

Ranking & UB-CF

IIC3633 - Sistemas Recomendadores

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Definición

Recommender Systems aim to help a user or a group of users in a system to select items from a crowded item or information space. (MacNee et. al 2006)

R. Burke tenía su propia definición, similar a esta, pero agregaba ...in a personalized way.

El problema de recomendación formalizado (Adomavicius et al. 2007)

$$\forall c \in C, s'_c = \operatorname{argmax}_{s \in S} u(c, s)$$

$u : C \times S \rightarrow R$, *funcion de utilidad*

R : *conjunto recomendado de items*

C : *conjunto de usuarios*

S : *conjunto de items*

1. Un Poco de Historia



Recomendaciones estilo Amazon.com

1.1 En 1992 Xerox PARC Tapestry

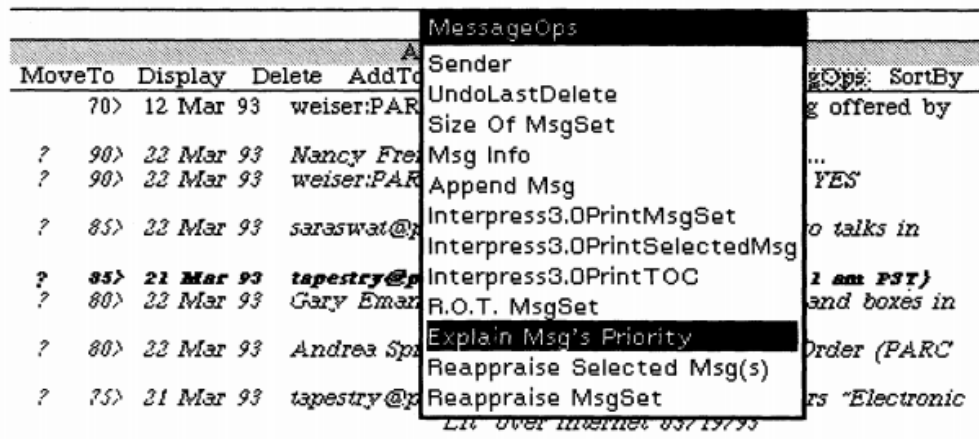


Figure 2. Requesting an explanation for a message's priority.

```

Annotations for message $ XNS-SMTP-Gateway:Parc:Xerox
appraiser terry$text:Bakersfield => priority 85
appraiser terry$$Subject:Briefs<California => priority 55
appraiser terry$sender:tapestry => priority 10
    
```











































Figure 3. An explanation of priorities assigned to a message by various appraisers.

am curious as to why this particular message was assigned priority 85. So I select the message by left-clicking on its summary, and then I click the "MsgOps" button at the top of the window. This produces a pop-up menu from which I select the "Explain Msg's Priority" option (see Figure 2.). The resulting textual explanation is shown in Figure 3.

Link to [PDF file](#)

1.2 MovieLens

Page 1 of 1422 1 2 3 4 ... 1422 next Skip to page #:

Prediction or Rating ↕	Your Rating	Movie Information	Wish List
★★★★★	5.0 stars	Pink Floyd: The Wall (1982) DVD info imdb flag Movie Tuner  Drama, Musical [add tag] Popular tags: social commentary   cult film   surreal  	<input type="checkbox"/>
★★★★☆	4.5 stars	Lives of Others, The (Das leben der Anderen) (2006) DVD info imdb flag Movie Tuner  Drama, Romance, Thriller - German [add tag] Popular tags: disturbing   psychology   romance  	<input type="checkbox"/>
★★★★☆	Not seen	Shawshank Redemption, The (1994) DVD info imdb flag Movie Tuner  Crime, Drama [add tag] Popular tags: based on a book   psychology   twist ending  	<input type="checkbox"/>
★★★★☆	Not seen	Godfather, The (1972) DVD info imdb flag Movie Tuner  Crime, Drama - English, Italian [add tag] Popular tags: organized crime   based on a book   Oscar (Best Picture)  	<input type="checkbox"/>
★★★★☆	Not seen	One Flew Over the Cuckoo's Nest (1975) DVD info imdb flag Movie Tuner  Drama [add tag] Popular tags: psychology   based on a book   Oscar (Best Picture)  	<input type="checkbox"/>
★★★★☆	Not seen	Usual Suspects, The (1995) DVD info imdb flag Movie Tuner  Crime, Mystery, Thriller - English, Hungarian, Spanish, French [add tag] Popular tags: organized crime   twist ending   Kevin Spacey  	<input type="checkbox"/>

