

Query-based Music Recommendations via Preference Embedding Chih-Ming Chen, Ming-Feng Tsai, Yu-Ching Lin, Yi-Hsuan Yang.



Institutes involved in this research work



CLIP Lab, National Chengchi University





MAC Lab, CITI, Academia Sinica

KKbox Machine Learning Team, KKBOX







Mozart: Symphony no.40 – 1st mvt. Song Artist: Gate to Classics Album: Gate to Classics: Symphony 1





Mozart: Symphony no.40 – 1st mvt. Song Artist: Gate to Classics



Mozart: Symphony no.40 – 1st mvt. (1632549) Artist: Gate to Classics Album: Gate to Classics: Symphony 1



Vivaldi: The Four Seasons - Summer: III Presto (韋瓦第:四季小提琴協奏曲「夏」—第三 樂章:急板) (1615297) Artist: Great Complosers 101 Album: Great Composers 101 -19



Dvorak: Symphony no.9 "From the New World" – 4th mvt. (1632558) Artist: Gate to Classics Album: Gate to Classics: Symphony 2



Beethoven: Piano Sonata "Moonlight", no.14 – 1st mvt. (1632838) Artist: Gate to Classics Album: Gate to Classics: Piano Work 2



Mozart: Eine Kleine Nachtmusik, K525 – 1st mvt. (1632570) Artist: Gate to Classics Album: Gate to Classics: Orchestral Work 1







Mozart: Symphony no.40 – 1st mvt. Song Artist: Gate to Classics



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One Direction Artist



One Thing (8439900) Artist: One Direction Album: One Thing



Don't Stop 不要停 (41724506) Artist: 5 Seconds Of Summer Album: 5 Seconds Of Summer



Red (15349635) Artist: Taylor Swift Album: Red



What Makes You Beautiful (你如此美麗) (4667747) Artist: One Direction Album: Up All Night The Souvenir Edition (青春無 敵 亞洲限定紀念版)



You & I (23167721) Artist: One Direction Album: Midnight Memories (Deluxe)





Les Miserables - Highlights Album Artist: Les Misérables









I Dreamed A Dream (Randy Graff, Robert Billig) (1999218) Artist: Les Misérables Album: Les Miserables - Highlights



One Day More (Cindy Benson, Jesse Corti, Robert Billig, Various Artists) (1999225) Artist: Les Misérables Album: Les Miserables - Highlights



Stars (Terrence Mann, Robert Billig) (1999222) Artist: Les Misérables Album: Les Miserables - Highlights



Wishing You Were Somehow Here Again (1196701)

Artist: Andrew Lloyd Webber Album: The Phantom of the Opera (Original Motion Picture Soundtrack) [Expanded Edition]



Empty Chairs At Empty Tables (David Bryant, Robert Billig) (1999231) Artist: Les Misérables Album: Les Miserables - Highlights

The Rum Tum Tugger (1296681) Artist: Original Cast & Original Cast Of Cats CATS Album: Cats (UK)



The Music Of The Night (15363771) Artist: Original London Cast & Andrew Lloyd Webber

Album: Phantom Of The Opera



Empty Chairs At Empty Tables (David Bryant, Robert Billig) (1999231) Artist: Les Misérables Album: Les Miserables - Highlights



The Point Of No Return (3650321) Artist: Andrew Lloyd Webber Album: The Phantom Of The Opera At The Royal Albert Hall



On My Own (Frances Ruffelle, Robert Billig) (1999226) Artist: Les Misérables



The Graph Embedding Models



Vertices

Relation Graph

Latent Space



The Graph Embedding Models



How to build the Relation Graph?

Vertices

How to learn the representations?



Construction of User Preference Network













112	16	8	-	-	-	
-	2	119	64	-	-	
-	-	32	-	109	5	
-	-	-	-	12	8	













Construction of User Preference Network



	-	-	
4	-	-	
	109	5	
	12	8	Mark Carlo

20



Construction of User Preference Network



112	24	-
121	64	-
-	32	114
-	-	20



User Preference Network



Edges: User Preference binary value / numerical value Bipartite Graph it's similar to CF-based models Heterogeneous Graph it considers multiple entities



User Preference Network



This is how we achieve the it considers multiple entities Query-based recommendations

Edges: User Preference binary value / numerical value Bipartite Graph it's similar to CF-based models Heterogeneous Graph







compress the info







Sample an Edge









Sample an Edge Random Walk











+ negative sampling





	-22			F		F			F
				HitRat	io@10				
	lastfm	n-1k (wind	low=5)	KKI	BOX (wind	ow=5)		SD (origin	nal)
	d = 16	d = 32	d = 64	d = 64	d = 128	d = 256	d = 64	d = 128	d = 250
Popularity	2.66%	2.66%	2.66%	4.32%	4.32%	4.32%	0.92%	0.92%	0.92%
MF	3.02%	3.93%	4.22%	7.11%	8.49%	8.93%	1.37%	1.79%	2.00%
DeepWalk	3.18%	3.55%	3.54%	11.61%	12.55%	13.08%	1.71%	1.95%	1.95%
LINE-2nd	3.44%	3.74%	4.10%	12.79%	13.47%	12.77%	1.62%	1.60%	1.14°
Proposed PE	$\mathbf{3.54\%}$	*4.22%	4.51%	12.95%	*13.74%	*14.20%	*2.08%	*2.15%	*2.19%
				mAP	@10				
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	d = 16	d = 32	d = 64	d = 64	d = 128	d = 256	d = 64	d = 128	d = 25
Popularity	3.27%	$\mathbf{3.27\%}$	3.27%	5.03%	5.03%	5.03%	1.04%	1.04%	1.04°
MF	1.87%	2.34%	2.60%	4.65%	5.85%	6.16%	1.88%	2.44%	2.81%
DeepWalk	1.82%	2.10%	1.99%	8.73%	9.47%	10.01%	2.66%	2.70%	2.55%
LINE-2nd	2.00%	2.10%	2.38%	9.95%	10.64%	10.09%	1.84%	1.60%	1.44%
Proposed PE	2.08%	2.55%	2.71%	10.14%	10.86%	*11.31%	2.86%	*3.09%	*3.12%

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HitRatio@10											
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mAP@10

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	lastfm	-1k (wind	ow=5)	KKBOX (window= 5)			MSD (original)				
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mAP@10

Extension Work

Multiple **Queries:**

Extension Work

Multiple **Queries:**

 \gg Hotel California (16450759) Artist: Eagles Album: Eagles Greatest Hits Vol. 2 (Remastered)

We Are The Champions (2011 Remaster) (3458192) Artist: Queen Album: News Of The World

Stand by Me (16467790) Artist: Ben E. King Album: Stand by Me

Hotel California (16450210) Artist: Eagles

Album: Hotel California

Extension Work

When The Children Cry (1923450) Artist: White Lion Album: Pride

Hysteria (19347531) Artist: Def Leppard Album: Viva! Hysteria (Original Soundtrack)

Rock The Night (2048104) Artist: Europe Album: The Final Countdown The Best Of Europe (超級冠軍極精選)

We Are The Champions (1042551) Artist: Queen Album: Queen On Fire - Live At The Bowl(火線悍 將-現場演唱全紀錄)

