Trends in Information Retrieval 2019

山东大学 计算机科学与技术学院

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主要内容

Outline

- 当前研究热点
- 研究趋势1: 对话式检索与推荐
- 研究趋势2: Neural-IR and Applications
- 研究趋势3：基于知识的检索与挖掘

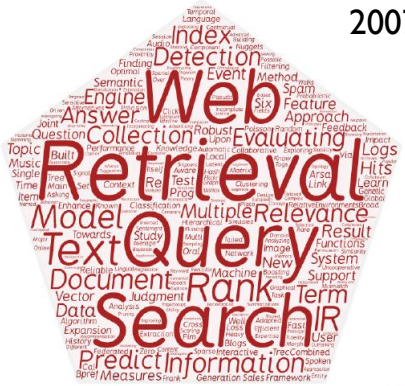
Several slides are from Prof. Zhicheng Dou's talk at YSSNLP 2019

信息检索的趋势

- Search engines are mature
  - and somehow are not fancy again
- Google/Bing/Baidu are becoming AI platforms, not just search engines

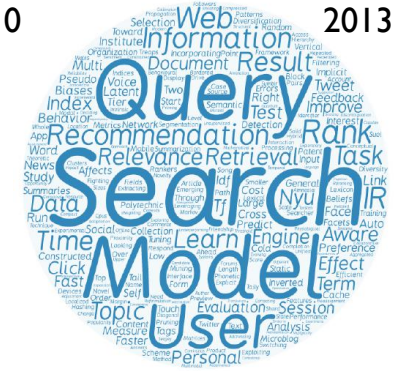
信息检索的趋势

2007



2010

2013

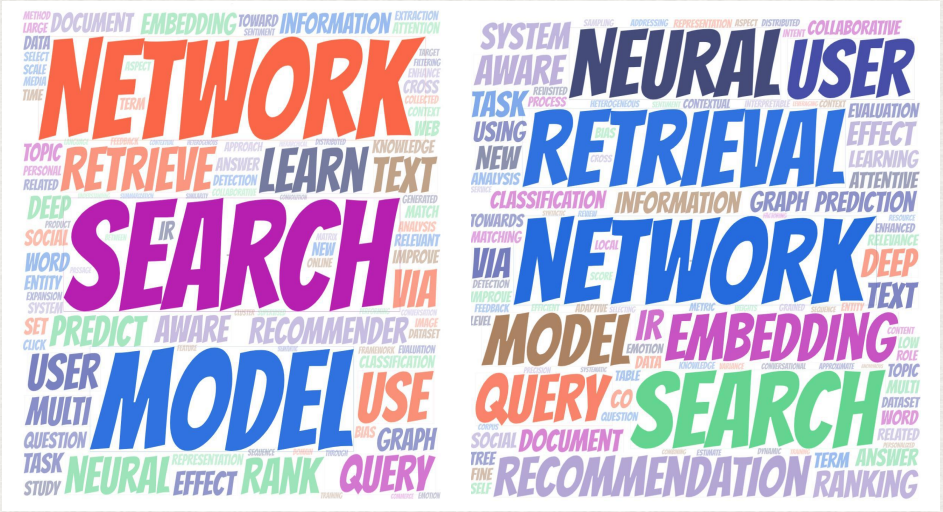


2016

信息检索的研究内容 SIGIR 2019 tracks

- Search and Ranking
- Future Directions
  - Novel approaches to IR, IR with new devices, Applications of search to social good, …
- Domain-Specific Applications
  - Email, entity, education, legal, health, enterprise, …
- Content Analysis, Recommendation and Classification
- Artificial Intelligence, Semantics, and Dialog
  - Question answering, Conversational systems and retrieval, Semantics and knowledge graphs, Deep learning for IR, embeddings, and agents
- Human Factors and Interfaces
  - User-centric aspects of IR
- Evaluation