[Link to Amatriain 2012](#)

NetFlix Prize (2007-2009)

Netflix Prize **COMPLETED**

Home Rules Leaderboard Update

Leaderboard

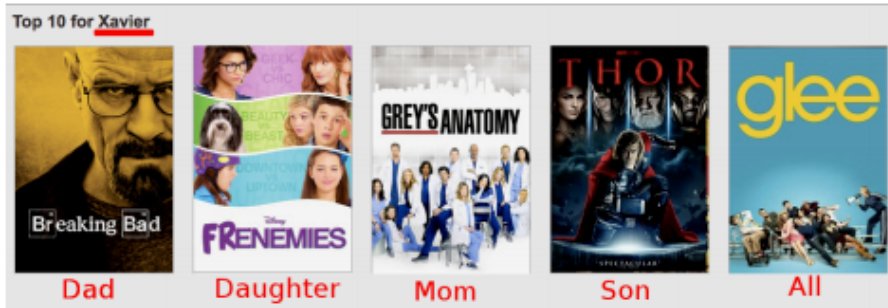
Showing Test Score. [Click here to show quiz score](#)

Display top 20 leaders.

Rank	Team Name	Best Test Score	% Improvement	Best Submit Time
Grand Prize - RMSE = 0.8567 - Winning Team: BellKor's Pragmatic Chaos				
1	BellKor's Pragmatic Chaos	0.8567	10.06	2009-07-26 18:18:28
2	The Ensemble	0.8567	10.06	2009-07-26 18:38:22
3	Grand Prize Team	0.8582	9.90	2009-07-10 21:24:40
4	Opera Solutions and Vandelay United	0.8588	9.84	2009-07-10 01:12:31
5	Vandelay Industries I	0.8591	9.81	2009-07-10 00:32:20
6	Pragmatic Chaos I	0.8594	9.77	2009-06-24 12:06:56
7	BellKor in BigChaos	0.8601	9.70	2009-05-13 08:14:09
8	Dace	0.8612	9.59	2009-07-24 17:18:43
9	Feeds2	0.8622	9.48	2009-07-12 13:11:51
10	BigChaos	0.8623	9.47	2009-04-07 12:33:59
11	Opera Solutions	0.8623	9.47	2009-07-24 00:34:07
12	BellKor	0.8624	9.46	2009-07-26 17:19:11

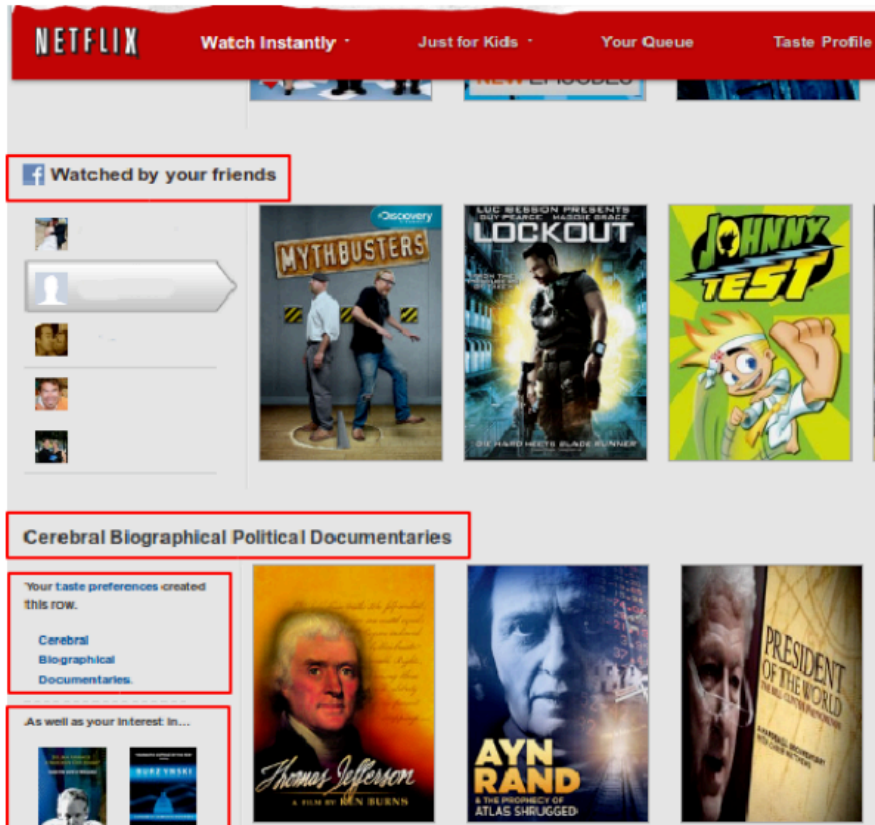
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1.3 Netflix en 2012



