大规模在线教育知识图谱构建

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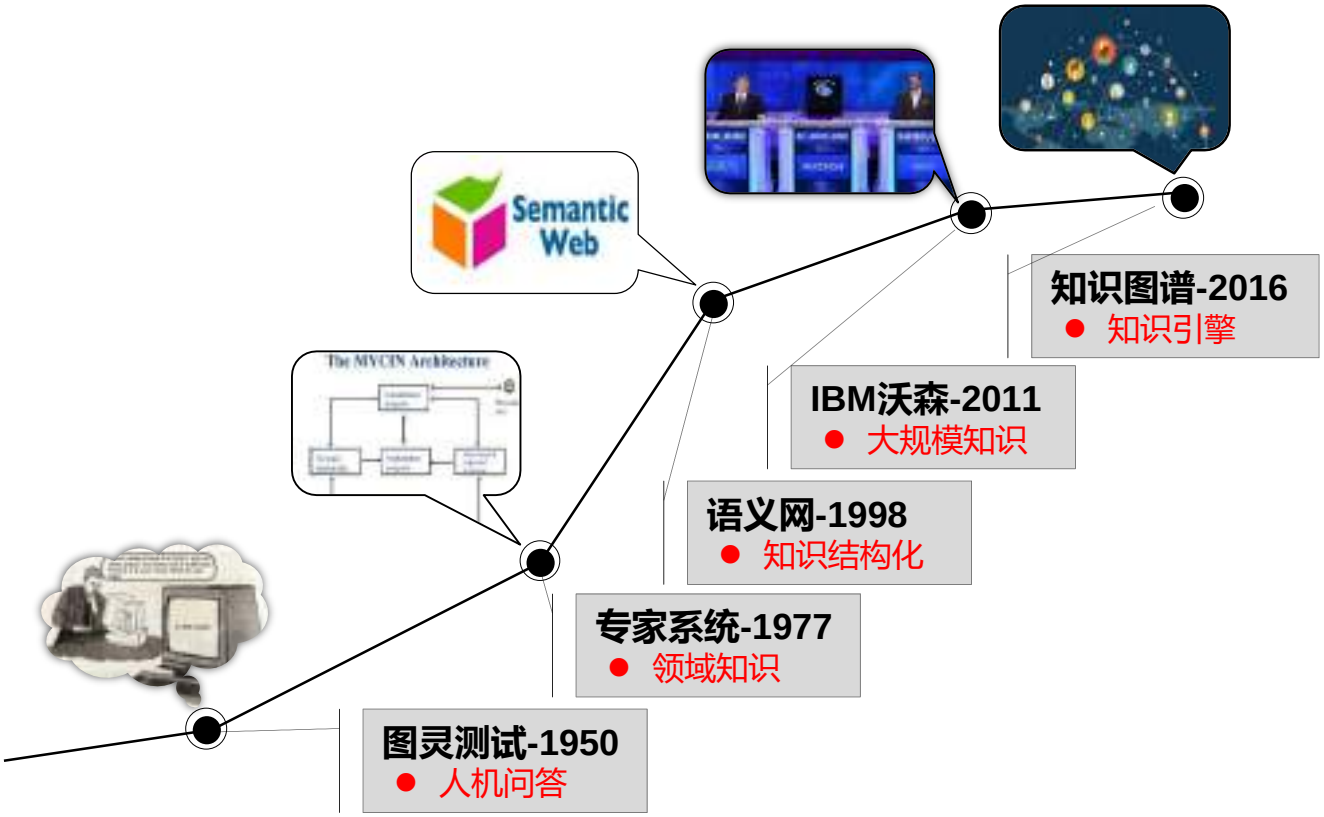
主要内容

- **智能学术搜索**
  - 人工智能与知识
  - 智能学术搜索
- **大规模在教育知识图谱构建**
  - 以知识为中心的大规模在线教育资源组织
  - 概念学习
  - 概念扩展
  - 概念先后修关系发现
- **总结**

人工智能对知识的需求



知识是人工智能的核心命题与关键基础

第三代人工智能

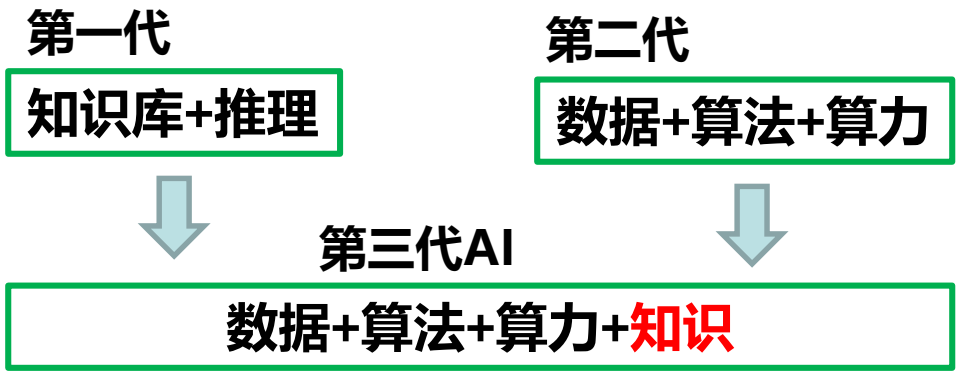
- Explainable, robust, credible and safe AI

  可解释的、鲁棒的、可信安全的人工智能

- From AI without understanding to AI with understanding

  从不带理解的人工智能成为带理解的人工智能

摘自张钹院士在YOCSEF精英大会上报告



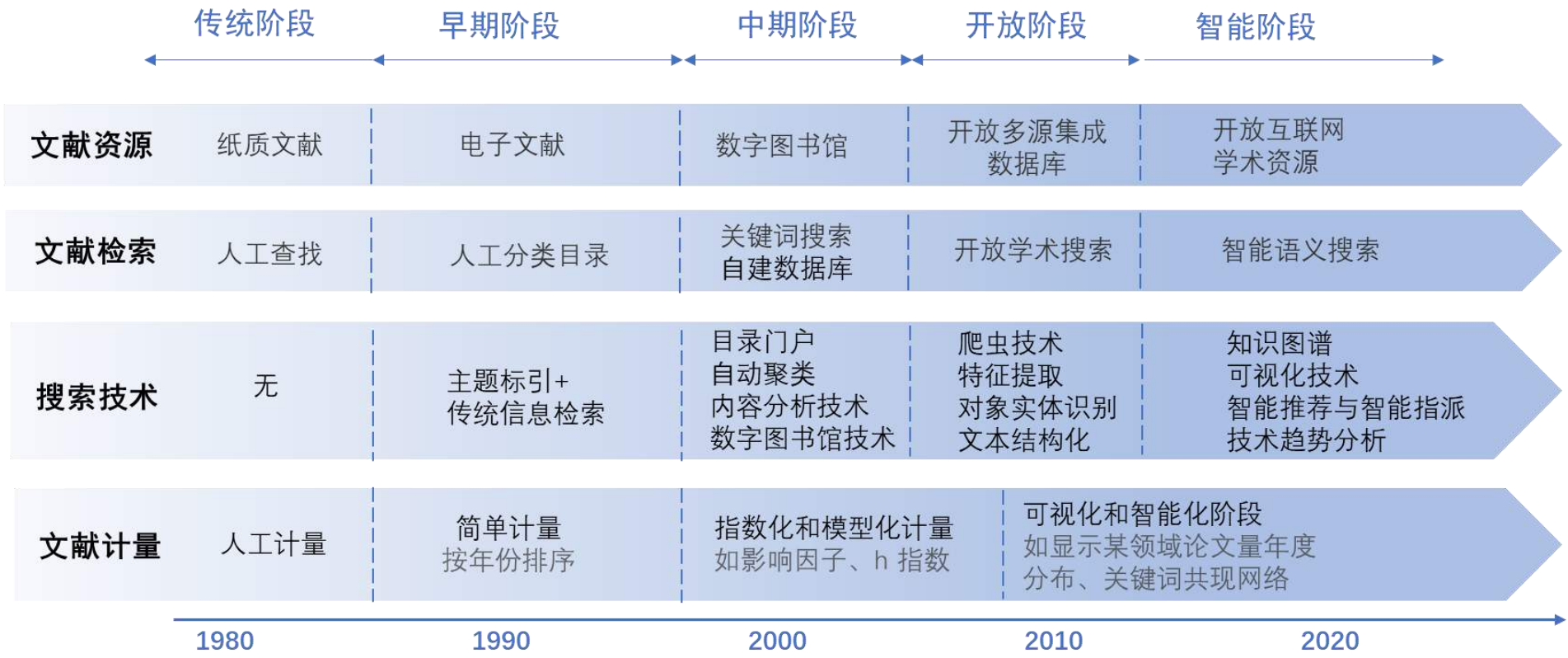
实现从数据智能到知识智能的跃迁是人工智能的必由之路

人工智能之学术搜索

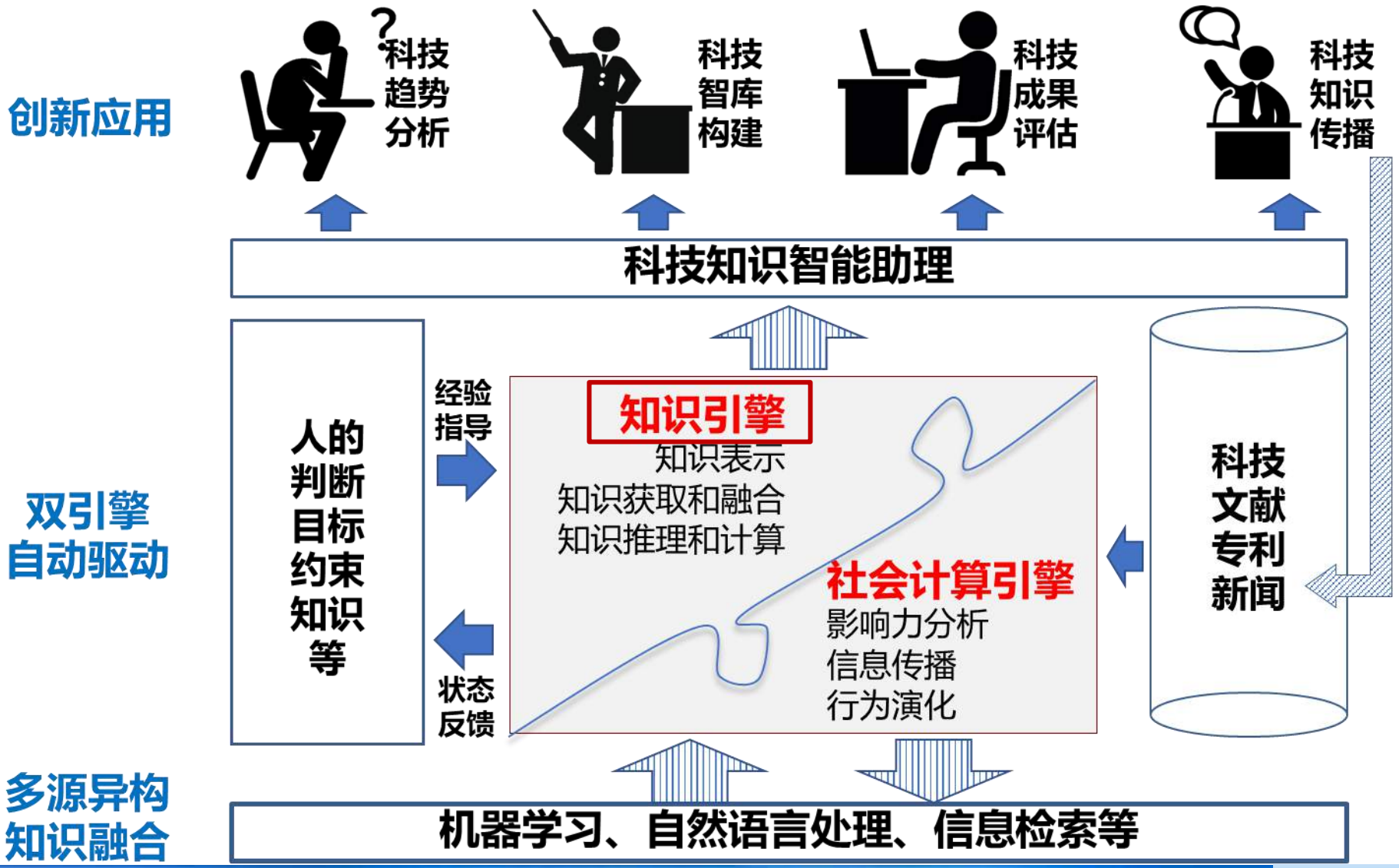
扫码微信阅读

人工智能之学术搜索

学术搜索引擎发展历程



人工智能之学术搜索


创新应用
科技趋势分析
科技智库构建
科技成果评估
科技知识传播
科技知识智能助理
双引擎自动驱动
人的判断目标约束知识等
经验指导
状态反馈
知识引擎
知识表示
知识获取和融合
知识推理和计算
社会计算引擎
影响力分析
信息传播
行为演化
科技文献专利新闻
多源异构知识融合
机器学习、自然语言处理、信息检索等

