1 HYPERPARAMETER LIST

Model	Hyperparameter	Range	Type	Distribution
All	Emb. size	10 - 100	Integer	uniform
	λ_{L2}	1e-4 - 1e-2	Real	log-uniform
MF, ACF, U-ProtoMF, I-ProtoMF, UI-ProtoMF	Train loss	BCE, BPR, CE	Categ.	
	Sampling	uniform, popular	Categ.	
	Negative samples	1 - 50	Integer	uniform
	Batch size	64 - 512	Integer	log2-uniform
	Optimizer	Adam, Adagrad	Categ.	
	LR	1e-4 - 1e-1	Real	log-uniform
ACF	# Anchors	10 - 100	Integer	uniform
	λ_{exc}	1e-2 - 10	Real	log-uniform
	λ_{inc}	1e-2 - 10	Real	log-uniform
U-ProtoMF, UI-ProtoMF	# User prototypes	10 - 100	Integer	uniform
	λ_1	1e-3 - 10	Real	log-uniform
	λ_2	1e-3 - 10	Real	log-uniform
I-ProtoMF UI-ProtoMF	# Item prototypes	10 - 100	Integer	uniform
	λ_3	1e-3 - 10	Real	log-uniform
	λ_4	1e-3 - 10	Real	log-uniform

Table 1. Hyperparameter list, value ranges, and distributions for the models reported in this paper.

We report in Table 1 the list of the hyperparameters, the values ranges, and distributions for the models reported in this paper. More details on the hyperparameter optimization can be found in Section 4.

2 EVALUATION RESULTS USING OTHER THRESHOLDS k

We report in Table 2 and Table 3 the evaluation of the models over the three datasets at cutoff thresholds of 5 and 50, respectively. The sign † shows the significant improvements of the models over MF, and ‡ over ACF.

Model	ml-1m		AmazonVid		lfm2b-1mon	
	NDCG	HitRatio	NDCG	HitRatio	NDCG	HitRatio
MF	.273	.407	.111	.162	.093	.139
RBMF	.230	.346	.075	.112	.208†	.288 †
ACF	.276	.413	.154†	.244†	.236†	.350†
U-ProtoMF	.278	.412	.121†	.178†	.145†	.218†
I-ProtoMF	.247	.370	.150†	.235†	.204†	.310†
UI-ProtoMF	**.325**†‡	**.477**†‡	**.177**†‡	**.266**†‡	**.296**†‡	**.422**†‡

Table 2. Evaluation results w.r.t. accuracy metrics at cutoff 5.

Model	ML-1M		AmazonVid		LFM2B-1MON	
	NDCG	HitRatio	NDCG	HitRatio	NDCG	HitRatio
MF	.393	.858	.251	.776	.200	.567
RBMF	.362	.863	.154	.445	.299†	.650†
ACF	.416†	.952†	.306†	**.864**†	.385†	.926†
U-ProtoMF	.413†	.934†	.260†	.779†	.271†	.752†
I-ProtoMF	.390	.930†	.294†	.828†	.344†	.874†
UI-ProtoMF	**.455**†‡	**.967**†‡	**.310**†	.813†	**.429**†‡	**.936**†

Table 3. Evaluation results w.r.t. accuracy metrics at cutoff 50.

3 EXAMPLES ON LFM2B-1MON

The following examples are taken from the trained UI-ProtoMF model on the LFM2B-1MON dataset. We show 3 representative users and items prototypes in Table 4.

User Prototype 16	User Prototype 35	User Prototype 30
Come Together	**Stupid Love**	**Iron Ox**
The Beatles	*Lady Gaga*	*Emancipator*
More Than a Feeling	**Physical**	**Dreamer's Wake**
Boston	*Dua Lipa*	*Rival Consoles*
Sunshine of Your Love	**Don't Start Now**	**Lush**
Cream	*Dua Lipa*	*Four Tet*
Baba O'Riley	**Say So**	**Alright**
The Who	*Doja Cat*	*Tycho*
Let It Be	**Feel Me**	**Immunity**
The Beatles	*Selena Gomez*	*Jon Hopkins*

Item Prototype 6	Item Prototype 16	Item Prototype 13
Explorers	**Workinonit**	**Architecture of Aggression**
DLJ	*J Dilla*	*Megadeth*
Amber	**Crime Pays**	**Transylvania**
EnRa	*Freddie Gibbs*	*Iron Maiden*
Winter's Kiss	**Rhymes Like Dimes**	**Steeler**
Chris Mazuera	*MF DOOM*	*Judas Priest*
my new love	**Fancy Clown**	**Caught in the Middle**
elijah who	*Madvillain*	*Dio*
early mornings	**Figaro**	**Poison Was The Cure**
Eevee	*Madvillain*	*Megadeth*

Table 4. Top-5 related items of three representative user prototypes (top) and item prototypes (bottom) based on the UI-ProtoMF model on the LFM2B-1MON dataset.

As we can see from the upper part of Table 4, the three user prototypes present different music preferences. Prototype 16's top tracks are from Rock/Hard Rock bands, while prototype 35's recommendations belong all to female pop singers. Prototype 30, instead, prefers Electronic and Downtempo music.

Similarly, the three item prototypes in the lower part of Table 4 capture different music genres. In fact, prototype 6's top neighbors are Lo-fi tracks, while prototype 16's are mostly Hip Hop and Rap. Lastly, prototype 13 represents a prototypical Heavy-Metal track.