Multi-intent-aware Session-based Recommendation

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Check out our paper and code for details!

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Paper Code

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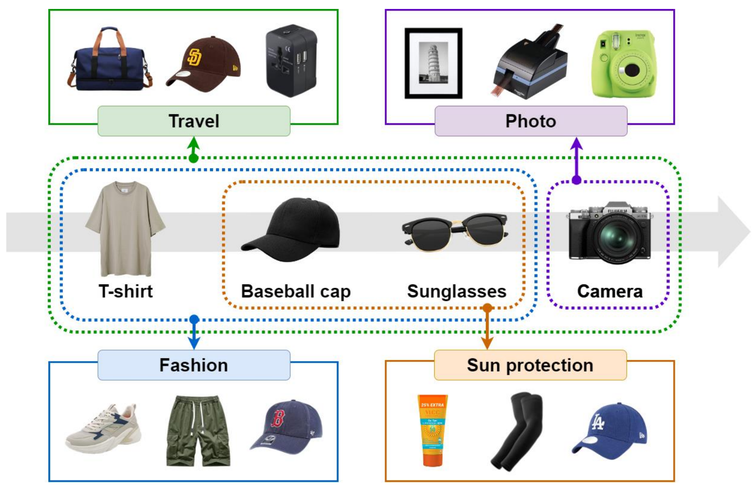
Motivation

Session-based Recommendation (SBR) predicts the next item(s) based on the current session.

- Sessions are typically short but may have **multiple user intents**, but existing SBR models overlook this.
- It is more appropriate to recommend with multiple intents.



Takeaways

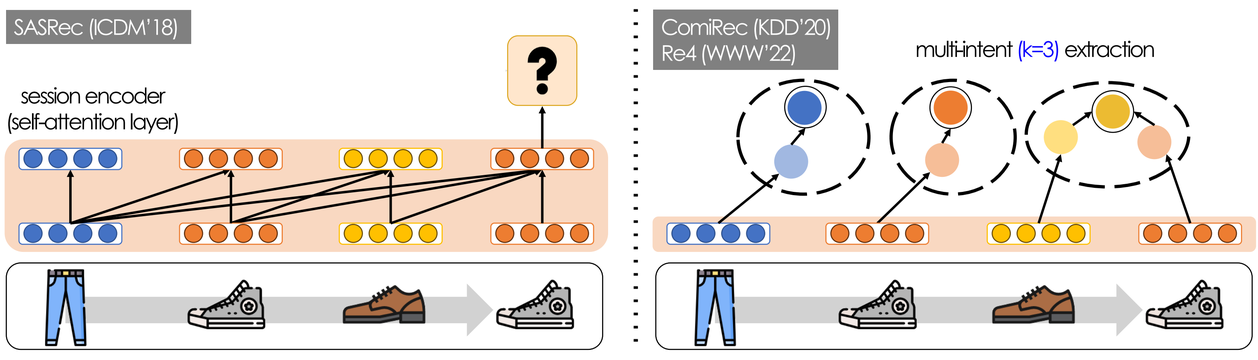
- ✓ **MiaSRec** is a novel SBR model exploits **multiple user intents in a session**.
- ✓ It **fully captures a variety of intents** utilizing multiple session item representations and dynamically selects more important ones.
- ✓ It **effectively aggregates multiple intents** by max- and average-pooling functions.

Research Question

How can we consider **multiple intents** for a more accurate session-based recommender model?

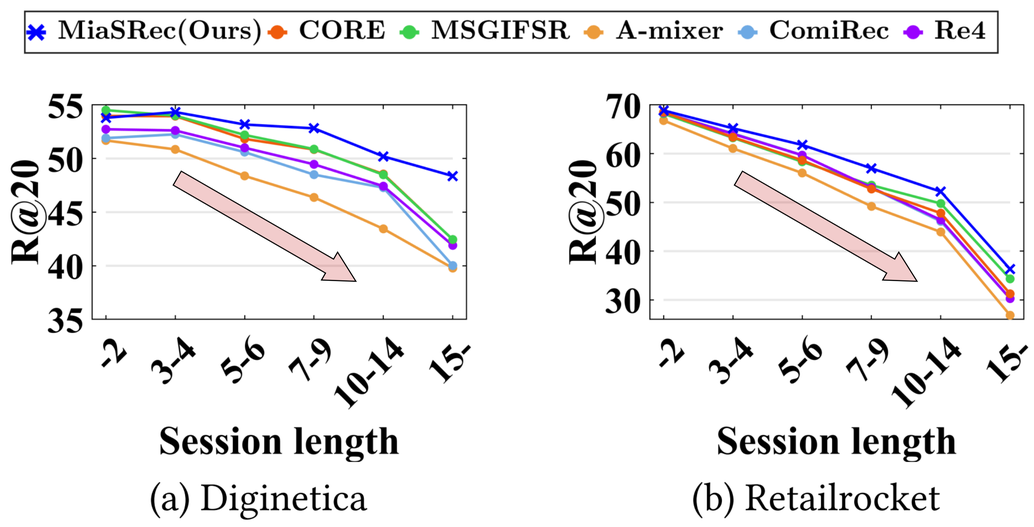
Limitation of Existing Methods

(1) Most existing models focused on a single session representation for capturing user preferences.
(2) Some models consider multi-intent, but assume that there is a fixed number of intents, regardless of the characteristics of the sequence.