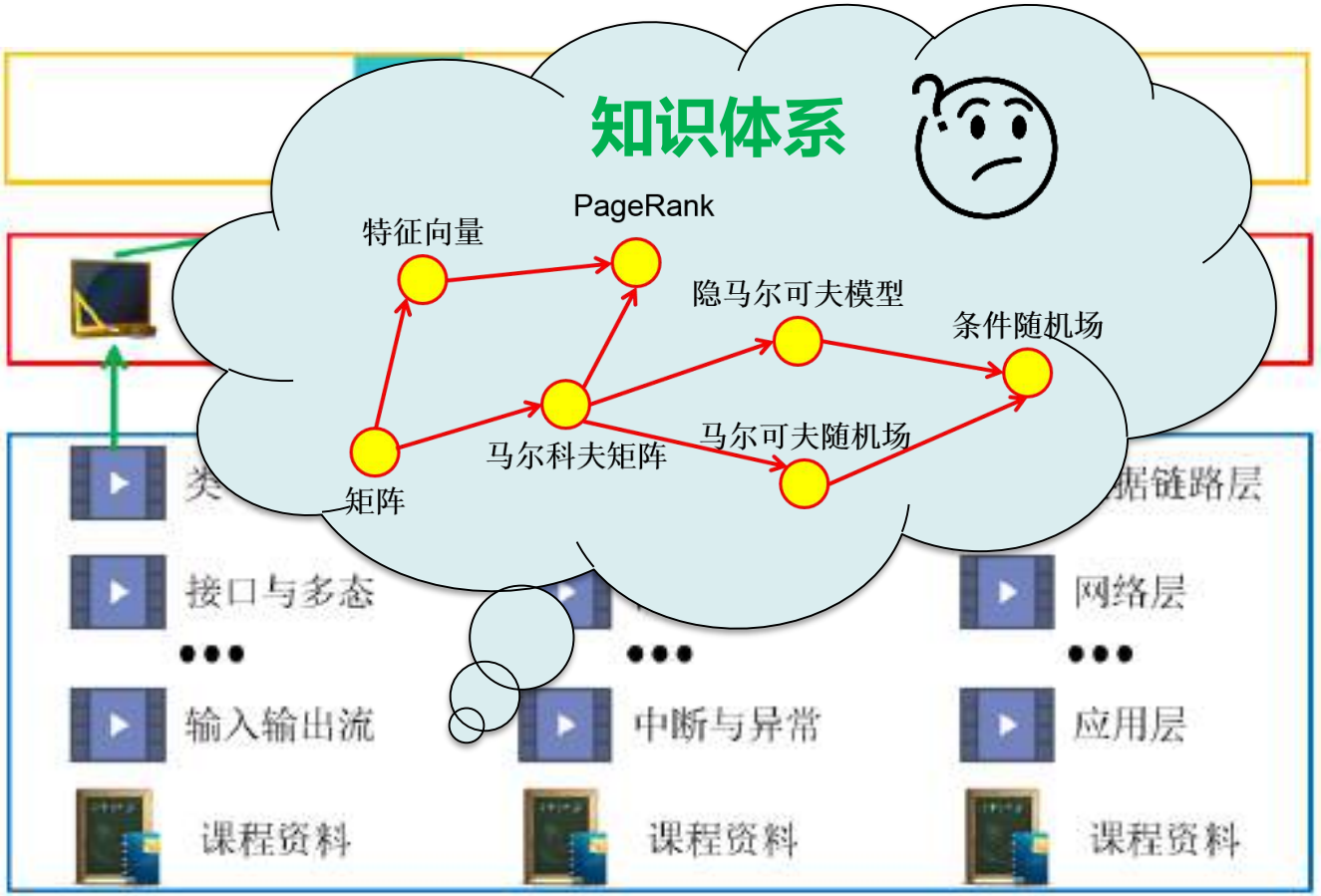
大规模在线教育知识图谱构建

领域—课程—视频 三级组织

1 学科

2 课程

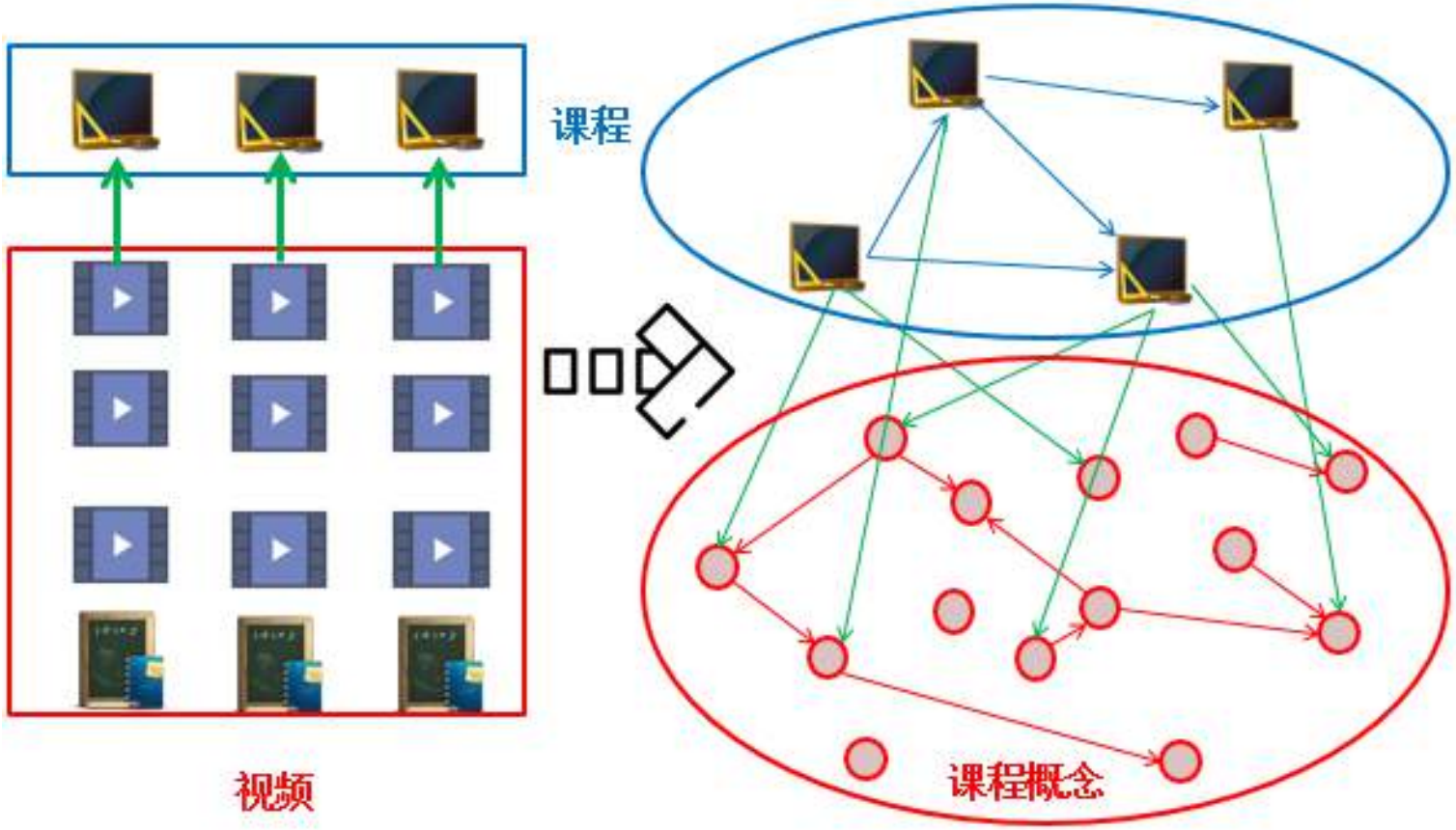
3 视频



大规模在线教育数据：知识概念

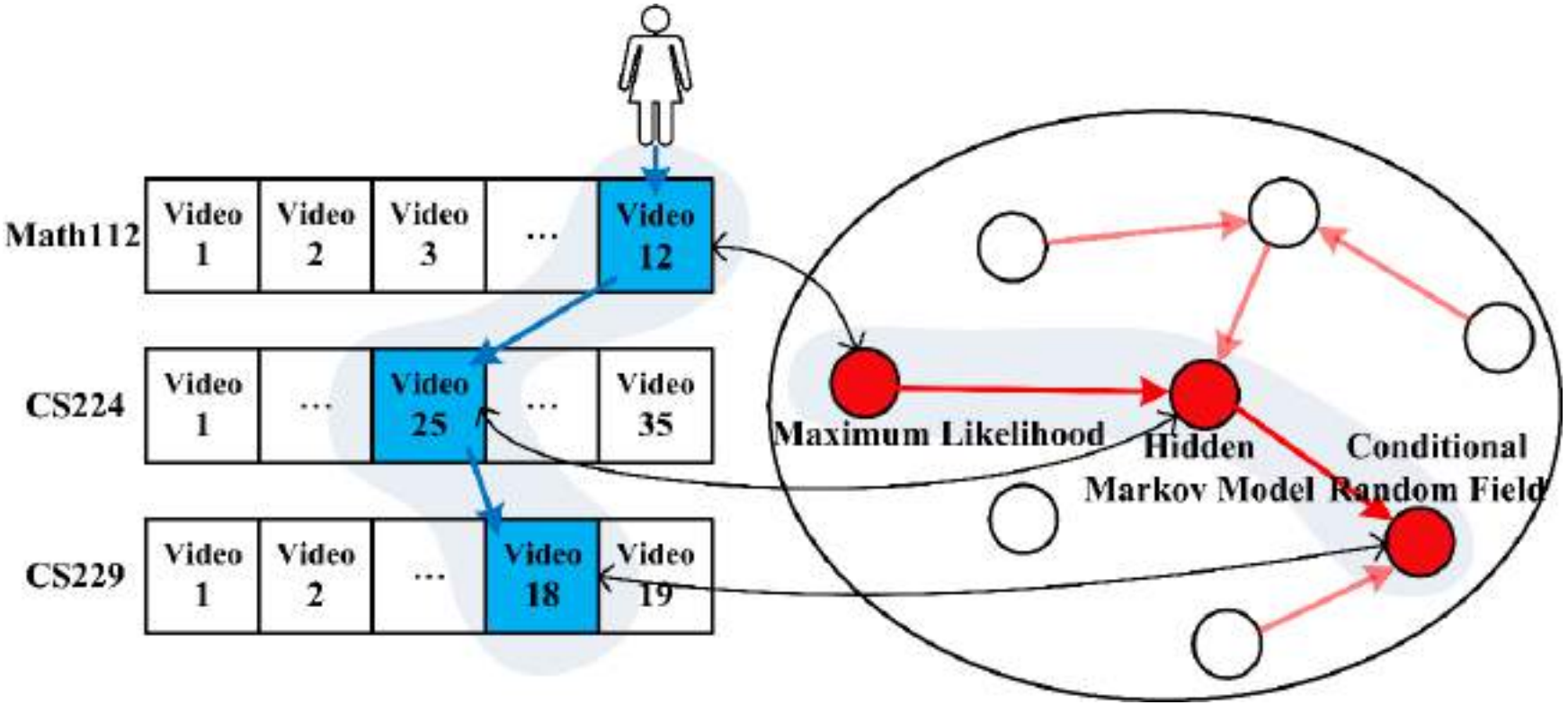
视频为中心

知识为中心



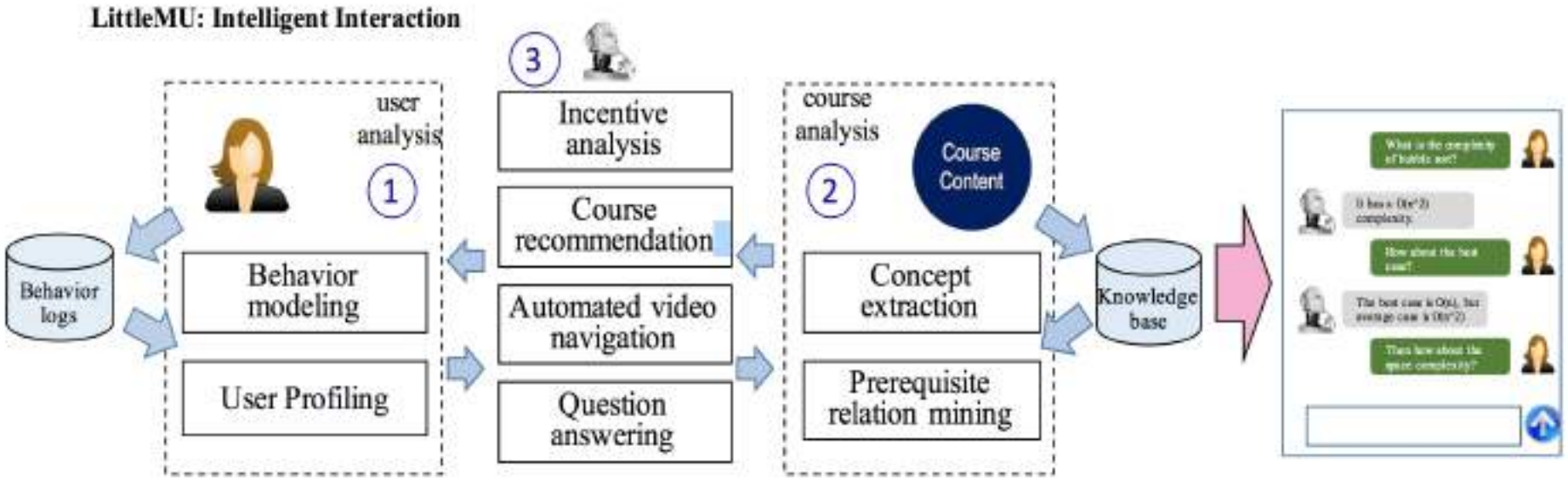
在线教育课程知识体系构造

应用——智能学习路径规划



在线教育智能交互的知识服务

应用—智能助教



大规模在线教育知识图谱

- 以知识为核心大规模在线教育资源组织
- 基于置信度网络传播的课程概念抽取
- 利用外部知识库的概念概念扩展
- 基于多维度特征的课程概念先后序关系学习

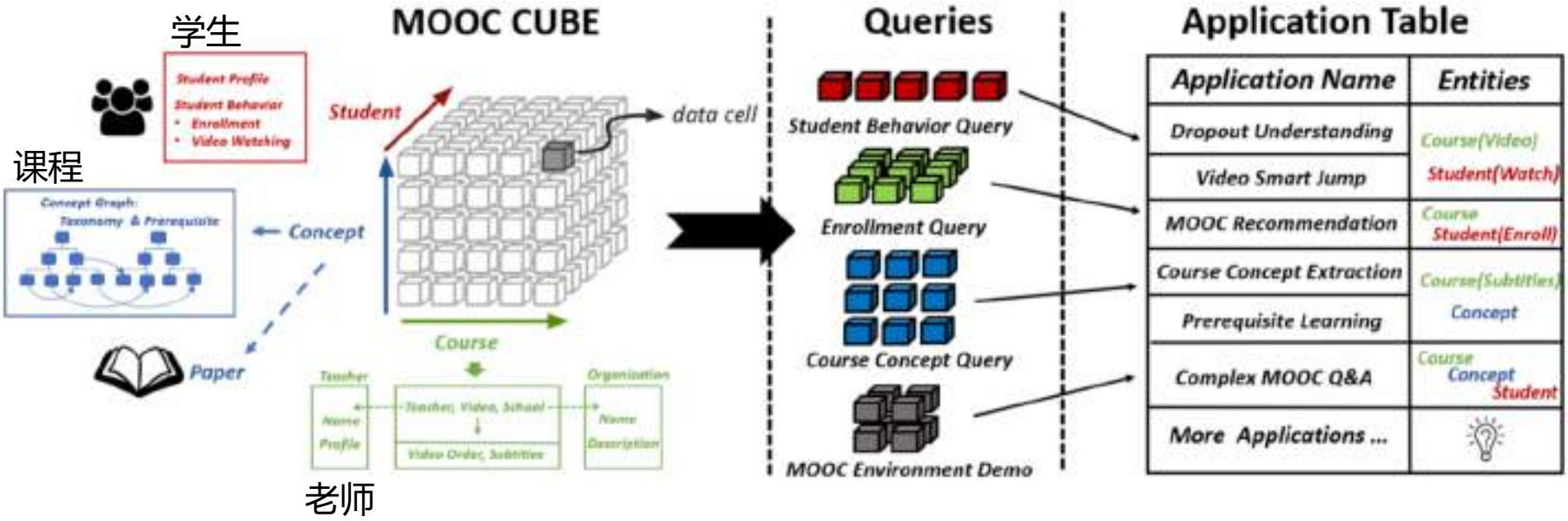
[1] MOOCCube: A Large-scale Data Repository for NLP Applications in MOOCs, ACL2020
[2] Course Concept Extraction in MOOCs via Embedding-Based Graph Propagation, IJCNLP2017
[3] Course Concept Expansion in MOOCs with External Knowledge and Interactive Game, ACL2019
[4] Prerequisite Relation Learning for Concepts in MOOCs. ACL2017

大规模在线教育数据立方体

- **MOOCCube: 服务于MOOC相关研究的开源大规模数据仓库**

  学生行为记录，课程视频资料，知识概念体系

开源链接：http://moocdata.cn/data/MOOCCube



大规模在线教育数据：用户行为

- MOOCCube 细粒度学生行为记录

Student Profile

Student Behavior
- Enrollment
- Video Watching

用户个人画像

性别，年龄，所在地...

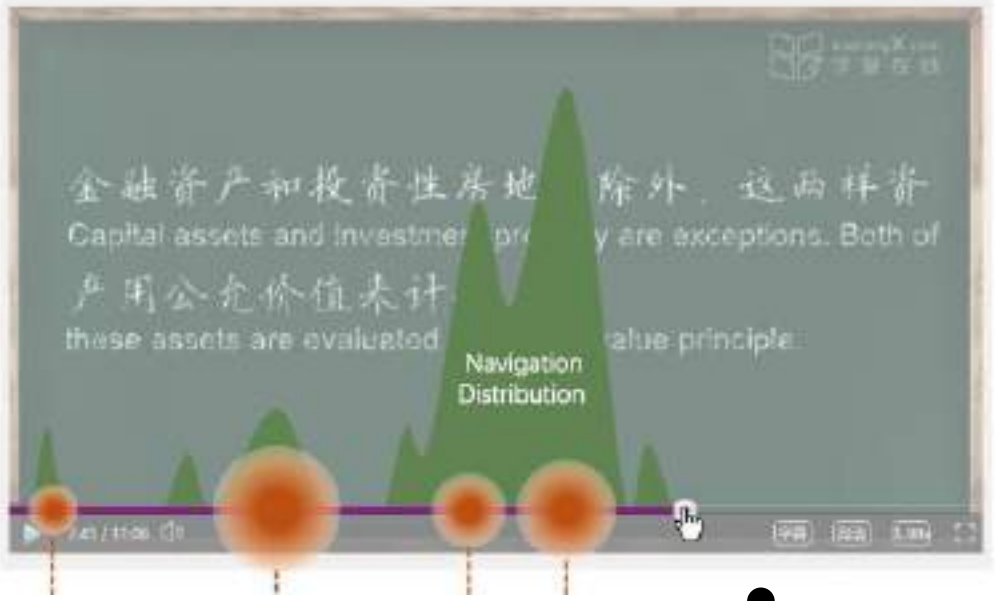
用户视频学习记录

(精确到毫秒)

学习时长

学习次数

观看视频的观看范围(t_1, t_2)



199,199名学生，4,874,298人次观看视频记录

大规模在线教育数据：课程信息

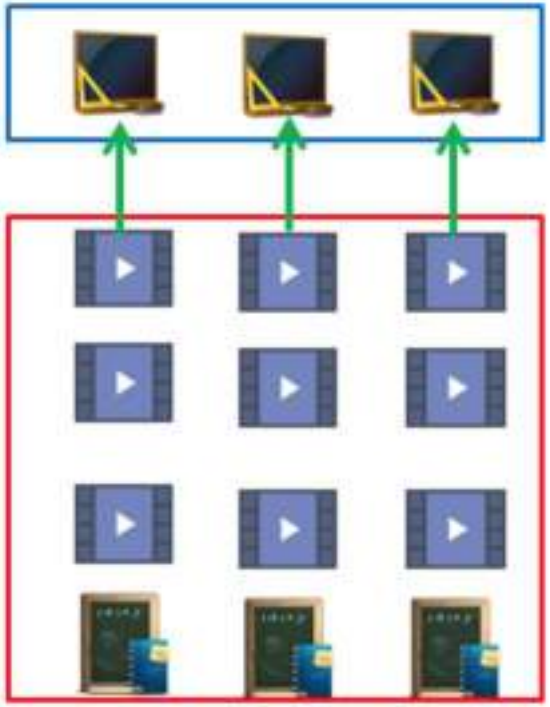
- **MOOCCube课程信息：**

课程信息：

- 教师
- 开课机构

视频信息：

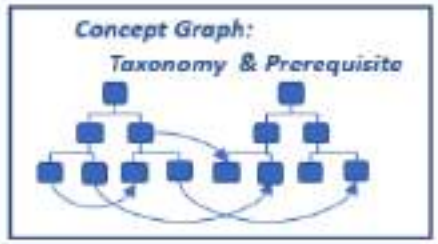
- 字幕文本
- 视频顺序



706门课程，38,181个视频

大规模在线教育数据：知识概念

MOOCCube知识概念体系:



- 课程概念集
- 概念先后修关系
- 概念的相关资源(论文)

106,056个知识概念，并被进一步补充

在线教育课程知识图谱构建

课程概念 + **先后序关系** ⇨ **知识体系**

定义

- 课程视频中所教授的知识概念

例子

You might learn how to write a **bubble sort** and learn why a **bubble sort** is not as good as a **heapsort**. Next, we are going to talk about the **quick sort** algorithm. **Quicksort** is an algorithm invented in the 1960s by doctor Tony Hoare. It is also called the **partition exchange sort**, and is a typical algorithm based on **divide-and-conquer**.

……

Now we have the first version of **Q sort**. After we make an analysis on its performance. performance, we will find that **quicksort** is an **unstable sorting algorithm**. Fortunately, the **quick sort** has an average **time complexity** of n log n, and in most cases, it can achieve its optimal performance. We first estimate its performance under **independent uniform distribution**.

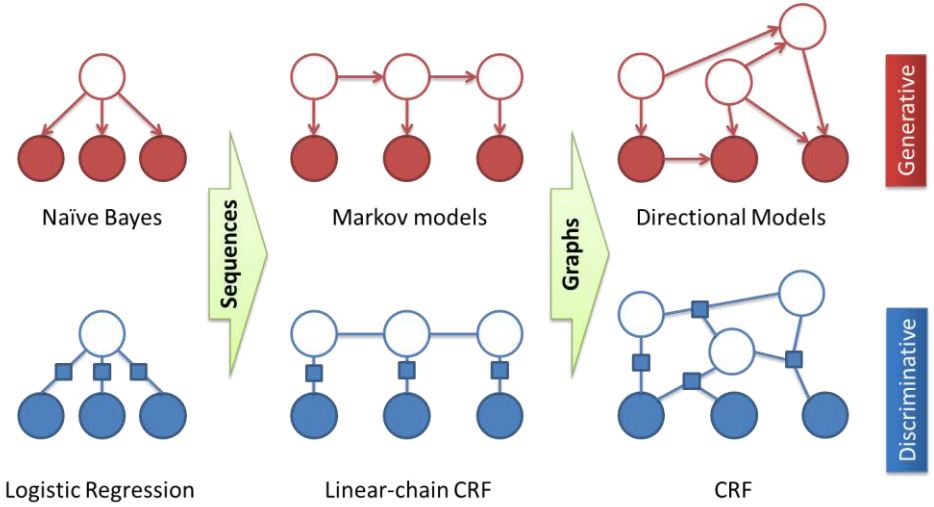
在线教育课程知识体系构造

课程概念 + 先后序关系 ⇨ 知识体系

定义

- 知识概念间的学习依赖关系

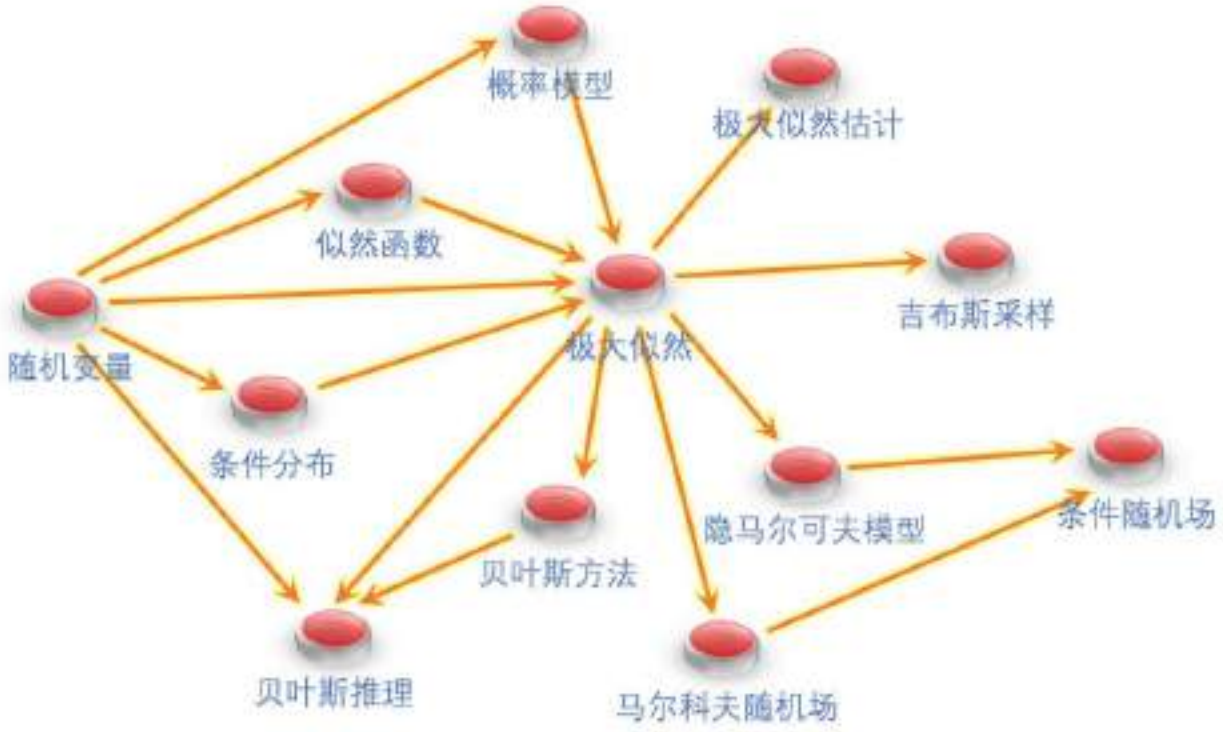
例子



Adapted from C. Sutton, A. McCallum, "An Introduction to Conditional Random Fields", ArXiv, November 2010

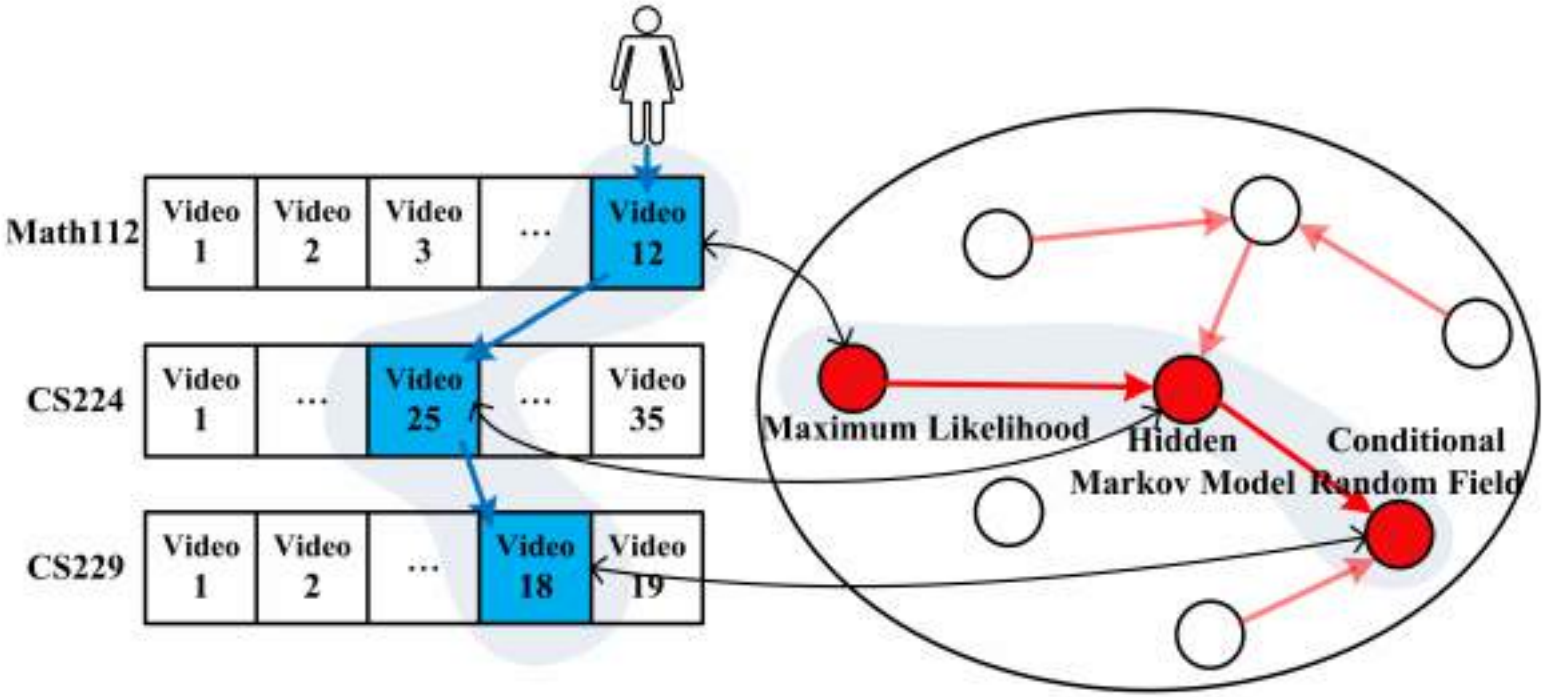
在线教育课程知识体系构建

课程概念 + 先后序关系 ⇨ 知识体系



课程概念图

在线教育课程知识体系构建



- How to extract concepts from course scripts?
- How to recognize (prerequisite) relationships between concepts?

[1] Liangming Pan, Chengjiang Li, Juanzi Li, and Jie Tang. Prerequisite Relation Learning for Concepts in MOOCs. **ACL'17**.

课程概念学习

Candidate Concept Extraction → Semantic Representation Learning → Graph-based Ranking

In this course, we will teach some basic knowledge about data mining and its application in business intelligence.

Video script

data mining

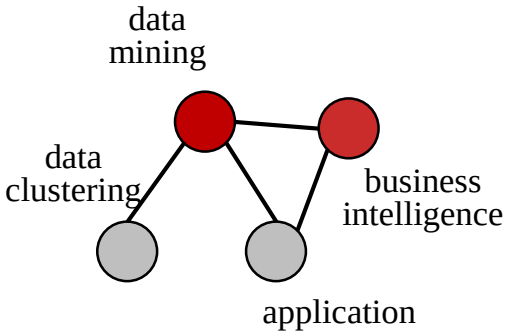
0.8	0.2	0.3	…	0.0	0.0

business intelligence

0.1	0.1	0.2	…	0.8	0.7

Vector representation

Learned via embedding or deep learning



课程概念抽取

课程概念的三个特性

短语性

- 课程概念应该是一个**语法正确的词组或短语**

信息性

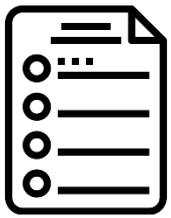
- 课程概念在语义上表示一个**科学或技术术语**

相关性

- 课程概念应该与MOOC课程语料中的**课程相关**

课程概念抽取

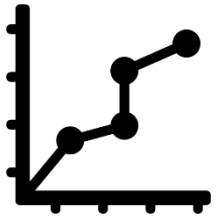
语义相关度



候选课程概念

维基百科语料

- **实体标注**
  - 对维基语料进行**实体标注**
- **词嵌入表示学习**
  - 学习维基语料的**词嵌入表示**
- **候选课程概念表示**
  - 通过**向量加和**得到候选概念向量表示
- **语义相关度度量**
  - **余弦相似度**作为候选概念间语义相关度