信息检索的研究内容：SIGIR 2019 papers



信息检索的趋势1: 对话式检索与推荐

对话式信息获取 （Conversational information seeking）：
通过对话式的交互模式从海量的网络文本中获取信息

- 对话式推荐 Conversational recommendation
- 对话式检索 Conversational search

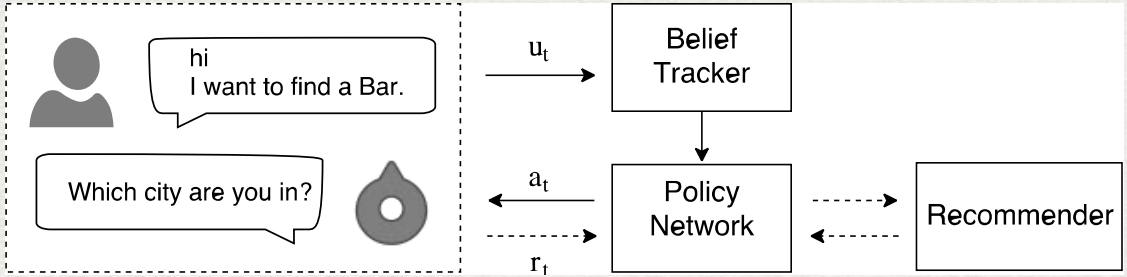
问答机器人
任务导向的对话生成系统
社交机器人
… …

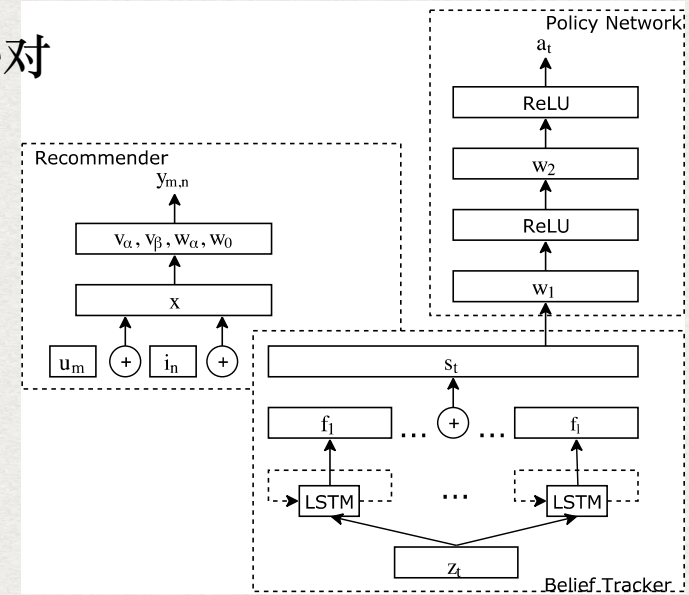
检索词理解，搜索过程管理
会话式语音检索（Session-based Spoken Search）
评估
应用场景

- CAIR 2018 :The Second International Workshop on Conversational Approaches to Information Retrieval.
- WCIS 2019 :The FirstWorkshop on Conversational Interaction Systems.
- Jianfeng Gao, Michel Galley and Lihong Li (2019), "Neural Approaches to Conversational AI", Foundations and Trends®in Information Retrieval:Vol. 13: No. 2-3, pp 127- 298.

信息检索的趋势1: 对话式推荐

- 对话历史转换为半结构化的检索词以及facet-value对
- 引入Belief tracker跟踪和分析每一步的对话内容
- 引入deep policy network



