

# LLM-Rec: Personalized Recommendation via Prompting Large Language Models



Hanjia Lyu<sup>1</sup>, Jiang Song<sup>2</sup>, Hanqing Zeng<sup>3</sup>, Yinglong Xia<sup>3</sup>, Qifan Wang<sup>3</sup>,  
Si Zhang<sup>3</sup>, Ren Chen<sup>3</sup>, Christopher Leung<sup>3</sup>, Jiajie Tang<sup>3</sup>, and Jiebo Luo<sup>1</sup>

<sup>1</sup>University of Rochester <sup>2</sup>UCLA <sup>3</sup>Meta AI

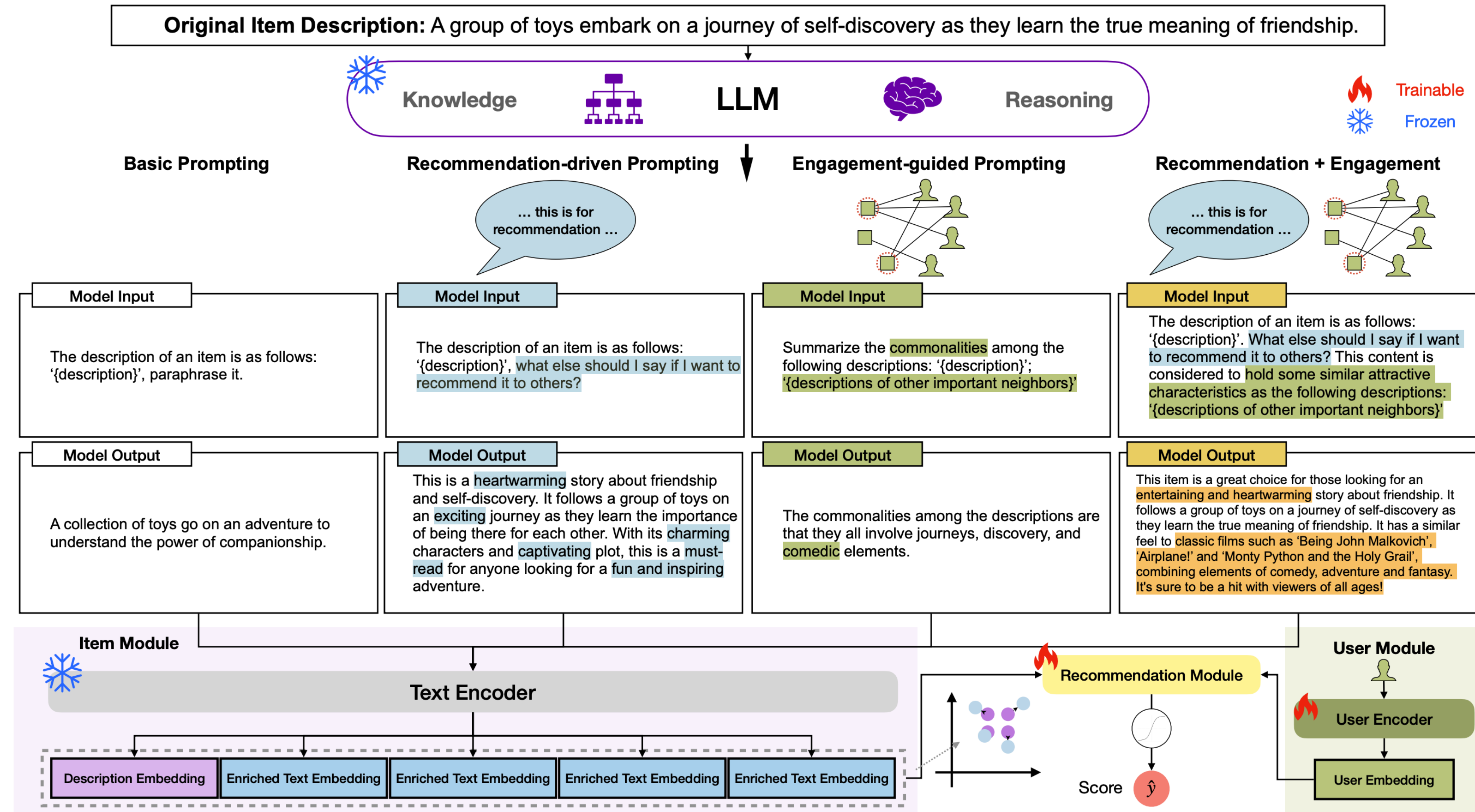


Meta AI UNIVERSITY of ROCHESTER

## Motivation

- 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



## Robustness of The Prompts

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

Prompting Strategy	Variant	
Basic	$p_{para}$	0.8859 $\pm 0.0898$
