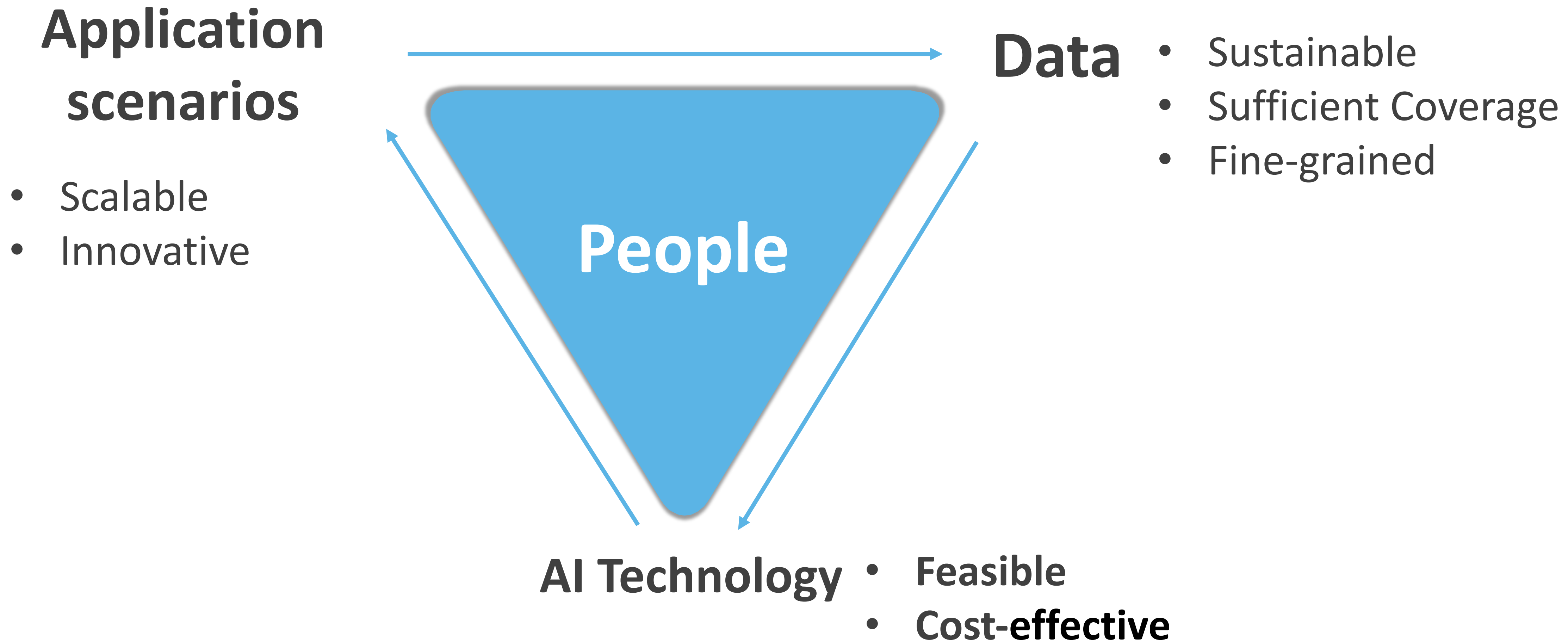




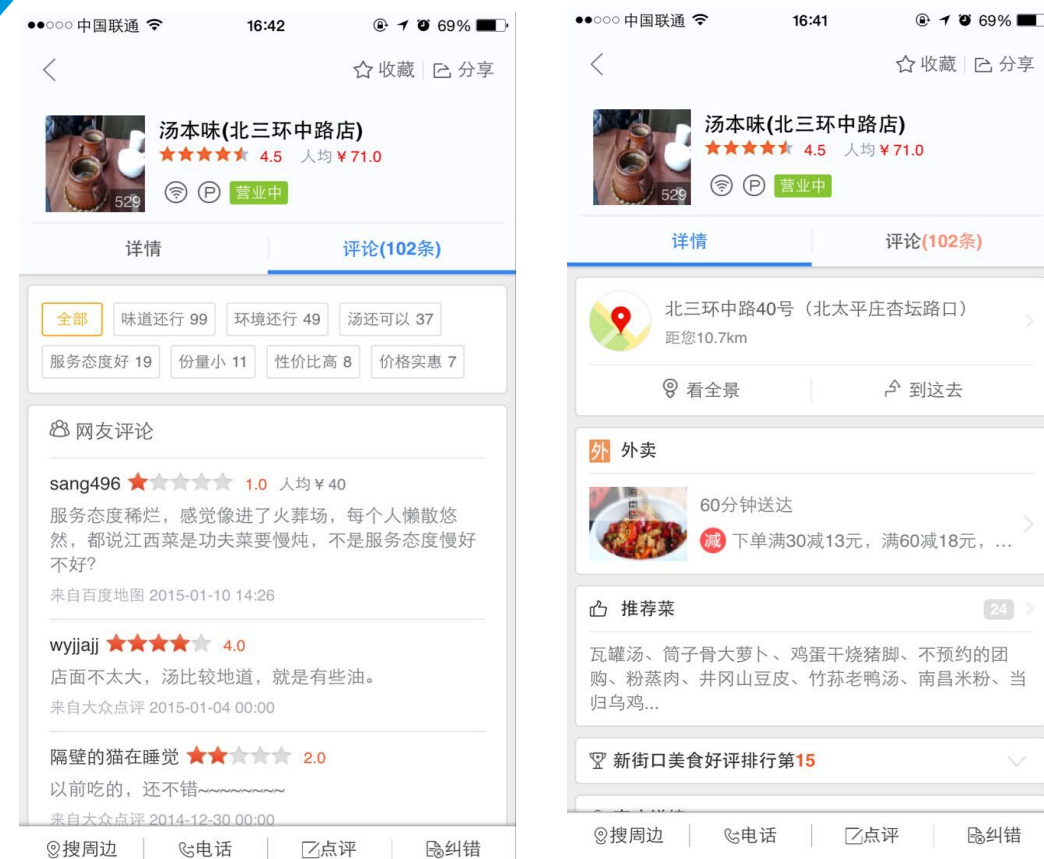
# Data Driven AI Thinking





# Intelligent POI Profiling: From Tags to Structures (Semantics)

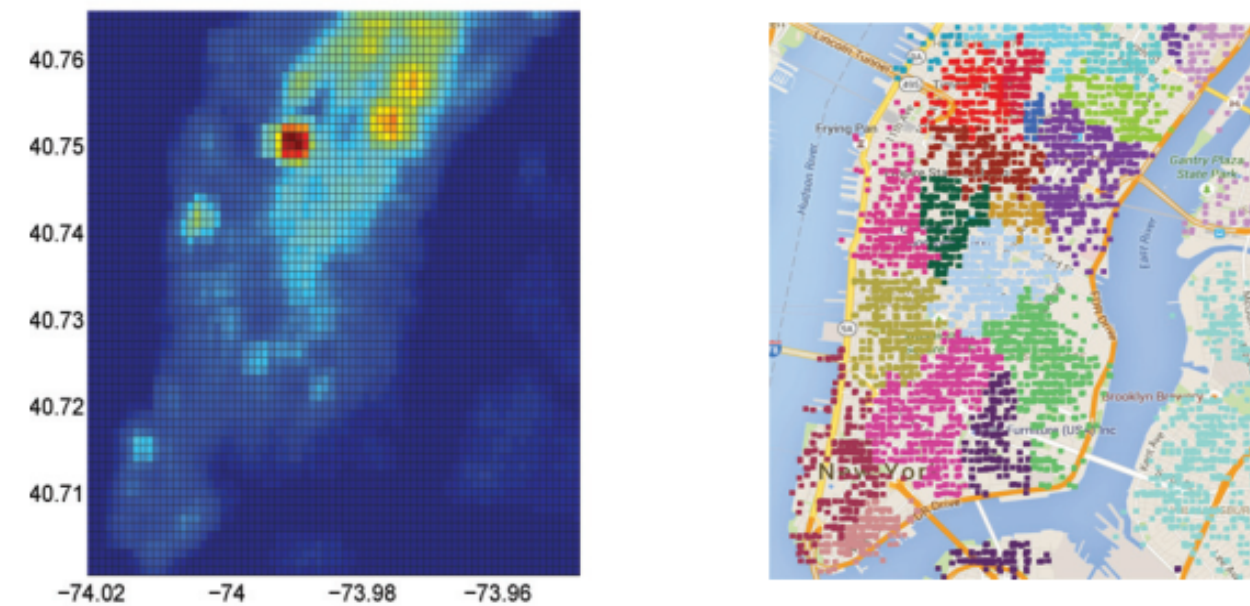
## Traditional POI Profiling



## POI life cycle characterizing



(a) Jan. 2015 (b) Feb. 2015 (c) Mar. 2015 (d) Apr. 2015  
 Figure 1: The evolutionary snapshots of restaurants in NYC (from 01/2015 to 04/2015). For each snapshot, the red mark indicates a new restaurant appeared on the map, and green cross indicates an existing restaurant is removed from the particular snapshot (determined by comparing the current snapshot to the previous snapshot).