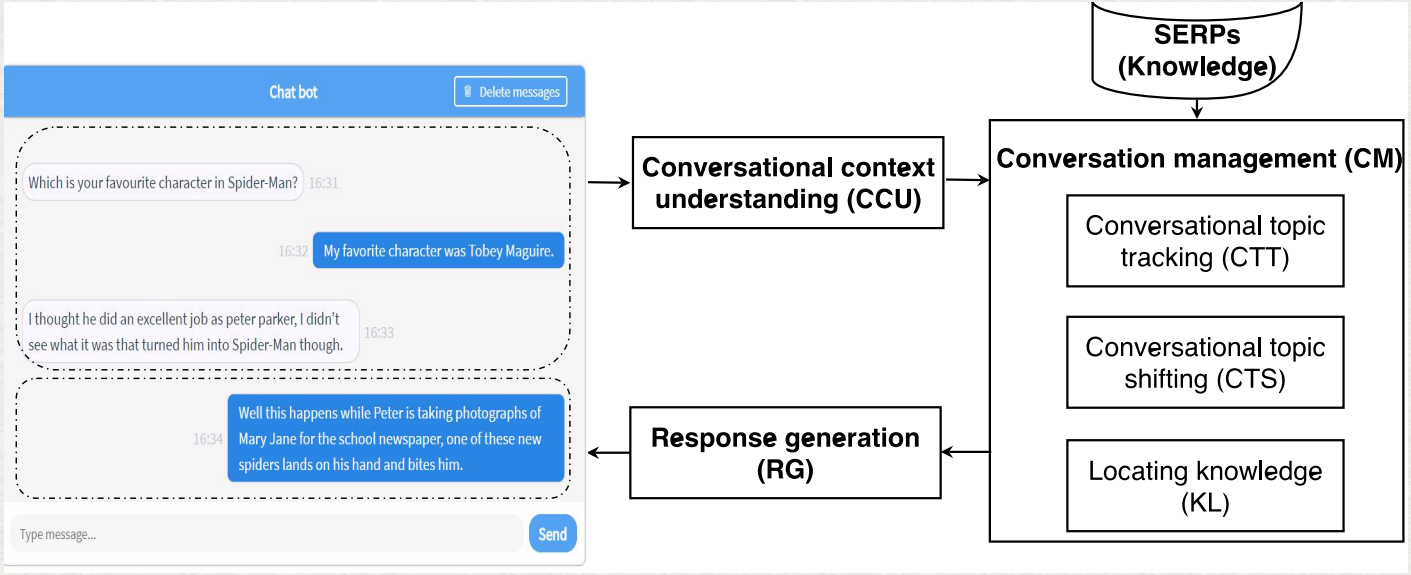


Yuemeng Sun, Yi Zhang, Conversational Recommender System, In SIGIR 2018

信息检索的趋势1: 对话式检索

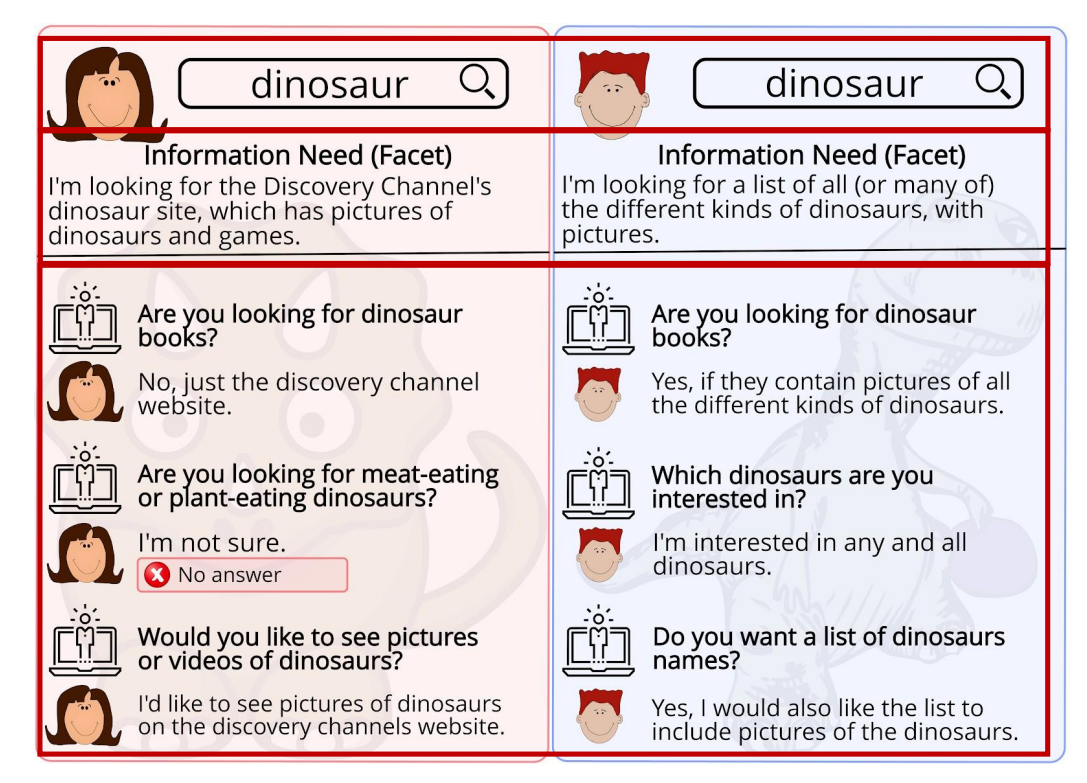
对话式检索（Belkin, CJIS 1980）目标：让检索界面对于用户更加的方便与自然

对话式搜索引擎结果页面 （ ）



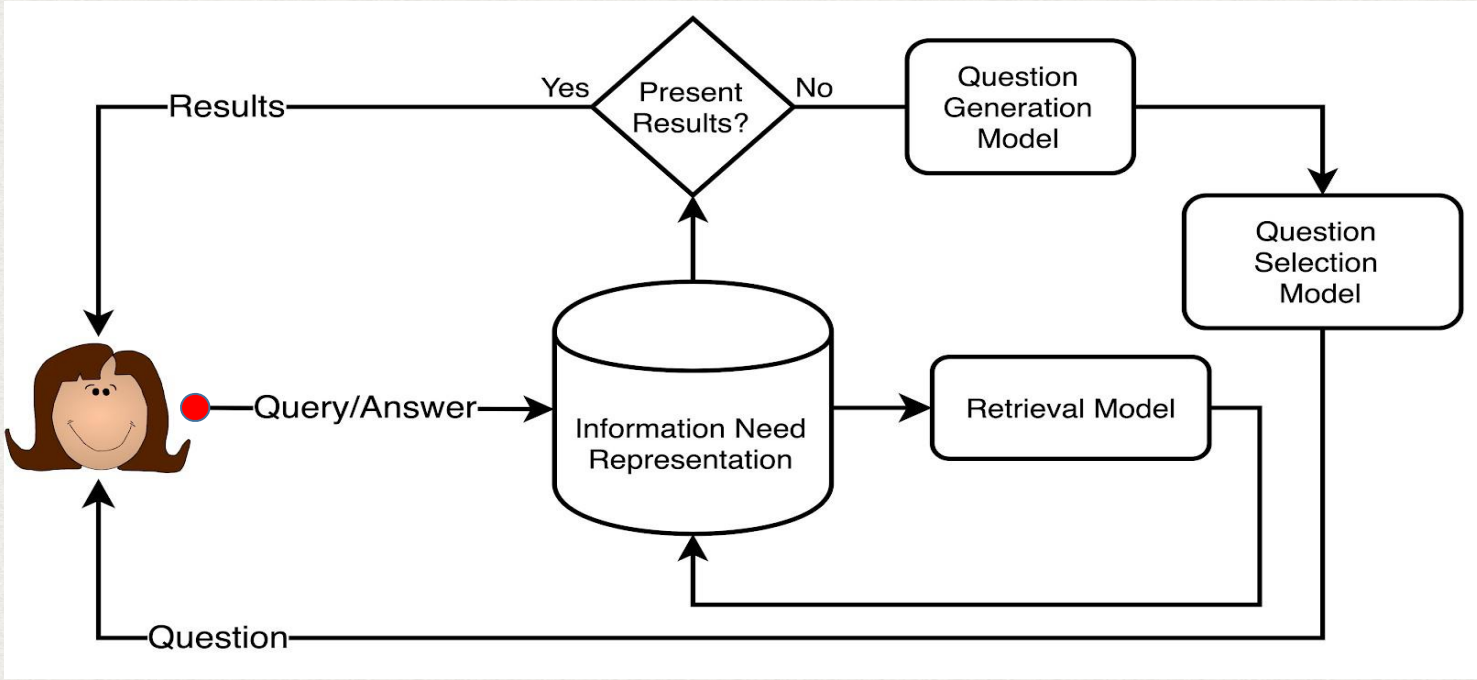
Maarten de Rijke, SERP-Based Conversations, in SCAI workshop on IJCAI 2019

信息检索的趋势1: 对话式检索



Mohammad Aliannejadi et al., Asking Clarifying Questions in Open-Domain Information-Seeking Conversations, SIGIR 2019

