RECSYS

NEURAL PERSONALIZED RANKING FOR IMAGE RECOMMENDATIONS

Alejandro Quiñones

NPR for image recommendations

Topics to be Covered

Contexto
Definiciones
Modelo
C-NPR
Experimentos

CONTEXTO

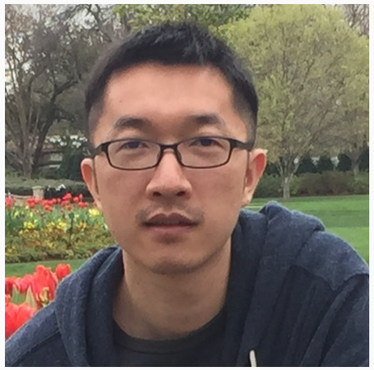
Un trabajo de

Wei Niu

wei.cse.tamu.edu

James Caverlee

caverlee.cse.tamu.edu

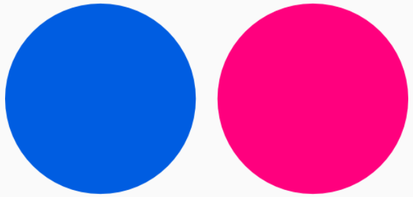


Haokai Lu

hlu.cse.tamu.edu

CONTEXTO

Images sharing en redes sociales



CONTEXTO

Images sharing en redes sociales

Acciones sociales

<<

Imágenes en el sistema

CONTEXTO

BPR: limitaciones del estado del arte

Weights

Iguales en producto punto

Lineal

Escala bilidad

limitada

CONTEXTO

Características de NPR

Weights

aprendidos

No Lineal

Escalable

DEFINICIONES

Las preferencias según MF

$$r_{ui} = p_u \cdot q_i + b_u + b_i + \alpha$$

DEFINICIONES

A posteriori de BPR

$$p(\Theta|j >_h k) \propto p(j >_h k|\Theta)P(\Theta)$$

$$p(j >_h k|\Theta) = \delta(r_{hj} - r_{hk})$$

DEFINICIONES

Función objetivo de BPR

$$\arg\max_{\Theta} \sum_{u_h \in \mathcal{U}, i_j \in \mathcal{P}_h, i_k \in \mathcal{N}_h} \left(\ln \left(\delta(r_{hj} - r_{hk}) \right) - \lambda_{\Theta} \left\| \Theta_{hjk} \right\|^2 \right)$$

MODELO

Función objetivo de BPR

Features

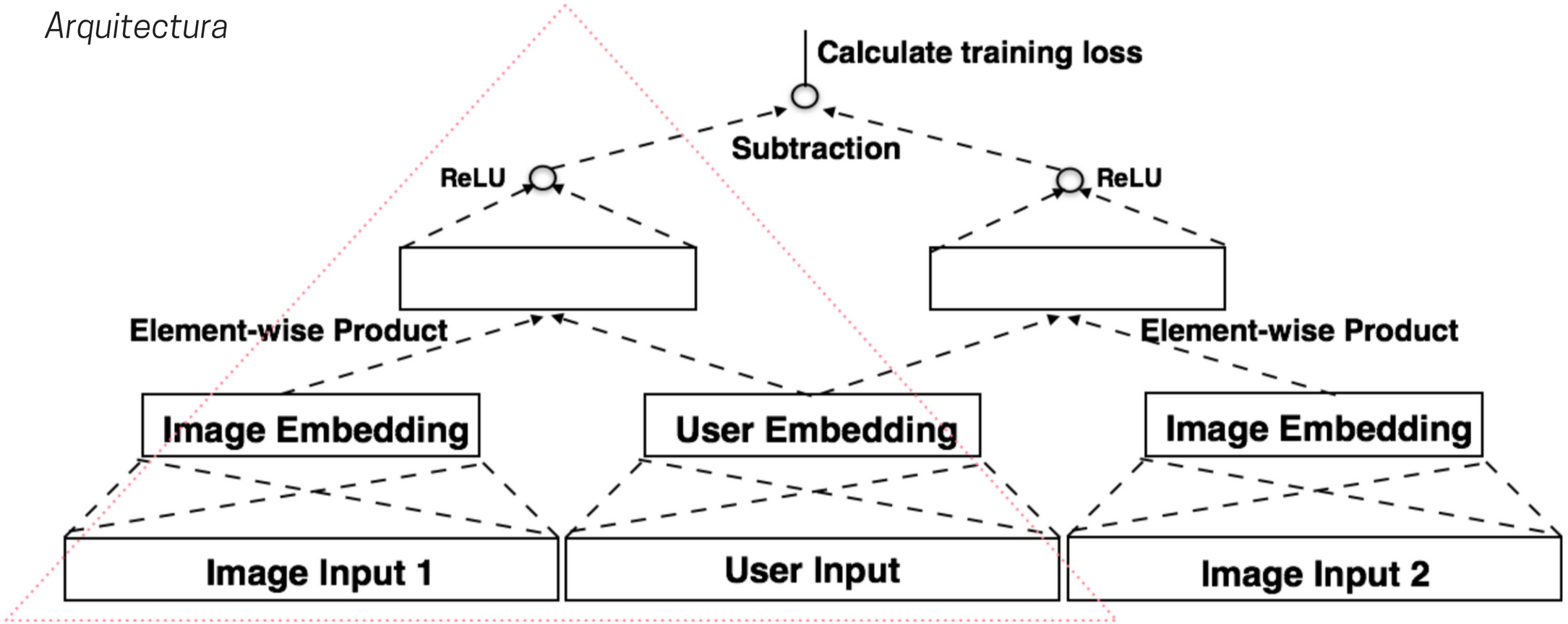
$$(h, j, k)$$

Labels

$$g(h,j,k) = \begin{cases} 1 & \text{for } j >_h k \\ -1 & \text{for } j <_h k \end{cases}$$

