Языковые модели в задачах предиктивного пользовательского ввода

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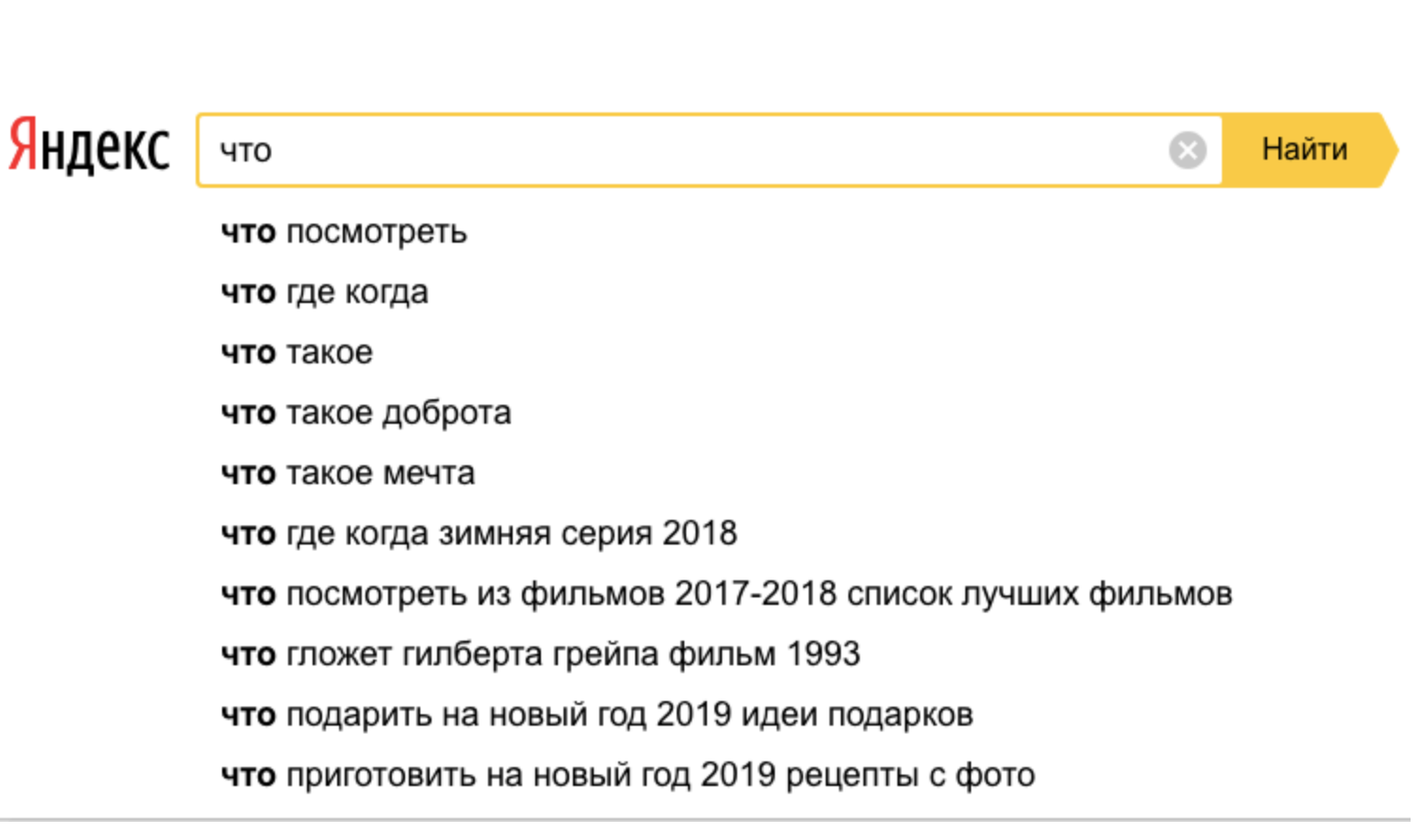
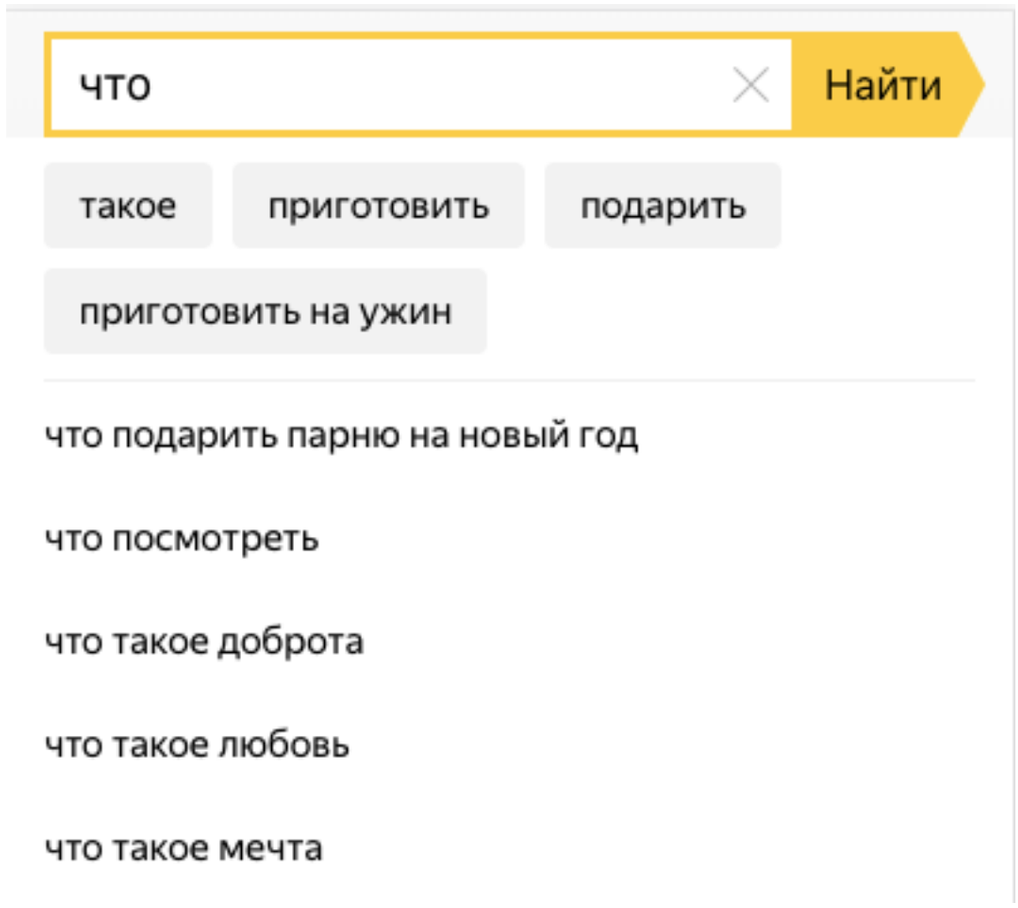
2018