信息检索的趋势1: 对话式检索



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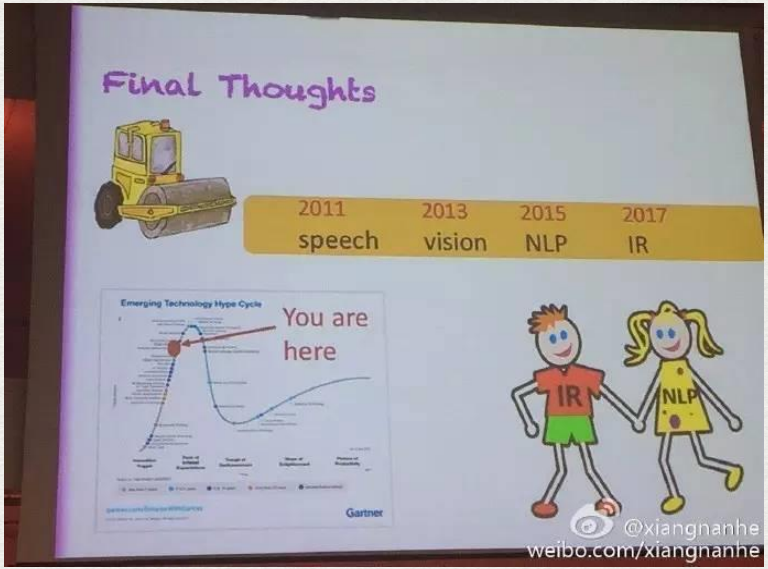
信息检索的趋势2: Neural-IR and Applications



Workshops

- Neu-IR 2016:The SIGIR 2016 Workshop on Neural Information Retrieval.
- Neu-IR 2017 :The SIGIR 2017 Workshop on Neural Information Retrieval.

Tutorials

- NN4IR@ECIR2018: Neural Networks for Information Retrieval, at ECIR 2018
- NN4IR@SIGIR2017: Neural Networks for Information Retrieval, tutorial at SIGIR 2017
- NN4IR@WSDM2018: Neural Networks for Information Retrieval, tutorial at WSDM 2018

Bhaskar Mitra, et al., An Introduction to Neural Information Retrieval, 2018

信息检索的趋势2: Neural-IR

Search vs QA?

- Search is harder as it has very strong baselines

Re-ranking vs Ranking

- Inverted index for semantic matching

Neural models

1. Capsule Network
2. GAN
3. Reinforcement Learning
4. BERT ...

Data Set / Model	Robust04		$GOV2_{MQ2007}$		WT09-14	Sougo-Log
	MAP	P@20	MAP	P@10	ERR@20	NDCG@1
BM25[46] $(1994)^{1,2}$	0.255	0.370	0.450	0.366	\	0.142
QL[120] $(1998)^{1,4}$	0.253	0.369	\	\	0.113	0.126
RM3[121] $(2001)^{5}$	0.287	0.377	\	\	\	\
RankSVM[122] $(2002)^{2}$	\	\	0.464	0.381	\	0.146
LambdaMart[100] $(2010)^{2}$	\	\	0.468	0.384	\	\
DSSM[13] $(2013)^{1,2}_{S/R/G}$	0.095	0.171	0.409	0.352	\	\
CDSSM[47] $(2014)^{1,2}_{S/R/G}$	0.067	0.125	0.364	0.291	\	0.144
ARC-I[17] $(2014)^{1,2}_{S/R/G}$	0.041	0.065	0.417	0.364	\	\
ARC-II[17] $(2014)^{1,2}_{S/I/G}$	0.067	0.128	0.421	0.366	\	\
MP[18] $(2016)^{1,2,4}_{S/I/G}$	0.189	0.290	0.434	0.371	0.148	0.218
Match-SRNN[69] $(2016)^{2}_{S/H/G}$	\	\	0.456	0.384	\	\
DRMM[21] $(2016)^{1,2,4}_{A/I/G}$	0.279	0.382	0.467	0.388	0.171	0.137
Duet[23] $(2017)^{3,4}_{A/H/G}$	\	\	0.474	0.398	0.134	\
DeepRank[33] $(2017)^{2}_{A/I/G}$	\	\	0.497	0.412	\	\
K-NRM[85] $(2017)^{4}_{A/I/G}$	\	\	\	\	0.154	0.264
PACRR[123] $(2017)^{6,4}_{A/I/M}$	0.254	0.363	\	\	0.191	\
Co-PACRR[118] $(2018)^{4}_{A/I/M}$	\	\	\	\	0.201	\
SNRM[28] $(2018)^{5}_{S/R/G}$	0.286	0.377	\	\	\	\
SNRM+PRF[28] $(2018)^{5}_{S/R/G}$	0.297	0.395	\	\	\	\
CONV-KNRM[84] $(2018)^{4}_{A/I/M}$	\	\	\	\	\	0.336
NPRF-KNRM[119] $(2018)^{6}_{A/I/G}$	0.285	0.393	\	\	\	\
NPRF-DRMM[119] $(2018)^{6}_{A/I/G}$	0.290	0.406	\	\	\	\
HiNT[34] $(2018)^{3}_{A/I/G}$	\	\	0.502	0.418	\	\

A Deep Look into Neural Ranking Models for Information Retrieval, Jiafeng Guo, et al., Information Processing and Management, 2019