Link to [Amatriain 2012](#)

1.3 Netflix en 2012 (continuación)



[Link to Amatriain 2012](#)

Ranking no personalizado (Blog de Evan Miller, 2009)

1. Popularidad.
2. Score: (Ratings Positivos) - (Ratings Negativos)
3. Score: (Rating Promedio) = (Ratings Positivos)/(Total de Ratings)
4. Score: **Considerando Ratings positivos y negativos**, Limite inferior del Intervalo de Confianza del Wilson Score, para un parámetro Bernoulli.

$$\left(\hat{p} + \frac{z_{\alpha/2}^2}{2n} \pm z_{\alpha/2} \sqrt{[\hat{p}(1 - \hat{p}) + z_{\alpha/2}^2/4n]/n} \right) / (1 + z_{\alpha/2}^2/n).$$

Donde \hat{p} es la proporción (estimada) de ratings positivos, $z_{\alpha/2}$ es el $(1 - \alpha/2)$ cuantil de la distribución normal, y n el número de ratings. α , también llamado nivel de significancia estadístico, generalmente se considera 95%.

Clasificación(es)

1. Considerando los Datos usados
 1. Basado en Reglas (Rule-based)
 2. Basado en Contenido (Content-based)
 3. Filtrado Colaborativo (el usuario y sus vecinos)
2. Considerando el Modelo
 1. Memory-based (KNN)
 2. Model-based (Representación latente)

Filtrado Colaborativo basado en el usuario

Dos tareas son necesarias:

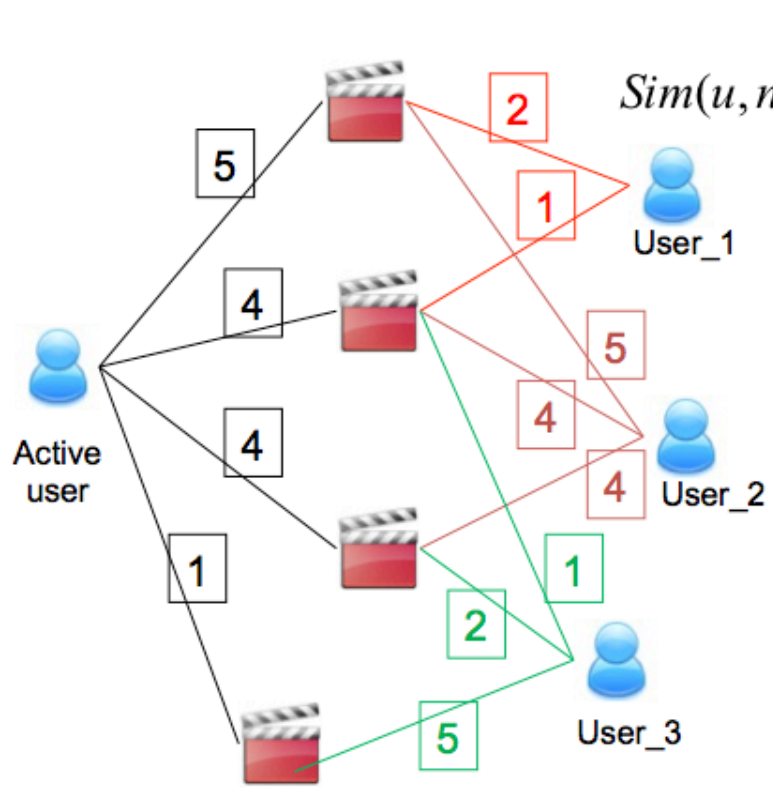
- KNN: Encontrar los K vecinos más cercanos (KNN) al usuario a :