Постановка Задачи:

Предсказание поискового запроса пользователя
с помощью языковых моделей





Проблемы:

- Скорость ответа
- Русский язык
- Другой синтаксис
- Сложные метрики
- Свежесть

Метрики

Онлайн:

- Время набора запроса / кол-во символов
- Клики на подсказки

Оффлайн:

- MRR@k
- Recall@k

Что другие люди уже делали в этой области?

A Neural Language Model for Query Auto-Completion

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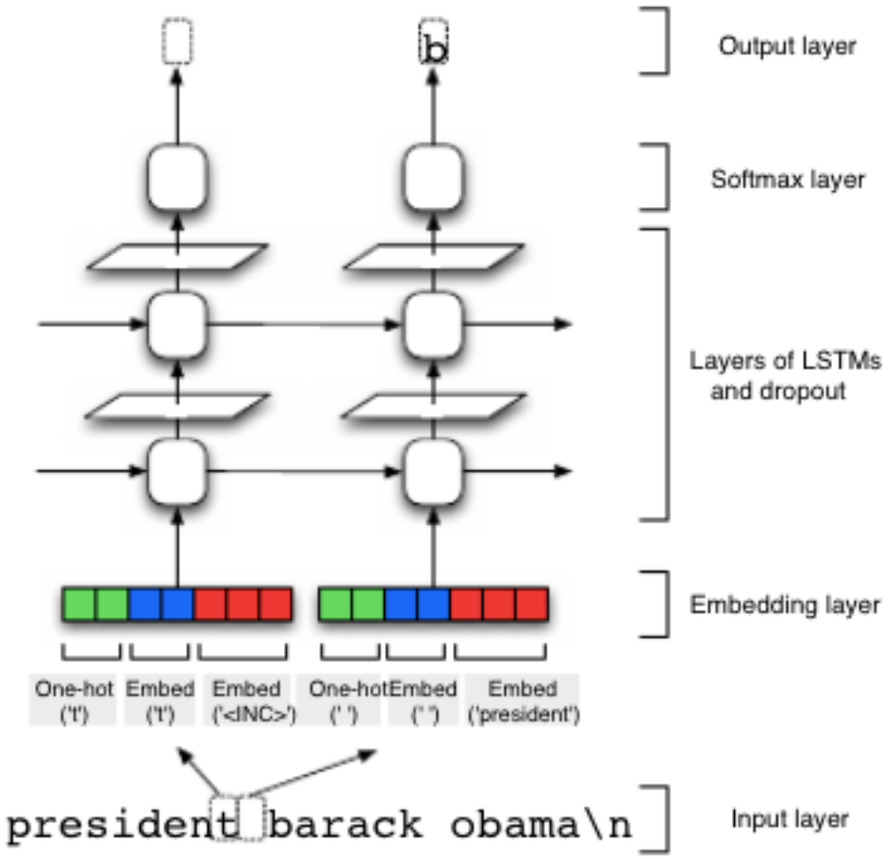

$$L = \sum_{q \in Q} \sum_{j=1}^{|q|-1} \log p(t_{j+1} | t_1, \ldots, t_j) \tag{4}$$

Table 2: MRR and PMRR evaluation results. The highest score for each metric is in bold face.

Model	MRR Seen	MRR Unseen	MRR All	PMRR Seen	PMRR Unseen	PMRR All
MPC [1]	0.428	0.000	0.171	0.566	0.000	0.225
Char. n-gram (n=7)	0.363	0.236	0.287	0.550	0.376	0.445
Mitra10K+MPC+λMART [12]	0.427	0.179	0.278	0.586	0.297	0.412
Mitra100K+MPC+λMART [12]	0.428	0.212	0.298	0.588	0.368	0.455
Proposed models						
NQLM(S)	0.381	0.287	0.325	0.557	0.460	0.499
NQLM(S)+WE	0.406	0.286	0.334	0.582	0.445	0.500
NQLM(L)+WE	0.419	0.303	0.349	0.589	0.465	0.514
NQLM(S)+MPC	0.433	0.287	0.346	0.580	0.460	0.508
NQLM(S)+WE+MPC	**0.434**	0.286	0.345	0.580	0.445	0.499
NQLM(L)+WE+MPC	**0.434**	0.303	**0.355**	0.580	0.465	0.511
NQLM(S)+MPC+λMART	0.428	0.288	0.344	**0.594**	0.465	0.516
NQLM(S)+WE+MPC+λMART	0.428	0.288	0.344	0.590	0.454	0.508
NQLM(L)+WE+MPC+λMART	0.428	**0.305**	0.354	0.593	**0.475**	**0.522**

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Personalized Language Model for Query Auto-Completion

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Size	Model	Seen	Unseen	All
	MPC	.292	.000	.203
	Unadapted	.292	.256	.267
(S)	ConcatCell	.296	.263	.273
	FactorCell	.300	.264	.275
	Unadapted	.324	.286	.297
(B)	ConcatCell	.330	.298	.308
	FactorCell	.335	.298	.309

Table 2: MRR reported for seen and unseen prefixes for small (S) and big (B) models.

$$h_t = \sigma([w_t, h_{t-1}]\mathbf{W} + b + \mathbf{V}u) \quad (1)$$

$$h_t = \sigma([w_t, h_{t-1}]\mathbf{W}' + b) \quad (2)$$

$$\mathbf{A} = (u_i \times_1 \mathbf{Z}_L)(\mathbf{Z}_R \times_3 u_i) \quad (3)$$