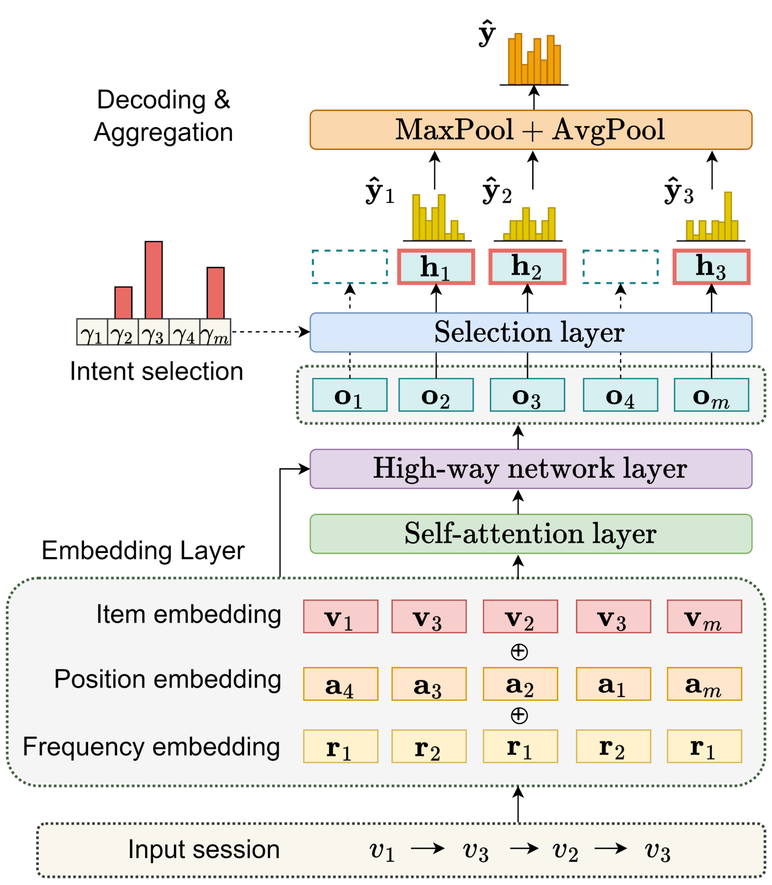
Performance over Different Session Length

As the session length increases, the user intents become more diverse and multifaceted, resulting in a performance drop.



Wang-Cheng Kang, Julian J. McAuley. Self-Attentive Sequential Recommendation. ICDM 2018: 197-206
Yukuo Cen, Jianwei Zhang, Xu Zou, Chang Zhou, Hongxia Yang, Jie Tang. Controllable Multi-Interest Framework for Recommendation. KDD 2020: 2942-2951
Shengyu Zhang, Lingxiao Yang, Dong Yao, Yujie Lu, Fuli Feng, Zhou Zhao, Tat-Seng Chua, Fei Wu. Re4: Learning to Re-contrast, Re-attend, Re-construct for Multi-interest Recommendation. WWW 2022: 2216-2226

MiaSRec: Multi-intent-aware Session-based Recommendation

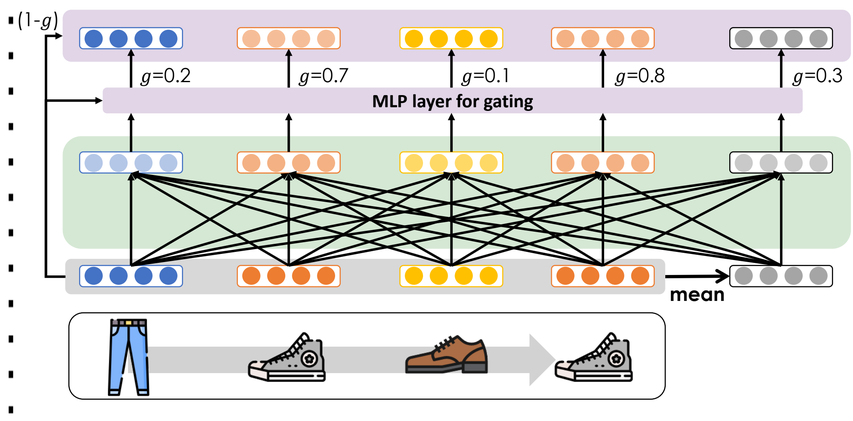


We propose **MiaSRec** to address challenges for modeling multiple user intents:
(1) how to fully capture multiple user intents inherent in each session?
(2) how to filter out unimportant ones among multiple intents?

For challenge (1), we utilize **multiple representations** derived from each session item.