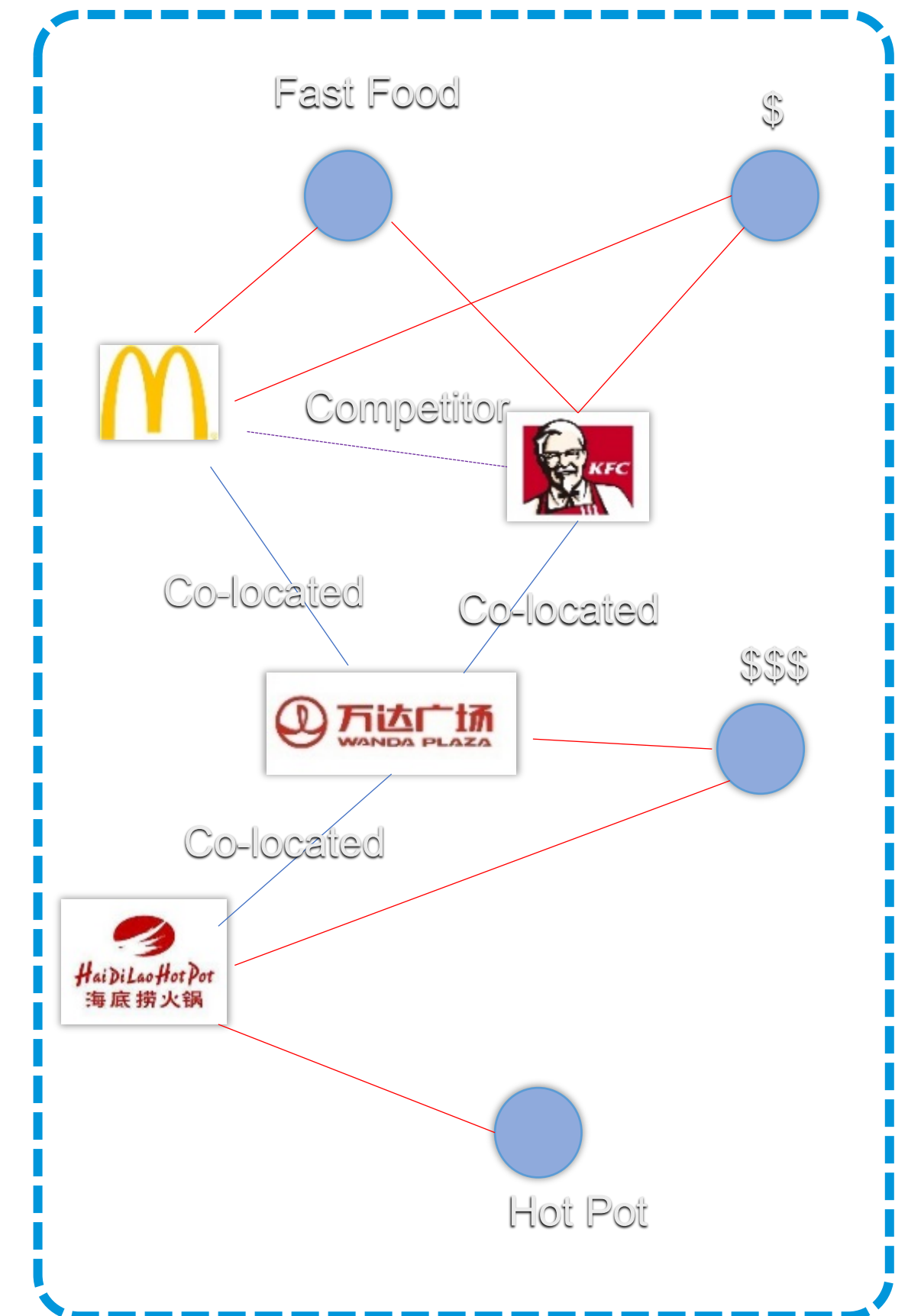


(a) heatmap regarding taxi dropoffs (b) clustering results on  $P(u)$   
 Figure 8: An example of clustering results of Manhattan in Dec. 2015.

## POI Clustering

.....