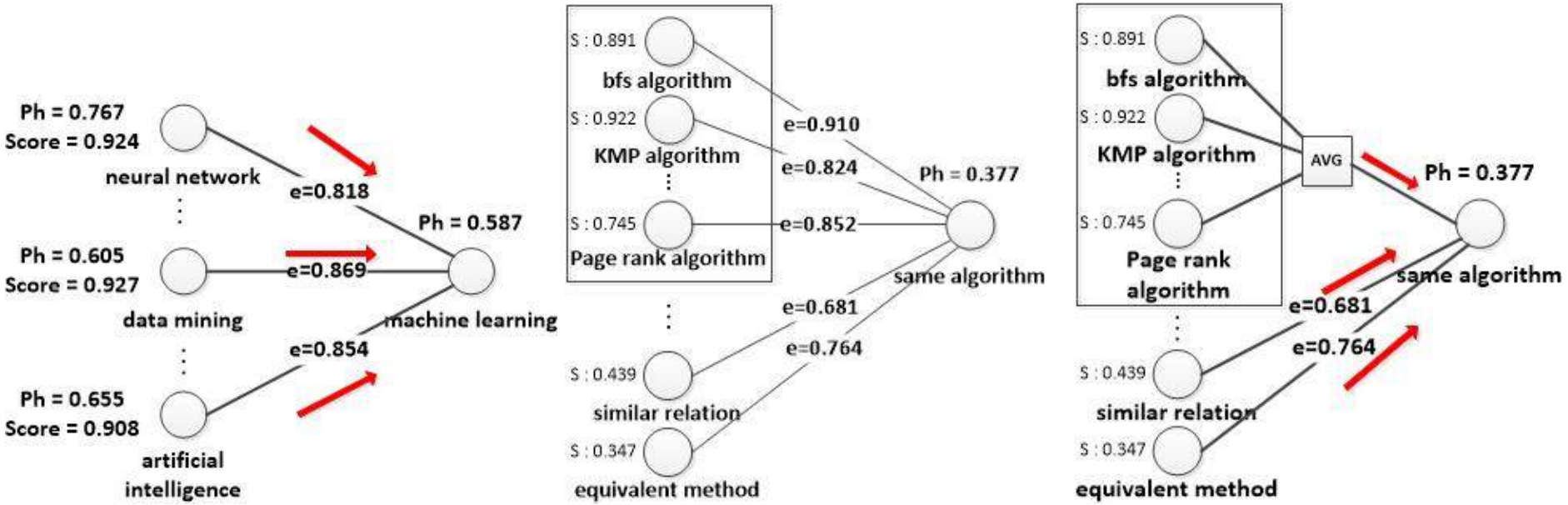


语义相关度

课程概念抽取

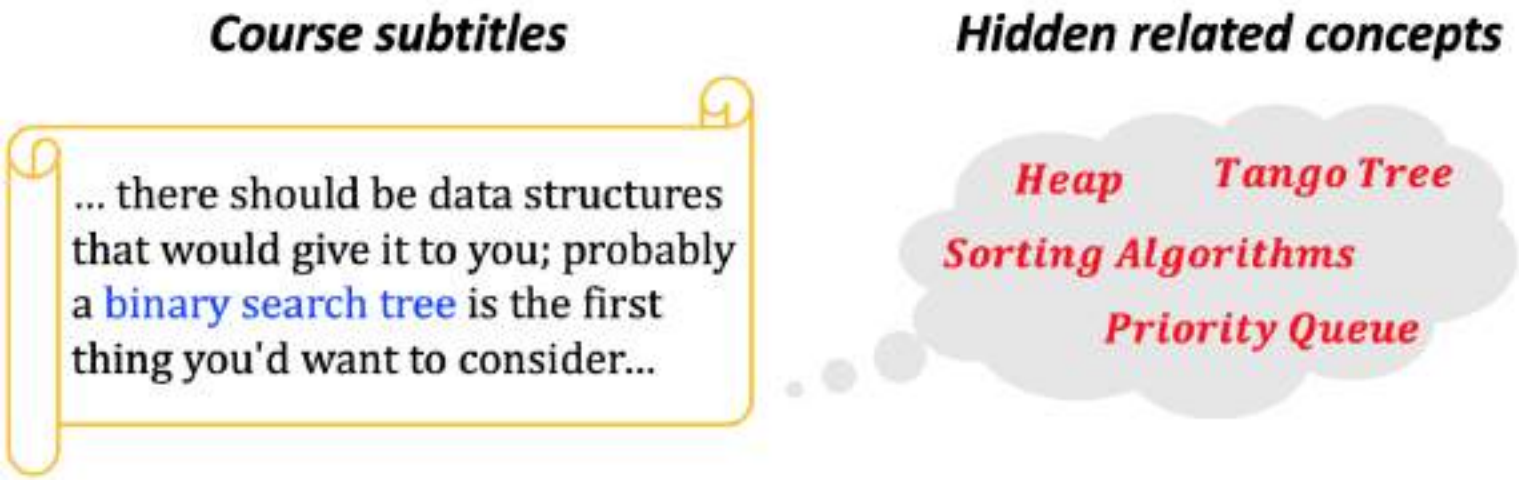
置信度图传播

- 课程概念图中，课程概念与其他课程概念**以高语义相关度相连接**
- 可以通过少数种子概念通过**置信度传播**找出更多课程概念



课程概念扩展

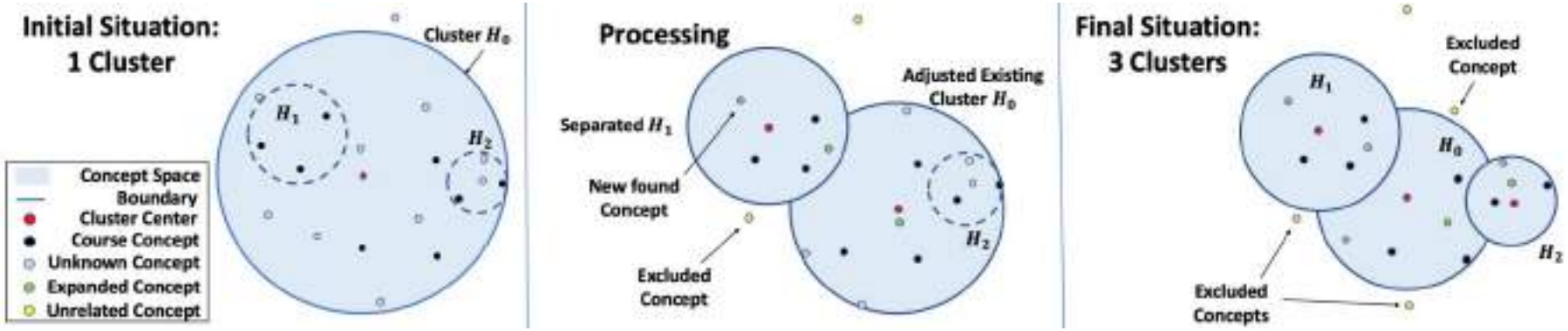
大量课程相关概念并不出现在课程文本中



这些概念可能由于多种原因能够帮助当前学习

课程概念扩展

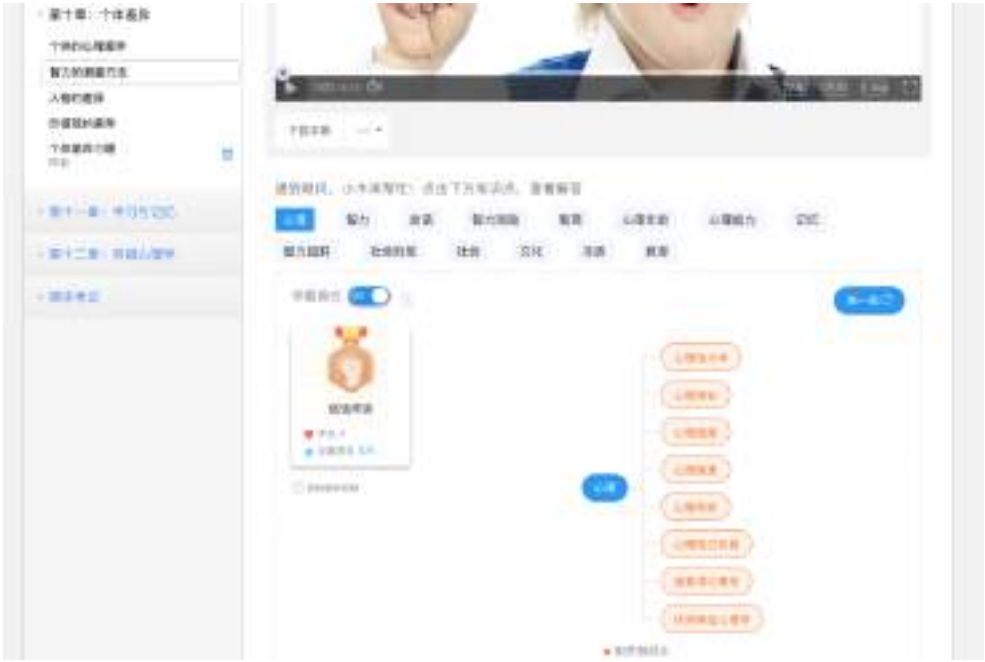
利用外部知识库中的概念，进行课程概念扩展



- 语义漂移是课程概念扩展任务中一个重要的挑战，因此使用了基于动态聚类的概念扩展方法

课程概念扩展

同时，设计在线互动小游戏，收集用户反馈



- “学霸模式”小游戏，放置于课程视频下，吸引用户找出相关概念

前后序概念关系学习

语义特征

- 语义相关度

上下文特征

- 视频引用距离
- 句子引用距离
- 维基引用距离

结构特征

- 平均位置距离
- 分布不对称性距离
- 复杂度水平距离

语义特征

语义相关度

- 语义相关度在判断概念对是否具有先后序关系上具有重要作用
- 若两个概念语义相关度很低，则它们之间具有学习依赖性的概率较低
- 采用与课程概念抽取任务中相同的方法度量语义相关度

矩阵 ✗ 人类学

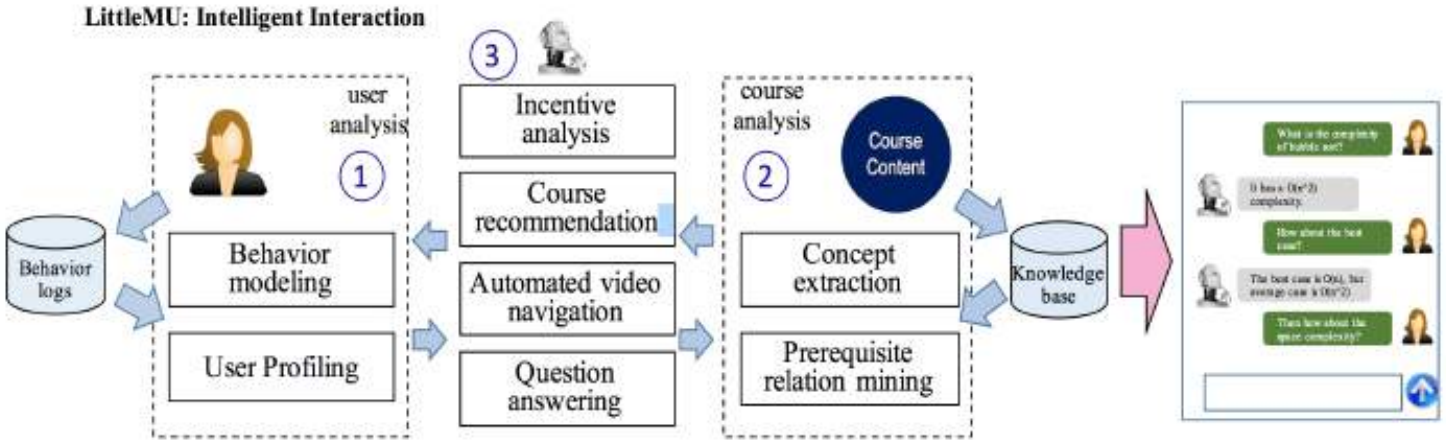
梯度下降 √ 后向传播算法

上下文特征

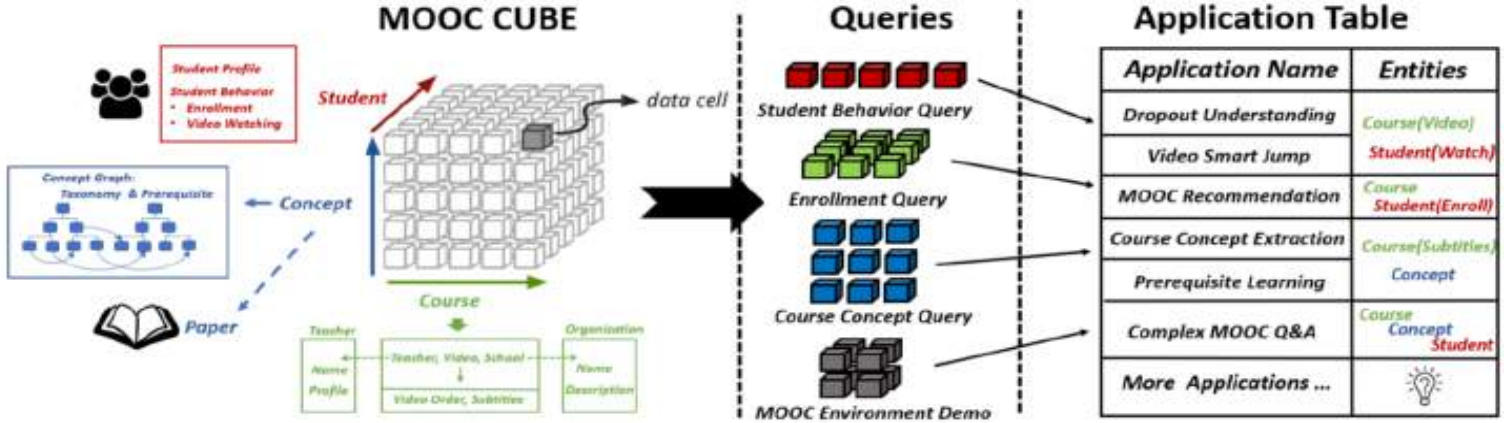
引用距离

- **核心假设：**在教师教授概念A时，如果教师经常提及概念B，反过来，在教师教授概念B时，概念A却很少被提及，则概念B很可能是概念A的先序概念

在线教育智能交互的知识服务



学堂智能知识机器人“小木”



大规模在线教育数据仓库 MOOCCube

总 结

- 知识图谱是人工智能的基础设施
- 知识图谱构建需要高质量大规模知识获取技术支持
- 知识驱动的智能学术搜索技术是学术搜索的新型态

谢谢大家！

大数据知识管理服务平台技术与实践

杜一

中国科学院计算机网络信息中心 大数据知识工程实验室

2020年6月2日

学术搜索

Google Scholar

Microsoft Academic Search Beta

Baidu 学术

学术搜索

Google Scholar

Microsoft Academic Search Beta

Bai du 学术

Semantic Scholar

Academia.edu

AMiner

学术搜索

Google Scholar

Microsoft Academic Search Beta

Baidu 学术

Semantic Scholar

Academia.edu

AMiner

万方数据 WANFANG DATA

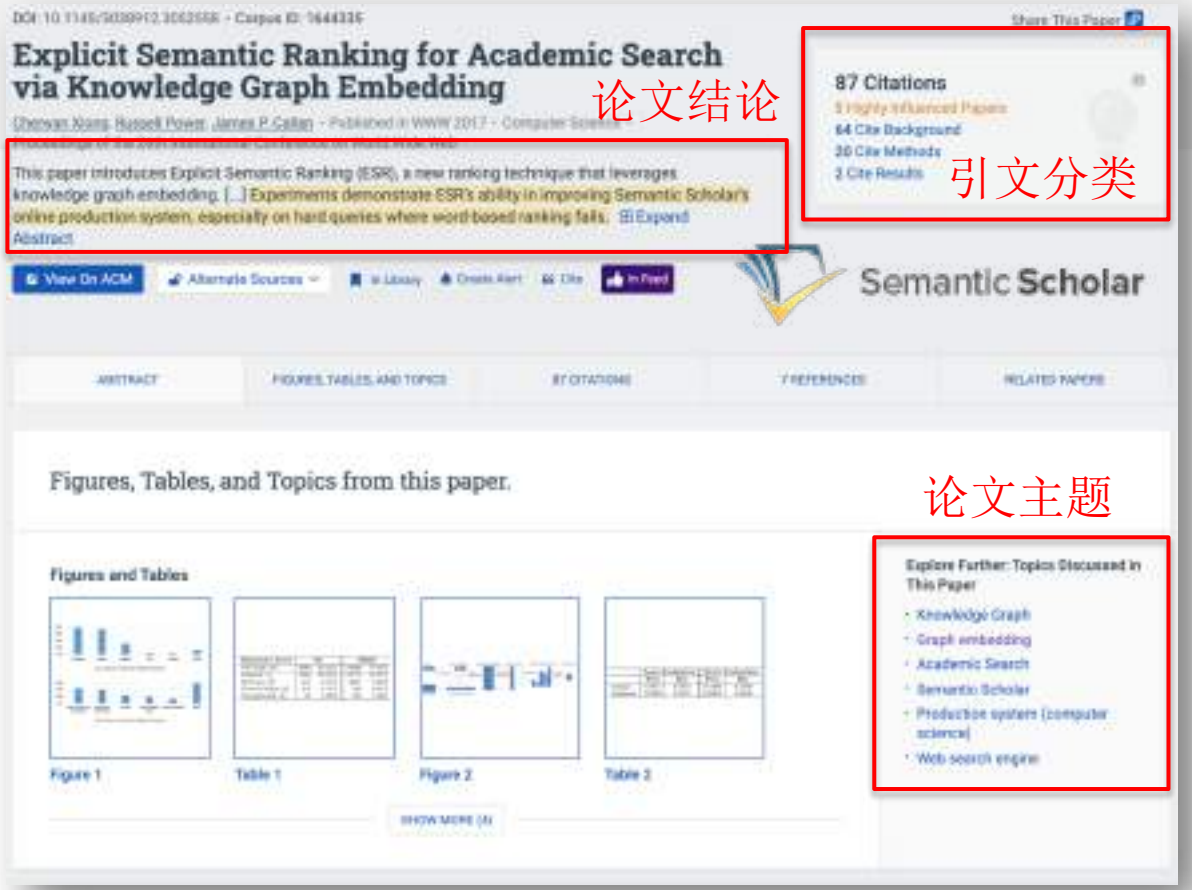
WEB OF SCIENCE

Scopus

CNKI中国知网 www.cnki.net

中国知识基础设施工程

学术搜索


Explicit Semantic Ranking for Academic Search via Knowledge Graph Embedding
论文结论
87 Citations
64 Cite Background
30 Cite Methods
2 Cite Results
引文分类
This paper introduces Explicit Semantic Ranking (ESR), a new ranking technique that leverages knowledge graph embedding. [...] Experiments demonstrate ESR's ability in improving Semantic Scholar's online production system, especially on hard queries where word-based ranking fails.
Semantic Scholar
Figures, Tables, and Topics from this paper.
论文主题
Figures and Tables
Explore Further: Topics Discussed in This Paper
Knowledge Graph
Graph embedding
Academic Search
Semantic Scholar
Web search engine

学术搜索

Aminer 论文溯源树

大数据知识管理服务平台

空间科学领域知识图谱与决策支持系统

基于知识图谱的科技合作智能化管理服务平台

中科院国际合作数据汇聚与分析平台

国家自然科学基金大数据知识管理服务平台

烟草科技知识图谱服务平台

Information Science Data Platform

大数据知识管理服务平台

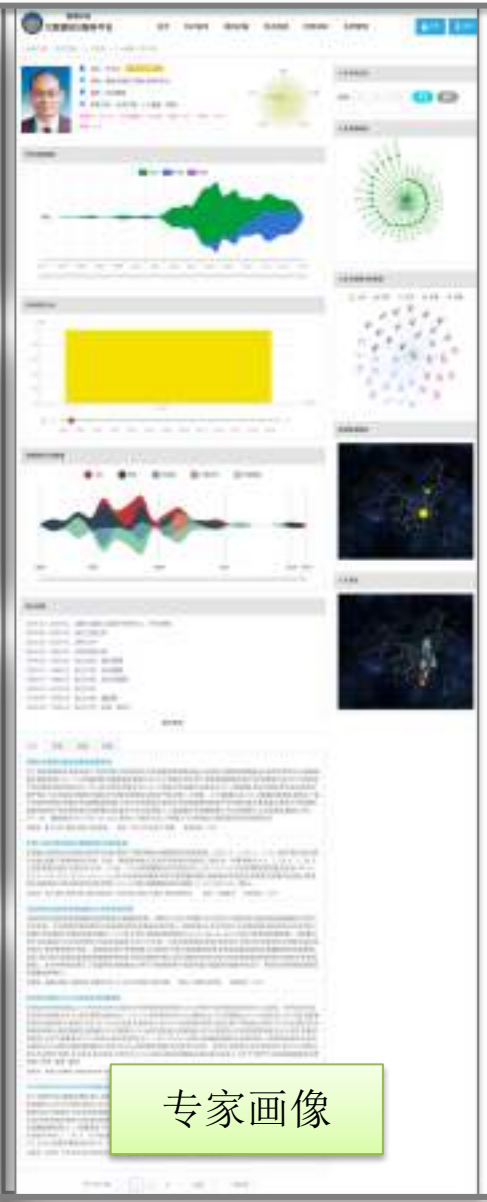
大数据知识管理服务平台

学科趋势

交叉学科

学术团队

资助方向



专家画像

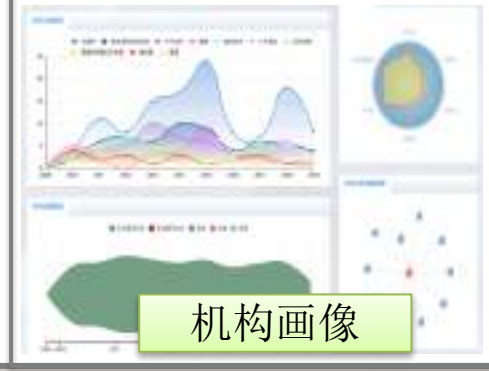
学科热词

热词矩阵

人才合作

关联路径

研究热点



机构画像

大数据知识管理服务平台

来自内部的需求逐渐增多

基金委　科学院　空间中心　烟草总局　出版社　… …

交叉学科　热词矩阵　研究热点

学术团队　专家画像　人才合作　机构画像

资助方向

大数据知识管理服务平台

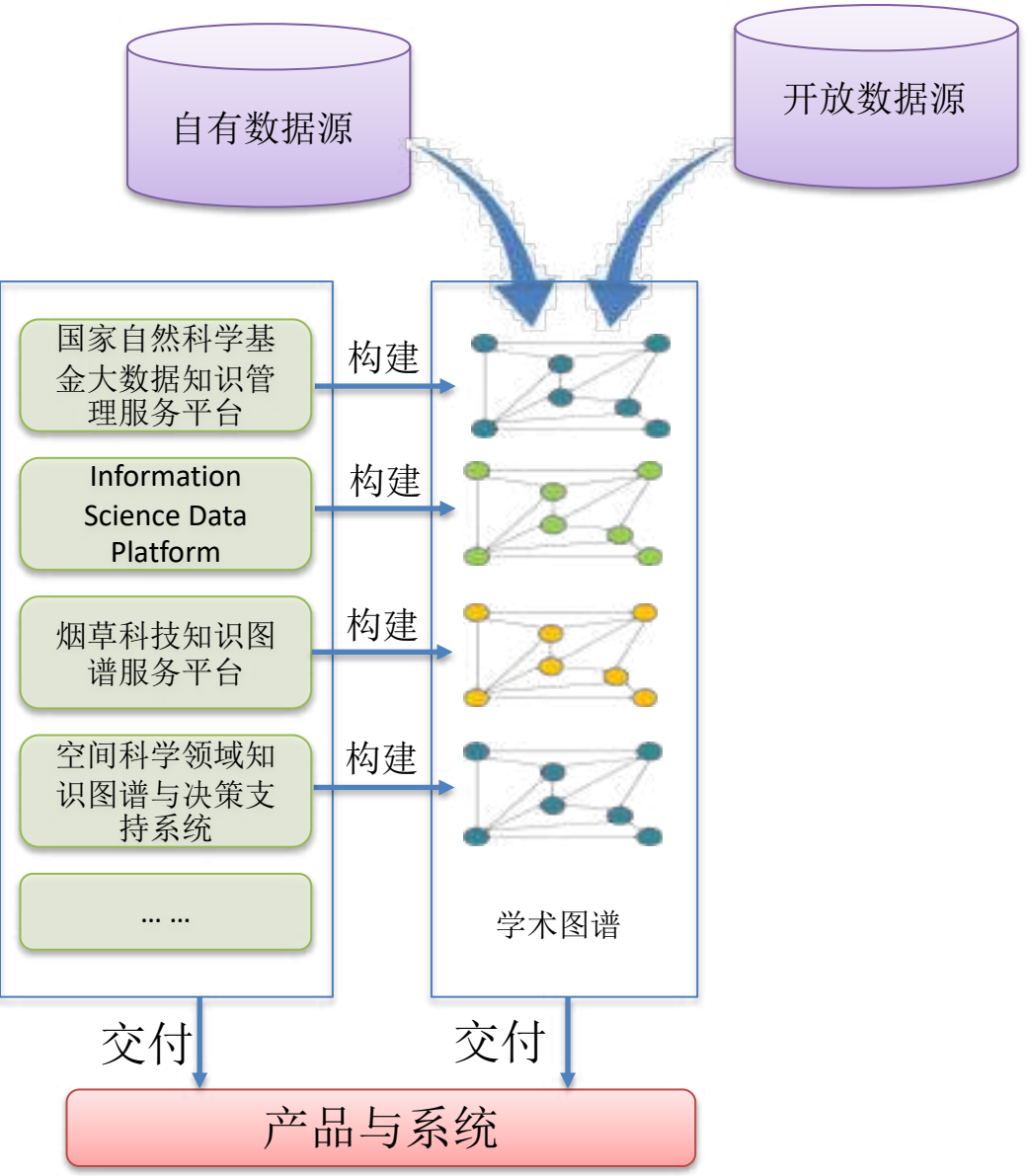
来自内部的需求逐渐增多

学术深度挖掘需求迫切

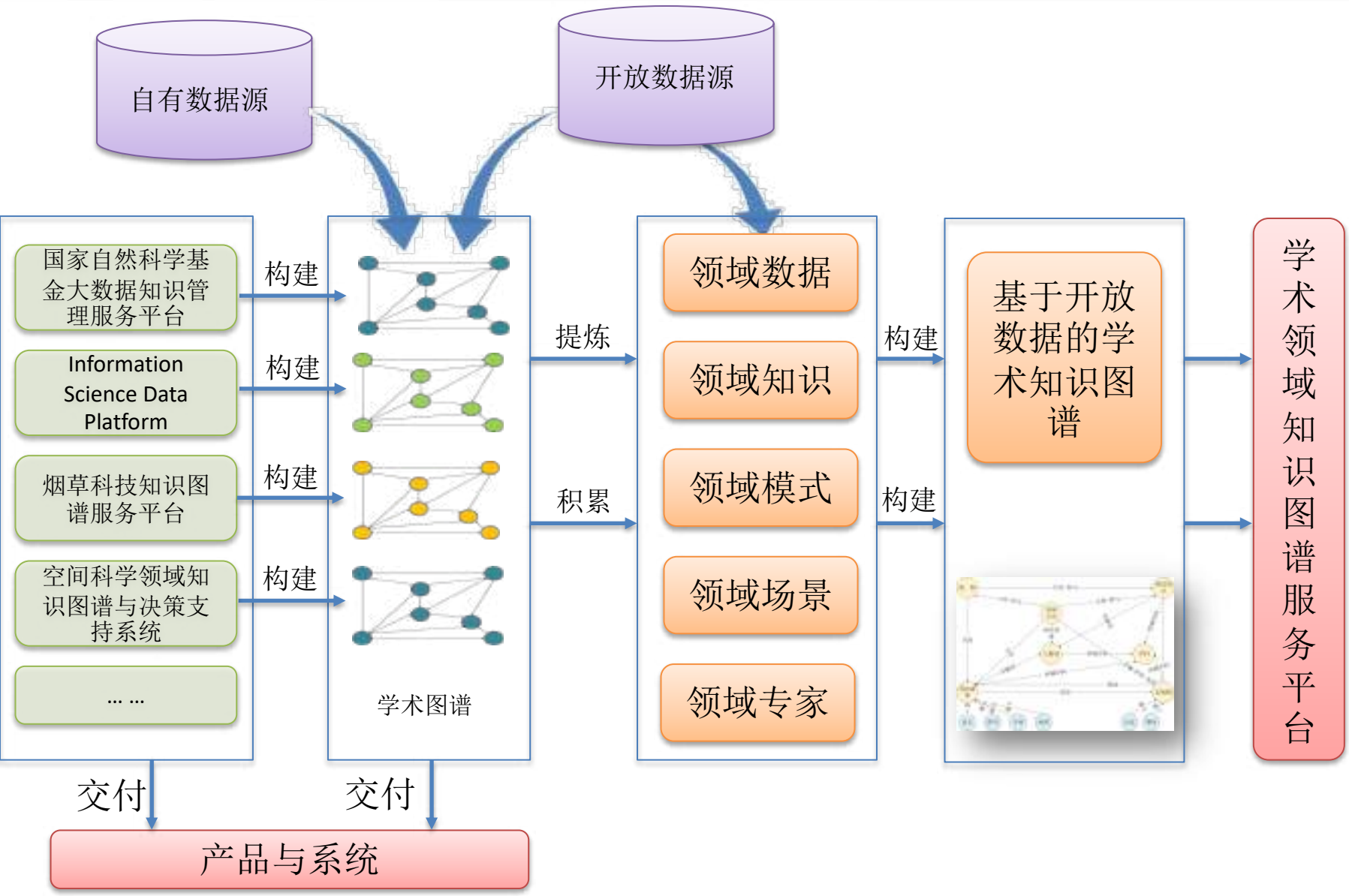
人员关系　科研社区　学术画像　人才引进　学科交叉　… …

构建科技领域知识图谱，
建设知识管理服务平台，
满足内外部科研学术需求

科技领域知识图谱


自有数据源
开放数据源
国家自然科学基金大数据知识管理服务平台
Information Science Data Platform
烟草科技知识图谱服务平台
空间科学领域知识图谱与决策支持系统
… …
构建
构建
构建
构建
学术图谱
交付
交付
产品与系统