$$\text{Similaridad}(a, i) = w(a, i), i \in K$$

- **Predecir** el rating que un usuario a dará a un ítem j :

$$p_{a,j} = \bar{v}_a + \alpha \sum_{i=1}^n w(a, i)(v_{i,j} - \bar{v}_i)$$

Ejemplo: Correlación de Pearson

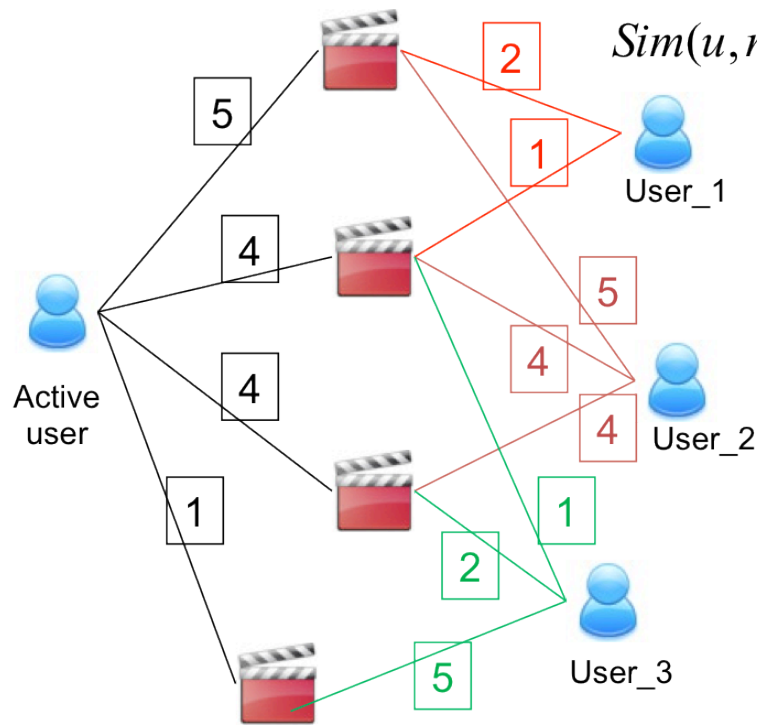


$$Sim(u, n) = \frac{\sum_{i \in CR_{u,n}} (r_{ui} - \bar{r}_u)(r_{ni} - \bar{r}_n)}{\sqrt{\sum_{i \in CR_{u,n}} (r_{ui} - \bar{r}_u)^2} \sqrt{\sum_{i \in CR_{u,n}} (r_{ni} - \bar{r}_n)^2}}$$

