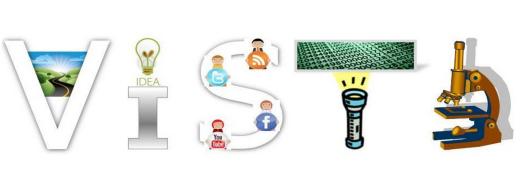
LLM-Rec: Personalized Recommendation via Prompting Large Language Models





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Motivation

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- □ Text-based recommendation systems (RS) are challenged by incomplete or insufficient information within item descriptions
- ☐ Augmenting descriptions can improve personalization by enriching richer metadata, leading to more accurate and user-specific suggestions

LLM-Rec Original Item Description: A group of toys embark on a journey of self-discovery as they learn the true meaning of friendship. LLM Reasoning Recommendation-driven Prompting **Engagement-guided Prompting** Recommendation + Engagement **Basic Prompting Model Input** Model Input **Model Input** Model Input The description of an item is as follows: '{description}'. What else should I say if I want Summarize the commonalities among the The description of an item is as follows: The description of an item is as follows: to recommend it to others? This content is '{description}', what else should I say if I want to following descriptions: '{description}'; '{description}', paraphrase it considered to hold some similar attractive '{descriptions of other important neighbors}' recommend it to others? characteristics as the following descriptions: '{descriptions of other important neighbors} **Model Output Model Output Model Output Model Output** This is a heartwarming story about friendship This item is a great choice for those looking for an entertaining and heartwarming story about friendship. It and self-discovery. It follows a group of toys on follows a group of toys on a journey of self-discovery as The commonalities among the descriptions are an exciting journey as they learn the importance A collection of toys go on an adventure to they learn the true meaning of friendship. It has a similar of being there for each other. With its charming that they all involve journeys, discovery, and understand the power of companionship. feel to classic films such as 'Being John Malkovich', characters and captivating plot, this is a mustcomedic elements. 'Airplane!' and 'Monty Python and the Holy Grail', read for anyone looking for a fun and inspiring combining elements of comedy, adventure and fantasy. adventure. It's sure to be a hit with viewers of all ages! **Item Module User Module** Recommendation Module + **Text Encoder** User Encoder Enriched Text Embedding | Enriched Text Embedding Enriched Text Embedding | Enriched Text Embedding **User Embedding** Score

Main Results

- ☐ Integrating the text augmented by LLM-Rec boosts recommendation performance
- □ LLM-Rec empowers simple MLP to attain comparable or even superior performance

			Movielens-1M			Recipe	
		Precision@10	Recall@10	NDCG@10	Precision@10	Recall@10	NDCG@10
Item Popularity		0.0426 ± 0.0019	0.0428 ± 0.0028	0.0530 ± 0.0035	0.0116 ± 0.0025	0.0274 ± 0.0083	0.0201 ± 0.0053
MLP		0.2922 ± 0.0019	0.2455 ± 0.0031	0.3640 ± 0.0039	0.0325 ± 0.0021	0.0684 ± 0.0066	0.0580 ± 0.0054
AutoInt (Song et al., 2019)		0.2149 ± 0.0078	0.1706 ± 0.0075	0.2698 ± 0.0092	0.0351 ± 0.0032	0.0772 ± 0.0102	$\underline{0.0658} \pm 0.0089$
DCN-V2 (Wang et al., 2021)		0.2961 ± 0.0050	0.2433 ± 0.0057	0.3689 ± 0.0033	$\underline{0.0360} \pm 0.0036$	$\underline{0.0786} \pm 0.0104$	0.0653 ± 0.0085
EDCN (Chen et al., 2021)		0.2935 ± 0.0036	0.2392 ± 0.0051	0.3678 ± 0.0053	0.0354 ± 0.0030	0.0772 ± 0.0091	0.0652 ± 0.0071
TagGPT (Li et al., 2023a)	LLAMA-2-7B	0.2991 ± 0.0017	0.2556 ± 0.0038	0.3723 ± 0.0023	0.0353 ± 0.0024	0.0751 ± 0.0067	0.0641 ± 0.0057
	GPT-3	0.3001 ± 0.0027	0.2569 ± 0.0028	0.3747 ± 0.0042	0.0356 ± 0.0032	0.0752 ± 0.0084	0.0637 ± 0.0068
KAR (Xi et al., 2023)		0.3056 ± 0.0026	0.2623 ± 0.0034	0.3824 ± 0.0042	0.0298 ± 0.0018	0.0611 ± 0.0049	0.0525 ± 0.0043
- augmented with ground truth		0.3075 ± 0.0015	0.2636 ± 0.0035	0.3853 ± 0.0027	-	-	-
LLM-REC	LLAMA-2-7B	0.3102 ± 0.0014	0.2712 ± 0.0026	$\underline{0.3867}_{\pm 0.0027}$	0.0359 ± 0.0024	0.0770 ± 0.0076	0.0632 ± 0.0052
		(+6.16%)	(+10.47%)	(+6.24%)	(+10.46%)	(+12.57%)	(+8.97%)
	GPT-3	0.3150 ± 0.0023	0.2766 ± 0.0030	0.3951 ± 0.0035	0.0394 ± 0.0033	0.0842 ± 0.0098	0.0706 ± 0.0084
	UF 1-3	(+7.80%)	(+12.67%)	(+8.54%)	(+21.23%)	(+23.10%)	(+21.72%)

Description: A troubled child psychologist helps a young boy who is able to see and communicate with the dead.