科技领域知识图谱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… …
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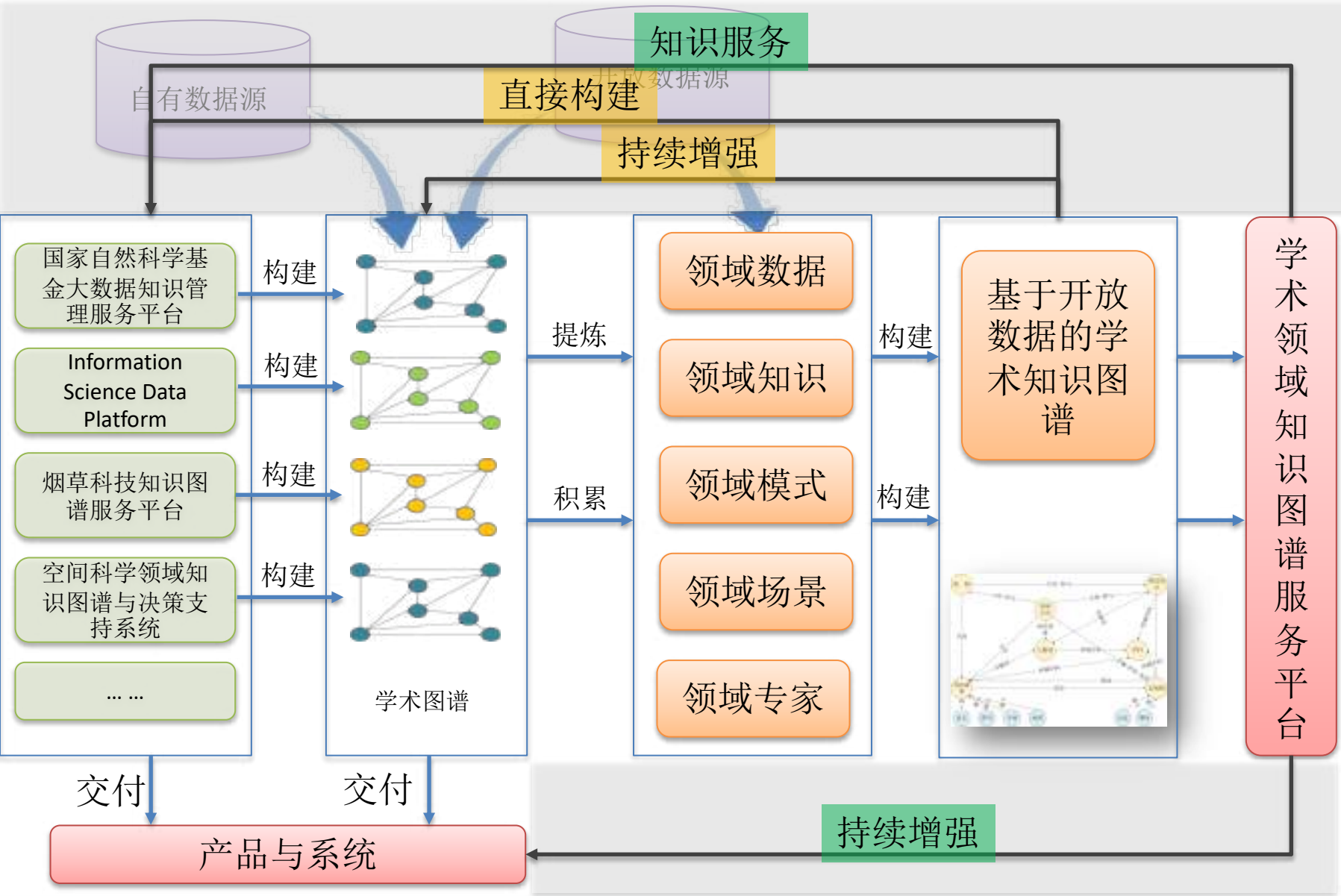
学术图谱
提炼
积累
领域数据
领域知识
领域模式
领域场景
领域专家
构建
构建
基于开放数据的学术知识图谱
学术领域知识图谱服务平台
交付
交付
产品与系统

科技领域知识图谱


自有数据源
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… …
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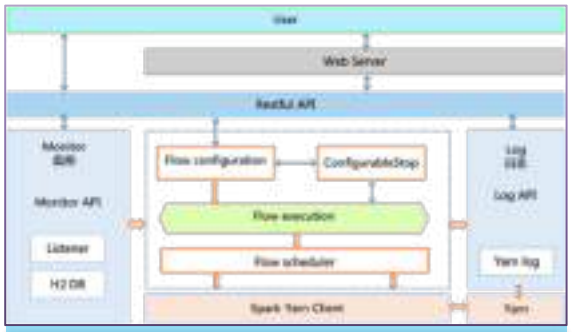
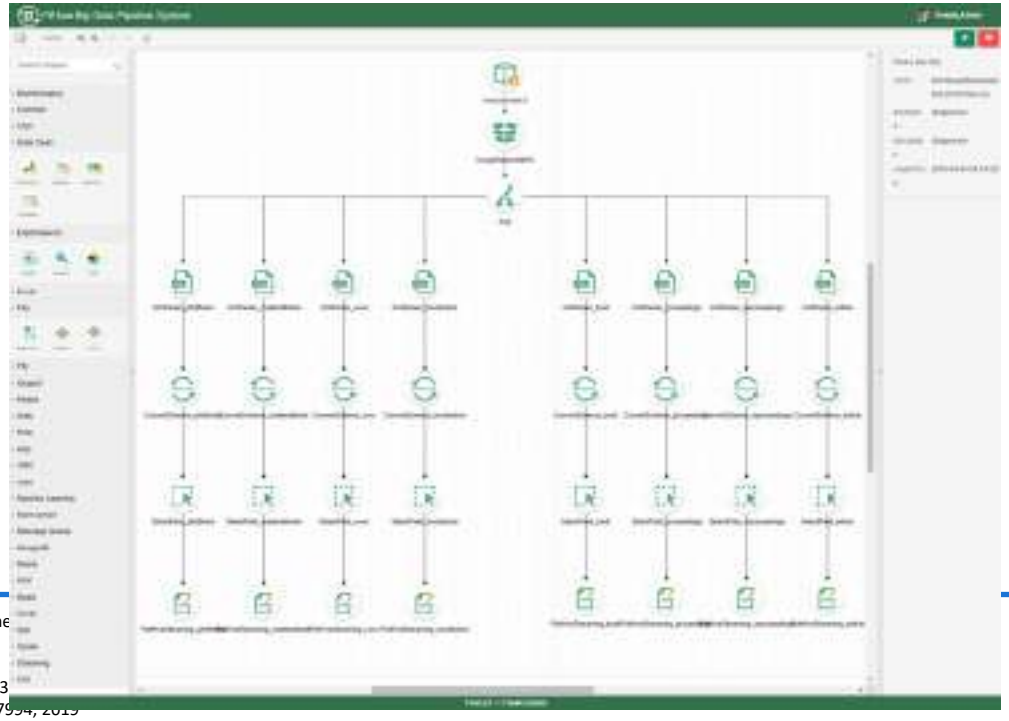
科技领域知识图谱：关键技术

自动及半自动的数据采集、处理流水线机制



PiFlow 架构

流水线实例



1. 乔子越,杜一*,傅衍杰,王鹏飞,周园春,Unsupervised Author Disambiguation using Heterogene
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5. 杜一,乔子越,周园春,一种基于异质图卷积神经网络嵌入的作者名字消歧方法,201910635794, 2019
6. 杜一,乔子越,周园春,一种基于异质网络嵌入的学者名字消岐方法,2018112671819, 2018
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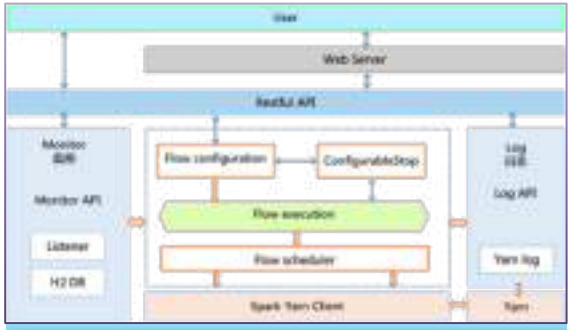
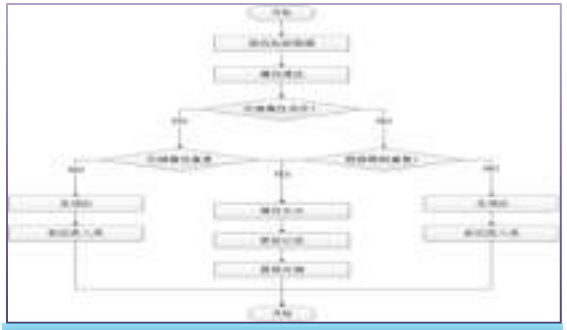
自动及半自动的数据采集、处理流水线机制



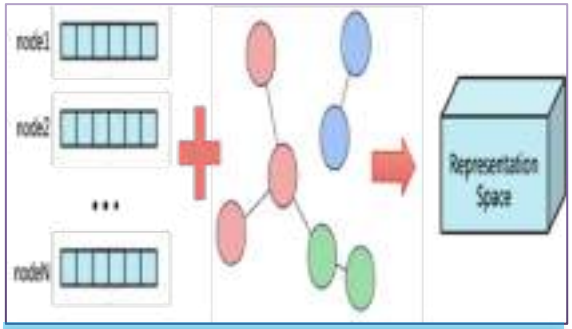
PiFlow 架构

流水线实例

基于统计规则及深度学习方法的实体融合方法

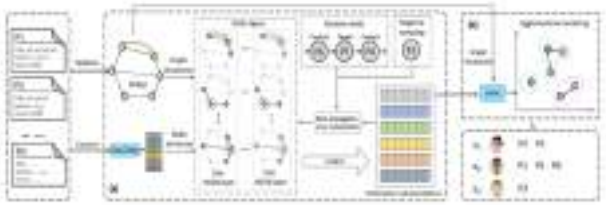


基于规则组合的实体融合



基于GraphEmbedding实体融合

Name	Our method	Component	Zhang et al. 2018	Xu et al. 2018	Zhang et al. 2017
Ajay Gupta	**0.790**	0.329	0.568	0.552	0.618
Alok Gupta	1	0.690	0.689	0.892	0.500
Bin Yu	**0.696**	0.292	0.431	0.585	0.616
David Cooper	0.900	0.327	0.737	0.884	**0.931**
David Nelson	**0.944**	0.219	0.750	0.735	0.556
Fei Su	1	0.648	0.933	0.630	0.941
Hao Wang	**0.684**	0.086	0.403	0.557	0.545
Jie Tang	**0.982**	0.883	0.657	0.522	0.910
Thomas Weil	**0.960**	0.502	0.703	0.522	0.352
Yang Wang	0.508	0.118	0.273	**0.574**	0.409
Avg.	**0.786**	0.507	0.715	0.681	0.680



1. 乔子越,杜一*,傅衍杰,王鹏飞,周园春,Unsupervised Author Disambiguation using Heterogeneous Graph Convolutional Network Embedding, IEEE Big Data, 2019
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5. 杜一,乔子越,周园春,一种基于异质图卷积神经网络嵌入的作者名字消歧方法,2019106357994, 2019
6. 杜一,乔子越,周园春,一种基于异质网络嵌入的学者名字消歧方法,2018112671819, 2018
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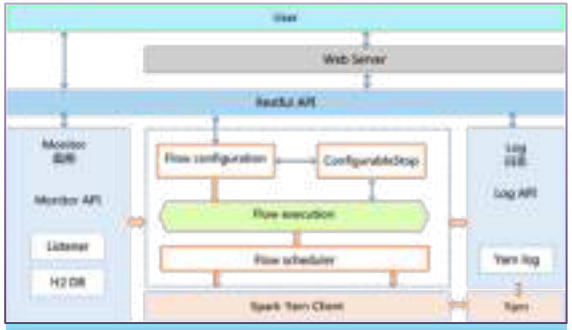
科技领域知识图谱：关键技术

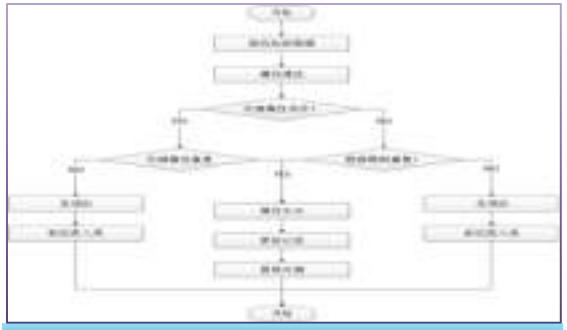
自动及半自动的数据采集、处理流水线机制



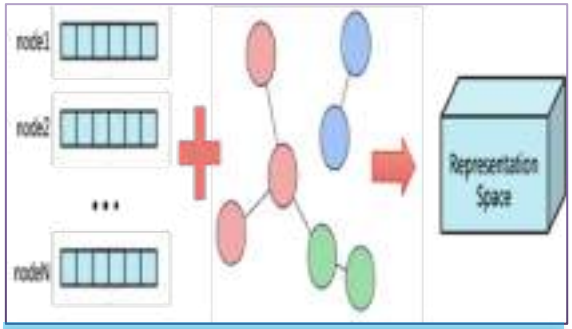
PiFlow 架构

流水线实例

基于统计规则及深度学习方法的实体融合方法

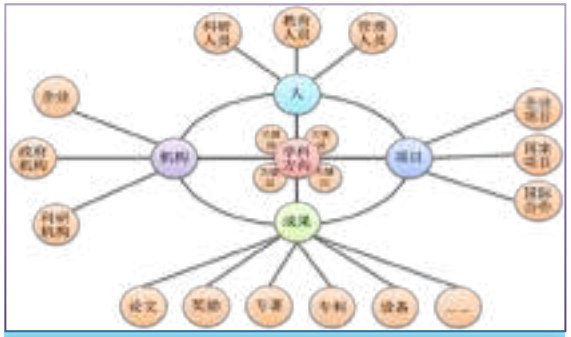


基于规则组合的实体融合

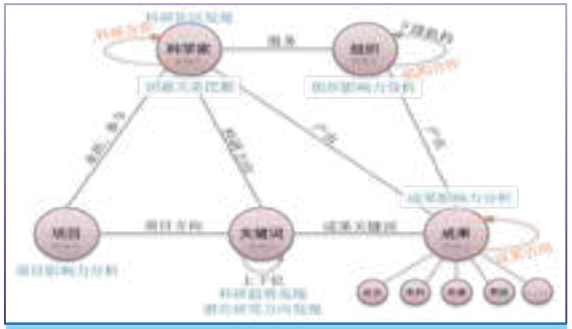


基于GraphEmbedding实体融合

基于属性图的科技领域知识图谱构建方法



基于规则的学术知识图谱



基于推理学习的学术知识图谱

1. 乔子越,杜一*,傅衍杰,王鹏飞,周园春,Unsupervised Author Disambiguation using Heterogeneous Graph Convolutional Network Embedding, IEEE Big Data, 2019
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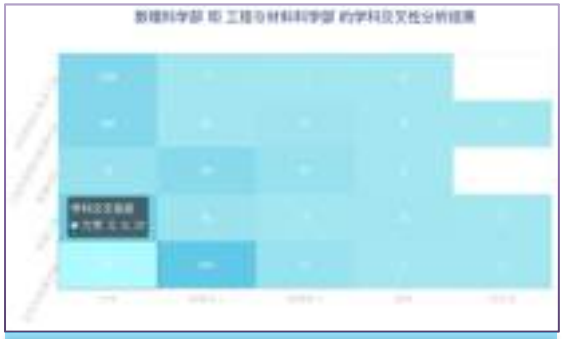
科技领域知识图谱：关键技术

基于学科的科研社区发现算法

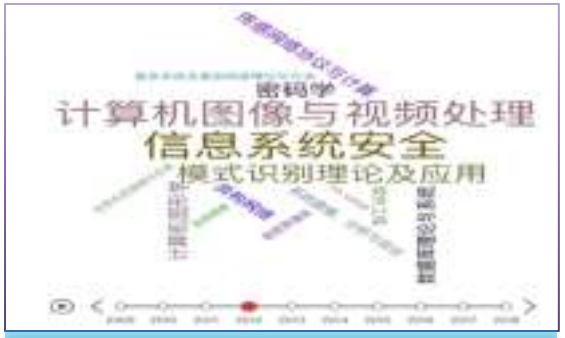
基于PageRank+SVD的高影响力人员关系网络挖掘

基于网络度量指标+标签传播的科研社区发现

学科交叉性评估及学科趋势预测方法

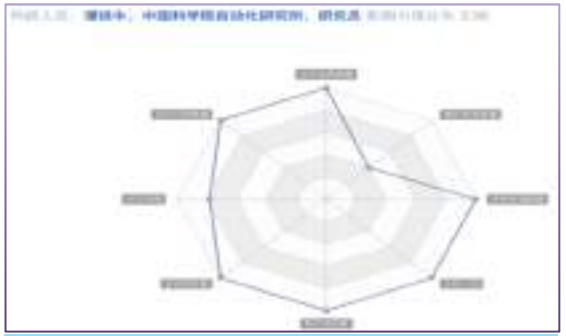


基于统计指标的学科交叉性评价

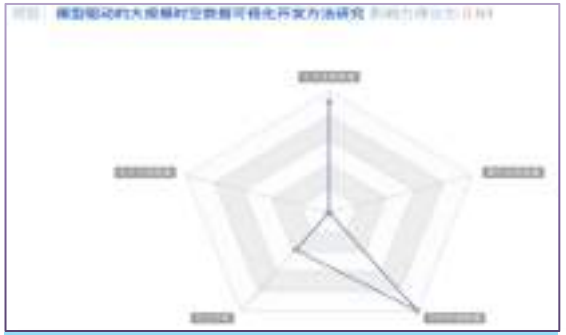


基于时序+图数据库的学科趋势评估

学术影响力评价方法



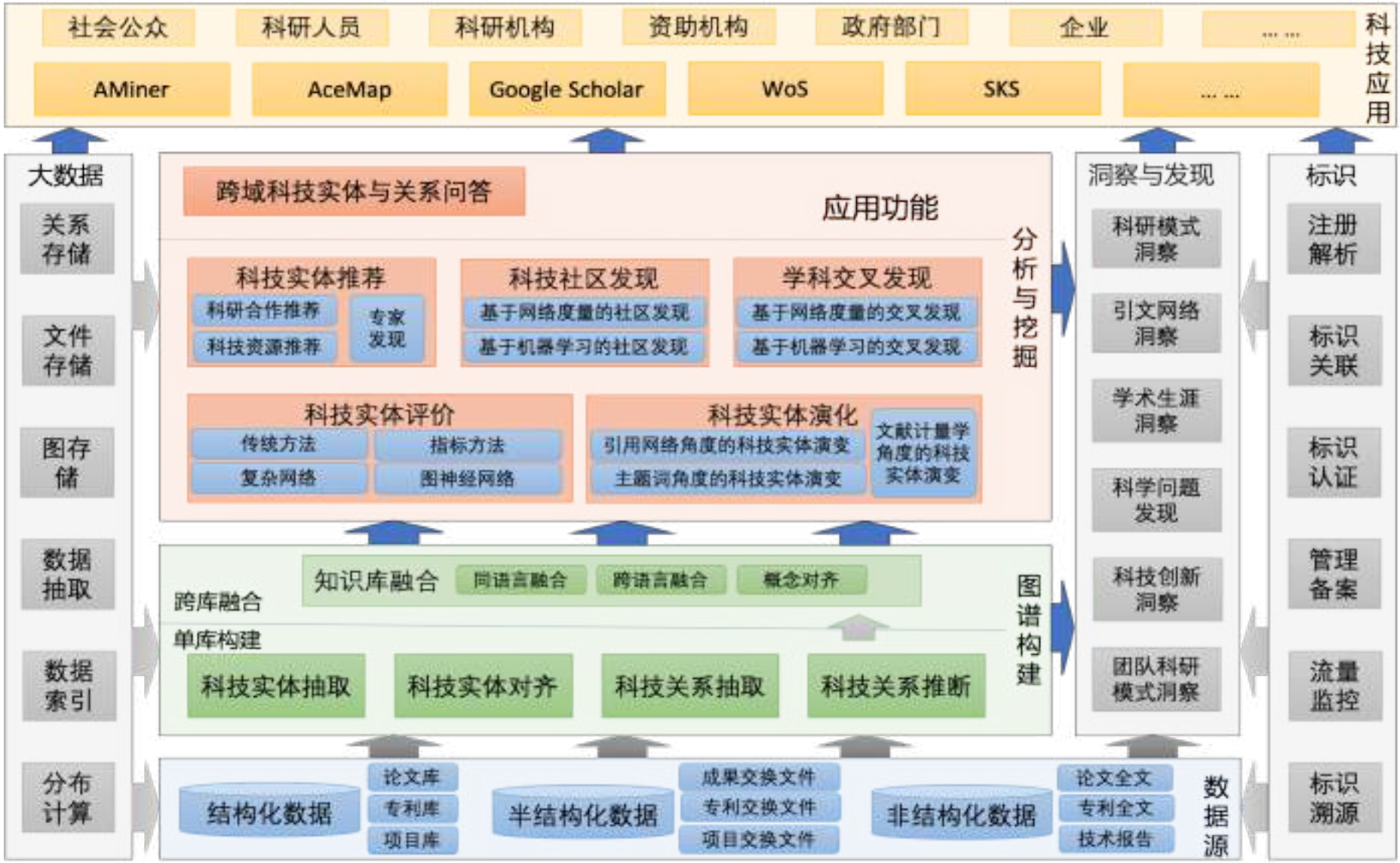
基于网络度量指标+计量学的科研人员影响力评价



基于网络度量指标+计量学的科研项目影响力评价

1. 王卫军, 崔文娟, 杜一*,周园春,基于词嵌入的国家自然科学基金学科交叉知识点分析方法 , 情报学报, 2020.(in submission)
2. 姚畅, 王晓帆, 杜一, 张兆田, 李建军, 郝艳妮, 国家自然科学基金大数据知识管理服务平台总体方案及关键技术研究, 中国科学基金,2019.

科技领域知识图谱：研究架构



周园春,王卫军,乔子越,肖濛, 杜一*, 科技大数据知识图谱构建方法及应用研究综述 , 中国科学 信息科学, 2020.

请批评指正！

AMiner
—Author-centric academic search and mining

Peng Zhang
Tsinghua University

[1] J. Tang, J. Zhang, L. Yao, J. Li, L. Zhang, and Z. Su. ArnetMiner: Extraction and Mining of Academic Social Networks. KDD'08. pp.990-998.