Ejemplo: Correlación de Pearson

SOLUCION

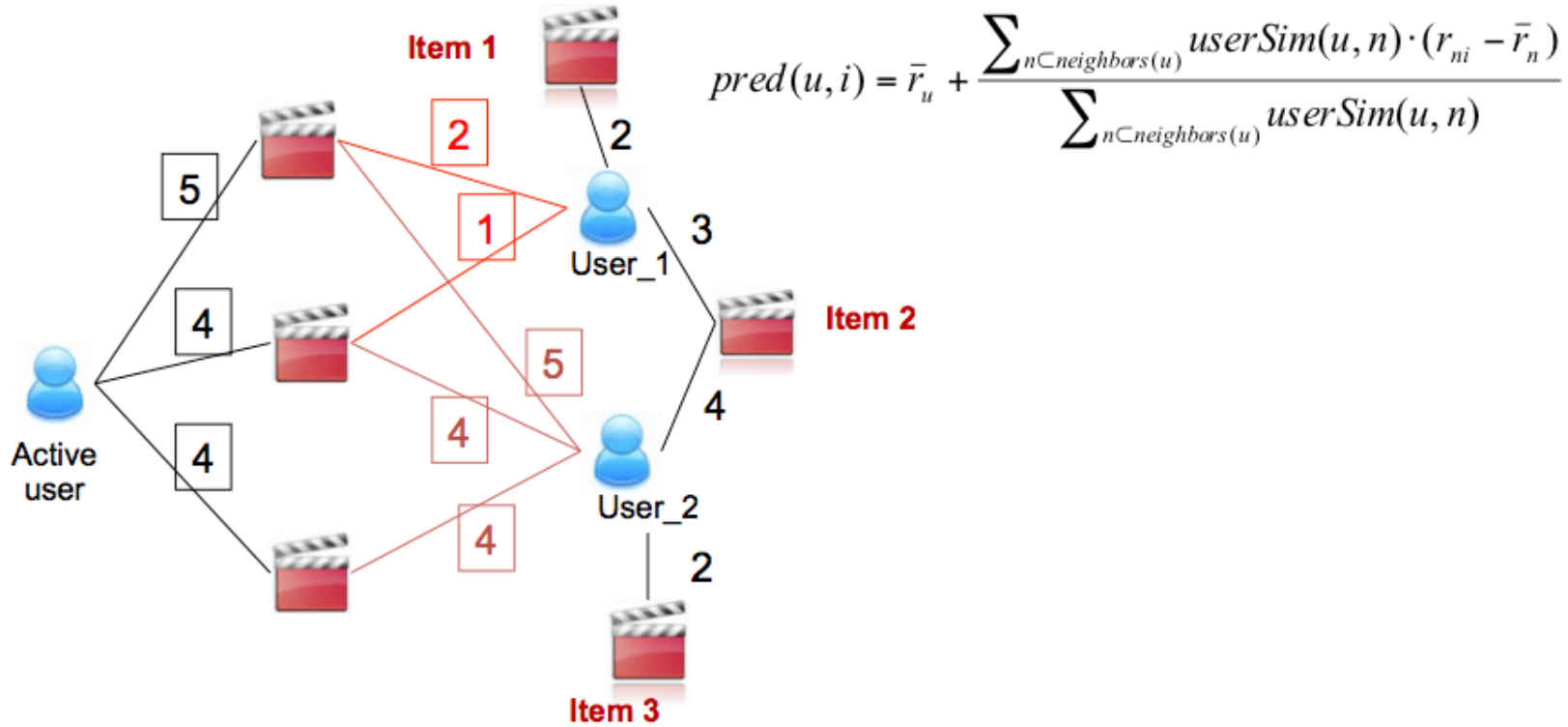
Ejemplo: Correlación de Pearson



$$Sim(u, n) = \frac{\sum_{i \in CCR_{u,n}} (r_{ui} - \bar{r}_u)(r_{ni} - \bar{r}_n)}{\sqrt{\sum_{i \in CCR_{u,n}} (r_{ui} - \bar{r}_u)^2} \sqrt{\sum_{i \in CCR_{u,n}} (r_{ni} - \bar{r}_n)^2}}$$