## POI Knowledge Graph





# Fine-grained ROI Profiling: Understanding the Urban Lives

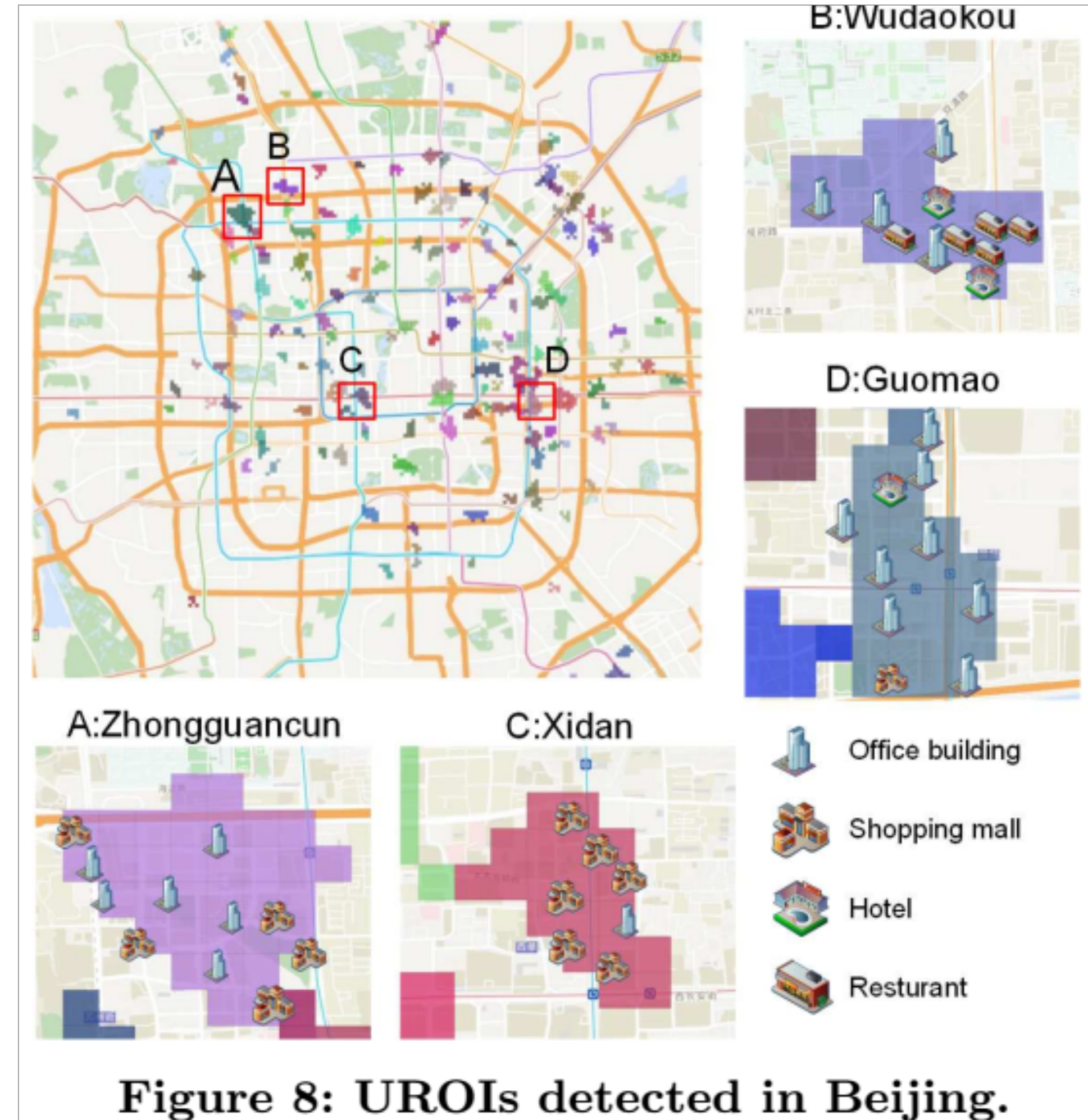
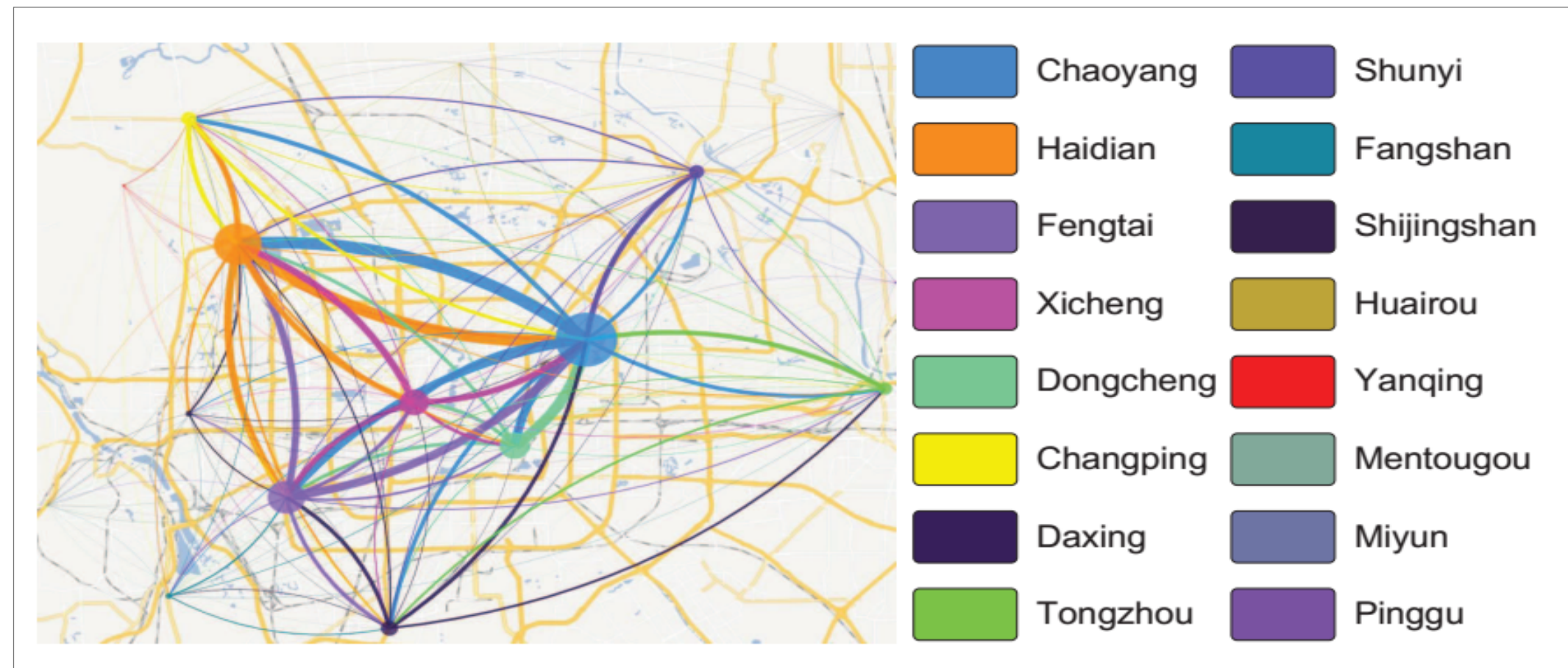