Academic search is far from sufficient…

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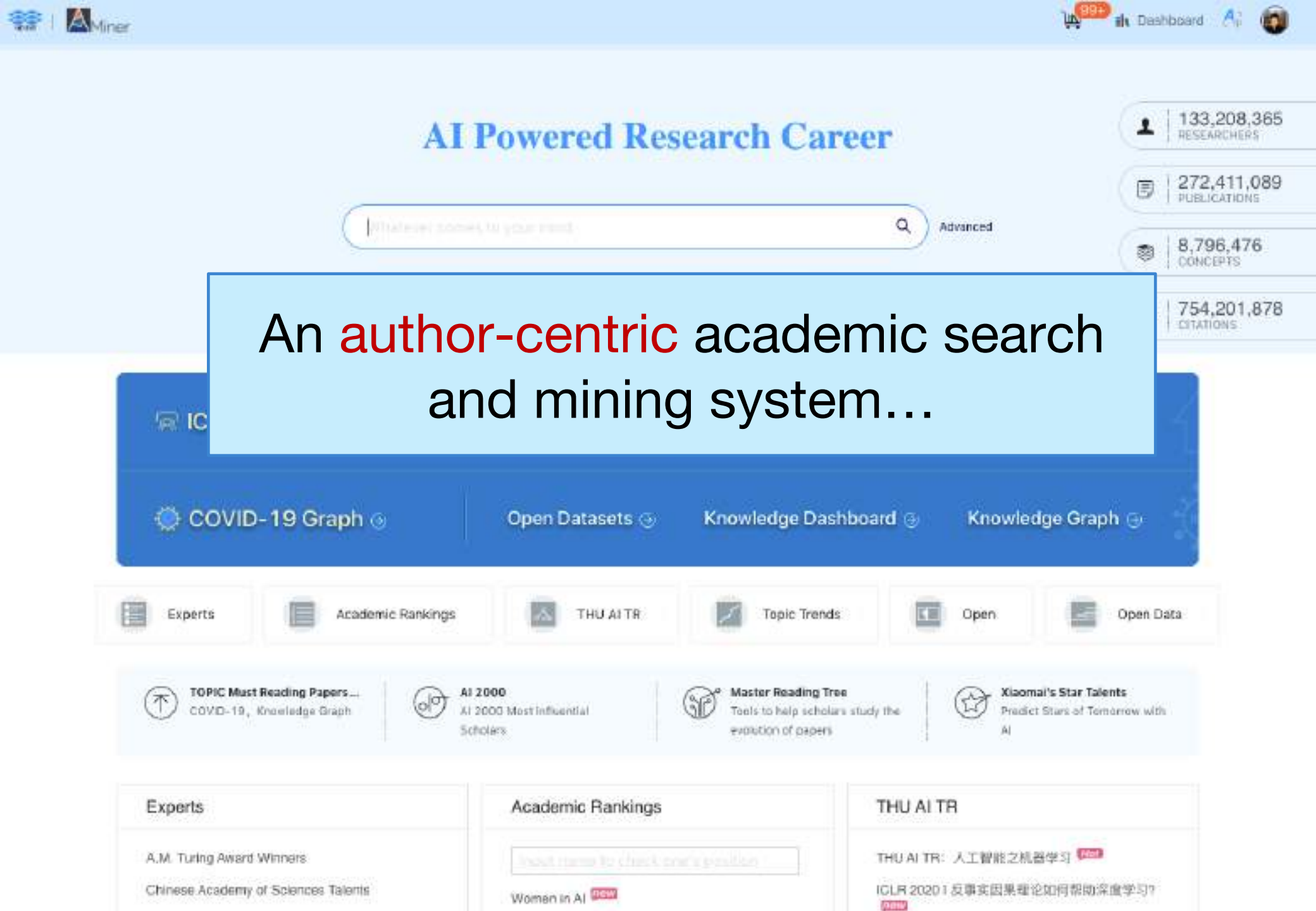
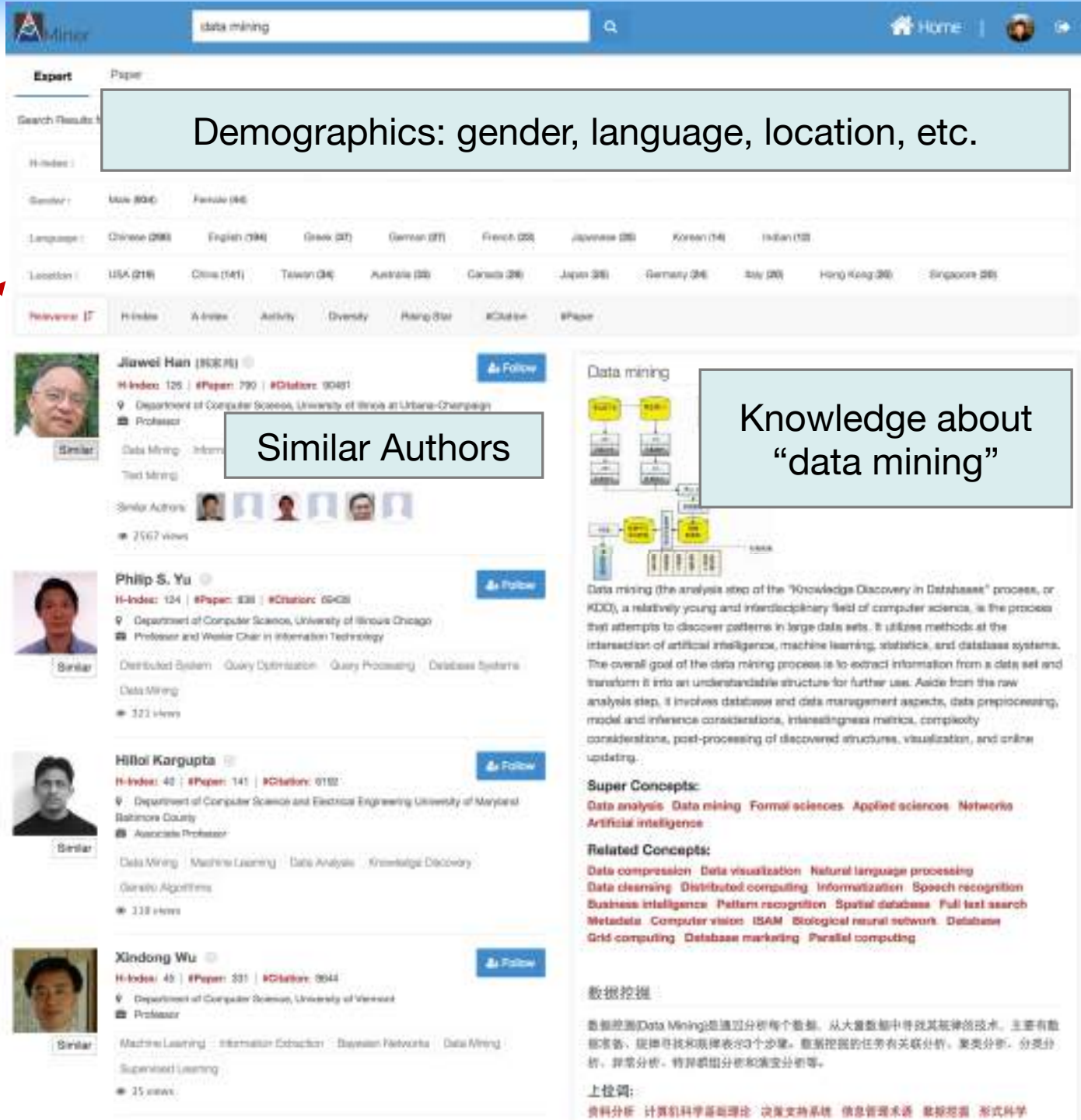

AI Powered Research Career
133,208,365
RESEARCHERS
272,411,089
PUBLICATIONS
8,796,476
CONCEPTS
754,201,878
CITATIONS
Advanced
An author-centric academic search and mining system…
COVID-19 Graph
Open Datasets
Knowledge Dashboard
Knowledge Graph
Experts
Academic Rankings
THU AI TR
Topic Trends
Open
Open Data
TOPIC Must Reading Papers...
COVID-19, Knowledge Graph
AI 2000
AI 2000 Most Influential Scholars
Master Reading Tree
Tools to help scholars study the evolution of papers
Xiaomai's Star Talents
Predict Stars of Tomorrow with AI
Experts
A.M. Turing Award Winners
Chinese Academy of Sciences Talents
Academic Rankings
Women in AI
THU AI TR
THU AI TR: 人工智能之机器学习
ICLR 2020 | 反事实因果理论如何帮助深度学习?

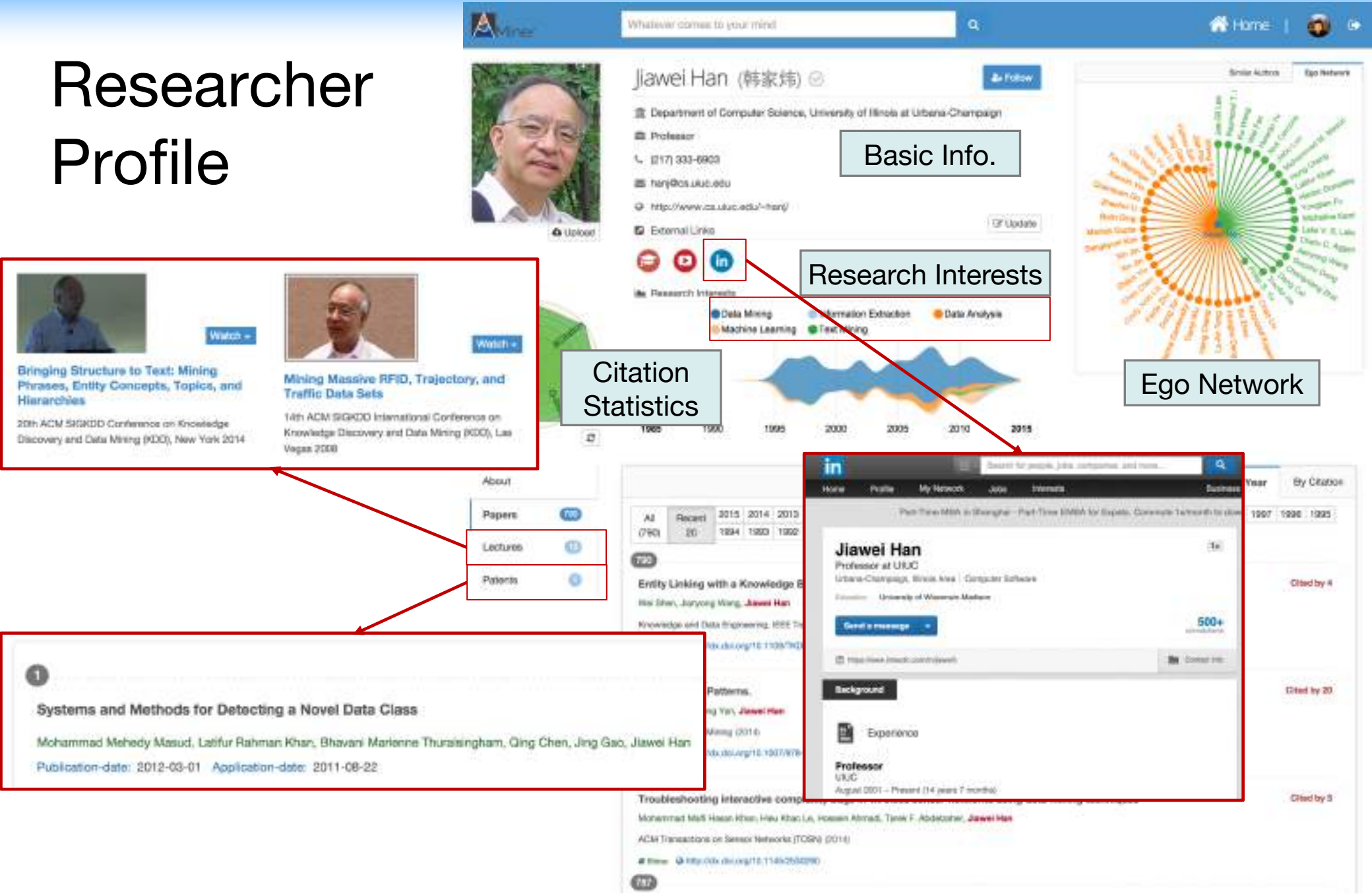
Expert Search

Finding experts, for “data mining”

with more semantic constraints, e.g., from USA, speak Chinese, gender, and age…



Researcher Profile



AMiner

- Academic search and mining system—https://aminer.cn
  - Online since 2006
  - **>136 million** researcher profiles
  - **>267 million** publication papers
  - **>341 million** requests
  - 20M IP access from 220 countries per month
- Deep analysis, mining, and search

Technology Overview

Tim Berners Lee
WWW Inventor
Turing Award Winner

Data->Semantics
Search->Intelligence

Extraction

Error rate reduced 40-56%

Linking

15 champions in the past 7 years

Intelligence

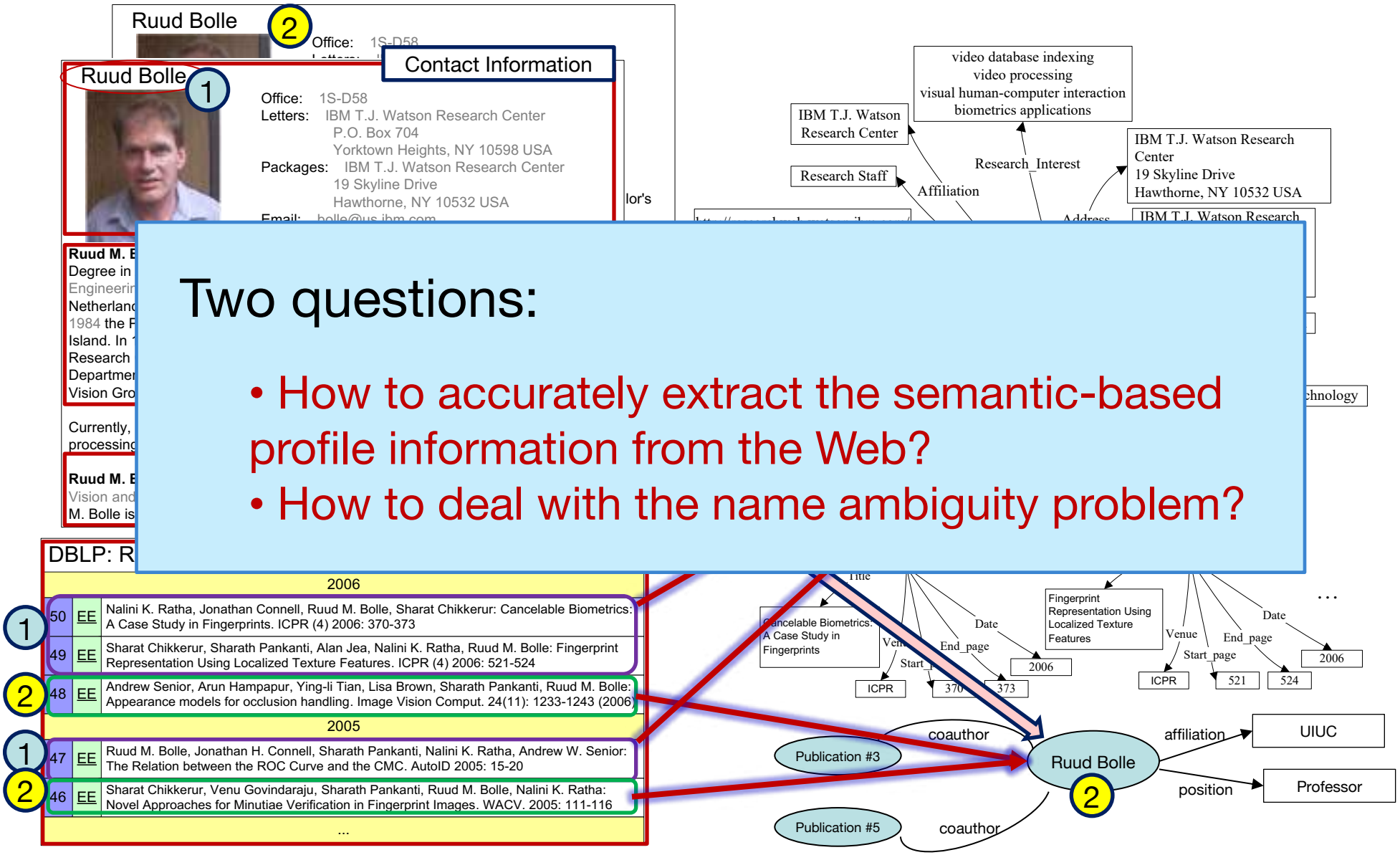
Recommendation accuracy +161%

Reported by UN

#citation>8,000, published ~20 papers on KDD

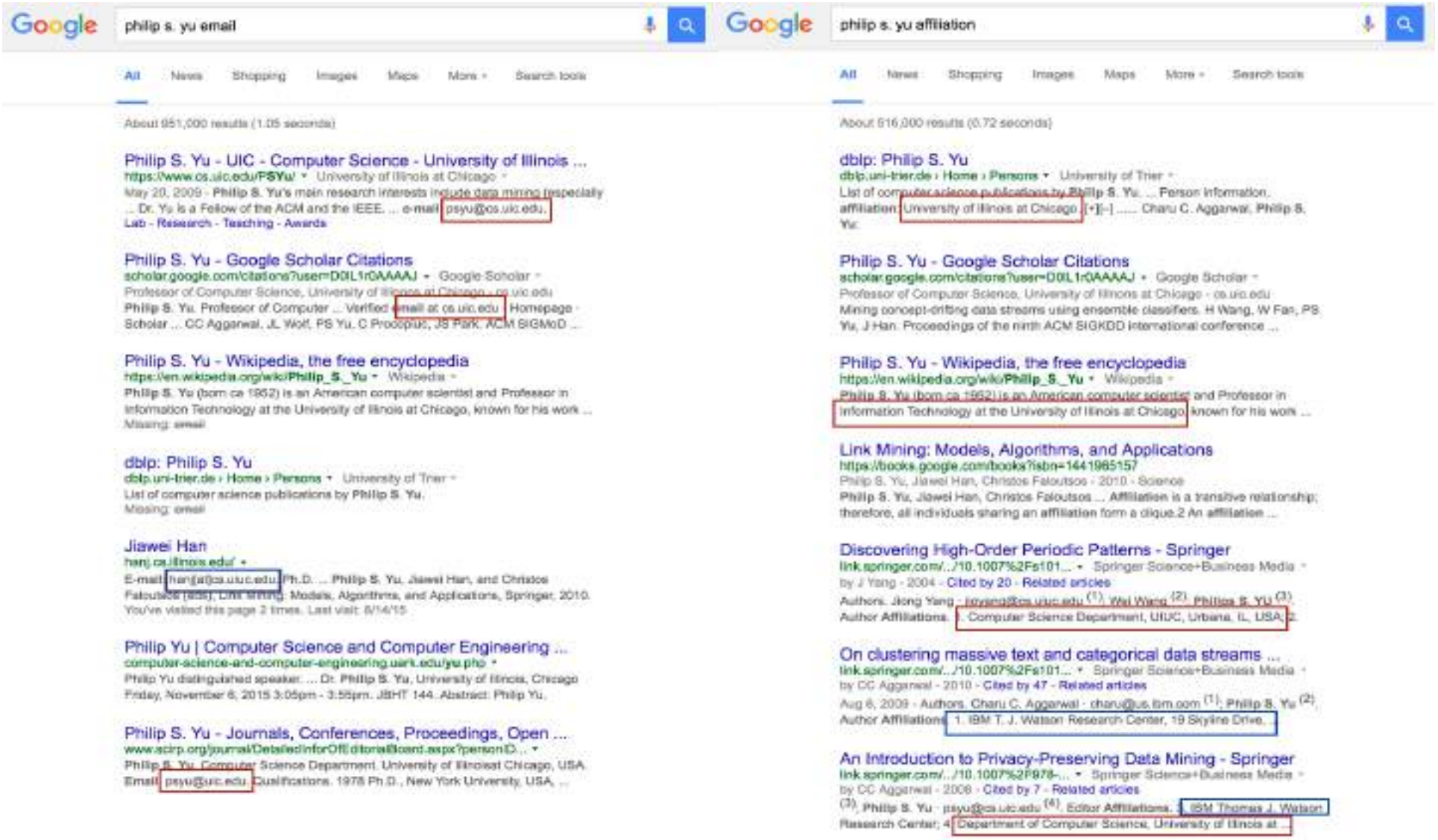
Extracting Profile Semantics from the Web

(ACM TKDD, WWW'12, ISWC'06, ICDM'07, ACL'07)



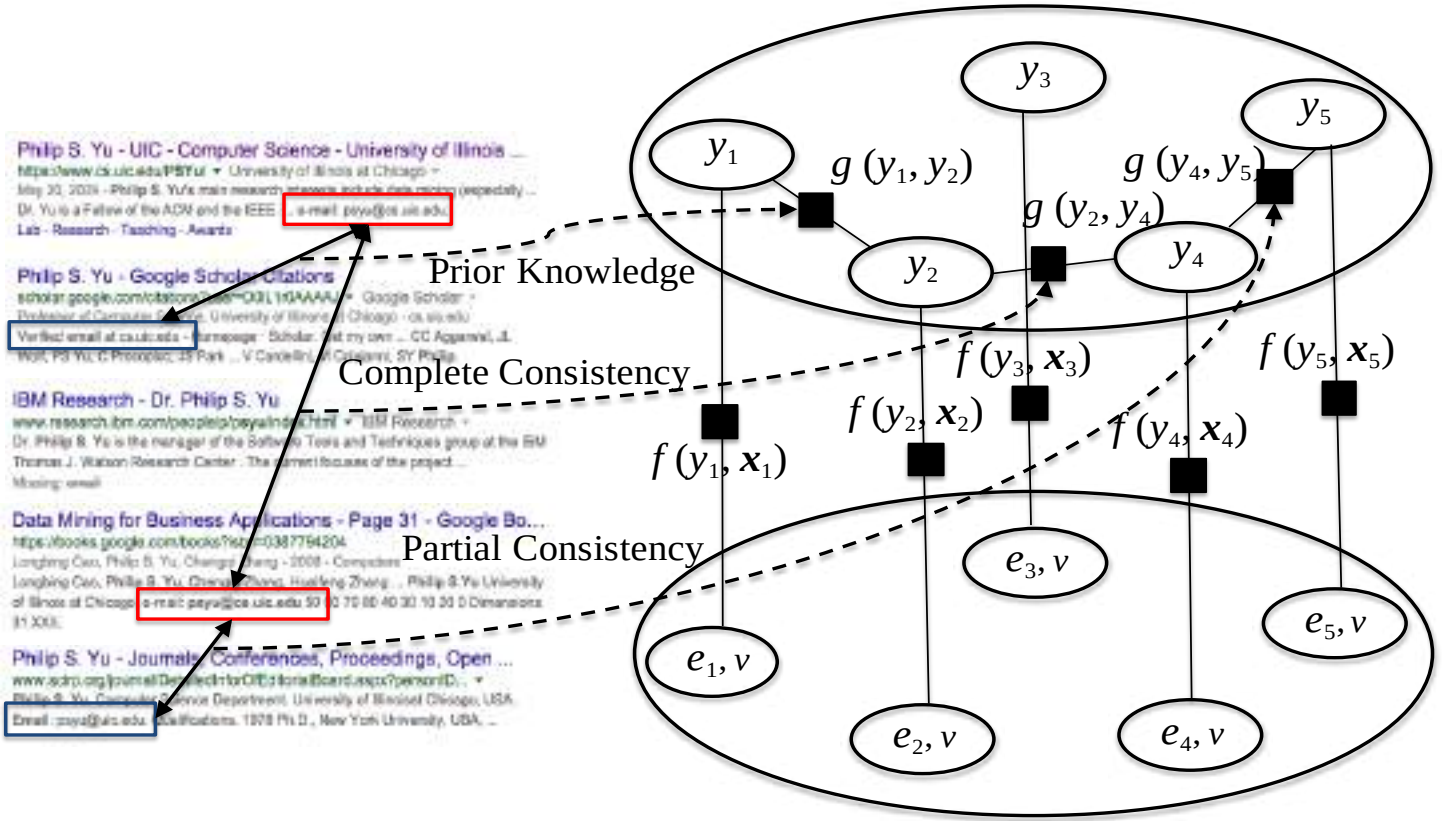
A Big Data Approach

- Search Engine as Data Source

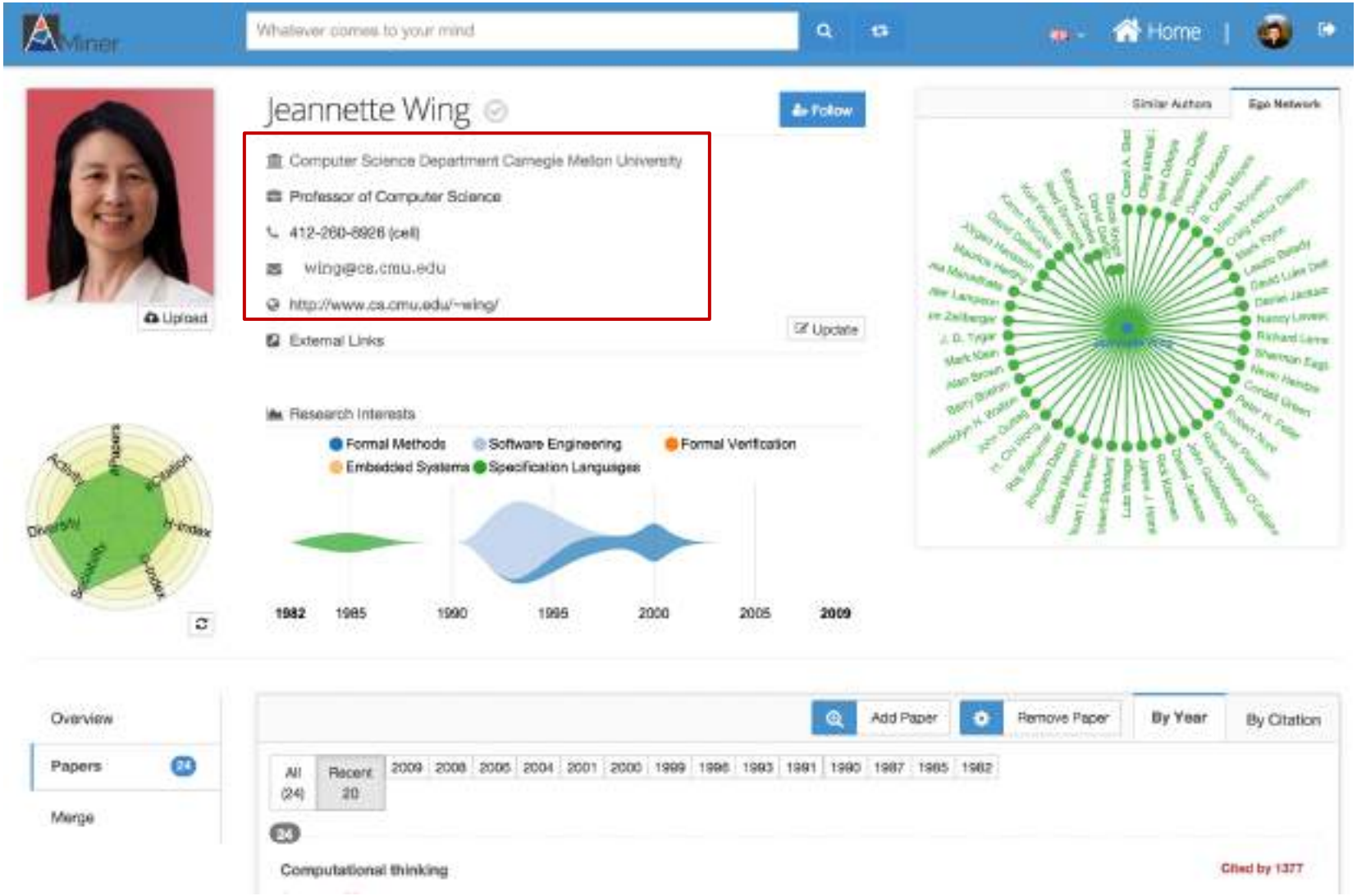


MagicFG: Markov Logic Factor Graph

- ✓ Depict and utilize correlations between possible candidates from redundant data.
- ✓ Incorporate human knowledge to guide and amend the classification model.