	active user
user_1	0.4472136
user_2	0.49236596
user_3	-0.91520863

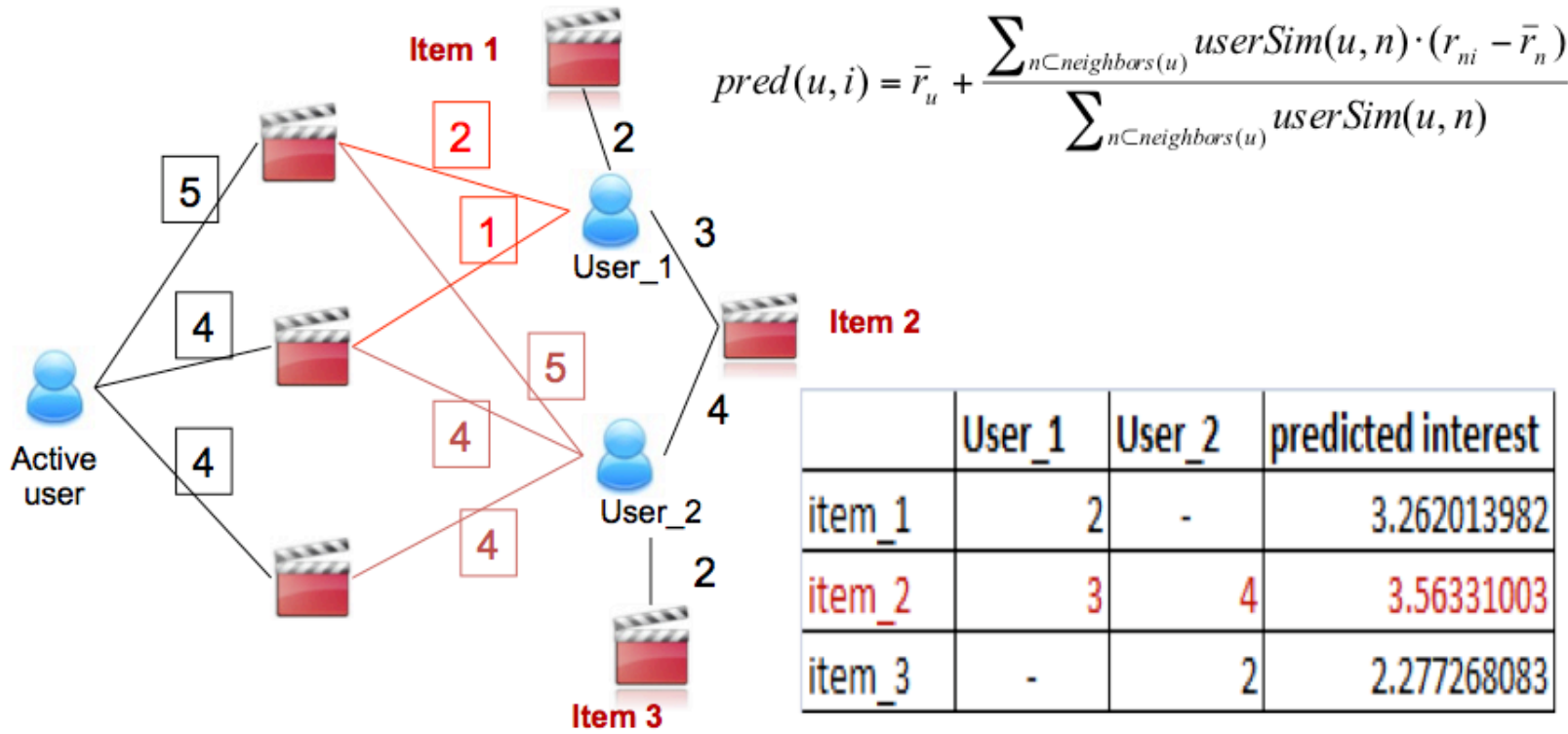
Ejemplo Paso 2: Predicción del rating



Ejemplo Paso 2: Predicción del rating

SOLUCION

Ejemplo Paso 2: Predicción del rating



Referencias

- Adomavicius, G., & Tuzhilin, A. (2005). Toward the next generation of recommender systems: A survey of the state-of-the-art and possible extensions. *Knowledge and Data Engineering, IEEE Transactions on*, 17(6), 734-749.
- Amatriain, X. (2013). Mining large streams of user data for personalized recommendations. *ACM SIGKDD Explorations Newsletter*, 14(2), 37-48.
- Miller, B. N., Albert, I., Lam, S. K., Konstan, J. A., & Riedl, J. (2003, January). MovieLens unplugged: experiences with an occasionally connected recommender system. In *Proceedings of the 8th international conference on Intelligent user interfaces* (pp. 263-266). ACM.
- Parra, D., & Sahebi, S. (2013). *Recommender systems: Sources of knowledge and evaluation metrics*. In *Advanced Techniques in Web Intelligence-2* (pp. 149-175). Springer Berlin Heidelberg.