	$p_{tag}$	0.9112 $\pm 0.1000$
	$p_{infer}$	0.6819 $\pm 0.1500$
Rec	$p_{para}^{rec}$	0.7011 $\pm 0.1369$
	$p_{tag}^{rec}$	0.8627 $\pm 0.1248$
	$p_{infer}^{rec}$	0.8458 $\pm 0.0652$
Eng	$p^{eng}$	0.6218 $\pm 0.1012$
Rec+Eng	$p^{rec+eng}$	0.8542 $\pm 0.0802$

## 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.

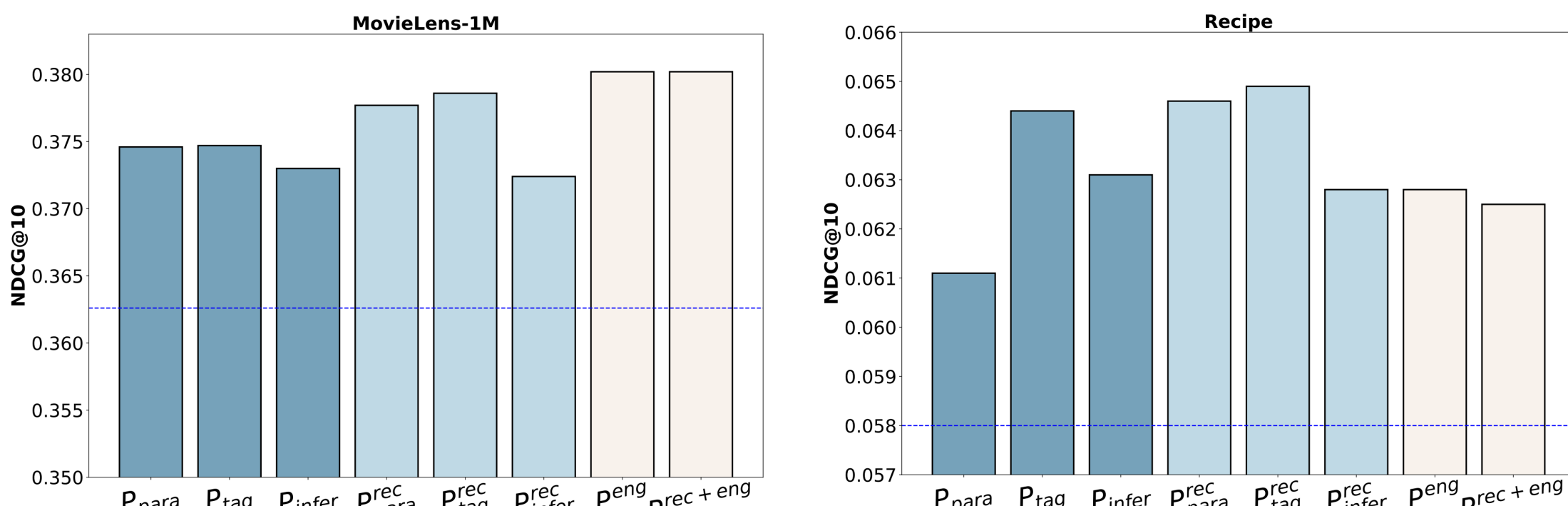
**Prec<sub>para</sub>:** I highly recommend this basic meatloaf! It's easy to make and tastes great hot or cold. It's perfect for a picnic or sandwiches, and you can even switch up the topping for something different. Try brushing on your favourite salsa, like a chipotle medium or hot salsa, for an extra 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.