Figure 8: UROIs detected in Beijing.





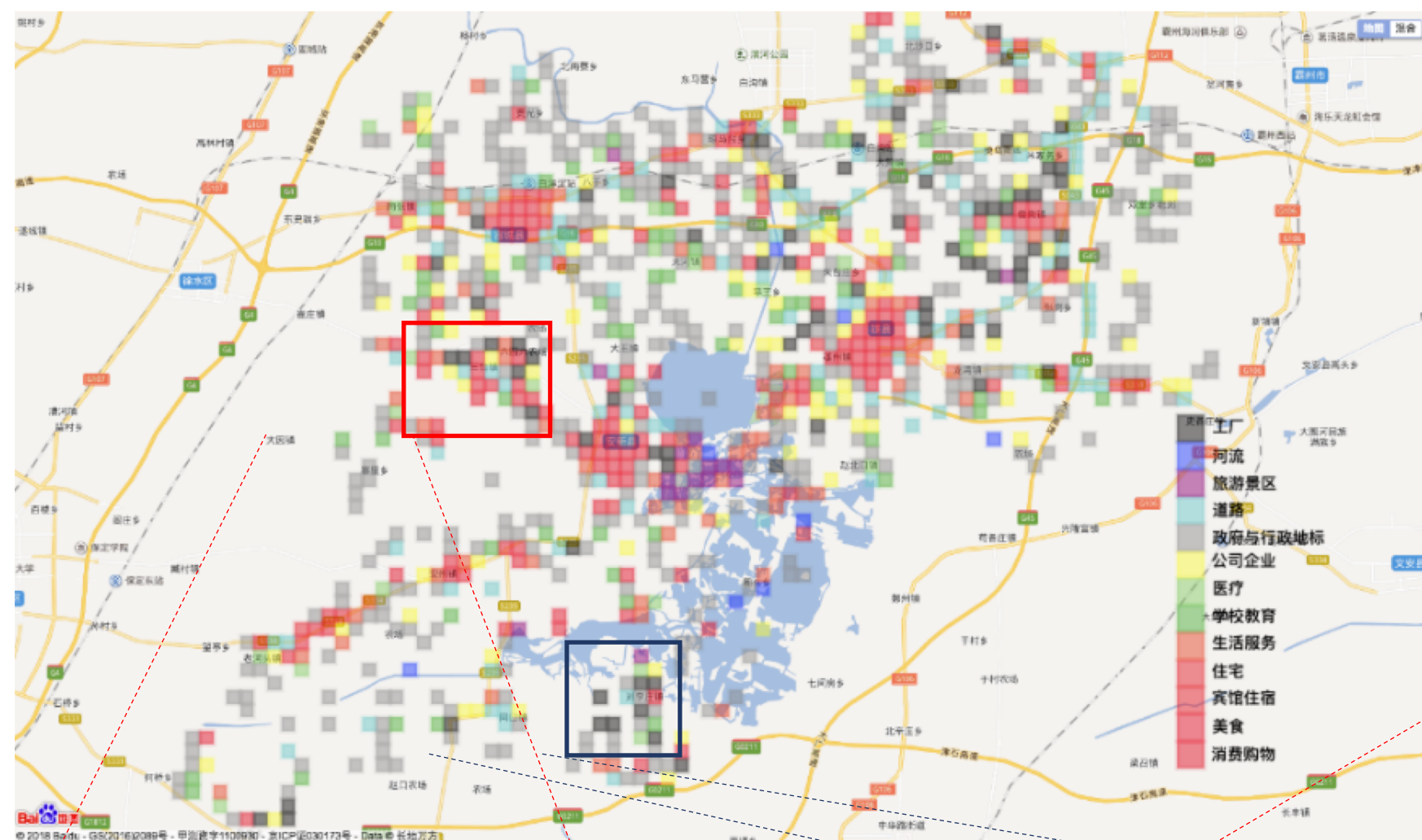


# 多模态出行引擎助力智慧出行

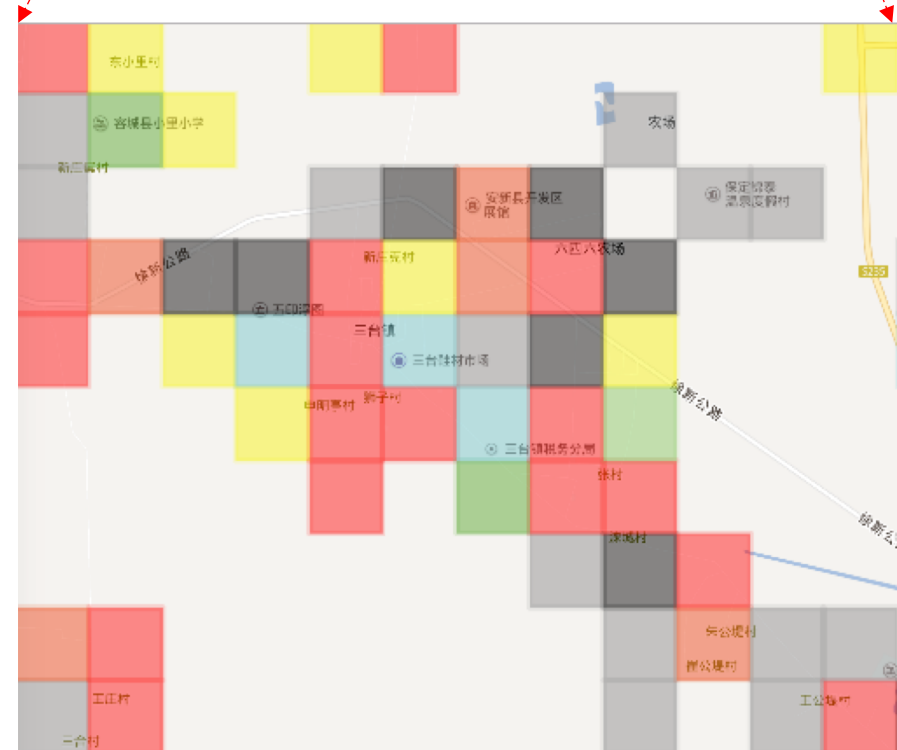