信息检索的趋势2: 推荐系统

基于深度学习的推荐算法汇总：

- Session-based Recommendation:
  - Sequence and Time Aware Neighborhood for Session-based Recommendations
  - RepeatNet: A Repeat Aware Neural Recommendation Machine for Session-based Recommendation
  - A Collaborative Session-based Recommendation Approach with Parallel Memory Modules
- Sequential Recommendation:
  - π-Net: A Parallel Information-sharing Network for Shared account Cross-domain Sequential Recommendations
  - Taxonomy-aware multi-hop reasoning networks for sequential recommendation
- Explainable/Review-based Recommendation
  - A Capsule Network for Recommendation and Explaining What You Like and Dislike
  - Neural Graph Collaborative Filtering
  - Reinforcement Knowledge Graph Reasoning for Explainable Recommendation
- Applications based on Recommendation
  - CROSS: Cross-platform Recommendation for Social E-Commerce
  - Unified Collaborative Filtering over Graph Embeddings
  - etc.

信息检索的趋势2: 可解释推荐系统

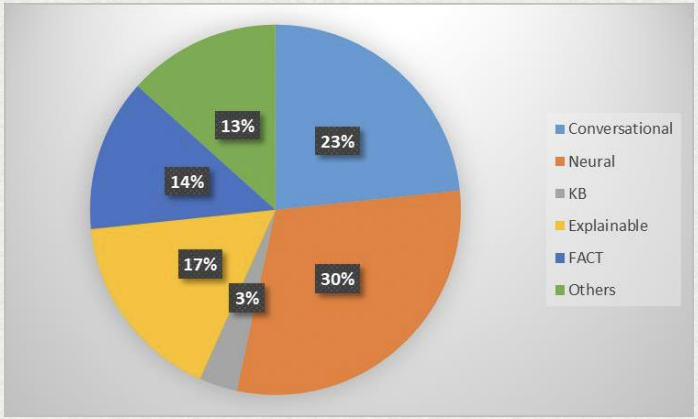
Workshops on explainable recommendation

EARS 2018: International Workshop on Explainable Recommendation and Search,

Yongfeng Zhang,Yi Zhang, and Min Zhang.

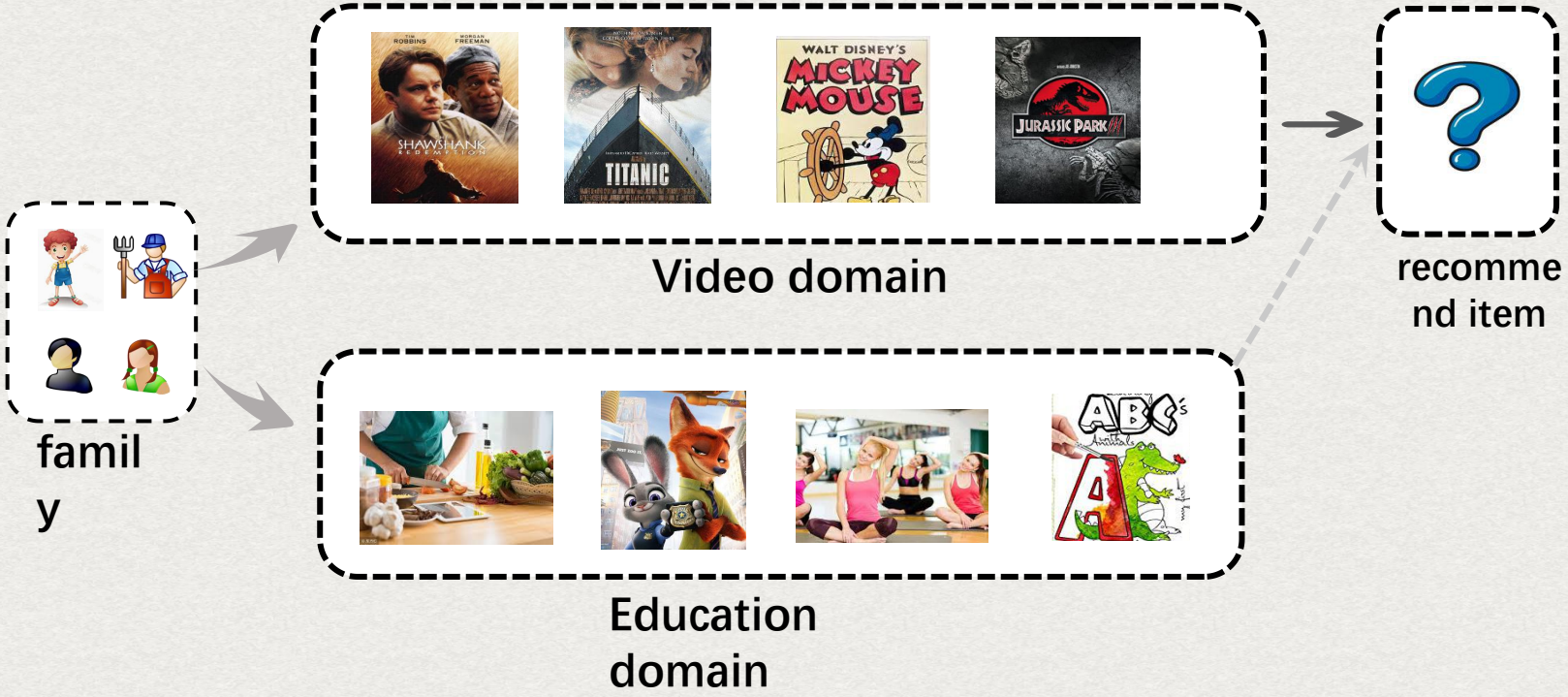
EARS 2019: International Workshop on Explainable Recommendation and Search