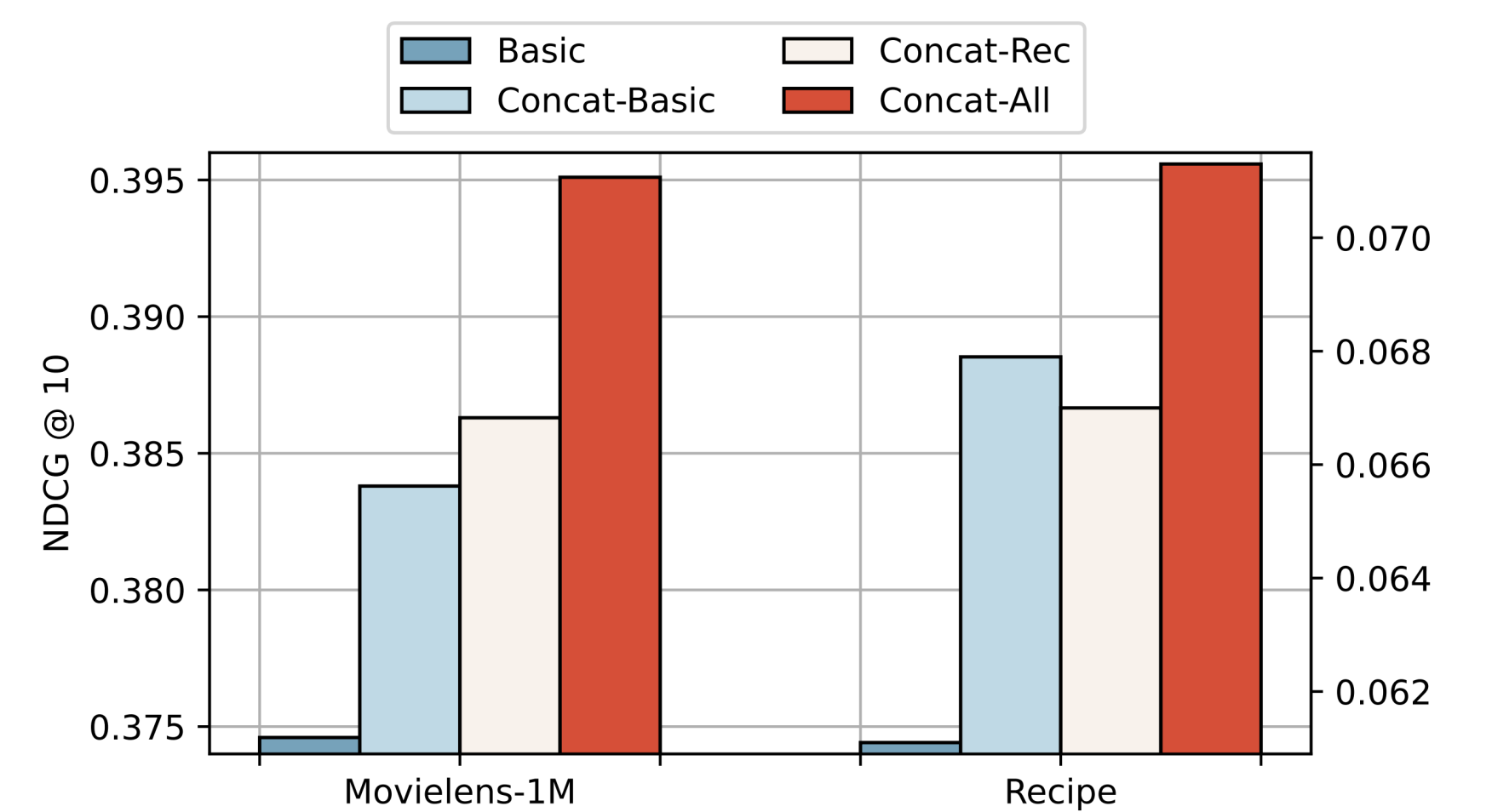
**Ingredients:** - 2 lbs ground beef - 1/2 cup bread crumbs - 1/4 cup onion, finely chopped - 1/4 cup green pepper, finely chopped - 1 egg - 1/4 cup ketchup - 1 teaspoon Worcestershire sauce - 1 teaspoon garlic powder - 1 teaspoon salt - 1/4 teaspoon black pepper - Optional: your favorite salsa