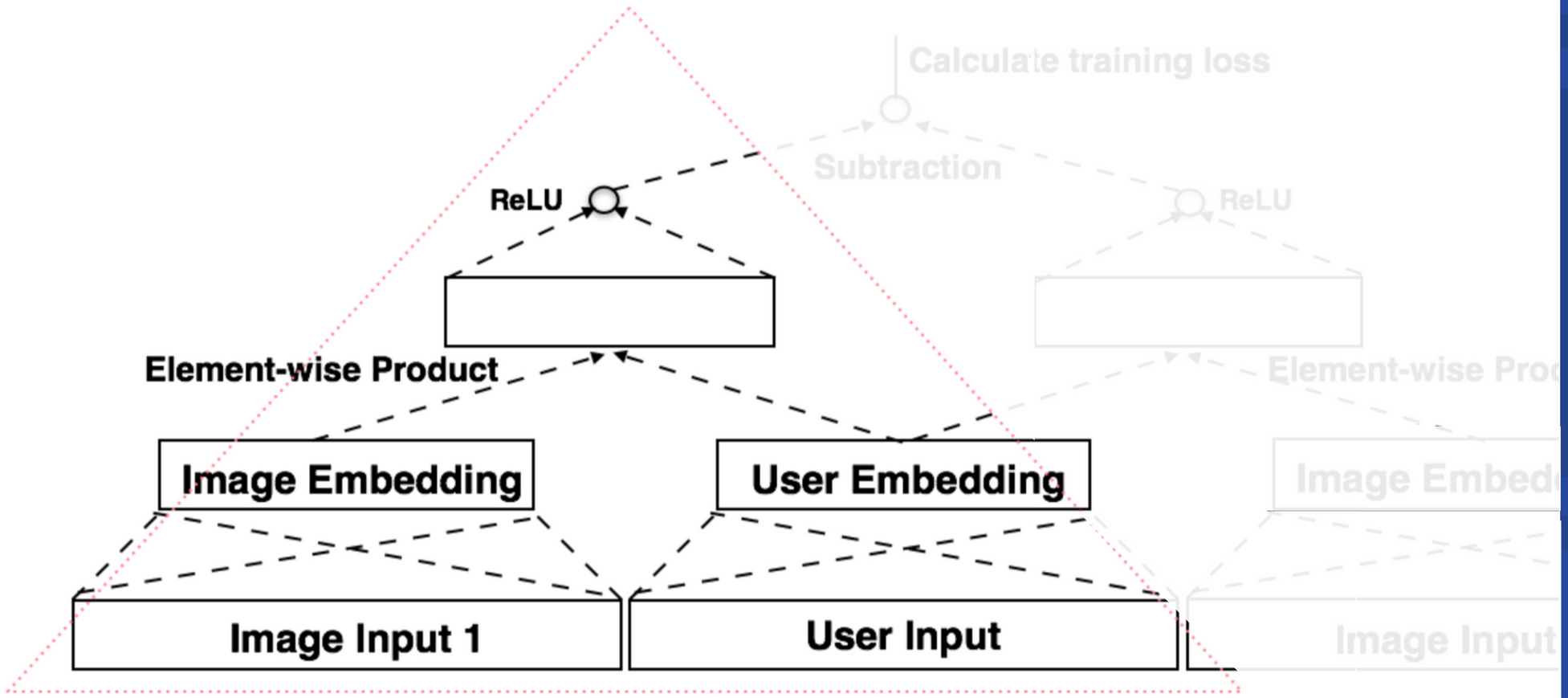
MODELO

Arquitectura



MODELO

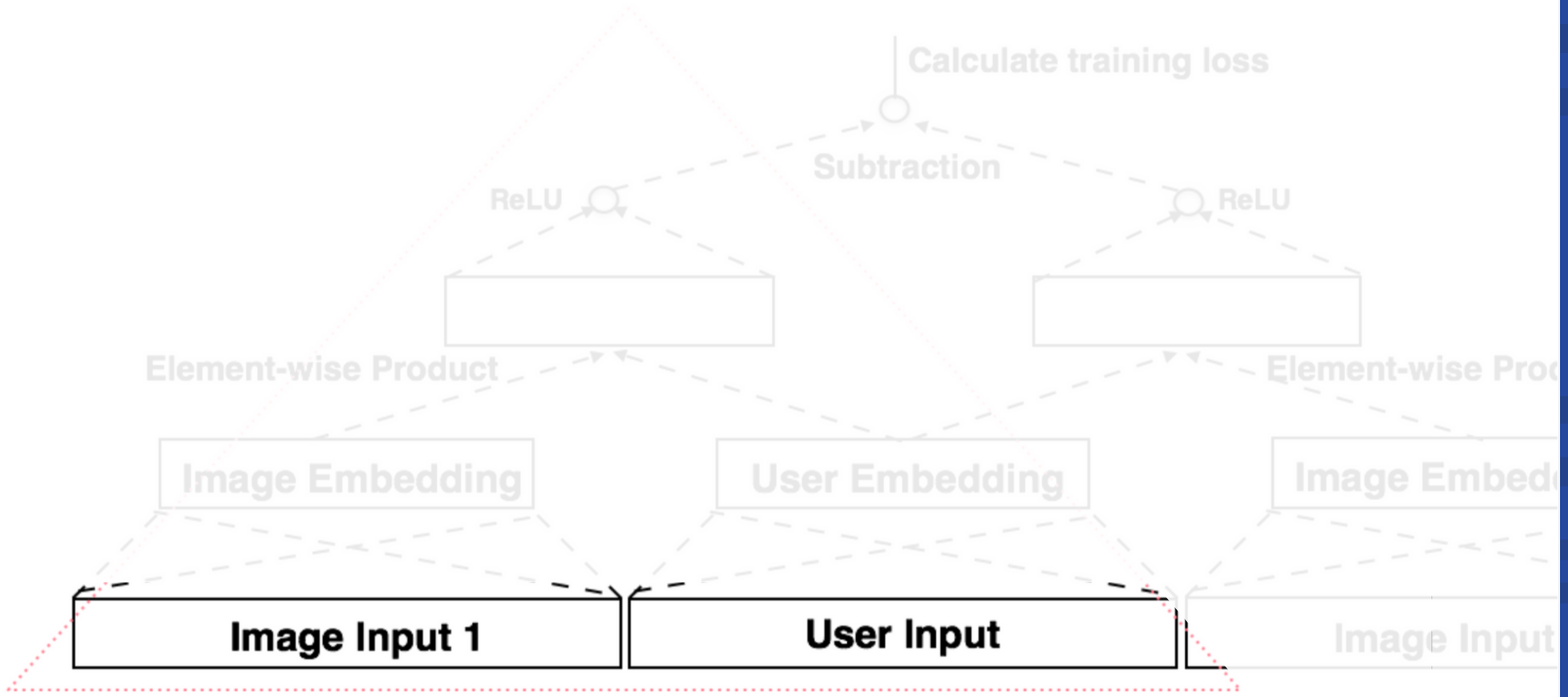
Arquitectura



MODELO

Arquitectura

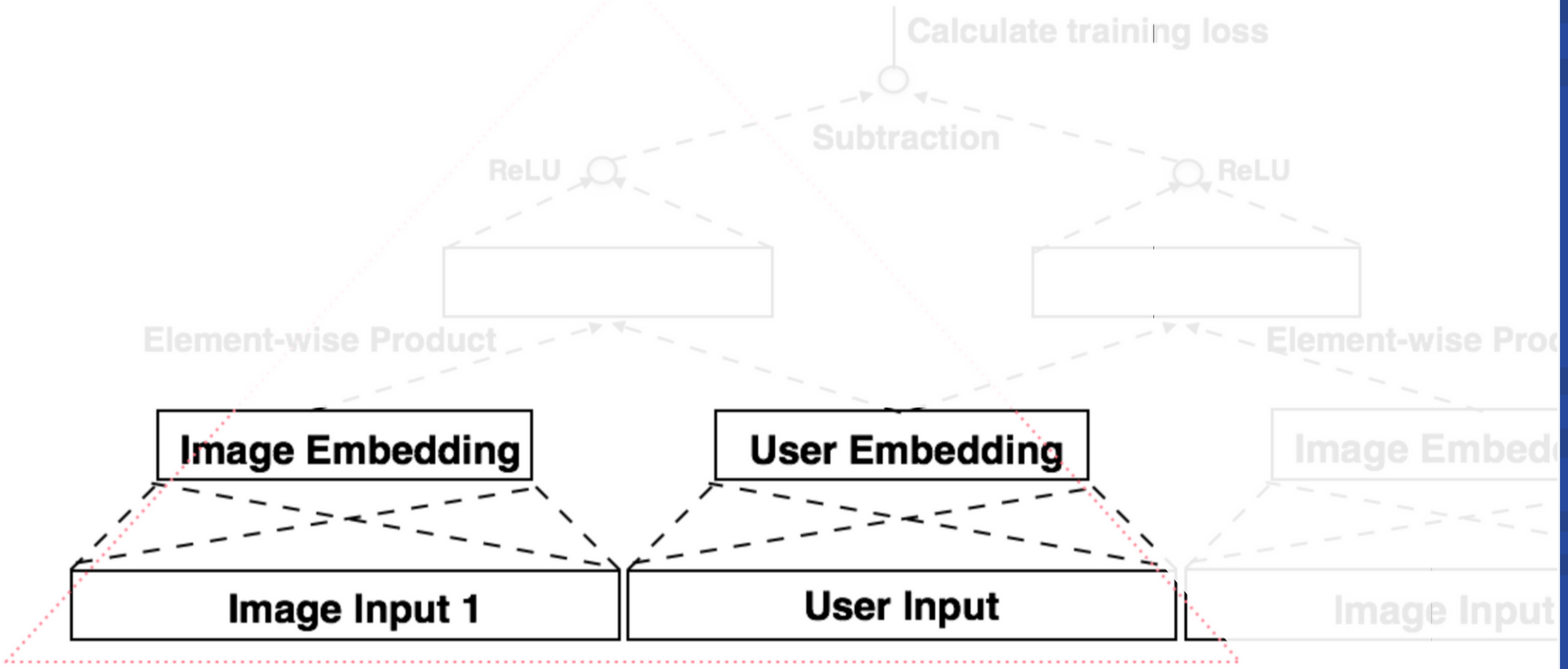
Input como one-hot



MODELO

Arquitectura

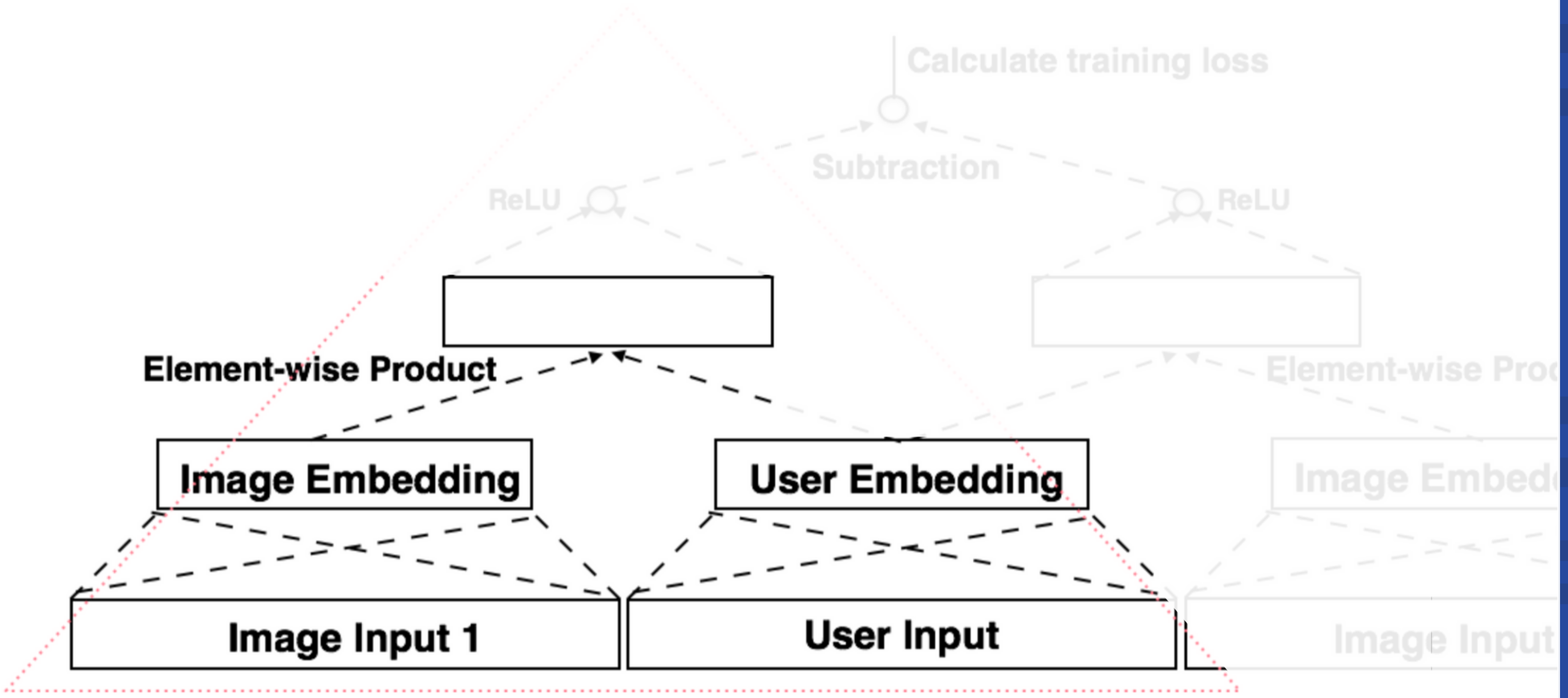
Embedding layer



MODELO

Arquitectura

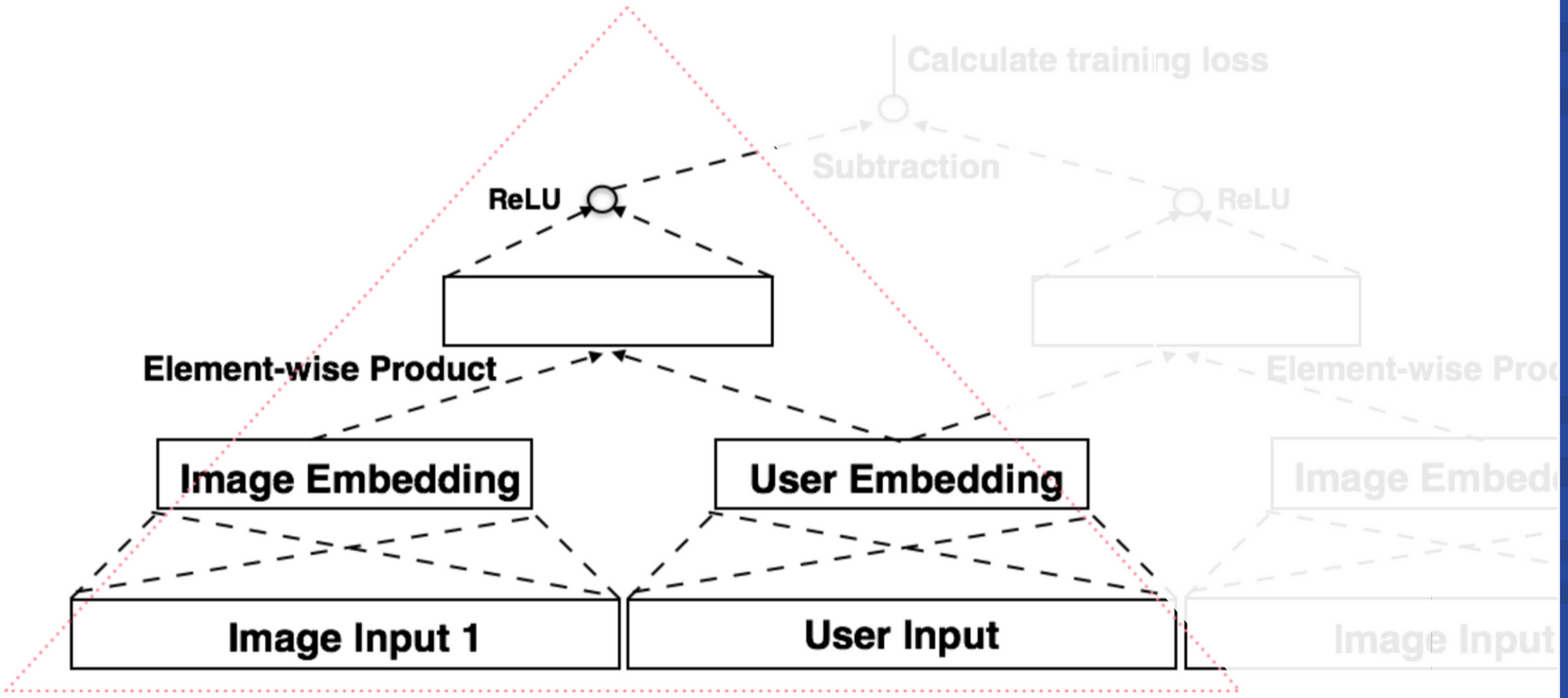
Producto punto ponderado



MODELO

Arquitectura

Producto punto ponderado



MODELO

Output de la red

$$\boldsymbol{p}_h = \boldsymbol{W}_u \boldsymbol{u}_h, \quad \boldsymbol{q}_j = \boldsymbol{W}_i \boldsymbol{i}_j, \quad \boldsymbol{q}_k = \boldsymbol{W}_i' \boldsymbol{i}_k$$

$$\boldsymbol{m}_{hj} = \boldsymbol{p}_h \circ \boldsymbol{q}_j$$

$$r_{hj} = a(\boldsymbol{w}^T \boldsymbol{m}_{hj} + b_1)$$

MODELO

Función objectivo del modelo

$$\frac{1}{n} \sum_{\substack{h \in \mathcal{U}, (i_j \in \mathcal{P}_h, i_k \in \mathcal{N}_h \\ | i_j \in \mathcal{N}_h, i_k \in \mathcal{P}_h)}} \ln\left(\delta\left((r_{hj} - r'_{hk}) \cdot g(h,j,k)\right)\right) - \lambda_\Theta \|\Theta\|^2$$