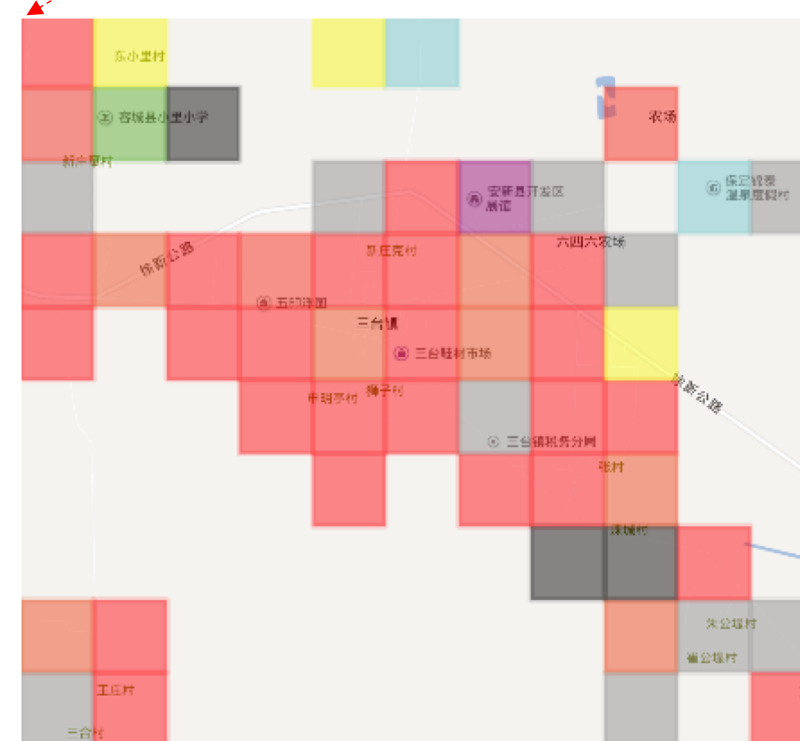
# Applications: Region function discovery for smart city