Yongfeng Zhang, Yi Zhang, Min Zhang, and Chirag Shah



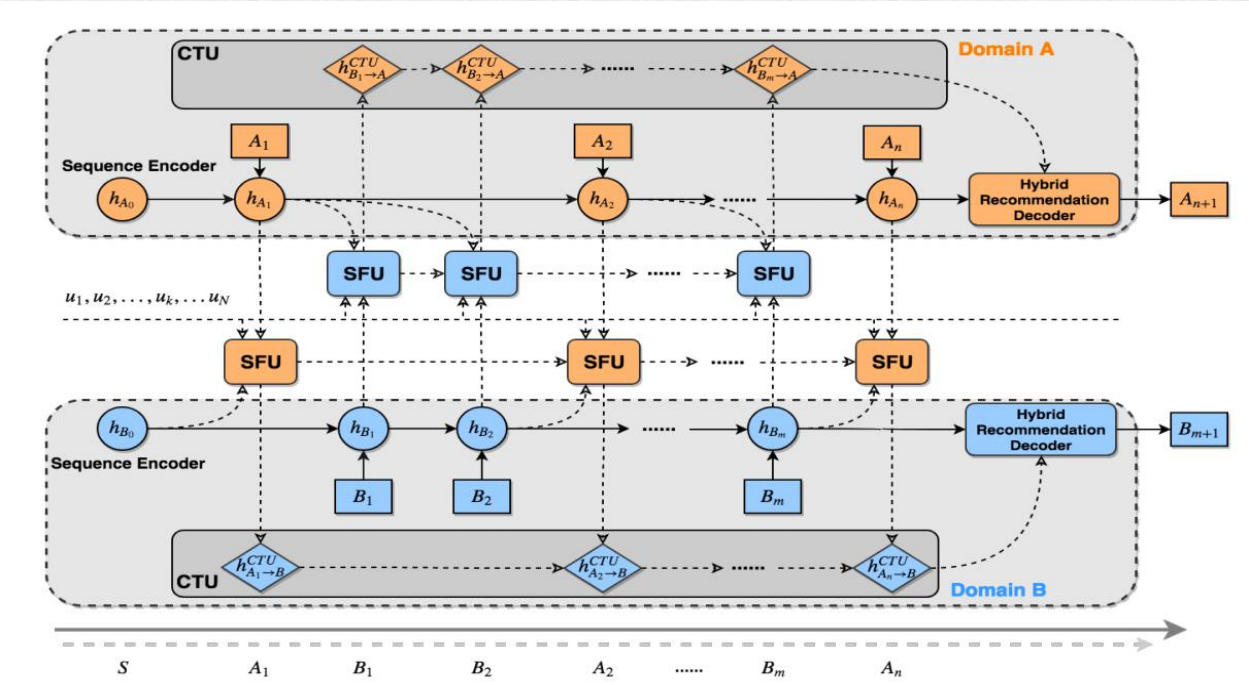
信息检索的趋势2: 跨域序列推荐

What is the cross-domain scenario?



Muyang Ma, et al., π-Net: A Parallel Information-sharing Network for Shared account Cross-domain Sequential Recommendations, In SIGIR 2019

信息检索的趋势2: 跨域序列推荐



Muyang Ma, et al., π-Net: A Parallel Information-sharing Network for Shared account Cross-domain Sequential Recommendations, In SIGIR 2019

信息检索的趋势2: Multi-modal Applications

多模态对话生成

Any similar one in blue?

How to match with it?

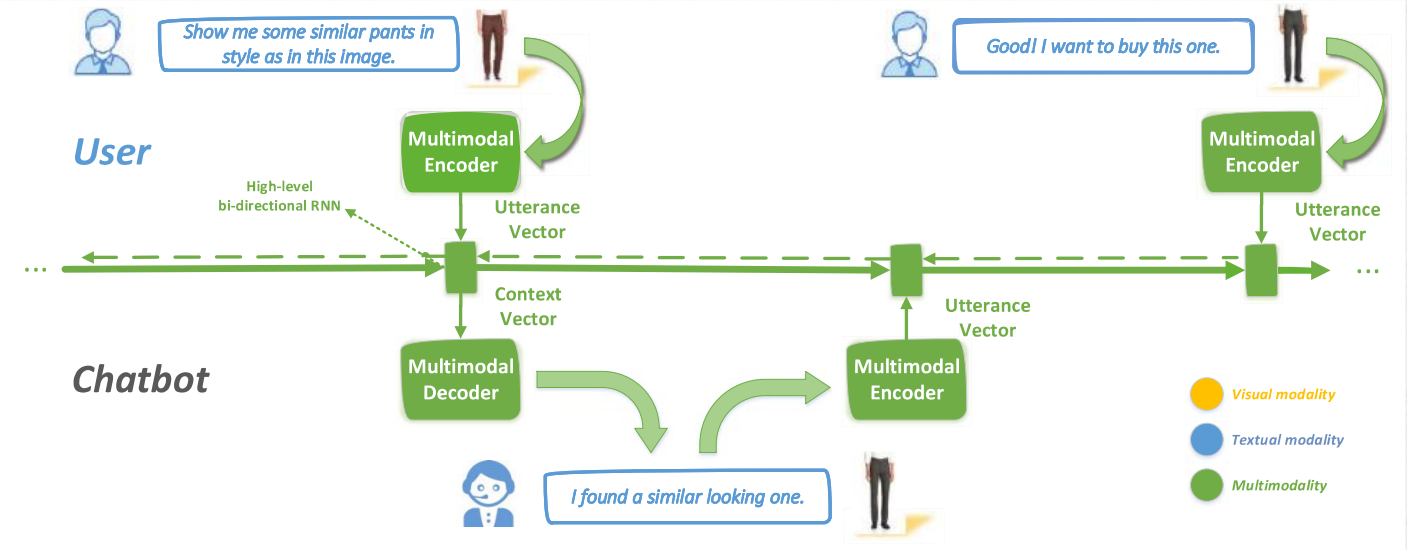
Is there any such restaurant nearby?