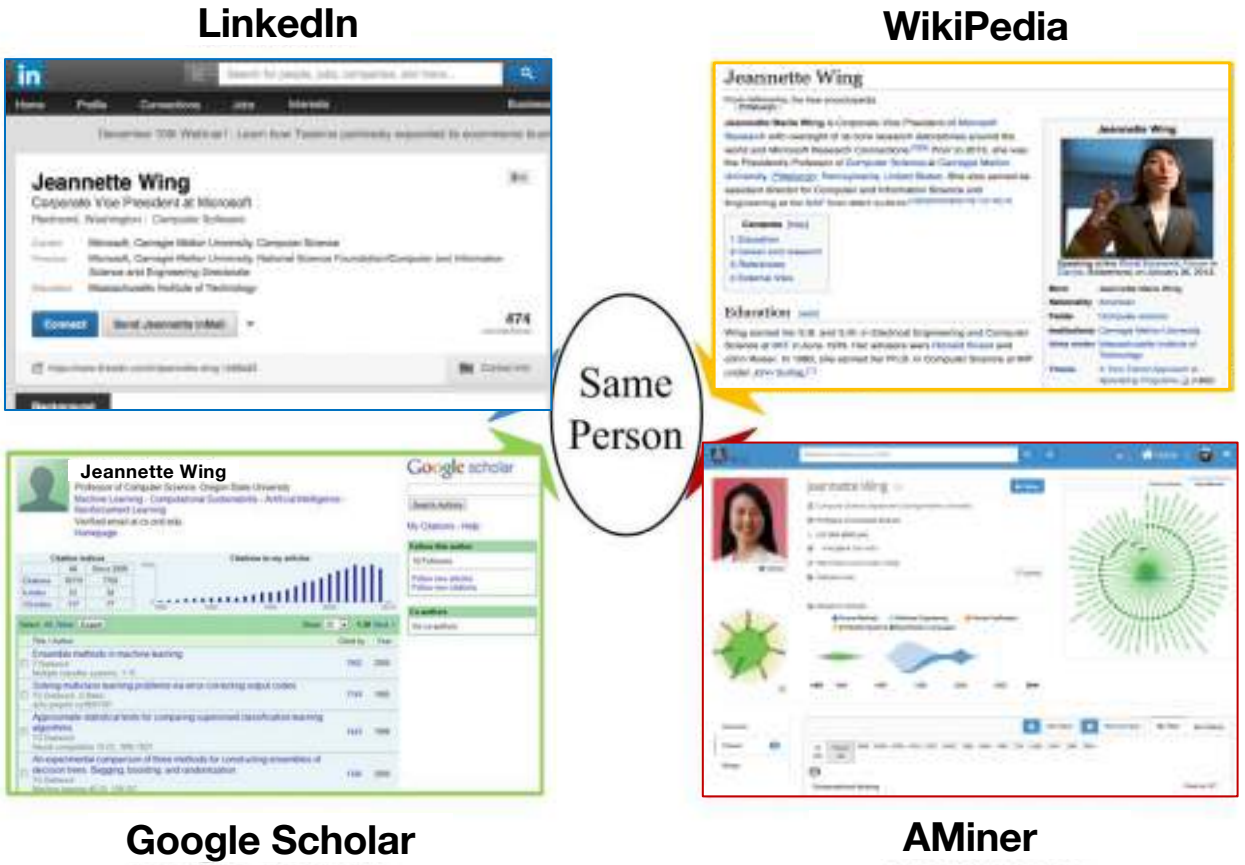


Is this Enough?

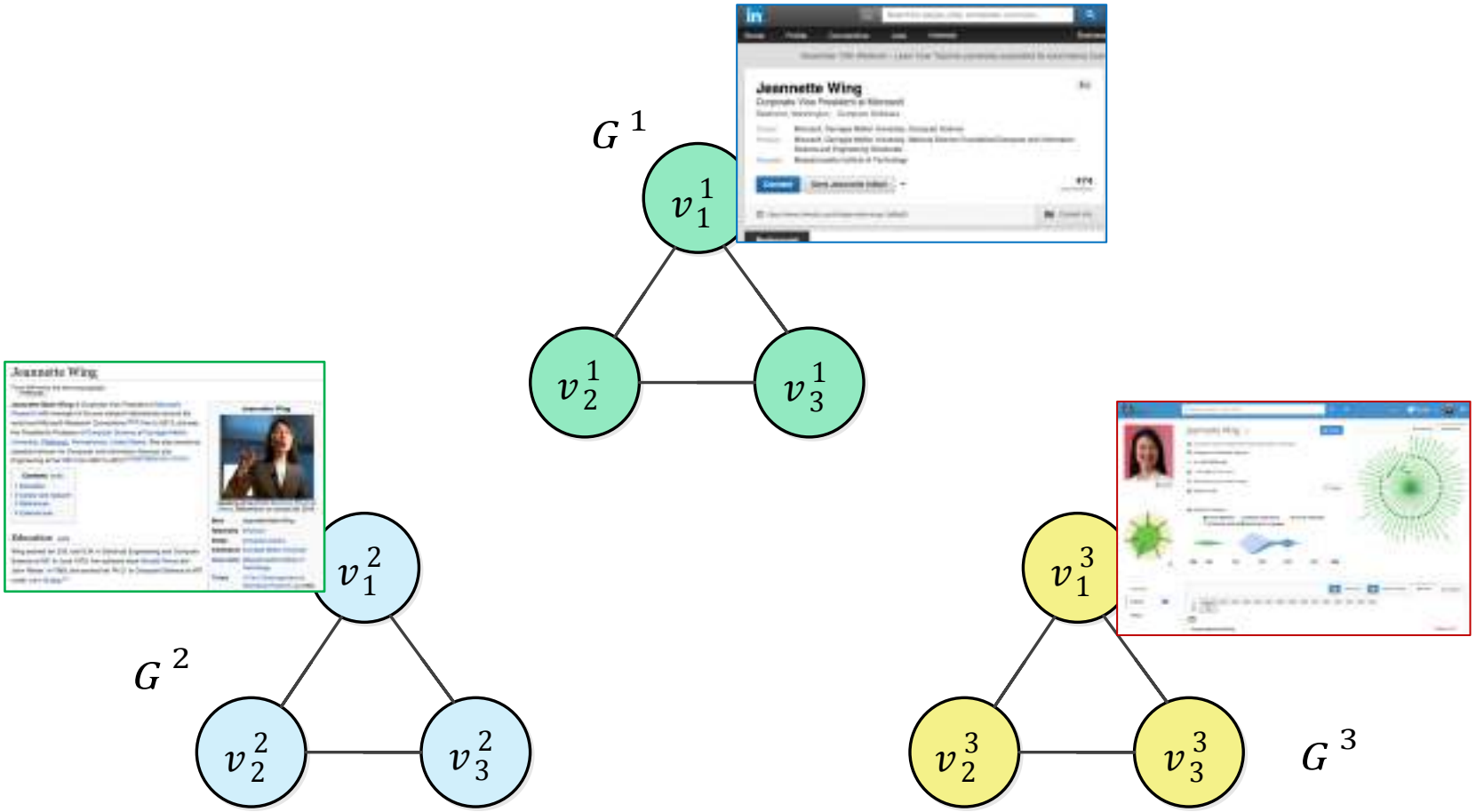


Linking Semantics across Networks

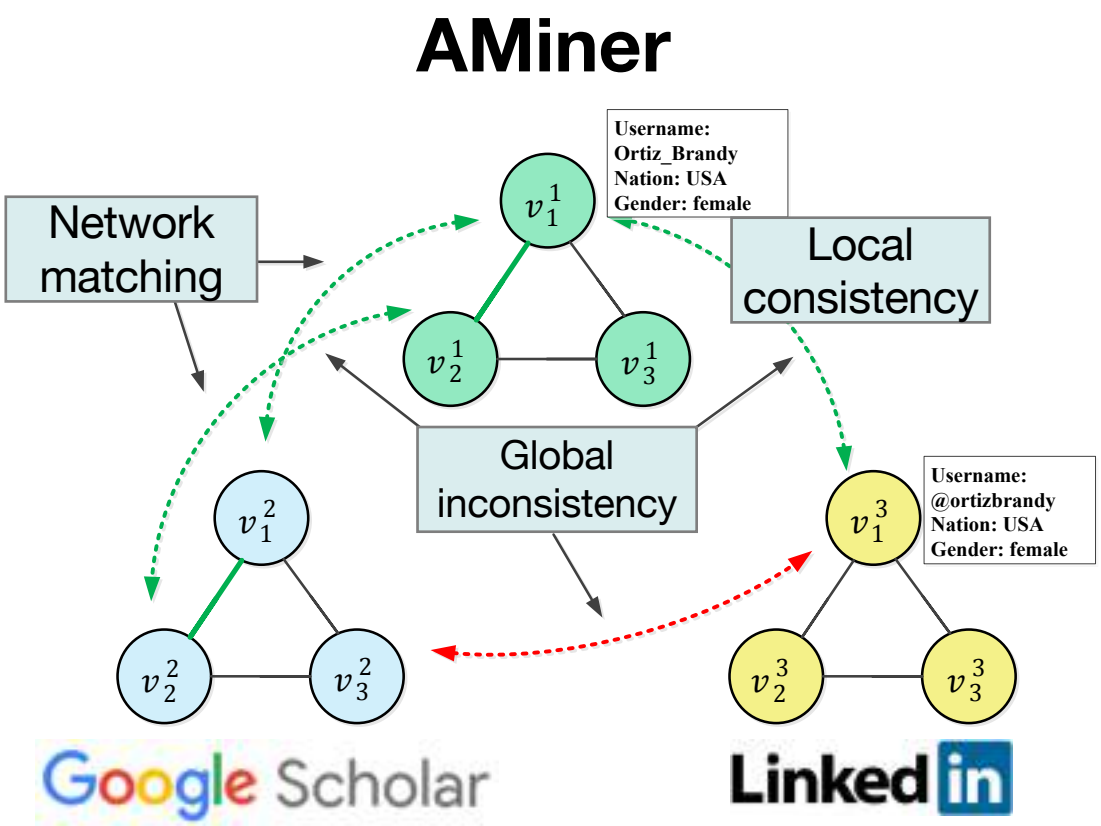
- Identifying users from multiple heterogeneous networks and integrating semantics from the different networks together.

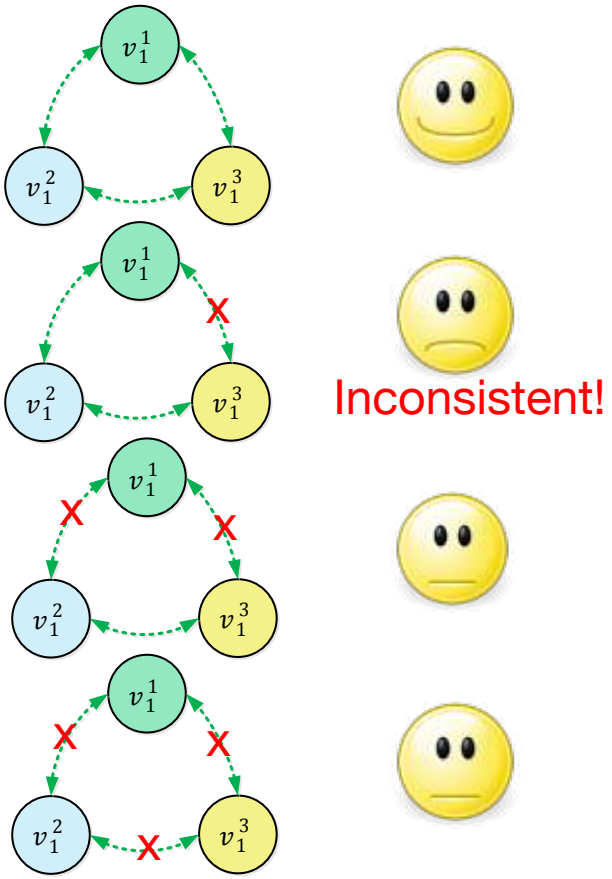


Considering the networks…



Local + Global consistency





COSNET: Connecting Social Networks with Local and Global Consistency

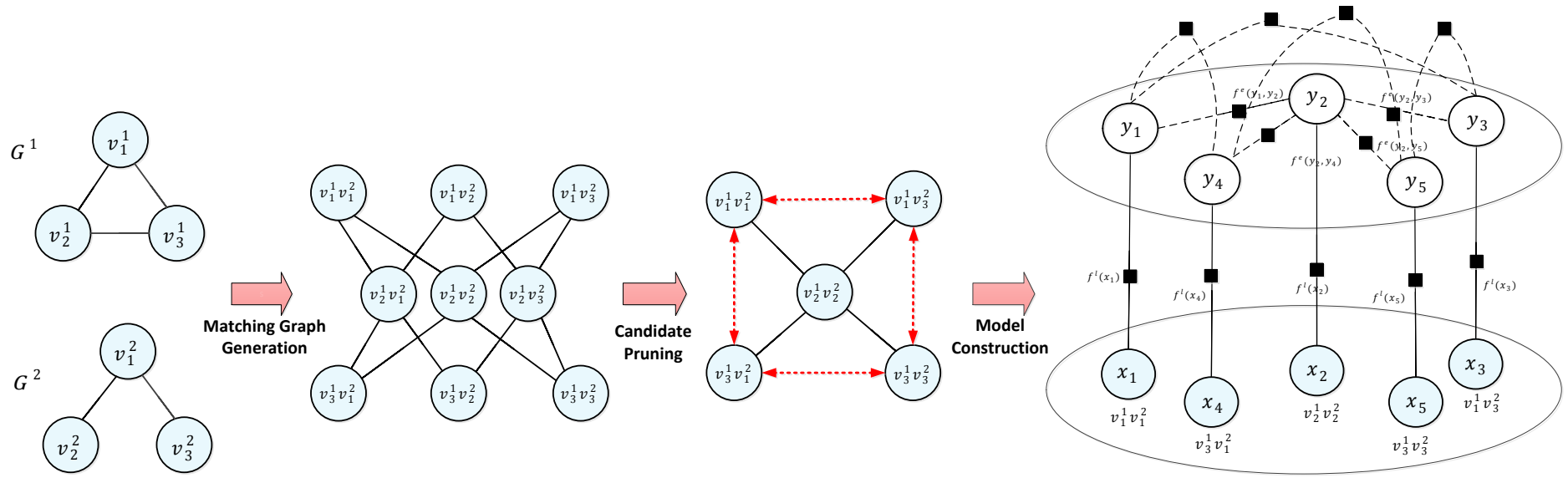
- Input: $\mathbf{G}=\{G^1, G^2, \ldots, G^m\}$, with $G^k=(V^k, E^k, R^k)$
- Formalization: $\mathbf{X}=\{x_i\}$, all possible pairwise matchings and each corresponds to $y_i \in \{1,0\}$

- COSNET: an energy-based model

$$Y^* = \arg\max E(Y, X)$$

[1] Yutao Zhang, Jie Tang, Zhilin Yang, Jian Pei, and Philip Yu. COSNET: Connecting Heterogeneous Social Networks with Local and Global Consistency. KDD'15, page 1485-1494.

Model Construction

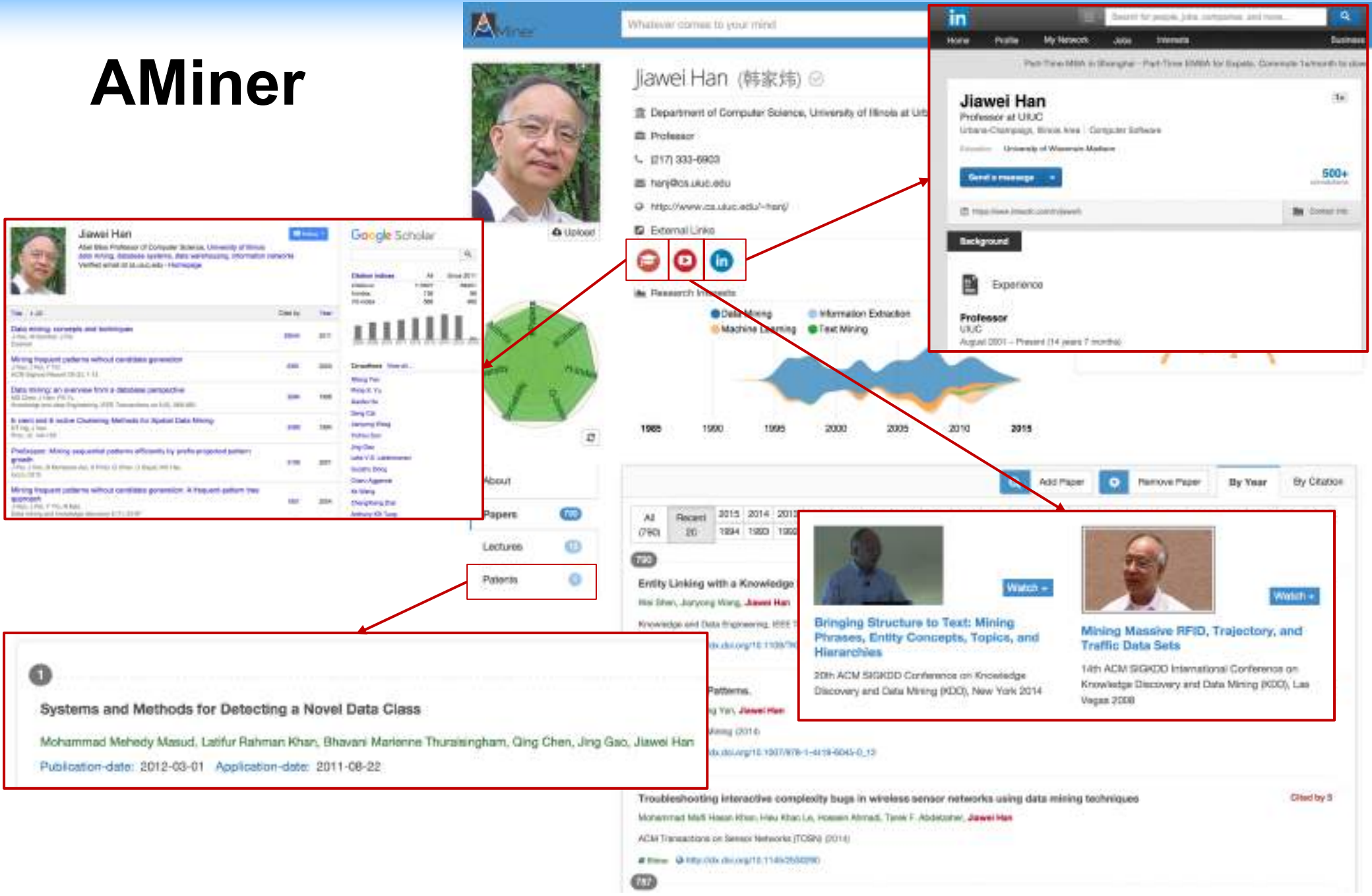


(a) Two input networks (b) The generated matching graph (c) Matching graph after pruning (d) The constructed model

Objective function by combining all the energy functions

$$E(Y,X) = \sum_{\mathbf{x}_i \in V_{MG}} \mathbf{w}_l^{\intercal} \mathbf{g}_l(\mathbf{x}_i, y_i) + \sum_{(\mathbf{x}_i,\mathbf{x}_j) \in E_{MG}} \mathbf{w}_e^{\intercal} \mathbf{f}_e(y_i, y_j) + \sum_{c \in T_{MG}} \mathbf{w}_t^{\intercal} \mathbf{f}_t(Y_c) \quad (2)$$

AMiner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Professor at UIUC
Background
Experience
Professor
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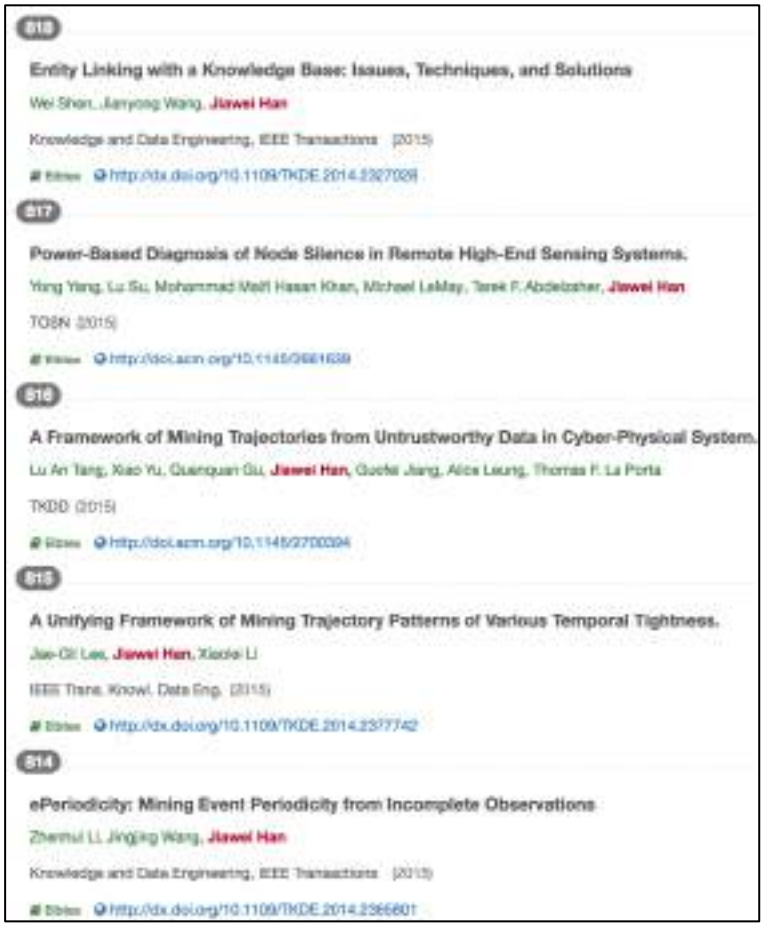
Bringing Structure to Text: Mining Phrases, Entity Concepts, Topics, and Hierarchies
Mining Massive RFID, Trajectory, and Traffic Data Sets
Systems and Methods for Detecting a Novel Data Class
Mohammad Mehedy Masud, Latifur Rahman Khan, Bhavani Marlenne Thuraisingham, Qing Chen, Jing Gao, Jiawei Han
Publication-date: 2012-03-01 Application-date: 2011-08-22

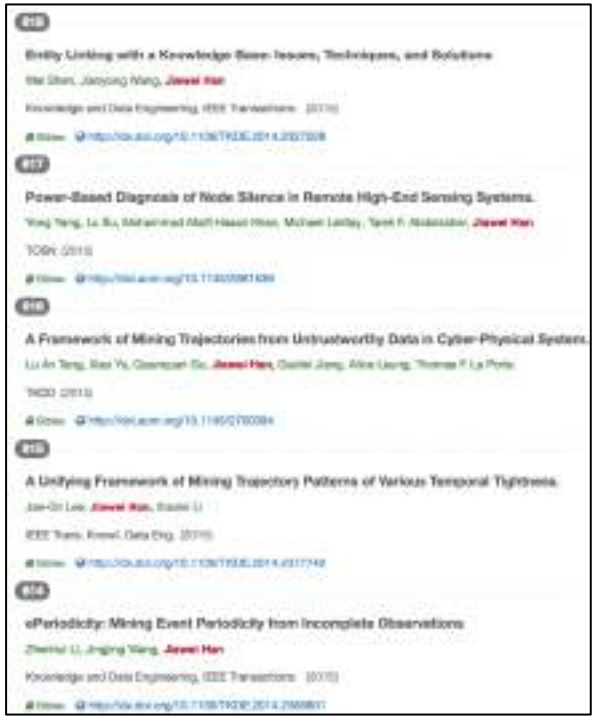
Discovering Expertise Semantics

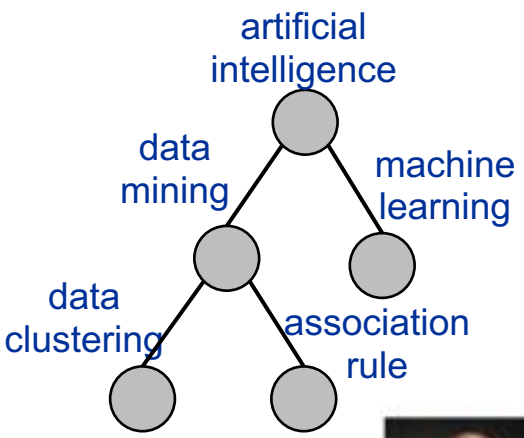
- Quantifying researchers' expertise using publications



The straightforward method is to extract high frequent terms as expertise; however, the extracted terms may be not good terms to represent expertise.