## 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 $\pm 0.0039$	0.0580 $\pm 0.0054$
Duplication	0.3567 $\pm 0.0043$	0.0590 $\pm 0.0068$
Text Concatenation	0.3853 $\pm 0.0027$	0.0591 $\pm 0.0065$
Concat-All (ours)	<b>0.3951 <math>\pm 0.0035</math></b>	<b>0.0706 <math>\pm 0.0084</math></b>

## Acknowledgments

Luo was supported in part by NSF Award #2238208.

## 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 $\pm 0.0019$	0.0428 $\pm 0.0028$	0.0530 $\pm 0.0035$	0.0116 $\pm 0.0025$	0.0274 $\pm 0.0083$	0.0201 $\pm 0.0053$
MLP		0.2922 $\pm 0.0019$	0.2455 $\pm 0.0031$	0.3640 $\pm 0.0039$	0.0325 $\pm 0.0021$	0.0684 $\pm 0.0066$	0.0580 $\pm 0.0054$
AutoInt (Song et al., 2019)		0.2149 $\pm 0.0078$	0.1706 $\pm 0.0075$	0.2698 $\pm 0.0092$	0.0351 $\pm 0.0032$	0.0772 $\pm 0.0102$	0.0658 $\pm 0.0089$
DCN-V2 (Wang et al., 2021)		0.2961 $\pm 0.0050$	0.2433 $\pm 0.0057$	0.3689 $\pm 0.0033$	0.0360 $\pm 0.0036$	0.0786 $\pm 0.0104$	0.0653 $\pm 0.0085$
EDCN (Chen et al., 2021)		0.2935 $\pm 0.0036$	0.2392 $\pm 0.0051$	0.3678 $\pm 0.0053$	0.0354 $\pm 0.0030$	0.0772 $\pm 0.0091$	0.0652 $\pm 0.0071$
LLM-REC	TagGPT (Li et al., 2023a)	LLAMA-2-7B	0.2991 $\pm 0.0017$	0.2556 $\pm 0.0038$	0.3723 $\pm 0.0023$	0.0353 $\pm 0.0024$	0.0751 $\pm 0.0067$
		GPT-3	0.3001 $\pm 0.0027$	0.2569 $\pm 0.0028$	0.3747 $\pm 0.0042$	0.0356 $\pm 0.0032$	0.0752 $\pm 0.0084$
	KAR (Xi et al., 2023)		0.3056 $\pm 0.0026$	0.2623 $\pm 0.0034$	0.3824 $\pm 0.0042$	0.0298 $\pm 0.0018$	0.0525 $\pm 0.0043$
	- augmented with ground truth		0.3075 $\pm 0.0015$	0.2636 $\pm 0.0035$	0.3853 $\pm 0.0027$	-	-
LLM-REC		LLAMA-2-7B	0.3102 $\pm 0.0014$	0.2712 $\pm 0.0026$	0.3867 $\pm 0.0027$	0.0359 $\pm 0.0024$	0.0632 $\pm 0.0052$
		GPT-3	0.3150 $\pm 0.0023$	0.2766 $\pm 0.0030$	0.3951 $\pm 0.0035$	0.0394 $\pm 0.0033$	0.0706 $\pm 0.0084$

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

**P<sub>para</sub>:** A child psychologist works with a young boy who has the ability to perceive and talk to spirits.

**P<sub>rec<sub>para</sub></sub>:** 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.

- The augmented content contains more detailed and expressive descriptions

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

Two variants of the augmented text:

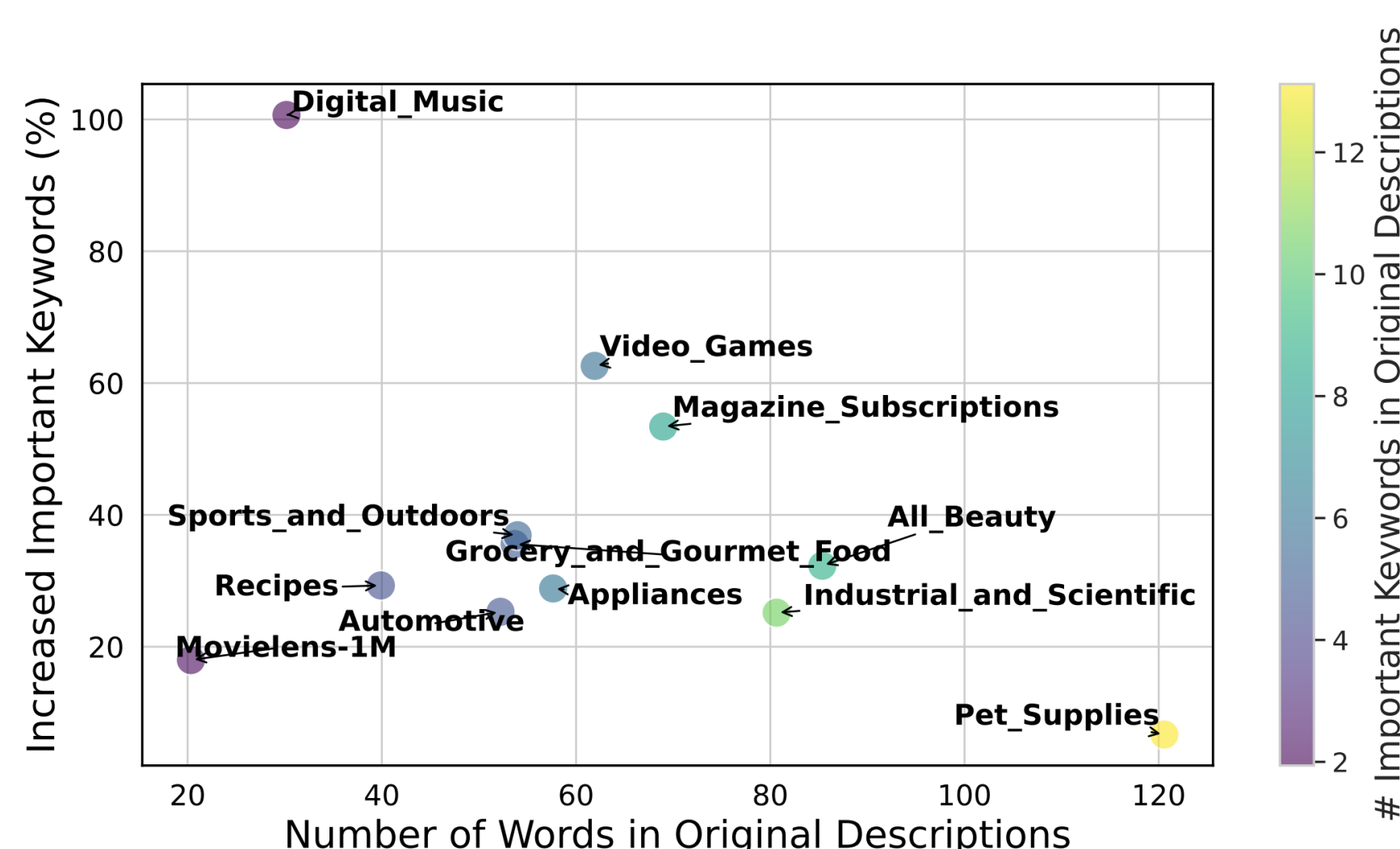
Inject keywords

**P<sub>para</sub>:** A child psychologist works with a young boy who has the ability to perceive and talk to spirits.

**P<sub>keyword<sub>para</sub></sub>:** A child psychologist works with a young boy who has the ability to perceive and talk to spirits. **thrillers, suspense, mystery.**

**P<sub>rec<sub>para</sub></sub>:** 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.

**P<sub>mask<sub>para</sub></sub>:** This movie is a must-watch for anyone who loves psychological **[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.



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