Is there any shop selling this nearby?

User Attention-guided Multimodal Dialog Systems Chen Cui, Wenjie Wang, Xuemeng Song, Minlie Huang, Xin-Shun Xu and Liqiang Nie, SIGIR 2019

信息检索的趋势2: Neural-IR and Applications

多模态对话生成

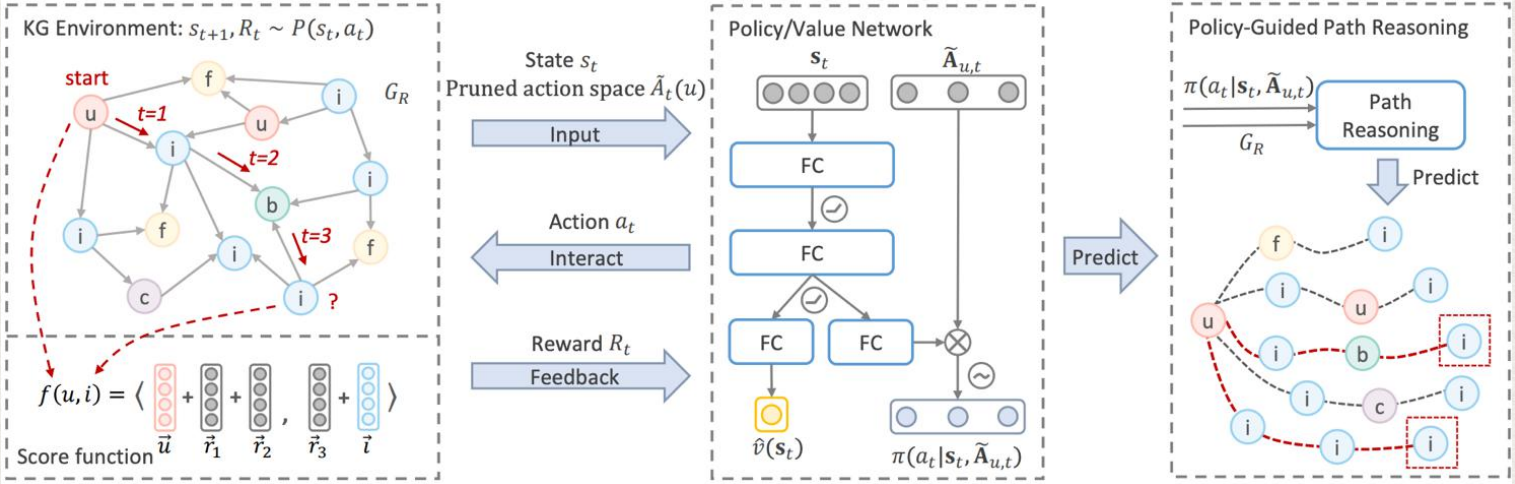


User Attention-guided Multimodal Dialog Systems Chen Cui, Wenjie Wang, Xuemeng Song, Minlie Huang, Xin-Shun Xu and Liqiang Nie, SIGIR 2019

信息检索的趋势3: 基于知识的检索与挖掘

Reinforcement KG Reasoning

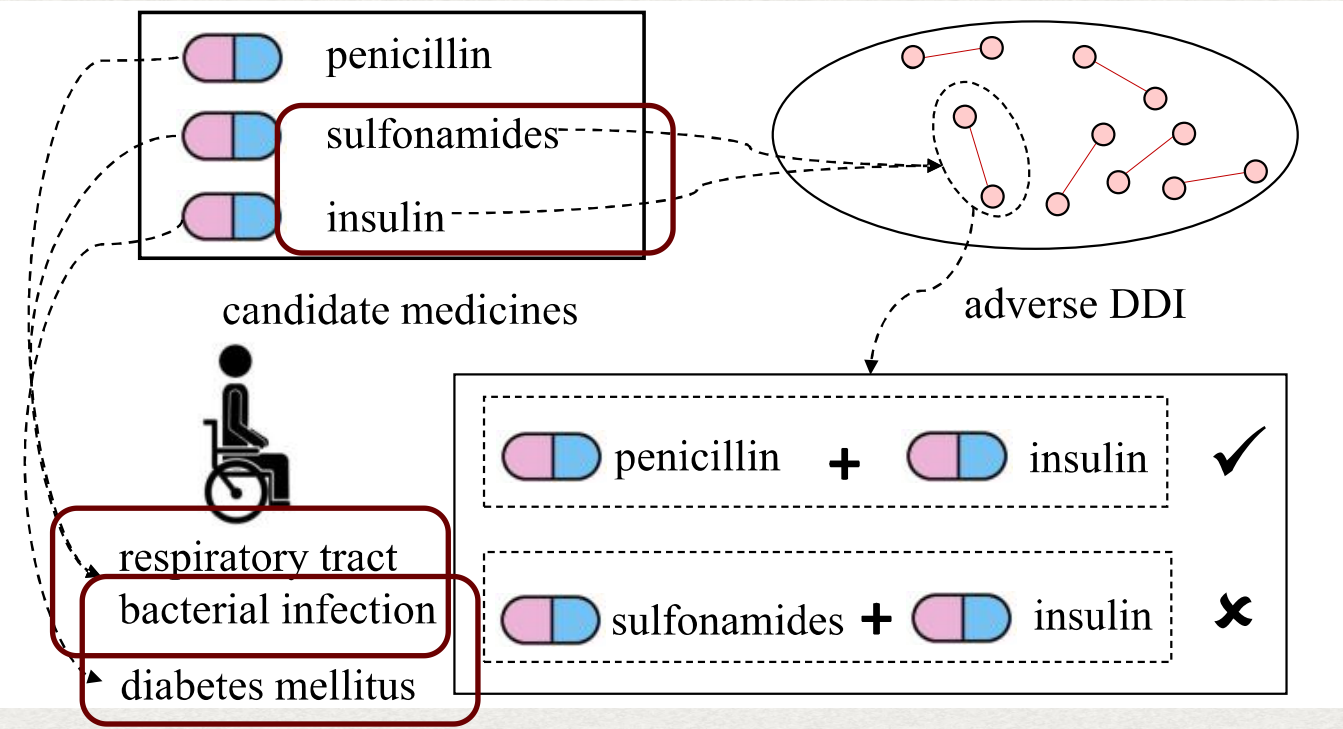
- Reinforcement Knowledge Graph Reasoning for Explainable Recommendation [Xian et al. SIGIR'2019]
- Paradigm of previous methods: for each user, for each candidate item, calculate ranking score based on path info between this user-item pair.
- Too many candidate items: Can we avoid enumerating all candidate items?