Knowledge-driven Semantic Mining





Knowledge graph

WIKIPEDIA
The Free Encyclopedia

Freebase

yago

Jiawei Han (韩家炜)

H-Index: 133 | #Paper: 818 | #Citation: 111164

Department of Computer Science, University of Illinois at Urbana-Champaign

Professor

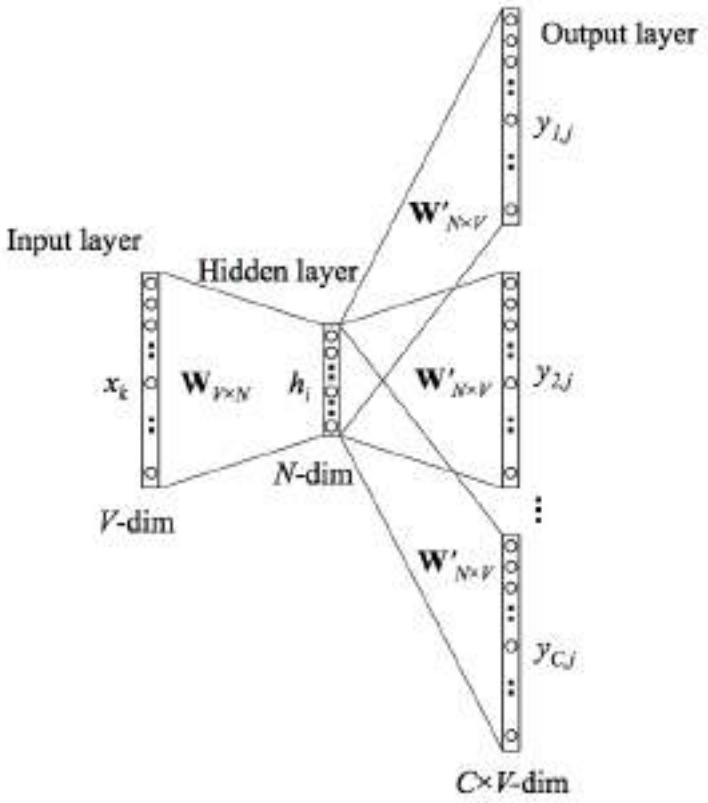
Following

Similar

Data Mining | Information Extraction | Data Analysis | Machine Learning | Text Mining

Z. Yang, J. Tang, and W. Cohen. Multi-Modal Bayesian Embeddings for Learning Social Knowledge Graphs. IJCAI'16.

Embedding Knowledge and Networks



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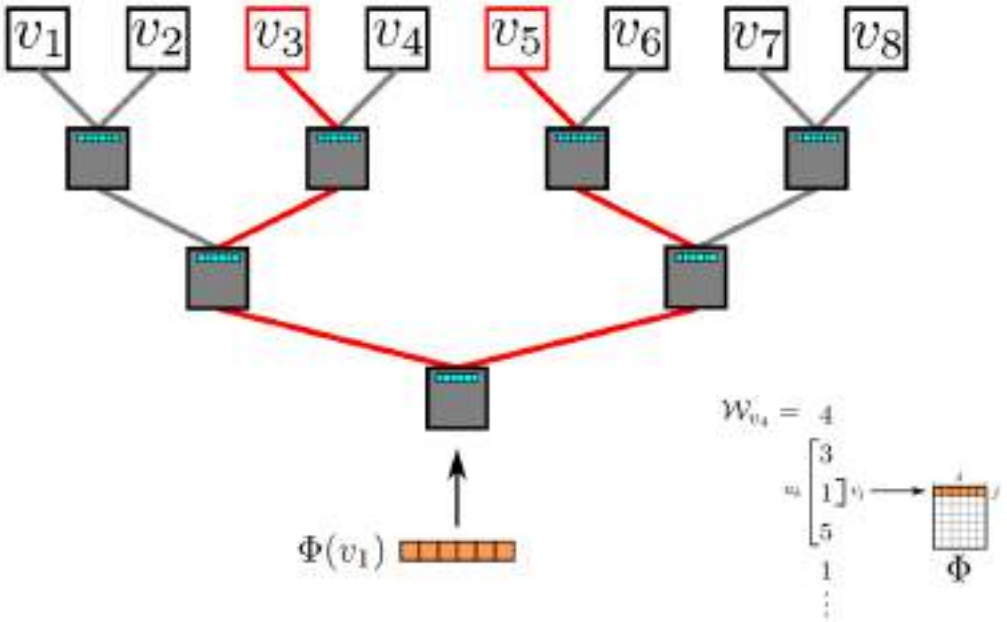
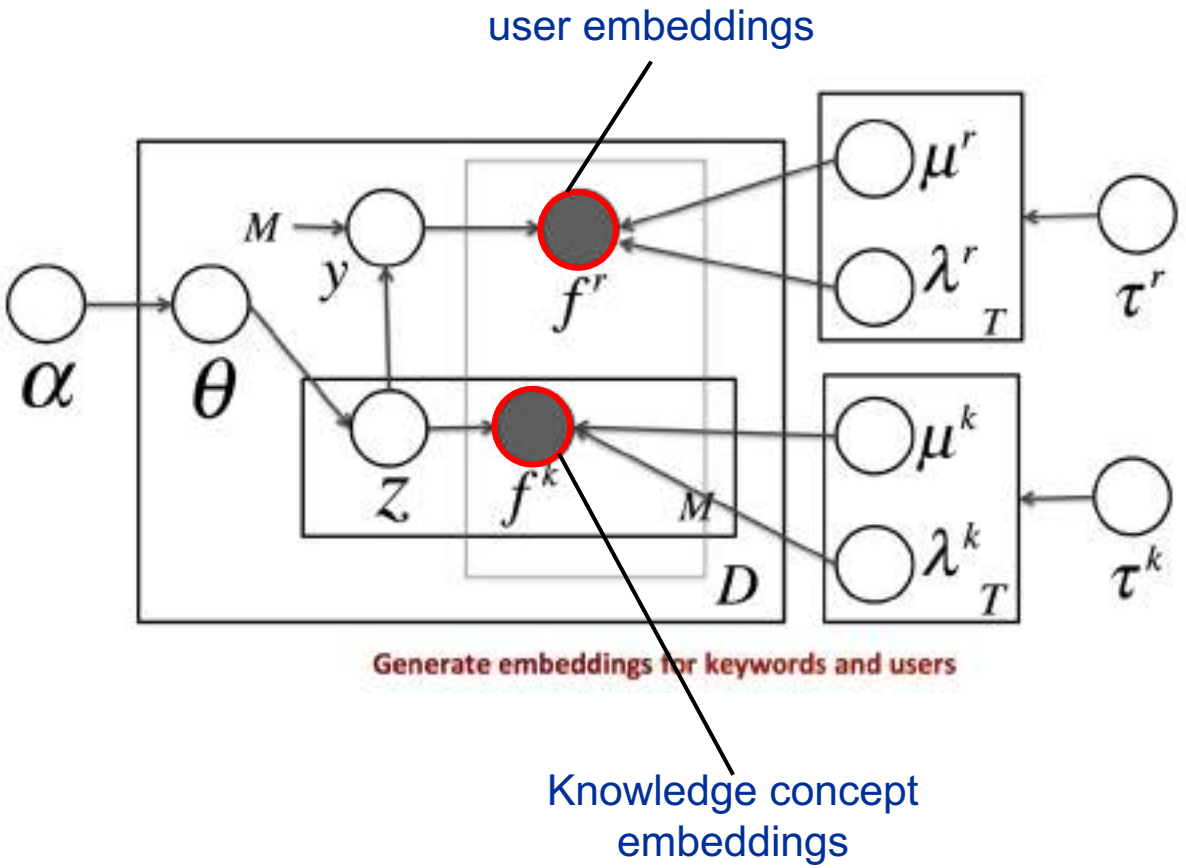


Knowledge concept embedding

Network-based researcher embedding

GenVector—bridging researcher network and knowledge graph



Examples

Case study: Dan Klein

GenVector	AM-base
Language models	Machine translation
Markov models	Word alignment
Probabilistic models	Bleu score
Natural language	Best result
Coreference resolution	Language model

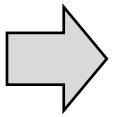
Case study: Xiaoou Tang

GenVector	AM-base
Feature extraction	Face recognition
Image segmentation	Face image
Image matching	Novel approach
Image classification	Line drawing
Face recognition	Discriminant analysis

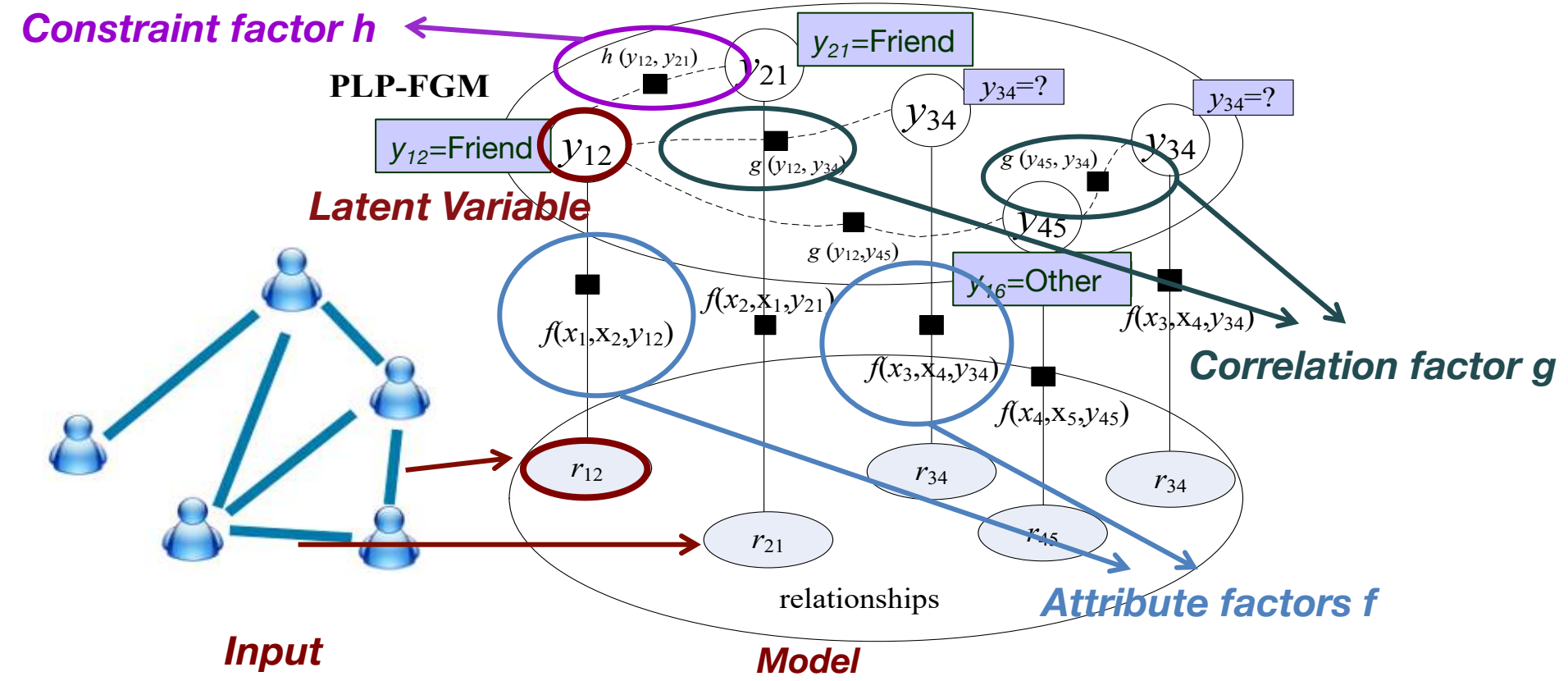
GenVector—the proposed Bayesian embedding method;
AM-base—previous language modeling method.

Discovering Network Semantics

- How to mine semantics within networks?
  - Who are Jiawei Han's students and advisor?



Partially Labeled Pairwise Factor Graph Model (PLP-FGM)



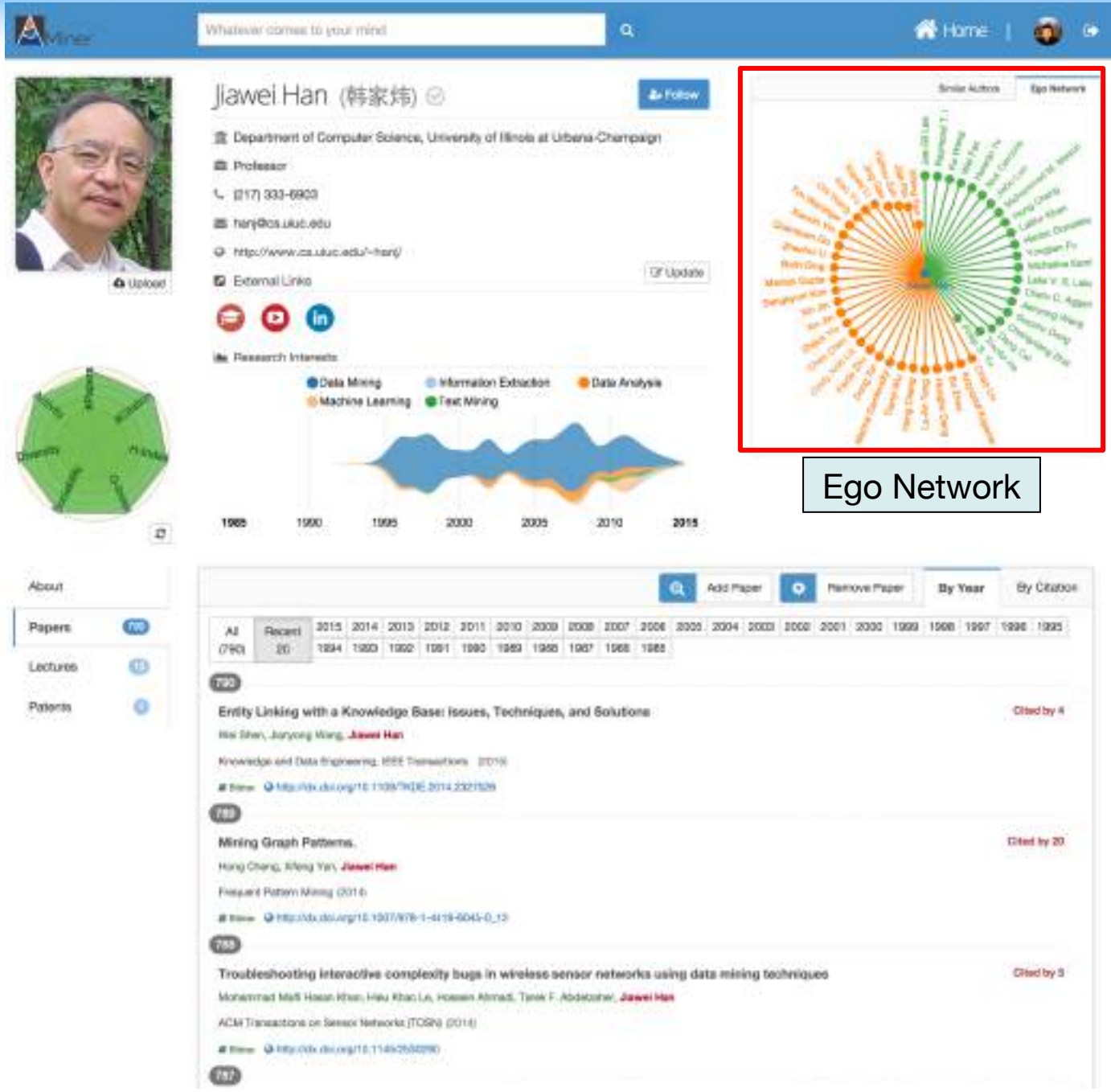
Map relationship to nodes in model

Example
#Coaut

Example:
Author A has a longer publication history than both B and C.

Wenbin Tang, Honglei Zhuang, and Jie Tang. Learning to Infer Social Ties in Large Networks. In ECML/PKDD'2011. pp. 381-397. (**Best Student Paper Runner-up**)

AMiner


Whatever comes to your mind
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Troubleshooting interactive complexity bugs in wireless sensor networks using data mining techniques
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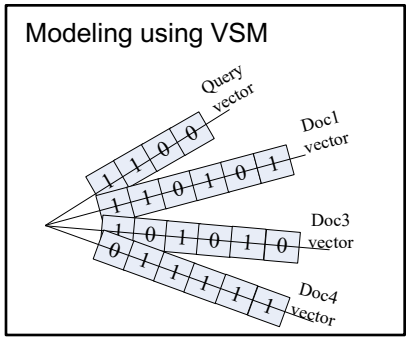
Search in AMiner

Search with keyword



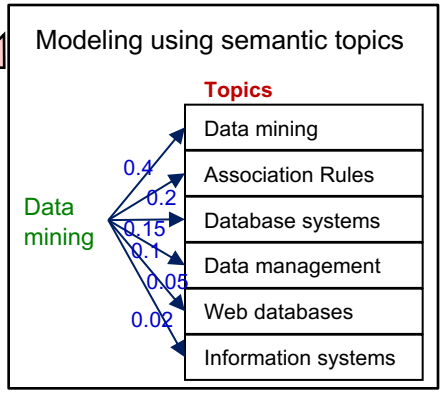
Return

[Principles of Data Mining.](#)
DJ Hand - Drug Safety, 2007 - drugsafety.adisonline.com

[Advances in Knowledge Discovery and Data Mining](#)
UM Fayyad, G Piatetsky-Shapiro, P Smyth, R…

[Data Mining: Concepts and Techniques](#)
J Han, M Kamber - 2001…

Search with semantic modeling



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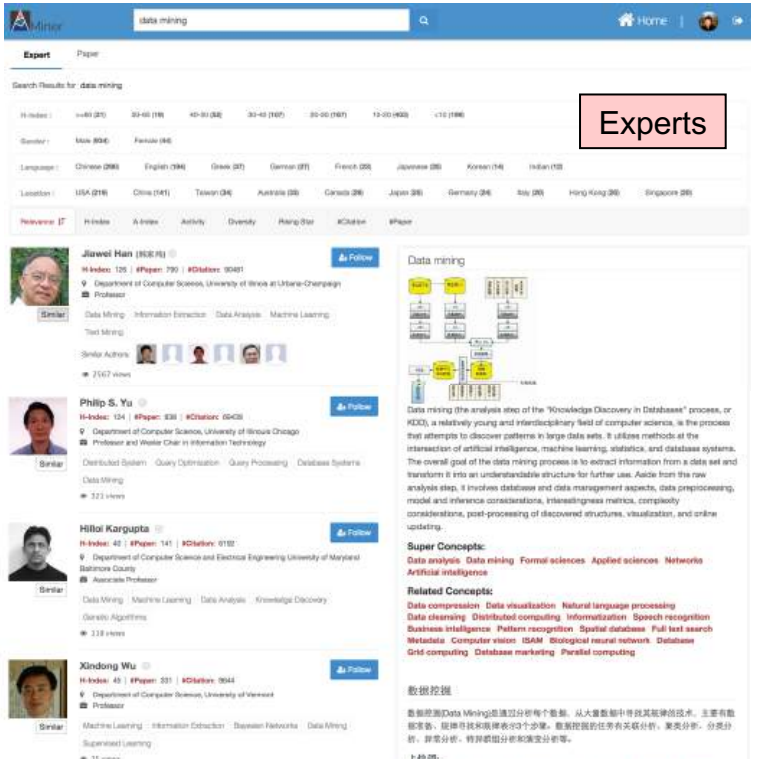
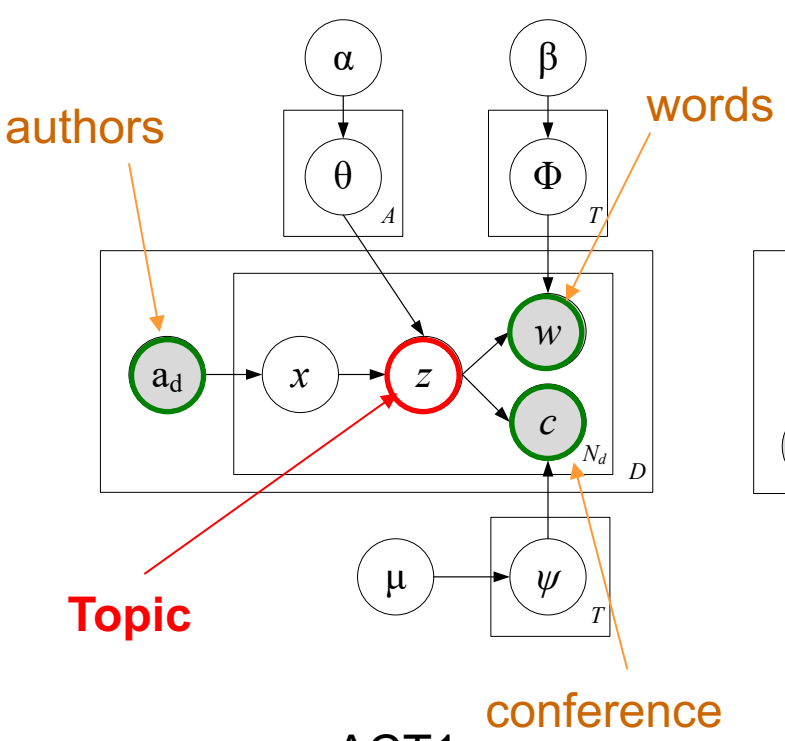
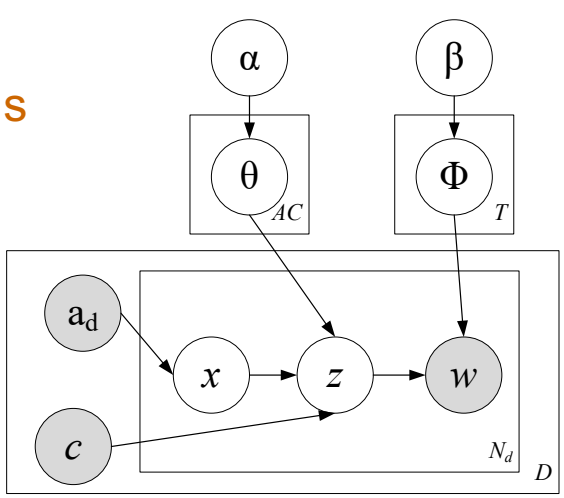


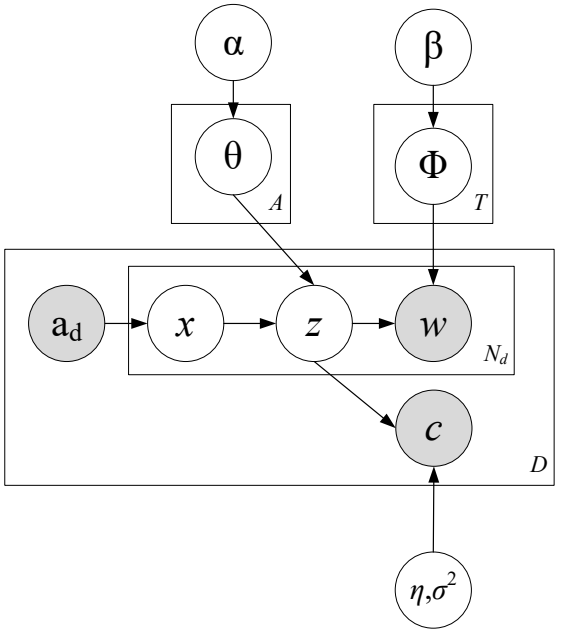
Modeling the Academic Network



ACT1



ACT2

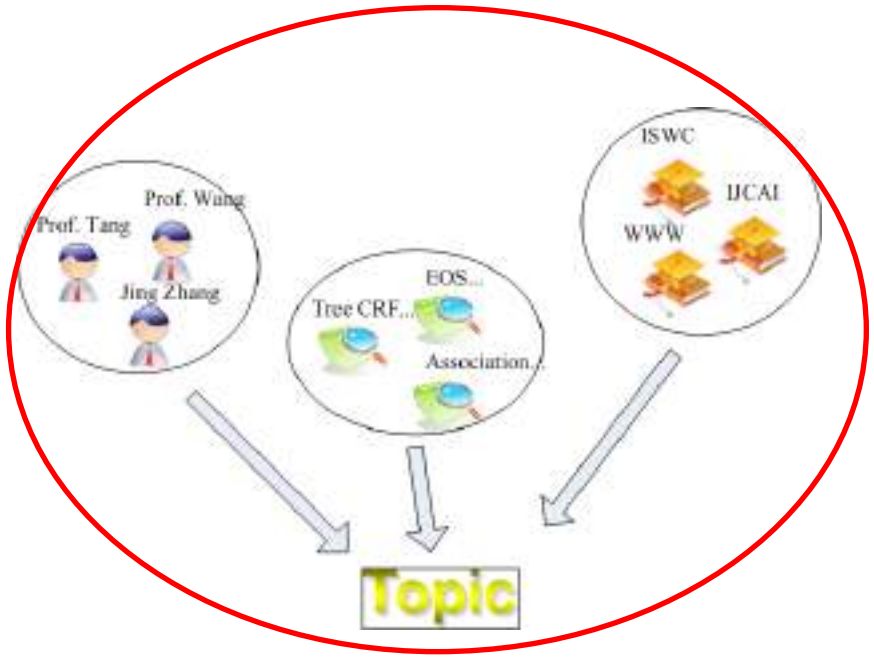


ACT3

Author-Conference-Topic Model [Tang et al., 08]