P_{para}: A child psychologist works with a young boy who has the ability to perceive and talk to spirits.

Prec_{para}: This movie is a must-watch for anyone who loves psychological thrillers. It follows the story of a child psychologist as he helps a young boy who can see and communicate with the dead. The movie is full of suspense and mystery, and will keep you on the edge of your seat. It's a great watch for anyone looking for an exciting and thought-provoking movie.

Two variants of the augmented text:

Precpara: A child psychologist works with a young boy who has the ability to perceive and talk to spirits.

Pkeyword para: A child psychologist works with a young boy who has the ability to perceive and talk to spirits. thrillers, suspense, mystery,

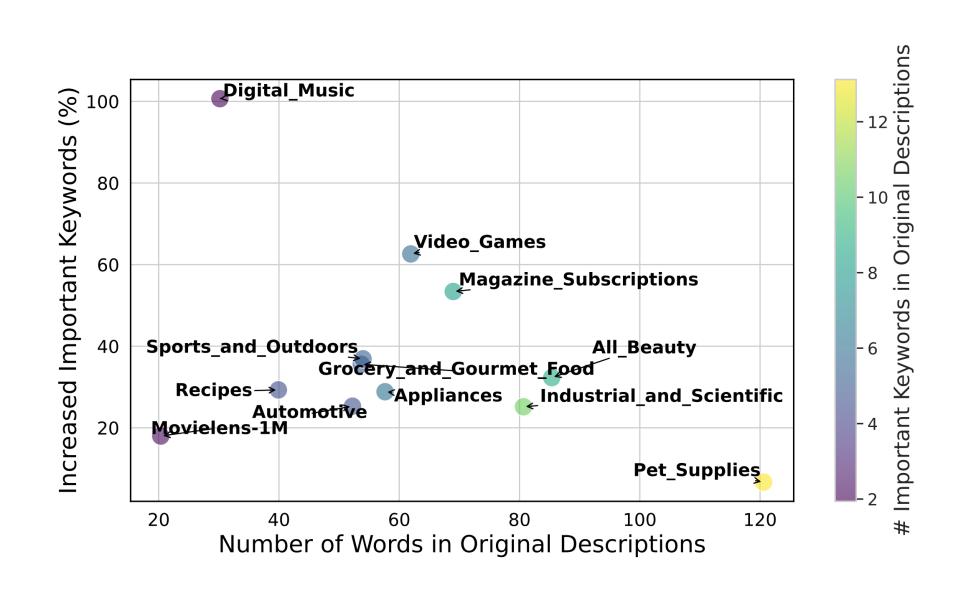
Precpara: This movie is a must-watch for anyone who loves psychological thrillers. It follows the story of a child psychologist as he helps a young boy who can see and communicate with the dead. The movie is full of suspense and mystery, and will keep you on the edge of your seat. It's a great watch for anyone looking for an exciting and thought-provoking movie.

Pmask para: This movie is a must-watch for anyone who loves psychologica. [MASK] It follows the story of a child psychologist as he helps a young boy who can see and communicate with the dead. The movie is full of [MASK] and [MASK] and will keep you on the edge of your seat. It's a great watch for anyone looking for an exciting and thought-provoking movie.

Inject keywords

The augmented content contains more detailed and expressive descriptions

	Movielens-1M	Recipe
p_{para}	0.3746 ± 0.0028	0.0611 ± 0.0053
$p_{para}^{keyword}$	0.3822 ± 0.0049	0.0615 ± 0.0060
p_{para}	(+2.03 %)	(+0.65%)
p_{para}^{rec}	0.3777 ± 0.0028	0.0646 ± 0.0072
1	$0.3769 \pm\! 0.0040$	0.0611 ± 0.0066
p_{para}^{mask}	(-0.21%)	(-0.52%)



- □ Applicable to varied domains
- □ **Not** confined to datasets with rich content

Robustness of The Prompts

□ Responses remain largely the same, despite the variations in wording of the prompts

·	Prompting	Strategy	Variant
the	Basic	$egin{aligned} p_{para} \ p_{tag} \ p_{infer} \end{aligned}$	0.8859 ± 0.0898 0.9112 ± 0.1000 0.6819 ± 0.1500
IS	Rec	$p_{para}^{rec} \ p_{tag}^{rec} \ p_{infer}^{rec}$	0.7011 ± 0.1369 0.8627 ± 0.1249 0.8458 ± 0.0659
	Eng	p^{eng}	0.6218 ± 0.1018
•	Rec+Eng	$p^{rec+eng}$	0.8542 ± 0.0803

Other Text Augmentation Methods

- □ LLM-Rec outperforms other text-based augmentation methods for recommendation
- ☐ This may lie in the potential **mismatch** between the generated knowledge and the target item

Description: easy and tasty served either hot or cold, wonderful sliced cold for a picnic or sandwiches. we have enjoyed this basic meatloaf for many years.try a change, instead of the usual topping, try your favourite salsa brushed on top, a nice chipotle medium or hot salsa is wonderful on it.