Personalized neural language models for real-world query auto completion

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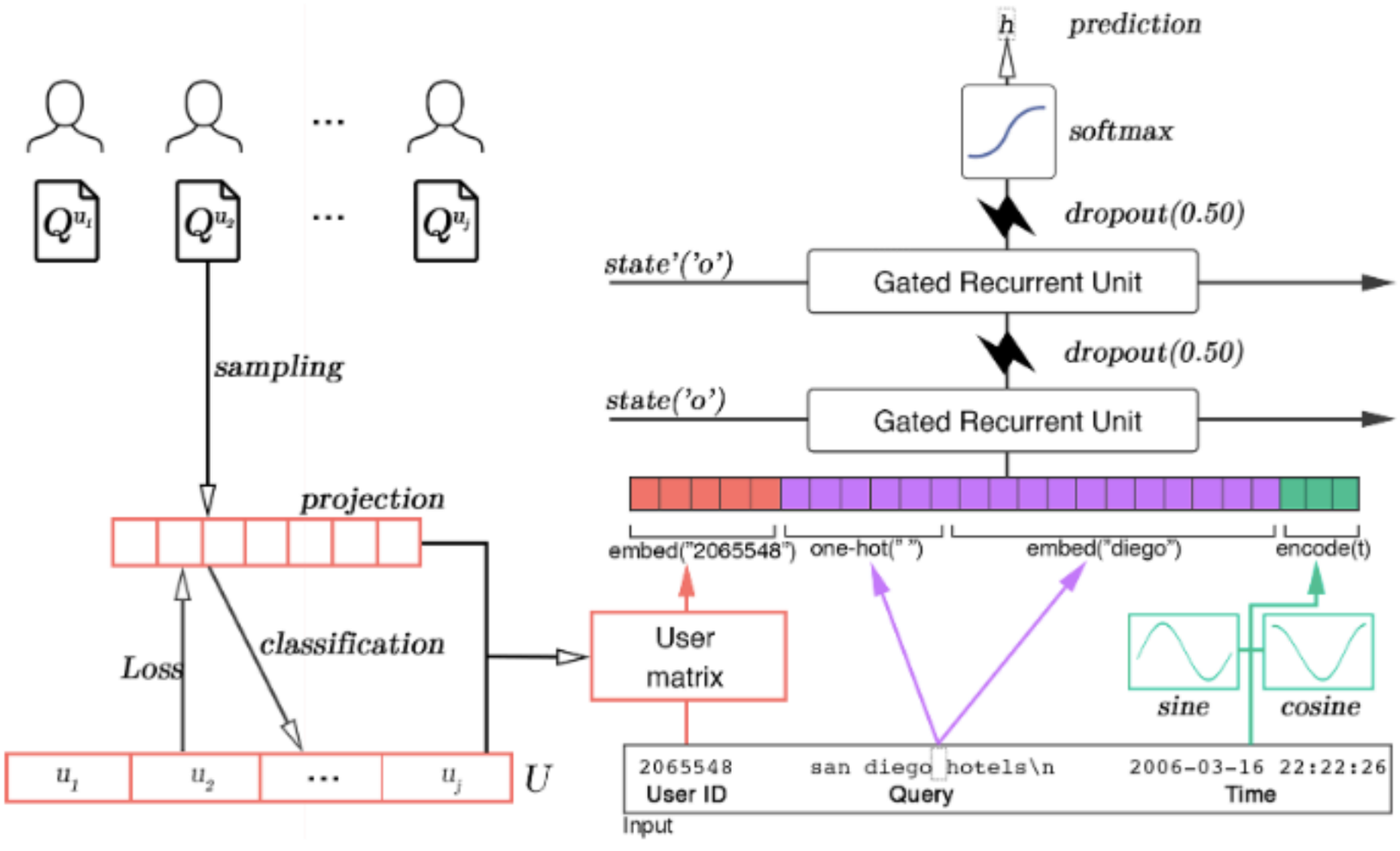

Figure 1: Architecture of our proposed model.

Table 1: MRR results for all tested models on the AOL and biomedical datasets with their average prediction time in seconds.

Model	AOL dataset				Biomedical dataset			
	MRR			Time	MRR			Time
	Seen	Unseen	All		Seen	Unseen	All	
MPC (Bar-Yossef and Kraus, 2011)	**0.461**	0.000	0.184	**0.24**	0.165	0.000	0.046	**0.29**
NQLM(L)+WE+MPC+λMART (Park and Chiba, 2017)	0.430	0.306	0.356	1.33	0.159	0.152	0.154	2.35
Our models in this paper								
NQAC	0.406	0.319	0.354	0.94	0.155	0.139	0.143	1.73
NQAC$_U$	0.417	0.325	0.361	0.98	**0.191**	0.161	0.169	1.77
NQAC$_{UT}$	0.424	0.326	0.365	0.95	0.101	**0.195**	0.157	1.81
NQAC$_{UT}$+D	0.427	0.326	0.366	1.32	0.186	0.185	0.185	2.04
NQAC$_{UT}$+MPC	**0.461**	0.326	0.380	0.68	0.165	**0.195**	**0.187**	1.20
NQAC$_{UT}$+MPC+λMART	0.459	**0.330**	**0.382**	1.09	0.154	0.179	0.172	2.01