Integrating Topic Model into Random Walk

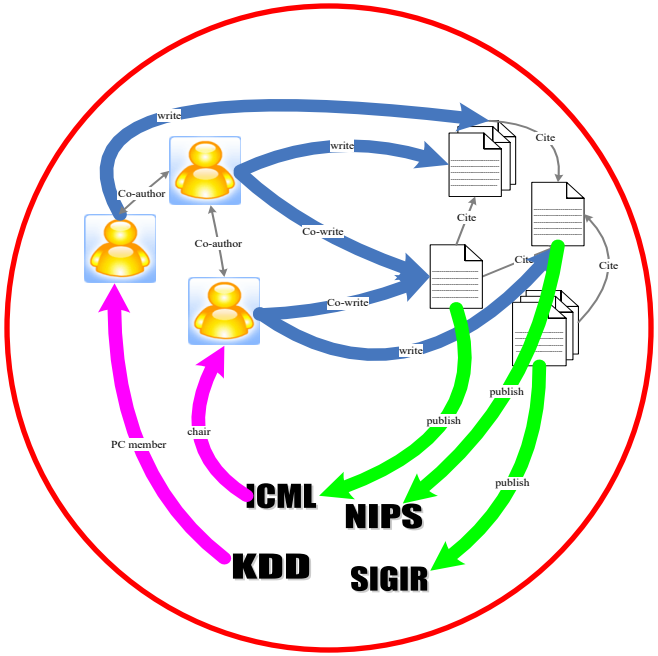
Modeling academic network with topics



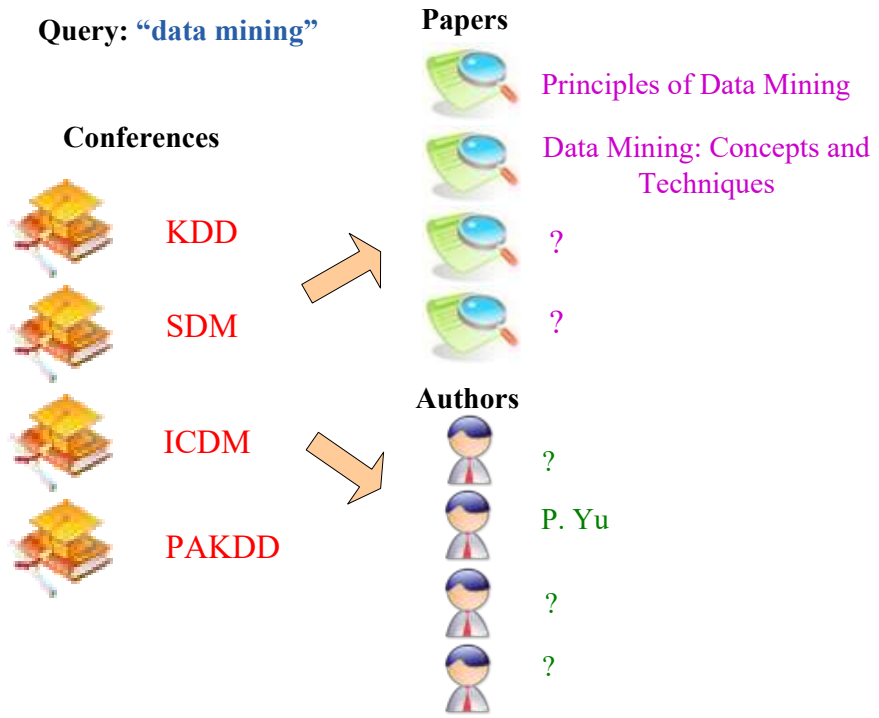
Author-Conference-Topic Model [Tang et al., 08]

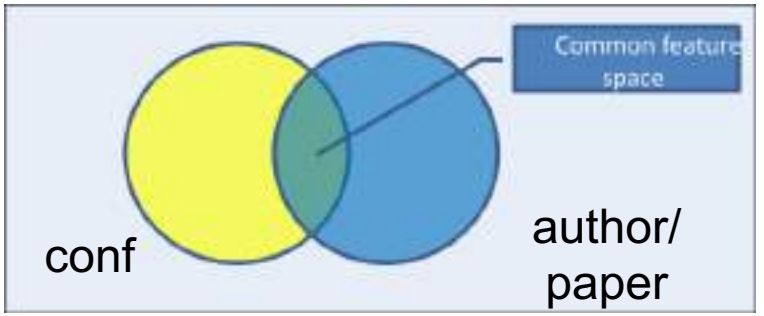
+

Random walk over the academic network



Heterogeneous Cross-domain Ranking





Loss in one domain

Loss in another domain

$$\min_{w_S, w_T} \left\{ \sum_{i=1}^{n_1} \left[1 - z_{S_i} \left\langle w_S, x_{S_i}^a - x_{S_i}^b \right\rangle \right]_+ + C \sum_{i=1}^{n_2} \left[1 - z_{T_i} \left\langle w_T, x_{T_i}^a - x_{T_i}^b \right\rangle \right]_+ + \lambda \|W\|_{2,1}^2 \right\}$$

Common feature space

$$\min_{w_S, w_T, U} \left\{ \sum_{i=1}^{n_1} \left[1 - z_{S_i} \left\langle w_S, U^T \left(x_{S_i}^a - x_{S_i}^b \right) \right\rangle \right]_+ + C \sum_{i=1}^{n_2} \left[1 - z_{T_i} \left\langle w_T, U^T \left(x_{T_i}^a - x_{T_i}^b \right) \right\rangle \right]_+ + \lambda \|W\|_{2,1}^2 \right\}$$

Results on Heterogeneous Tasks

- Expert finding verse Bole search (finding best supervisor)
- To obtain ground truth of bole for each query
  - We sent emails to 50 senior researchers and 50 junior researchers (91.6% are post doc or graduates)
  - Average their feedbacks

Table Results on heterogeneous tasks.

Approach	P@5	P@10	P@15	MAP	N@5	N@10
RSVM	.7714	**.8429**	.8285	.7756	.5545	.5947
RSVMt	.8000	.8286	.8476	.7837	.5923	.5999
MTRSVM	.8000	.8286	.8476	.7875	.6140	.6075
HCDRank	**.8285**	.7857	**.8571**	**.7971**	**.6189**	**.6112**
Language model	.6250	.6875	.6500	.6726	.3343	.3809

Why you will love AMiner?

—finding collaborations, applying for PhD, proposal reviewing, recruiting…

Related publications: ACM TKDD (2), IEEE TKDE (3), KDD'08-15, WWW'12-15,J. Informetrics, SIGMOD'09, IJCAI'09-15, ICML'14

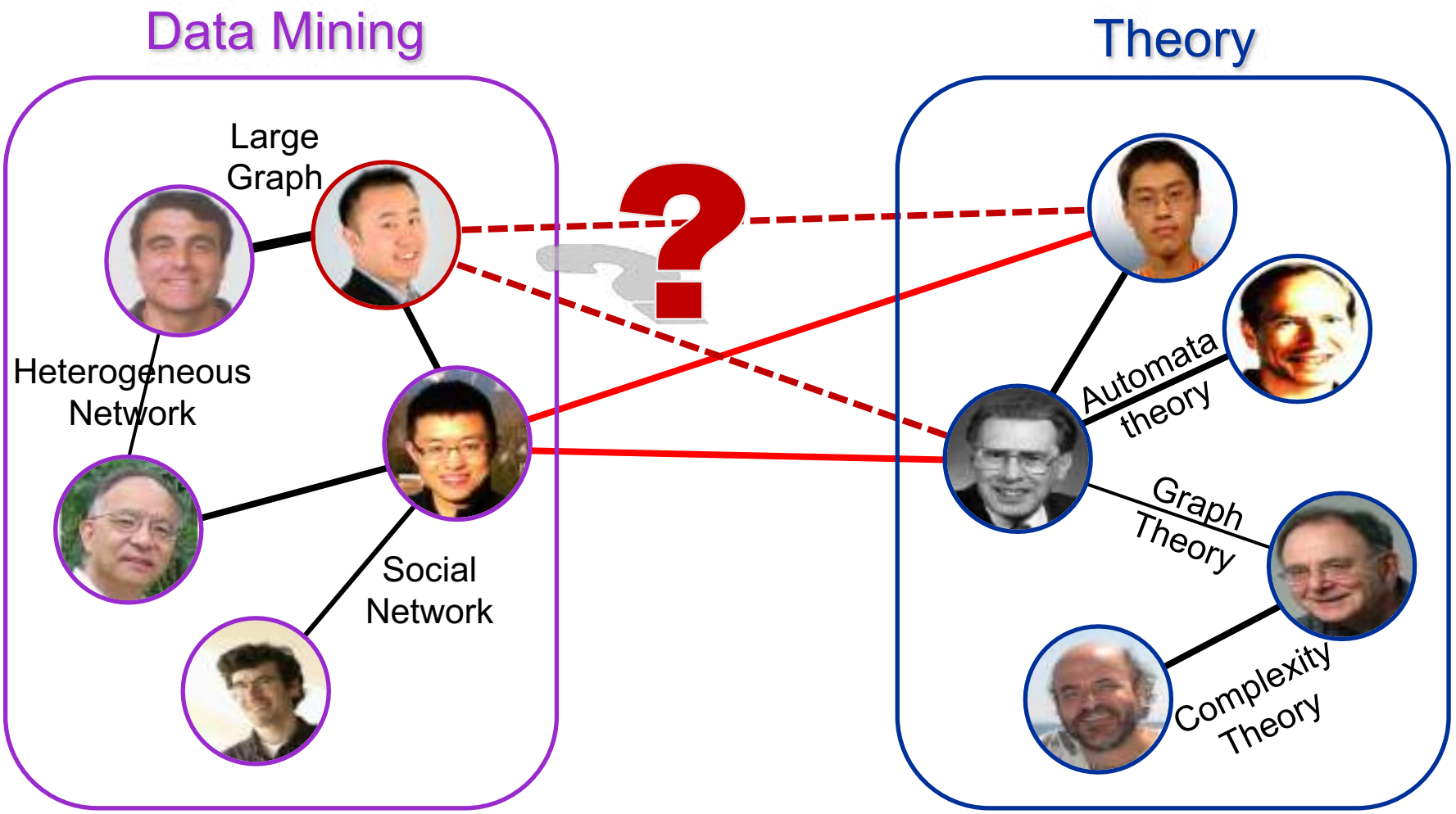
Examples – Expert search

- When starting a Work on a new research topic;
- Or brainstorming for novel ideas.

Researcher

- **Who are experts in this field?**
- **What are the top conferences in the field?**
- **What are the best papers?**
- **What are the top research labs?**

Examples – Collaboration Recommendation



Examples – More Challenging Questions…

Organization or Agency

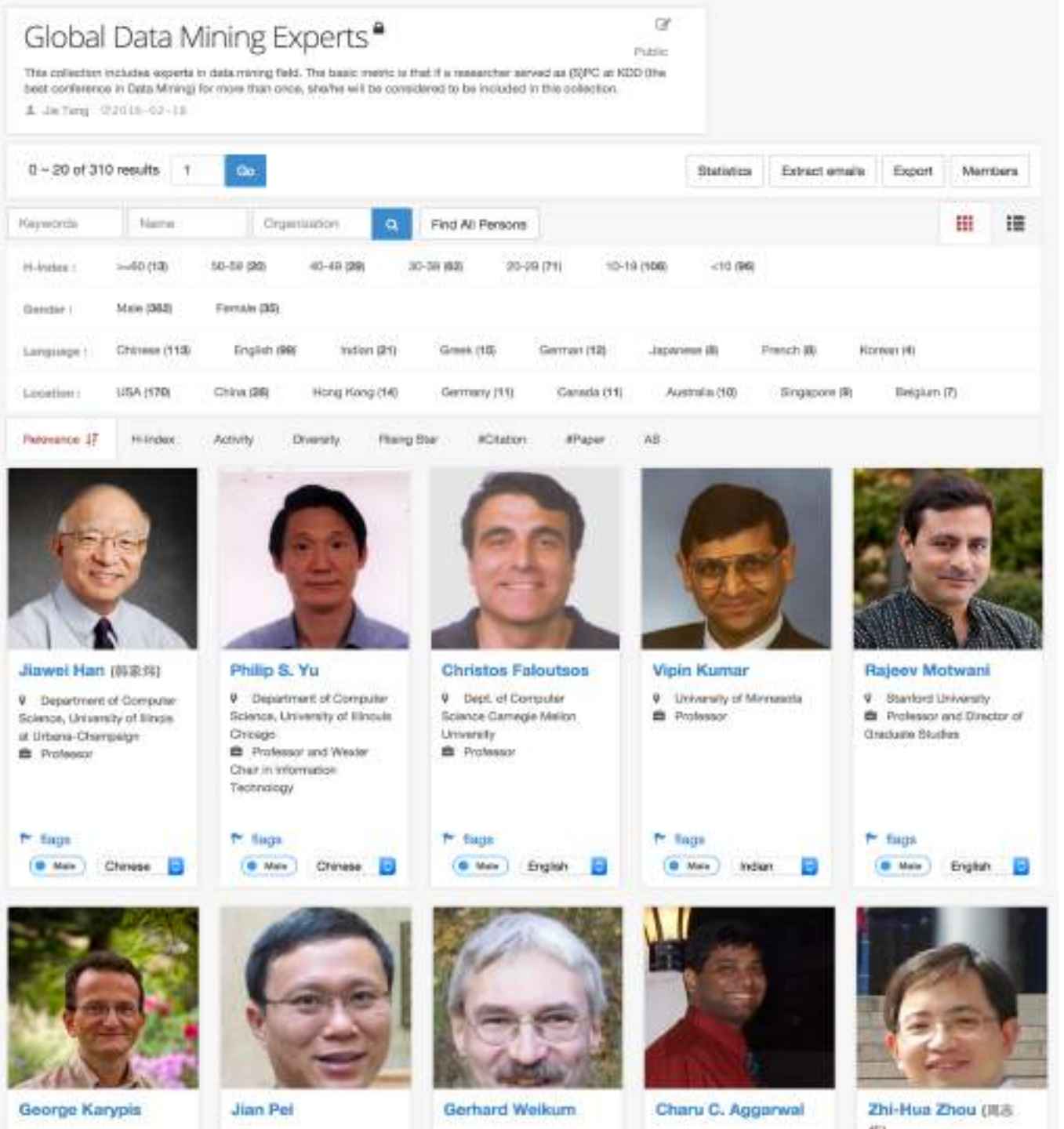
• Looking for researchers from the U.S. who can speak Chinese…

• Want to recruit female researchers working on WSDM

Data Mining Experts

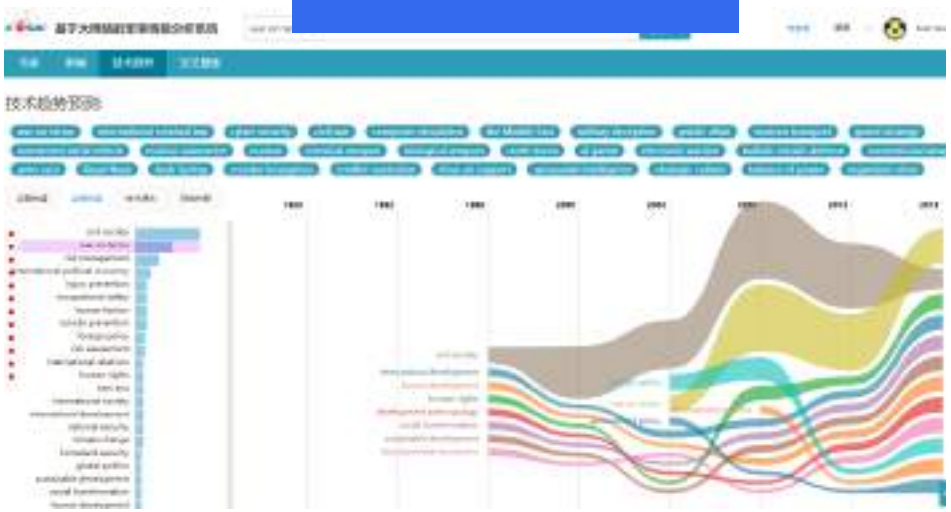
We use this tool to help MOST (Ministry of Science and Technology of the People's Republic of China) to identify experts in different research fields.

https://aminer.org/datamining-experts/



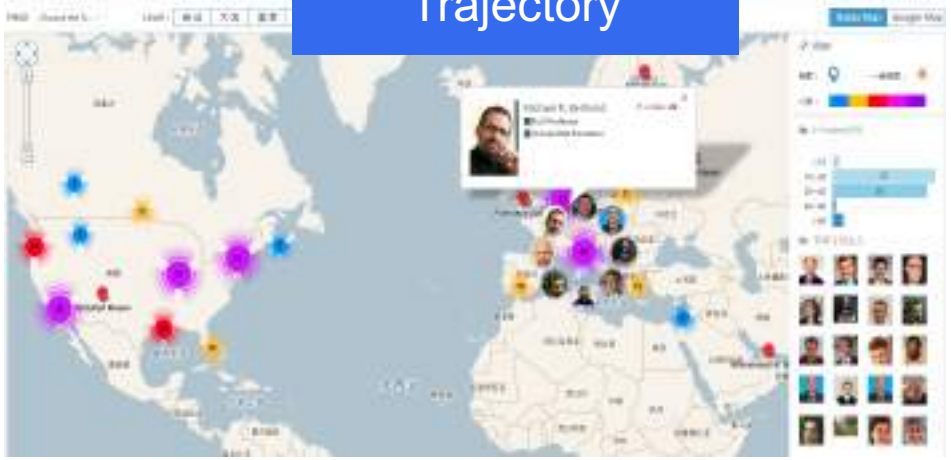
AMiner Services

Trend

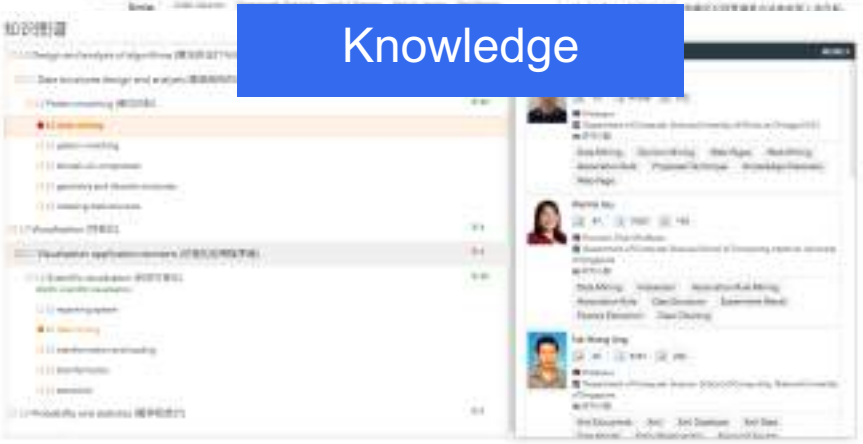


Expert Finding

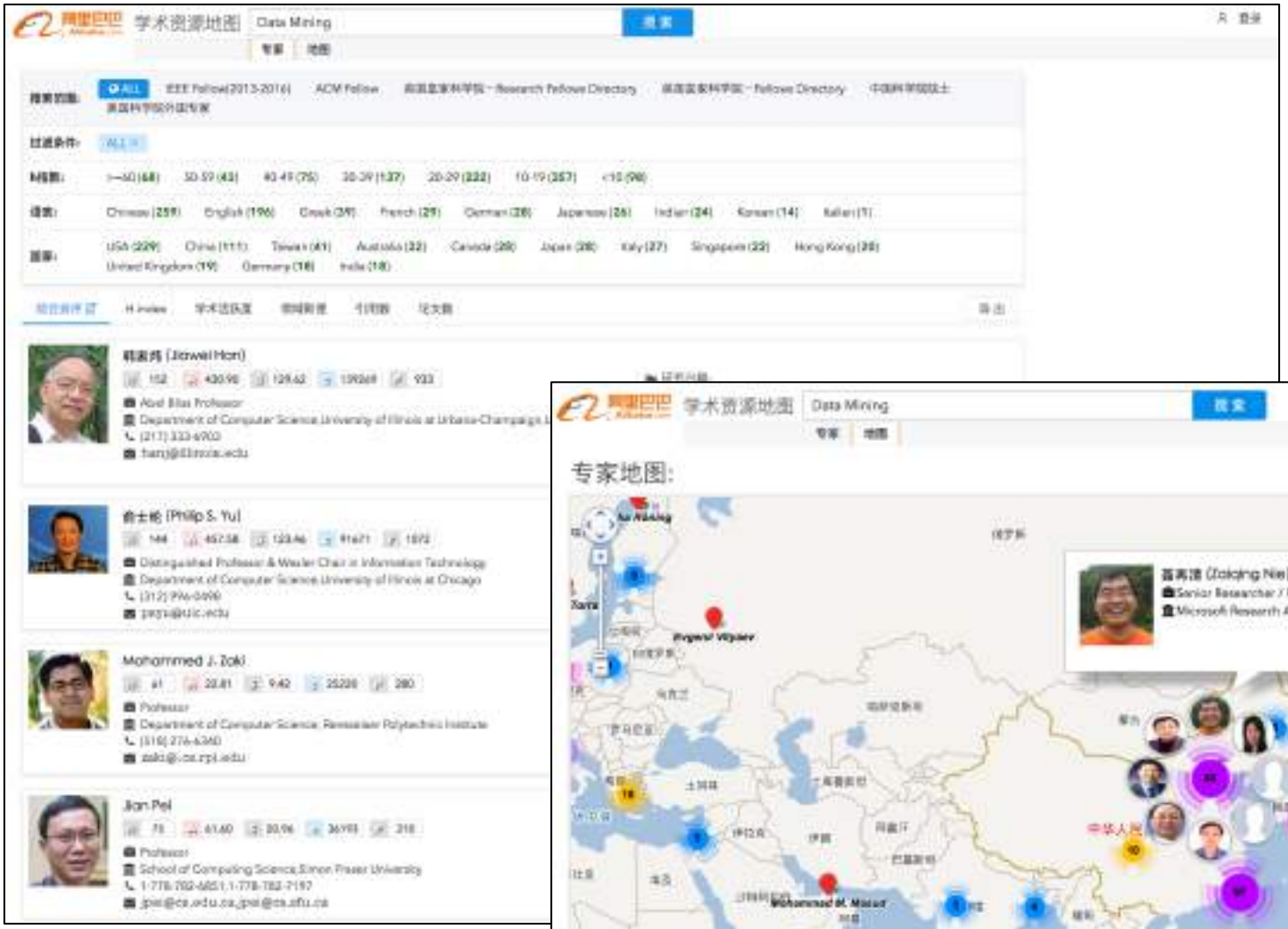
Trajectory



Knowledge



Talent Map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Data Mining
搜索
专家
地图
ALL
IEEE Fellow(2013-2016)
ACM Fellow
Research Fellows Directory
Fellows Directory
Chinese (259)
English (196)
Greek (39)
French (29)
German (28)
Japanese (26)
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Australia (32)
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Hong Kong (20)
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Career Trajectory of Top Experts

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Thanks to our partners

[1] J. Tang, J. Zhang, L. Yao, J. Li, L. Zhang, and Z. Su. ArnetMiner: Extraction and Mining of Academic Social Networks. KDD'08. pp.990-998.

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谢谢观看！

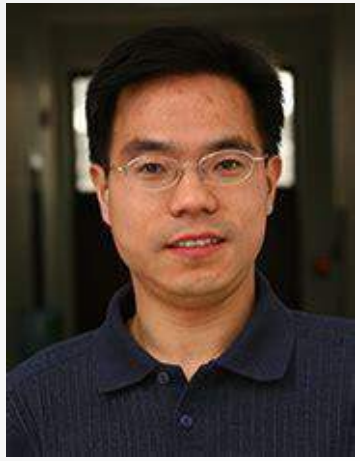
人工智能是学术搜索的未来吗?

AI Time 第十二期

AI Time是一群关注人工智能发展，并有思想情怀的青年人创办的圈子。AI Time旨在发扬科学思辨精神，邀请各界人士对人工智能理论、算法、场景、应用的本质问题进行探索，加强思想碰撞，打造成为北京乃至全国知识分享的聚集地。

嘉宾介绍

唐杰
清华大学计算机系教授
副系主任



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大数据技术与应用发展部主任

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目录

1. 学术搜索的内涵与外延
2. 思辨及讨论
    a. 技术篇
    b. 应用篇
    c. 产业篇
3. 总结与畅想

技术篇

- 学术搜索与普通搜索有什么区别，是更难还是更容易？
- 在学术搜索领域，我国现状是处在领跑、并跑还是跟跑？
- 关于学术搜索中的实体、知识融合，学术界已经有很多方法，但是在实践上并不能完全满足要求。如何应对这类问题？
- 在下列五个场景中：自动摘要生成、交叉学科发现、趋势分析与预测、学术影响力评价、专家&机构画像，还有哪些技术可以赋能？

应用篇

- 从用户角度（例如学者、期刊/会议、高校、基金资助机构等），AI在哪些场景已经发挥了作用？哪些场景还需要改进？还有哪些需求没有被满足？
- 在学术搜索领域还有哪些场景可以用AI赋能？
- 学术搜索+AI对国内外学术环境有哪些影响？

产业篇

- 目前谷歌、百度、微软等大型企业都持续在学术搜索上发力，作为Semantic Scholar 、Aminer这样的学术搜索平台，在哪些方向会有所突破?
- 面对Aminer这样的平台的冲击，百度学术这样的传统学术搜索引擎，应该如何响应?
- 学术搜索对学术出版，科技情报产业的意义在哪里，能否突破产业局限？还有哪些商业上的想象空间?
- 自内而外 VS 自外而内的模式，这两种模式在应用场景、构建模式上有何不同?

畅想未来

- 作为计算机、文献情报界以及产业界的代表，各位对学术搜索的未来怎么看？

- 为学术搜索领域从业者（科研人员、项目研发、产品设计等）提供一些建议？

It Is Your Turn

Q&A

谢谢大家

AI Time欢迎每一位有情怀的AI爱好者加入！我们需要您的思辨和碰撞！