C-NPR

Problemas de NPR

Sparse

Preferencia Compleja

C-NPR

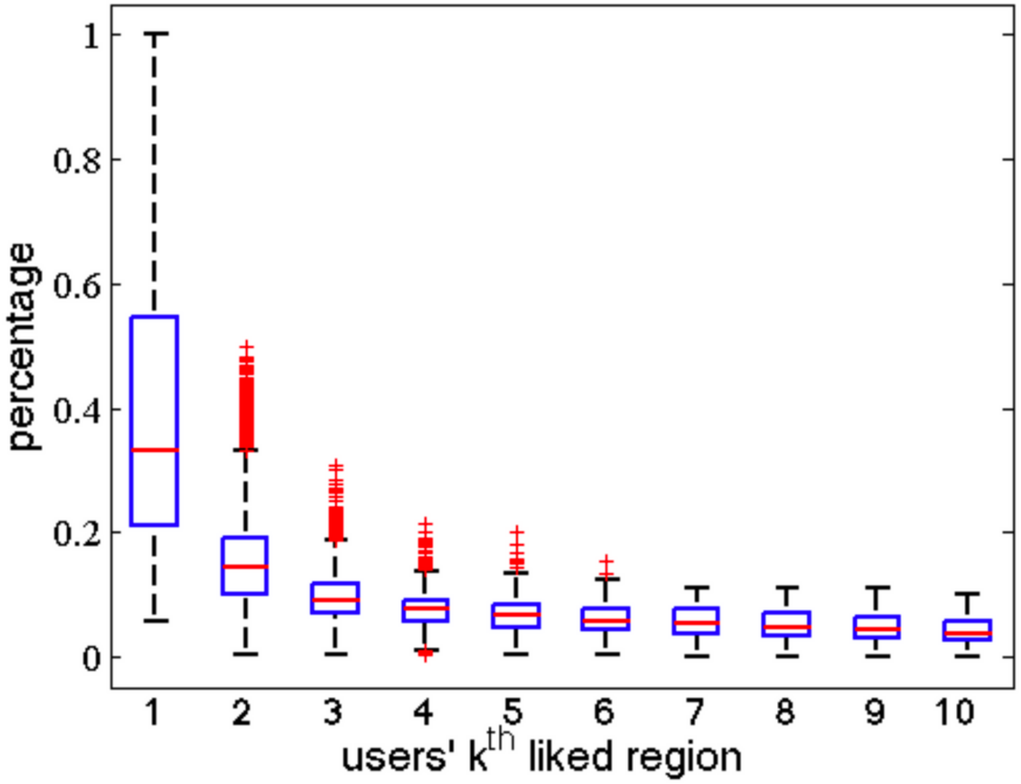
Geo

Topical

Visual

C-NPR

Geo


percentage
1
0.8
0.6
0.4
0.2
0
1
2
3
4
5
6
7
8
9
10
users' k^th liked region

C-NPR

Geo

33%

región
favorita

9%

región
más grande

C-NPR

Topical

~75%

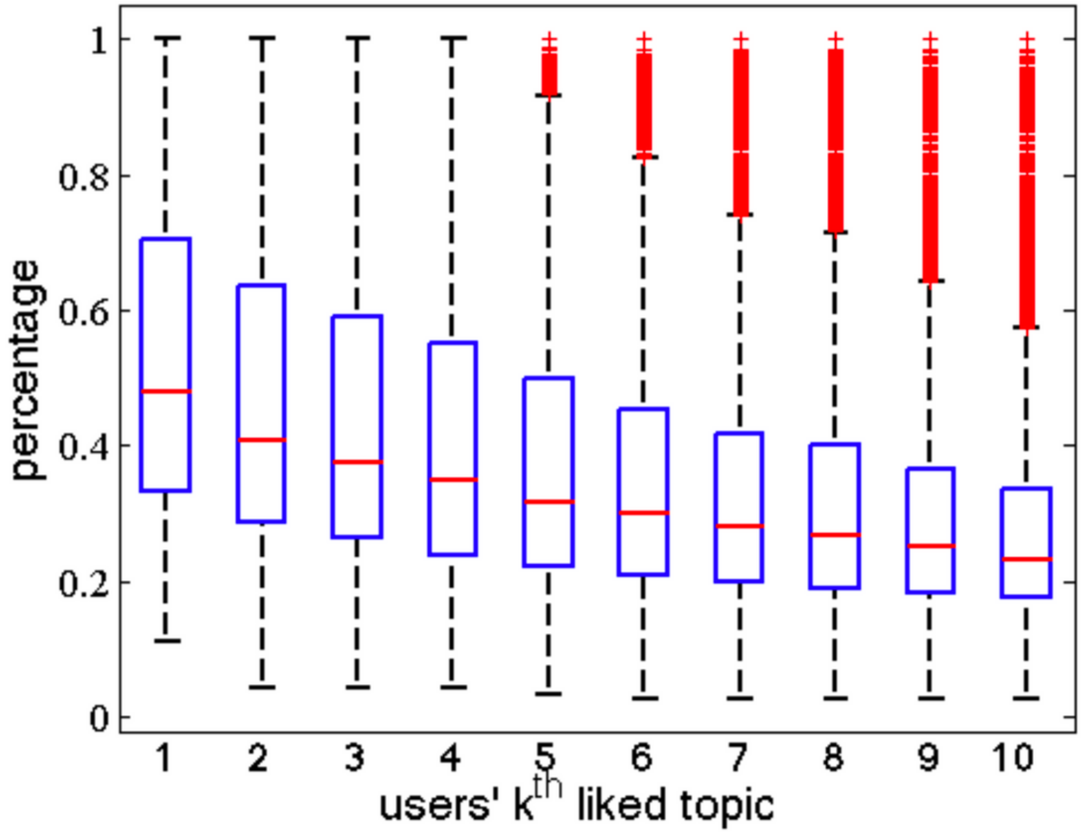
usuarios

~35%

imágenes con likes

C-NPR

Topical



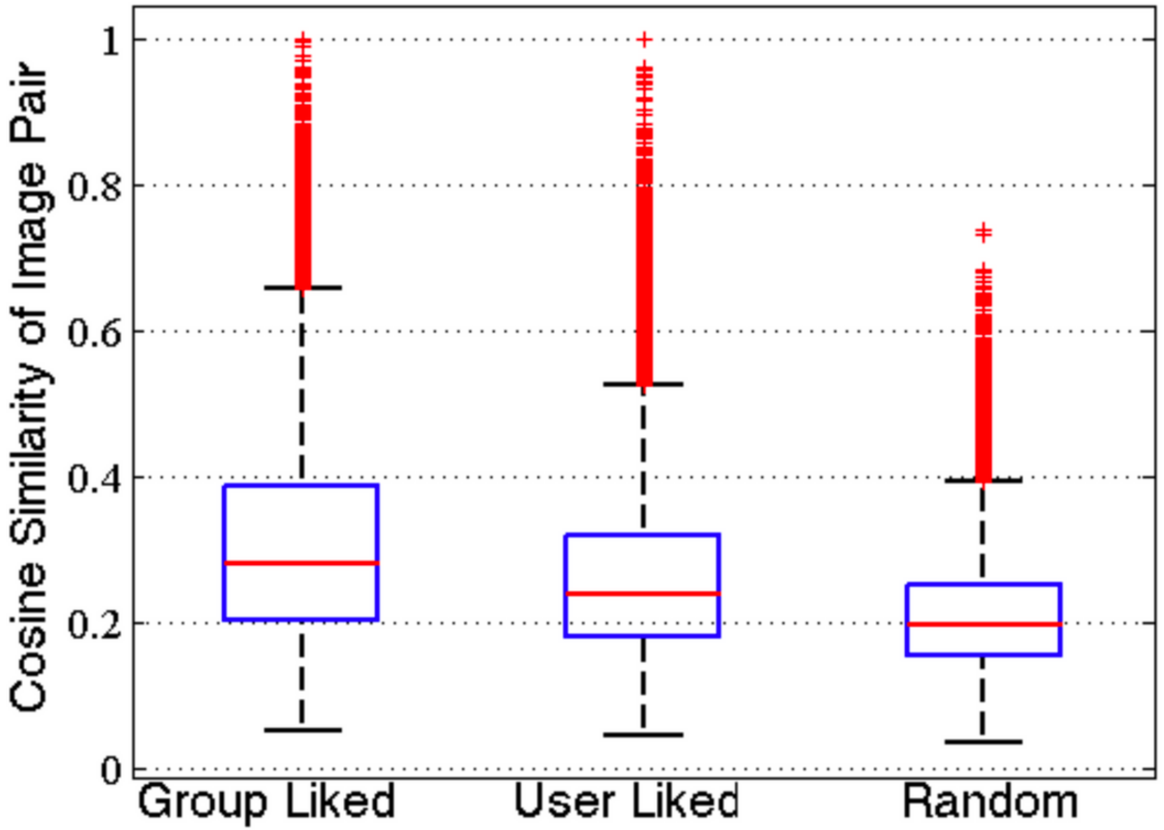
C-NPR