Xian et al. , Reinforcement Knowledge Graph Reasoning for Explainable Recommendation, In SIGIR 2019

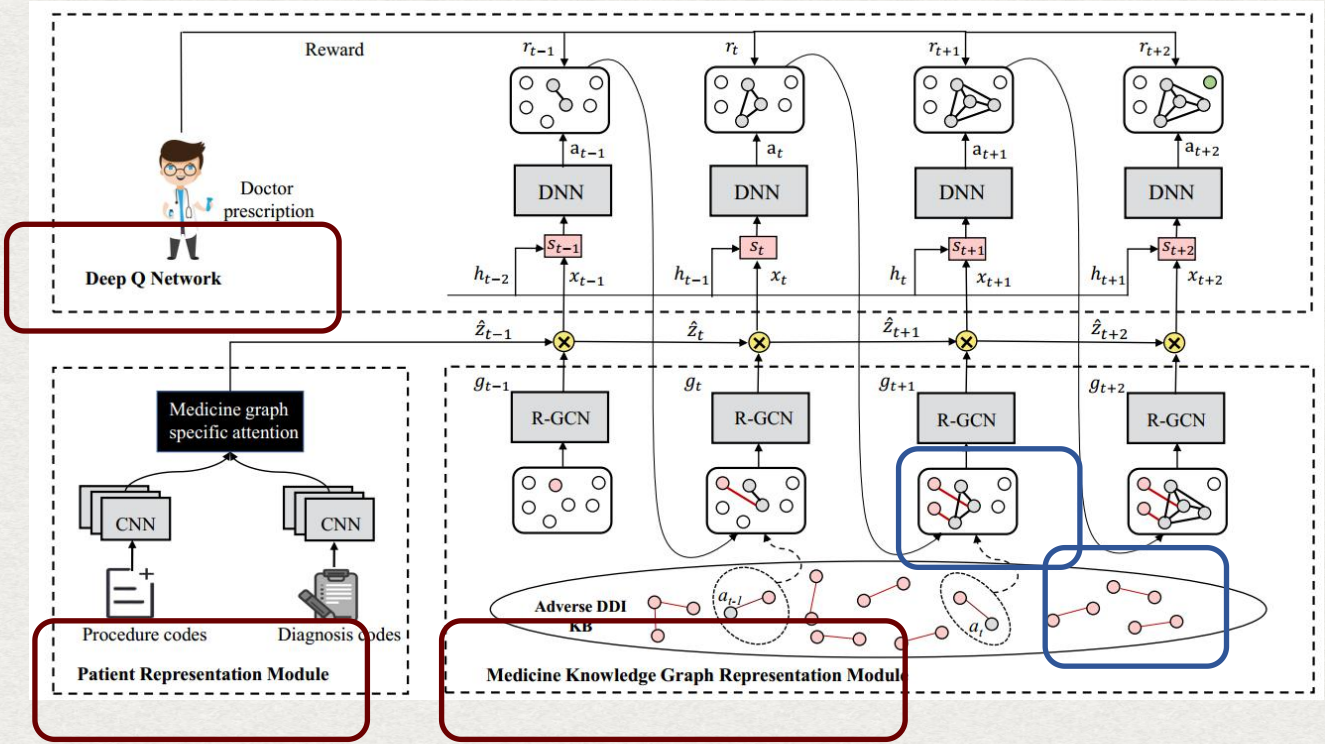
信息检索的趋势3: 基于知识的检索与挖掘

基于图卷积强化学习的药物组合预测



Order-free Medicine Combination Prediction with Graph Convolutional Reinforcement Learning. In CIKM , 2019.

CompNet



CompNet 模型结构

Order-free Medicine Combination Prediction with Graph Convolutional Reinforcement Learning. In CIKM , 2019.

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谢谢！