1 ➔ P4, P7) = 3 / 6 = 0.5
Confidence(P4, P7 ➔ P1) = 3 / 3 = 1.0 (Accept)
Confidence(P4 ➔ P1, P7) = 3 / 4 = 0.75 (Accept)
Confidence(P1, P7 ➔ P4) = 3 / 5 = 0.6
Confidence(P7 ➔ P1, P4) = 3 / 6 = 0.5
Confidence(P1, P4 ➔ P7) = 3 / 4 = 0.75 (Accept)

P1, P5, P7
Confidence(P1 ➔ P5, P7) = 3 / 6 = 0.5
Confidence(P5, P7 ➔ P1) = 3 / 3 = 1.0 (Accept)
Confidence(P5 ➔ P1, P7) = 3 / 4 = 0.75 (Accept)
Confidence(P1, P7 ➔ P5) = 3 / 5 = 0.6
Confidence(P7 ➔ P1, P5) = 3 / 6 = 0.5
Confidence(P1, P5 ➔ P7) = 3 / 3 = 1.0 (Accept)

P1, P6, P7
Confidence(P1 ➔ P6, P7) = 3 / 6 = 0.5
Confidence(P6, P7 ➔ P1) = 3 / 3 = 1.0 (Accept)
Confidence(P6 ➔ P1, P7) = 3 / 4 = 0.75 (Accept)
Confidence(P1, P7 ➔ P6) = 3 / 5 = 0.6
Confidence(P7 ➔ P1, P6) = 3 / 6 = 0.5
Confidence(P1, P6 ➔ P7) = 3 / 4 = 0.75 (Accept)

P2, P3, P7
Confidence(P2 ➔ P3, P7) = 3 / 4 = 0.75 (Accept)
Confidence(P3, P7 ➔ P2) = 3 / 3 = 1.0 (Accept)
Confidence(P3 ➔ P2, P7) = 3 / 4 = 0.75 (Accept)
Confidence(P2, P7 ➔ P3) = 3 / 4 = 0.75 (Accept)
Confidence(P7 ➔ P2, P3) = 3 / 6 = 0.5

Confidence(P2, P3 ➔ P7) = 3 / 3 = 1.0 (Accept)

P4, P6, P7
Confidence(P4 ➔ P6, P7) = 3 / 4 = 0.75 (Accept)
Confidence(P6, P7 ➔ P4) = 3 / 3 = 1.0 (Accept)
Confidence(P6 ➔ P4, P7) = 3 / 4 = 0.75 (Accept)
Confidence(P4, P7 ➔ P6) = 3 / 3 = 1.0 (Accept)
Confidence(P7 ➔ P4, P6) = 3 / 6 = 0.5
Confidence(P4, P6 ➔ P7) = 3 / 4 = 0.75 (Accept)

P1, P2, P3, P7
Confidence(P1 ➔ P2, P3, P7) = 3 / 6 = 0.5
Confidence(P2, P3, P7 ➔ P1) = 3 / 3 = 1.0 (Accept)
Confidence(P2 ➔ P1, P3, P7) = 3 / 4 = 0.75 (Accept)
Confidence(P1, P3, P7 ➔ P2) = 3 / 3 = 1.0 (Accept)
Confidence(P3 ➔ P1, P2, P7) = 3 / 4 = 0.75 (Accept)
Confidence(P1, P2, P7 ➔ P3) = 3 / 3 = 1.0 (Accept)
Confidence(P7 ➔ P1, P2, P3) = 3 / 6 = 0.5
Confidence(P1, P2, P3 ➔ P7) = 3 / 3 = 1.0 (Accept)
Confidence(P1, P2 ➔ P3, P7) = 3 / 3 = 1.0 (Accept)
Confidence(P3, P7 ➔ P1, P2) = 3 / 3 = 1.0 (Accept)
Confidence(P1, P3 ➔ P2, P7) = 3 / 3 = 1.0 (Accept)
Confidence(P2, P7 ➔ P1, P3) = 3 / 4 = 0.75 (Accept)
Confidence(P1, P7 ➔ P2, P3) = 3 / 5 = 0.6
Confidence(P2, P3 ➔ P1, P7) = 3 / 3 = 1.0 (Accept)

P1, P4, P6, P7
Confidence(P1 ➔ P4, P6, P7) = 3 / 6 = 0.5
Confidence(P4, P6, P7 ➔ P1) = 3 / 3 = 1.0 (Accept)
Confidence(P4 ➔ P1, P6, P7) = 3 / 4 = 0.75 (Accept)
Confidence(P1, P6, P7 ➔ P4) = 3 / 3 = 1.0 (Accept)
Confidence(P6 ➔ P1, P4, P7) = 3 / 4 = 0.75 (Accept)
Confidence(P1, P4, P7 ➔ P6) = 3 / 3 = 1.0 (Accept)
Confidence(P7 ➔ P1, P4, P6) = 3 / 6 = 0.5
Confidence(P1, P4, P6 ➔ P7) = 3 / 4 = 0.75 (Accept)
Confidence(P1, P4 ➔ P6, P7) = 3 / 4 = 0.75 (Accept)
Confidence(P6, P7 ➔ P1, P4) = 3 / 3 = 1.0 (Accept)
Confidence(P1, P6 ➔ P4, P7) = 3 / 4 = 0.75 (Accept)
Confidence(P4, P7 ➔ P6, P3) = 3 / 3 = 1.0 (Accept)
Confidence(P1, P7 ➔ P4, P6) = 3 / 5 = 0.6
Confidence(P4, P6 ➔ P1, P7) = 3 / 4 = 0.75 (Accept)

The strong associations rules are those are marked as “Accept”