A Hierarchical Recurrent Encoder-Decoder for Generative Context-Aware Query Suggestion

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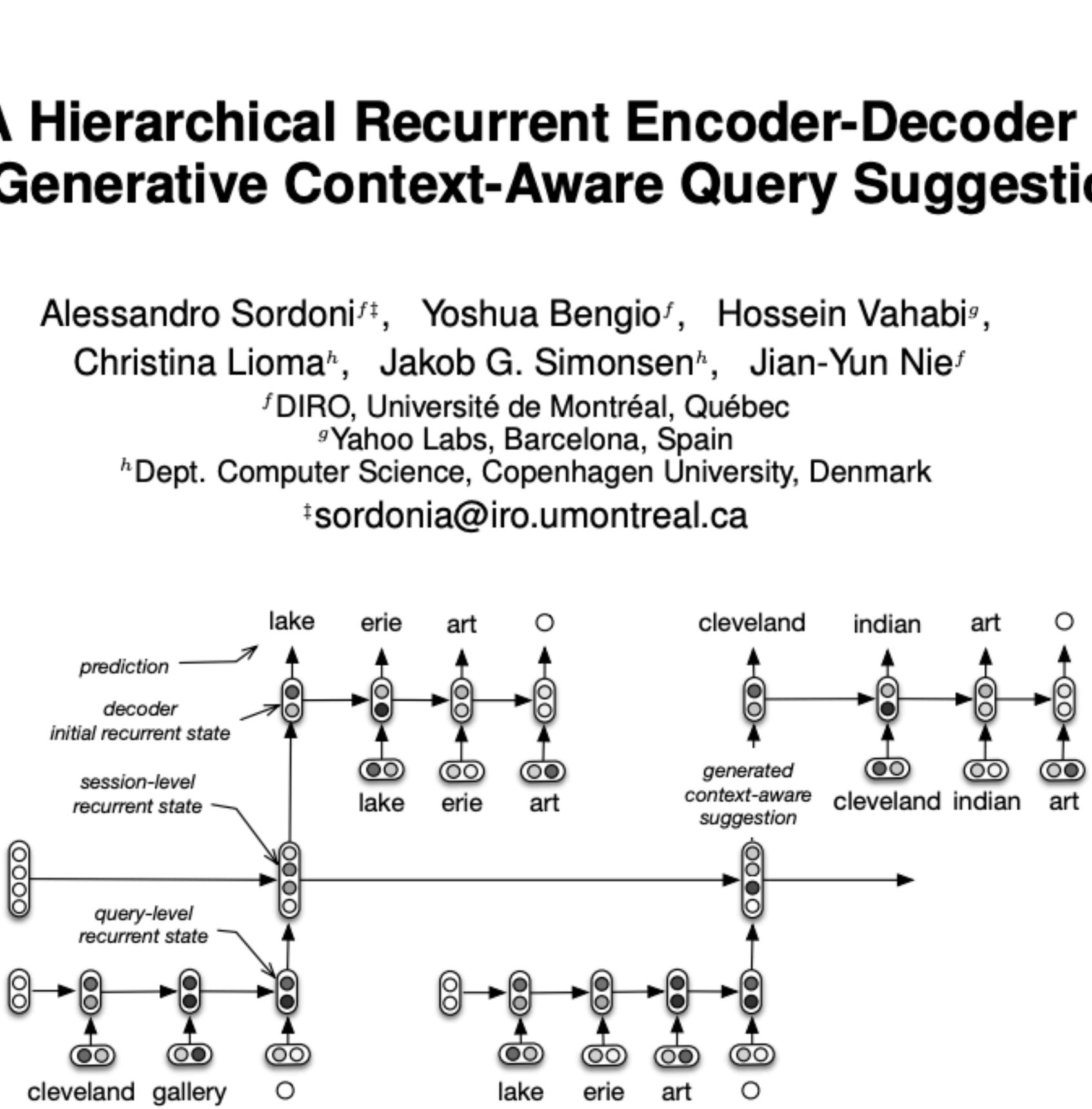