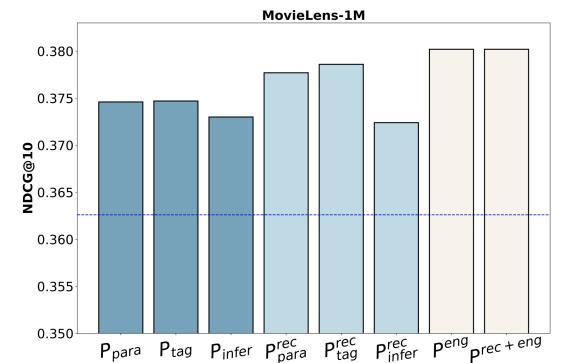
Prec_{para}: I highly recommend this basic meatloaf! It's easy to make and tastes great hot or cold. It's perfect for a picnic or sandwiches, and you can even switch up the topping for something different. Try brushing on your favourite salsa, like a chipotle medium or hot salsa, for an extra kick of flavour. You won't be disappointed!

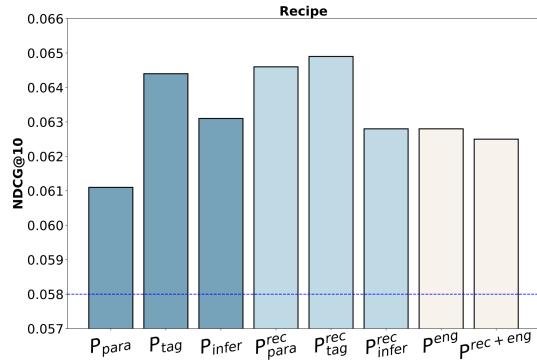
KAR: This easy and tasty meatloaf is a great dish to serve either hot or cold. It is perfect for a picnic or sandwiches, and can be enjoyed by everyone.

Ingredients: - 2 lbs ground beef - 1/2 cup bread crumbs - 1/4 cup onion, finely chopped - 1/4 cup green pepper, finely chopped - 1 egg - 1/4 cup ketchup - 1 teaspoon Worcestershire sauce - 1 teaspoon garlic powder - 1 teaspoon salt - 1/4 teaspoon black pepper - Optional: your favorite salsa

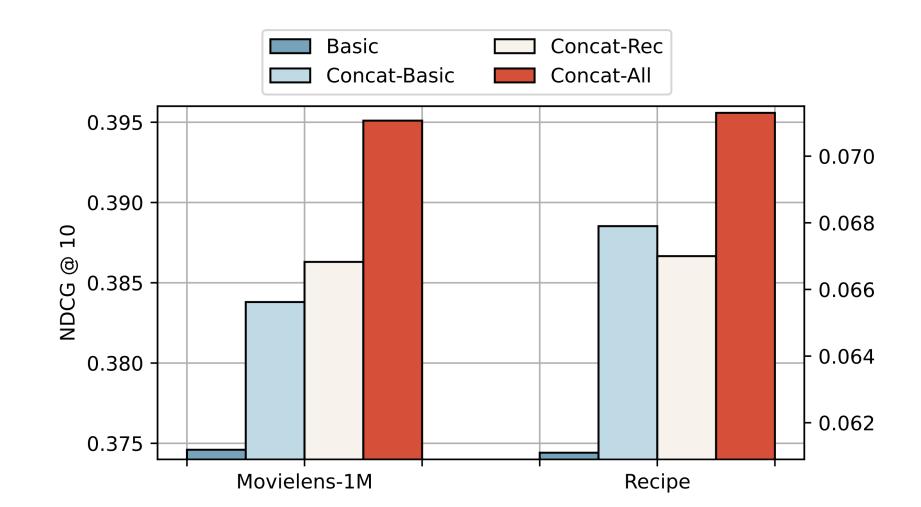
Ablation Study

☐ Improvement of each prompt varies across different domains





□ Concatenating more information **consistently** enhances recommendation performance



 Concatenating text embeddings is more effective than concatenating the raw text

	Movielens-1M	Recipe
Item Description	0.3640 ± 0.0039	0.0580 ± 0.0054
Duplication	0.3567 ± 0.0043	0.0590 ± 0.0068
Text Concatenation	$0.3853 \pm\! 0.0027$	0.0591 ± 0.0065
Concat-All (ours)	0.3951 ± 0.0035	0.0706 ± 0.0084

Acknowledgments

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