20-01-2026 - Apply architecture modeling for Collaborative Filtering.

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=> User Based Nearest Neighbor Recommendation

$$\Rightarrow Sim(a,b) = \frac{\sum_{p \in P} (r_{a,p} - \bar{r}_a)(r_{b,p} - \bar{r}_b)}{\sqrt{\sum_{p \in P} (r_{a,p} - \bar{r}_a)^2} \sqrt{\sum_{p \in P} (r_{b,p} - \bar{r}_b)^2}}$$

Alice, Bob & Chris

	I1	I2	I3	I4	I5
Alice	5	3	4	4	?
Bob	3	1	2	3	2
Chris	4	3	4	3	1

$$\Rightarrow \bar{r}_{Alice} = \bar{r}_a = 16/4 = 4$$

$$\bar{r}_{Bob} = \bar{r}_b = 9/4 = 2.4$$

$$\Rightarrow Sim(a,c) = \frac{\sum_{p \in P} (r_{a,p} - \bar{r}_a)(r_{b,p} - \bar{r}_b)}{\sqrt{\sum_{p \in P} (r_{a,p} - \bar{r}_a)^2} \sqrt{\sum_{p \in P} (r_{b,p} - \bar{r}_b)^2}}$$

$$= (5-4) \times (3-2.4) + (3-4) \times (1-2.4) + (4-4) \times (2-2.4)$$

$$= \frac{(5-4)\times(3-2.4) + (3-4)\times(1-2.4) + (4-5)\times(2-2.4) + (4-4)\times(3-2.4)}{\sqrt{(5-4)^2+(3-4)^2+(4-4)^2+(4-4)^2}\ \sqrt{(3-2.4)^2+(1-2.4)^2+(2-2.4)^2+(3-2.4)^2}}$$

$= \boxed{\quad}$ (-1 to 1) Correlation Coefficient

$\Rightarrow$ Relative Proximity of the Nearest Neighbors N:

$$pred(a,p) = \bar{r}_a + \frac{\sum_{b \in N} sim(a,b) \times (r_{b,p} - \bar{r}_b)}{\sum_{b \in N} sim(a,b)}$$

$\Rightarrow$ Key Points of Collaborative filtering:

↳ Better similarity & weighing metrics.

↳ Neighbourhood selection.

↳ Item-Based Nearest Neighbor Recommendation.

Evaluation