

# TDT4305 2021 - Assignment 7 solution

## Content-based recommendation

- What are the steps for recommending items to users using content-based recommendation?
  - See sections 9.2.4 to 9.2.6.

## Collaborative filtering recommendation

- Given the following utility matrix, predict user 3's rating of movie 1.

		Users				
		1	2	3	4	5
Movies	1	1	2	?	2	3
	2		3	3		
	3		1	3	5	
	4	5	3	2		2

- Calculate the Pearson correlation between movie 1 and the other movies.

1.  $m_1 = (1+2+2+3)/4 = 2$

$$r_1 = [1-2, 2-2, 0, 2-2, 3-2] = [-1, 0, 0, 0, 1]$$

$$\cos(r_1, r_1) = r_1 \cdot r_1 / \|r_1\| \cdot \|r_1\| = 2/2 = 1$$

2.  $m_2 = (3+3)/2 = 3$

$$r_2 = [0, 3-3, 3-3, 0, 0] = [0, 0, 0, 0, 0]$$

$$\cos(r_1, r_2) = r_1 \cdot r_2 / \|r_1\| \cdot \|r_2\| = 0/0 = \text{undefined}$$

3.  $m_3 = (1+3+5)/3 = 3$

$$r_3 = [0, 1-3, 3-3, 5-3, 0] = [0, -2, 0, 2, 0]$$

$$\cos(r_1, r_3) = r_1 \cdot r_3 / \|r_1\| \cdot \|r_3\| = 0/4 = 0$$

4.  $m_4 = (5+3+2+2)/4 = 3$

$$r_4 = [5-3, 3-3, 2-3, 0, 2-3] = [2, 0, -1, 0, -1]$$

$$\cos(r_1, r_4) = r_1 \cdot r_4 / \|r_1\| \cdot \|r_4\| = -3/3.464 = -0.866$$

- Let  $N$  be the set of 2 movies most similar to movie 1 that have been rated by user 3. Calculate user 3's predicted rating of movie 1.

$$\blacksquare (0 \cdot 3 - 0.866 \cdot 2) / (0 - 0.866) = 2$$