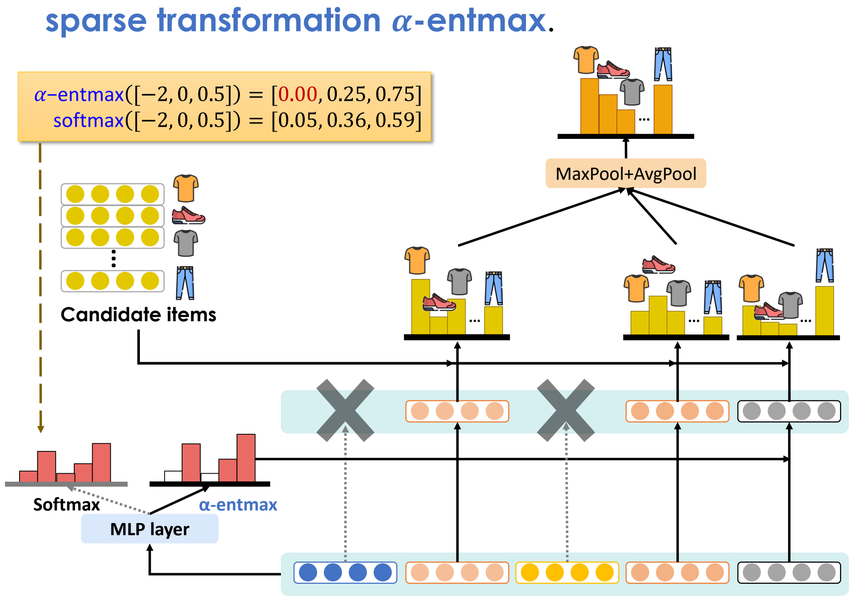
-To better understand the importance of each session item, we adopt **bi-directional self-attention**.

-To ensure each representations do not become similar and to better reflect different user intent, we leverage the **high-way network**.



For challenge (2), we **extract essential user intents** in a session.

-To adaptively extract multiple intents, we use a **sparse transformation α-entmax**.

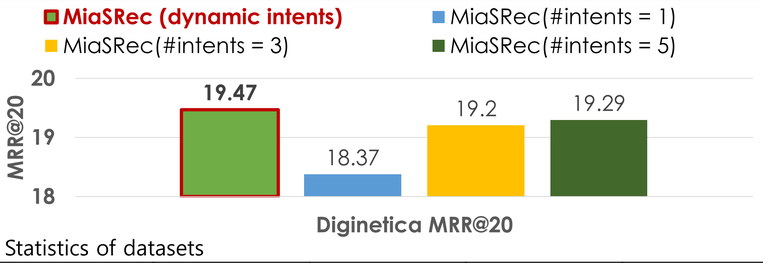


Experimental Results

- MiaSRec **consistently outperforms** the baselines on all datasets.
- It shows substantial improvements in recall with **longer session lengths** (Tmall, LastFM)

		Single-intent Models				Multi-intent Models				Proposed	
Dataset	**Metric**	**SASRec (ICDM '18)**	**SGNN-HN (CIKM '21)**	**DSAN (AAAI '21)**	**CORE (SIGIR '22)**	**ComiRec (KDD'20)**	**Re4 (WWW'22)**	**MSGIFSR (WSDM'22)**	**A-mixer (WSDM'23)**	**MiaSRec**	**Imp.**
Diginetica	Recall@20	49.86	50.60	52.06	52.89	51.22	51.59	53.20	49.84	**53.54**	+0.65%
	MRR@20	17.20	17.28	18.25	18.53	18.35	18.47	18.37	17.07	**19.47**	+5.04%
Retailrocket	Recall@20	59.70	57.43	61.13	61.77	61.56	61.65	63.04	59.49	**63.37**	+0.26%
	MRR@20	35.71	35.39	38.68	38.49	38.16	38.10	38.42	36.25	**39.23**	+1.41%
Yoochoose	Recall@20	63.64	61.60	63.73	64.64	62.48	63.13	65.20	63.73	**65.37**	+0.26%
	MRR@20	28.66	27.97	29.23	28.25	28.03	28.29	30.02	29.32	**30.74**	+2.39%
Tmall	Recall@20	35.80	39.71	42.82	44.91	42.10	42.40	35.39	38.76	**55.94**	+24.56%
	MRR@20	25.08	24.16	30.85	31.59	28.01	28.43	22.19	28.52	**33.57**	+6.27%
LastFM	Recall@20	20.53	22.72	22.47	22.75	22.13	23.02	22.73	22.93	**25.85**	+12.32%
	MRR@20	6.22	7.66	7.93	7.83	7.83	8.50	8.20	8.74	**9.95**	+13.06%

- MiaSRec with **dynamic intent selection** is better than using static number of intents



Statistics of datasets

Dataset	# Interacts	# Sessions	# Items	AvgLen
Diginetica	786,582	204,532	42,862	4.12
Retailrocket	871,637	321,032	51,428	6.40
Yoochoose	1,434,349	470,477	19,690	4.64
Tmall	427,797	66,909	37,367	10.62
LastFM	3,510,163	325,543	38,616	8.16