Visual

0.3	0.25	0.2
usuarios similares	mismo usuario	random

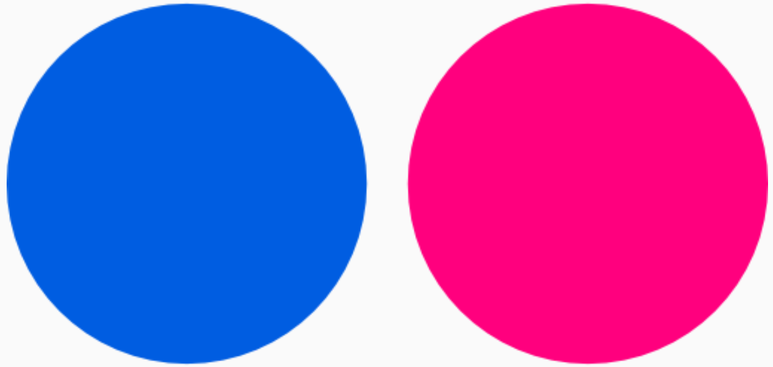
C-NPR

Visual


Cosine Similarity of Image Pair
1
0.8
0.6
0.4
0.2
0
Group Liked
User Liked
Random

EXPERIMENTOS

Dataset



FLICKR YFCC100M

EXPERIMENTOS

Dataset

>30

likes en imágenes

>10

imágenes likeadas

EXPERIMENTOS

Dataset

Dataset	#Users	#Images	#Feedback	Sparsity
Small	1,891	2,013	36,827	0.96%
Large	27,782	21,720	961,506	0.16%