Attention-based Hierarchical Neural Query Suggestion

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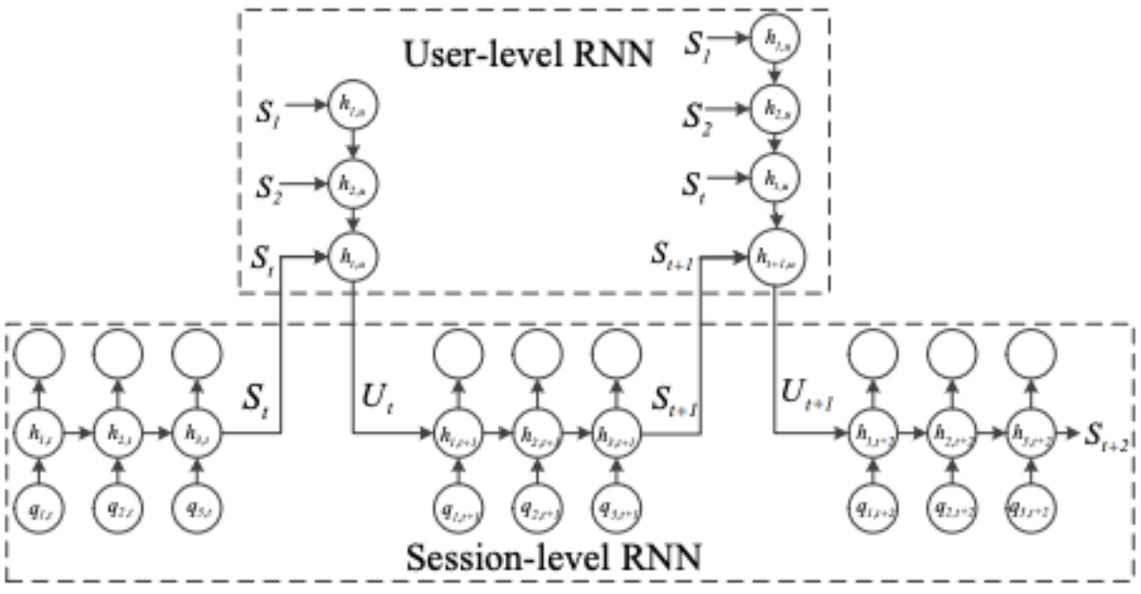

Figure 2: Structure of the HNQS model.

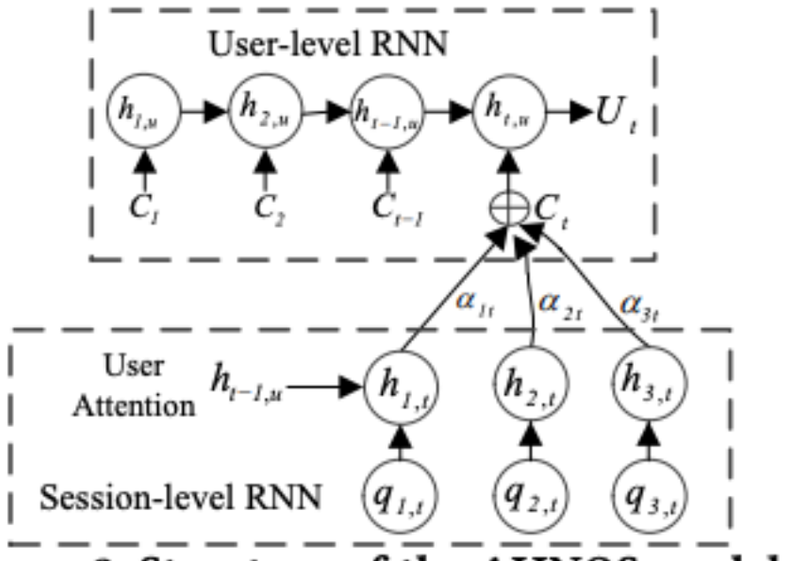

Figure 3: Structure of the AHNQS model.

План действий:

- Изучить литературу
- Взять / подготовить данные
- Попробовать разные ~~задачи~~ архитектуры
- Сравнить эти модели между собой
- Улучшать скорость / качество