EXPERIMENTOS

Métricas

Prec

Rec

F1

@5, @10, @15

EXPERIMENTOS

Baseline

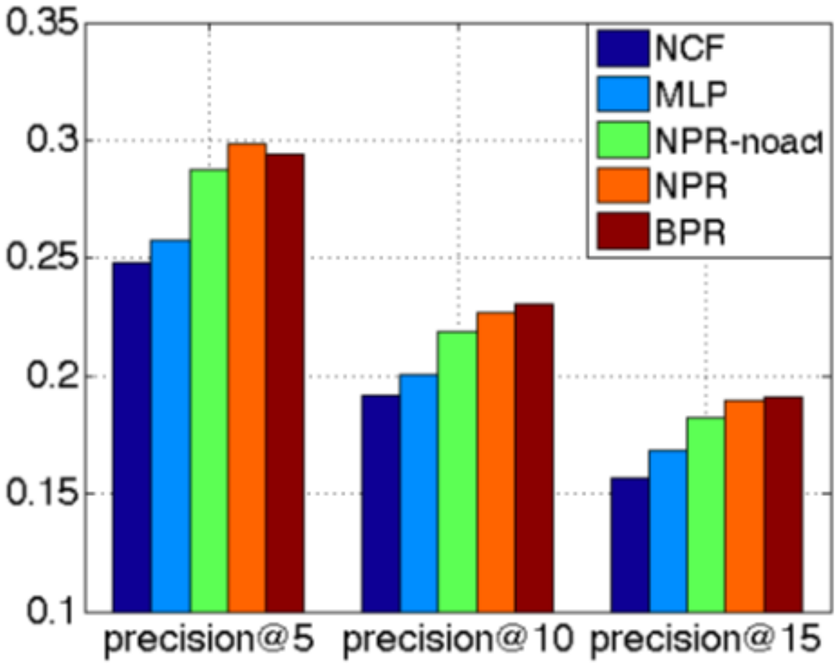
NCF

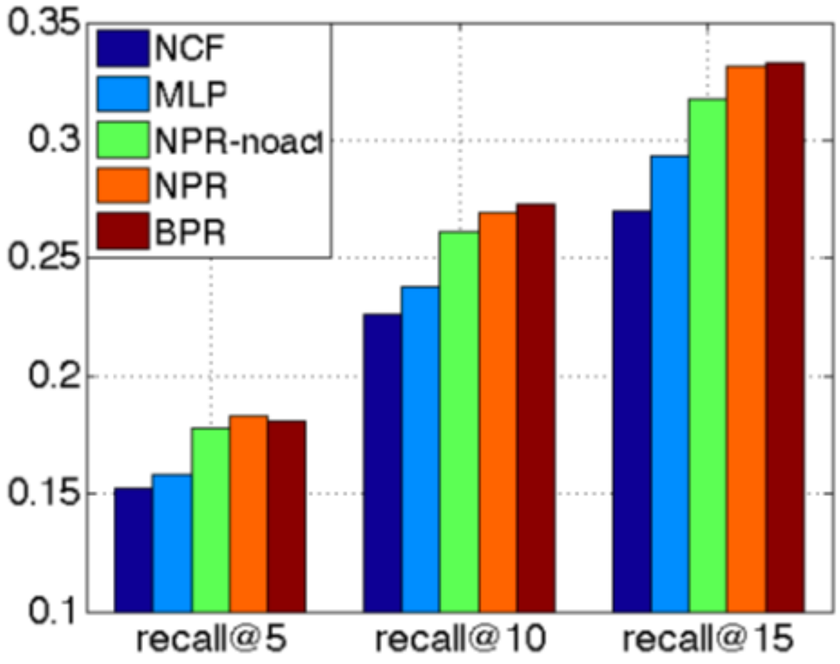
MLP

BPR

EXPERIMENTOS

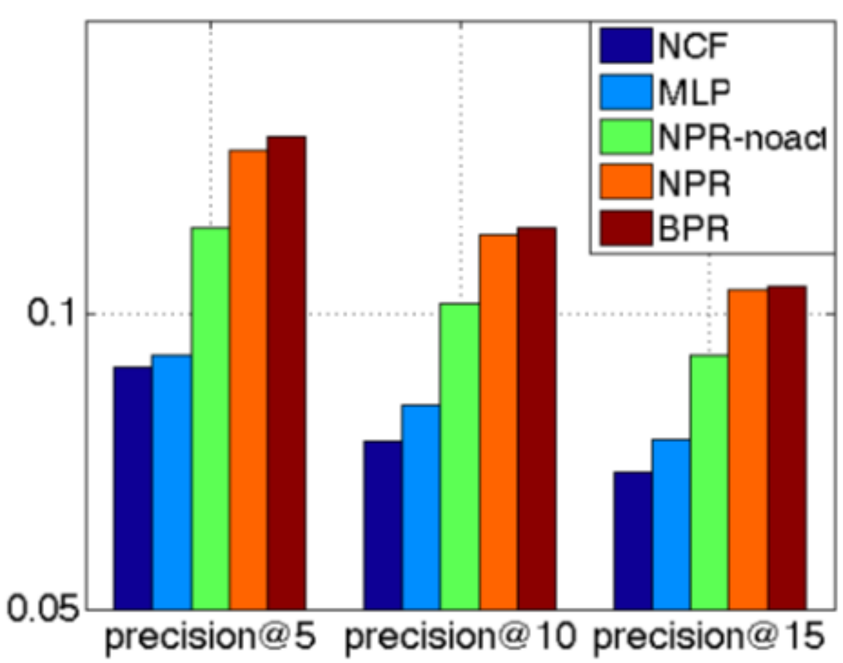
Resultados vs NPR: Small dataset

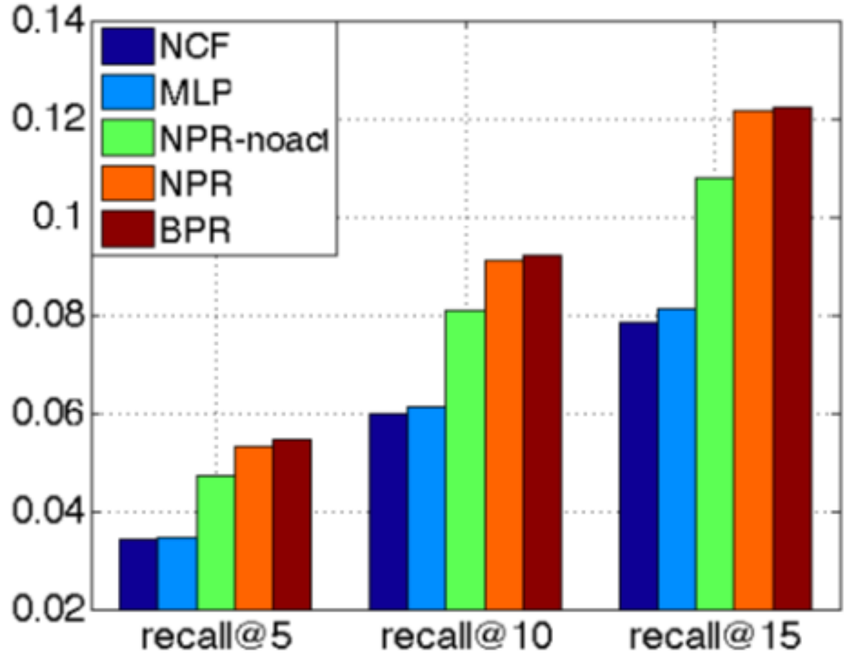




EXPERIMENTOS

Resultados vs NPR: Large dataset





EXPERIMENTOS

Resultados vs NPR: Cómo afecta el contexto?

Method	**p@5**	**p@10**	avg Δ	**r@5**	**r@10**	avg Δ
NPR	0.1280	0.1137	-	0.0531	0.0909	-
VNPR	0.1354	0.1177	+4.6%	0.0563	0.0952	+5.4%
TNPR	0.1411	0.1250	+10.1%	0.0599	0.1021	+12.6%
GNPR	0.1326	0.1178	+3.6%	0.0564	0.0953	+5.5%
C-NPR	0.1504	0.1317	+16.6%	0.0644	0.1081	+16.6%

EXPERIMENTOS

Resultados vs BPR: Cómo afecta el contexto?

Method	p@5	p@10	avg Δ	r@5	r@10	avg Δ
BPR	0.1302	0.1148	-	0.0544	0.0920	-
VBPR	0.1366	0.1188	+4.2%	0.0577	0.0961	+5.3%
TBPR	0.1384	0.1217	+8.5%	0.0588	0.0992	+8.0%
GBPR	0.1331	0.1171	+2.1%	0.0562	0.0950	+3.3%
C-BPR	0.1445	0.1255	+10.6%	0.0619	0.1034	+13.1%

EXPERIMENTOS

Resultados vs BPR: Cómo afecta el contexto?

Method	p@5	p@10	r@15	r@5	r@10	r@15
C-NPR(S)	0.2987	0.2371	0.1977	0.1866	0.2842	0.3471
C-BPR(S)	0.3034	0.2335	0.1945	0.1874	0.2801	0.3419
C-NPR(L)	0.1504	0.1317	0.1192	0.0644	0.1081	0.1430
C-BPR(L)	0.1445	0.1255	0.1141	0.0619	0.1034	0.1363

EXPERIMENTOS

Resultados vs BPR: Cómo afecta el contexto?

Method	p@5	p@10	r@15	r@5	r@10	r@15
C-NPR(S)	0.2987	0.2371	0.1977	0.1866	0.2842	0.3471
C-BPR(S)	0.3034	0.2335	0.1945	0.1874	0.2801	0.3419
C-NPR(L)	0.1504	0.1317	0.1192	0.0644	0.1081	0.1430
C-BPR(L)	0.1445	0.1255	0.1141	0.0619	0.1034	0.1363

EXPERIMENTOS

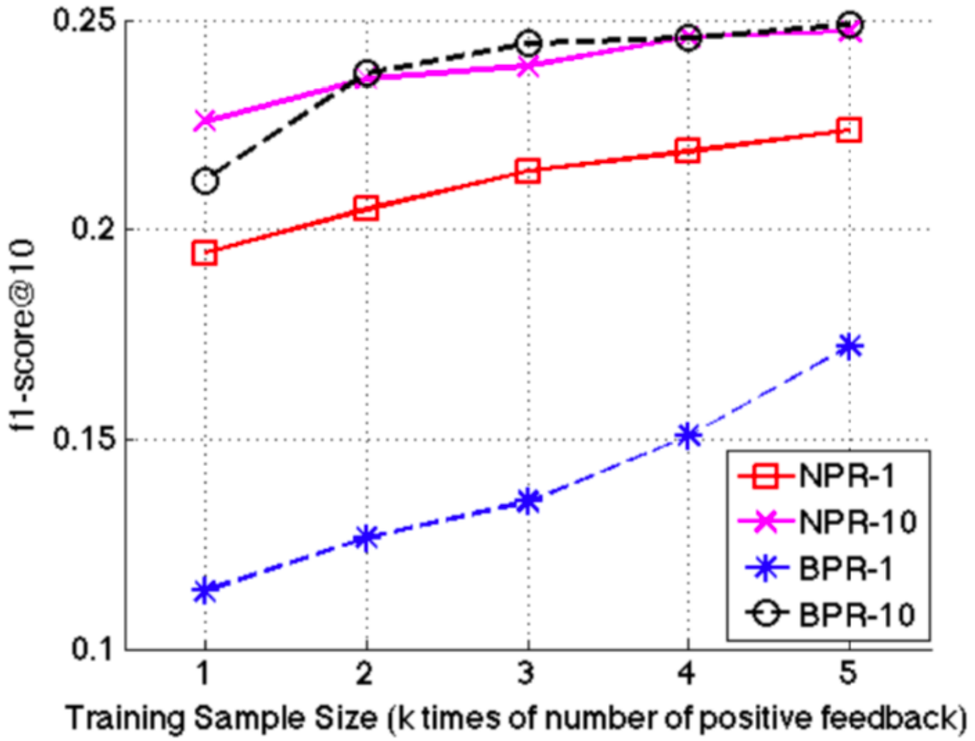
Resultados en Cold Start

Method	p@5	p@10	p@15	r@5	r@10	r@15
NPR	0.0723	0.0598	0.0518	0.0643	0.1063	0.1381
VNPR	0.0775	0.0628	0.0554	0.0683	0.1131	0.1455
TNPR	0.0820	0.0678	0.0584	0.0731	0.1206	0.1558
GNPR	0.0775	0.0644	0.0563	0.0685	0.1120	0.1455
C-NPR	0.0893	0.0721	0.0626	0.0769	0.1282	0.1668

<7 IMÁGENES LIKEADAS

EXPERIMENTOS

Resultados según training sample size



RECSYS

NEURAL PERSONALIZED RANKING FOR IMAGE RECOMMENDATIONS

Alejandro Quiñones