Xiong'an New Area 2017



Santai Town



2018年3月29日，市民在河北雄安新区容城县县城道路上骑行

## 大数据里的雄安之变

通过分析部分类别内的 POI 的增减变化，可以分析雄安新区未来的发展趋势

《瞭望东方周刊》记者陈融雪 / 北京报道

2017年4月1日，新华社发布消息：日前，中共中央、国务院印发通知，决定设立河北雄安新区。

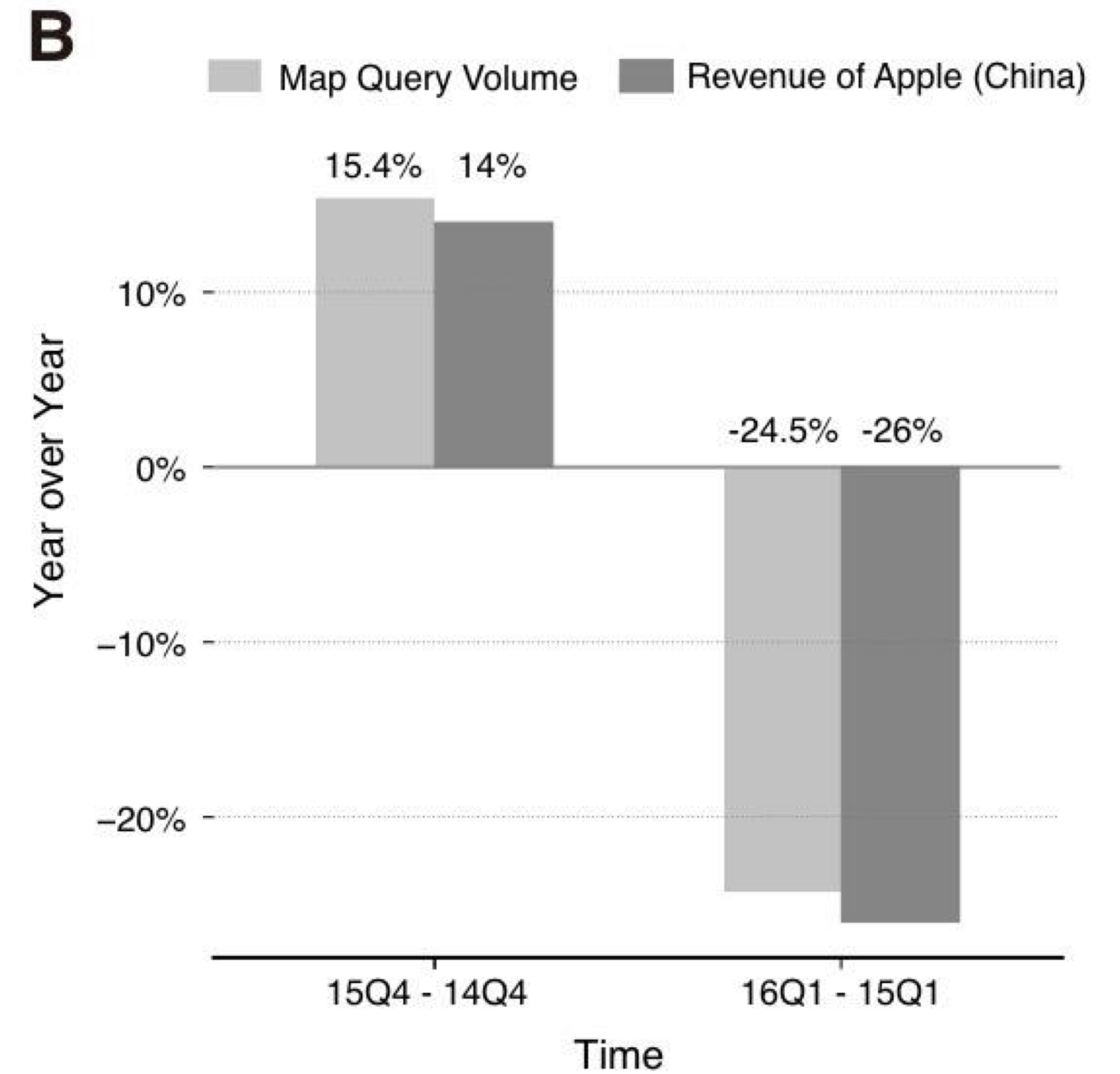
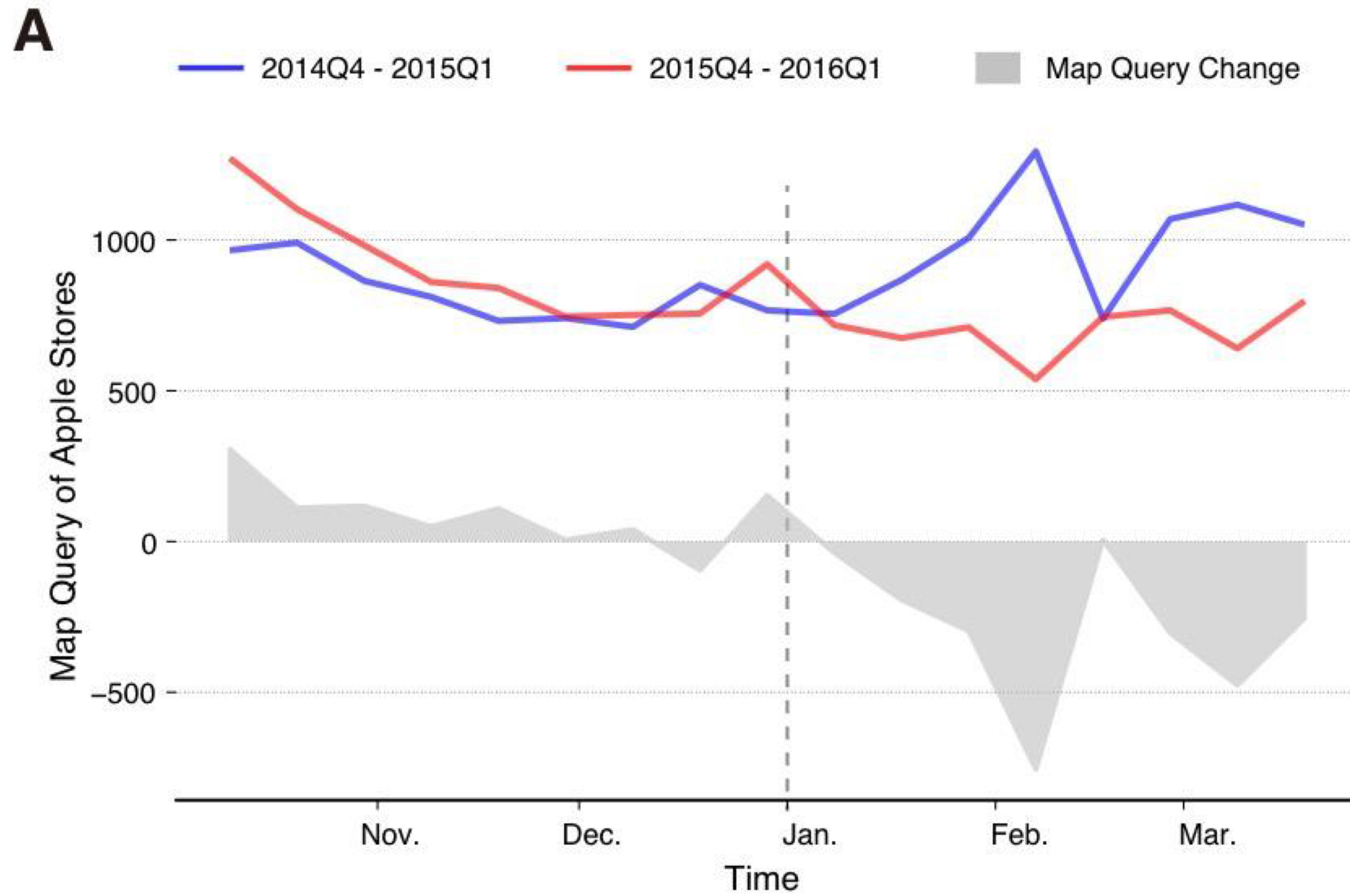
雄安新区的变化进行量化分析，提供了视角独特的报告。

### 功能区域

功能区域是指按照机器学习的方法，比如



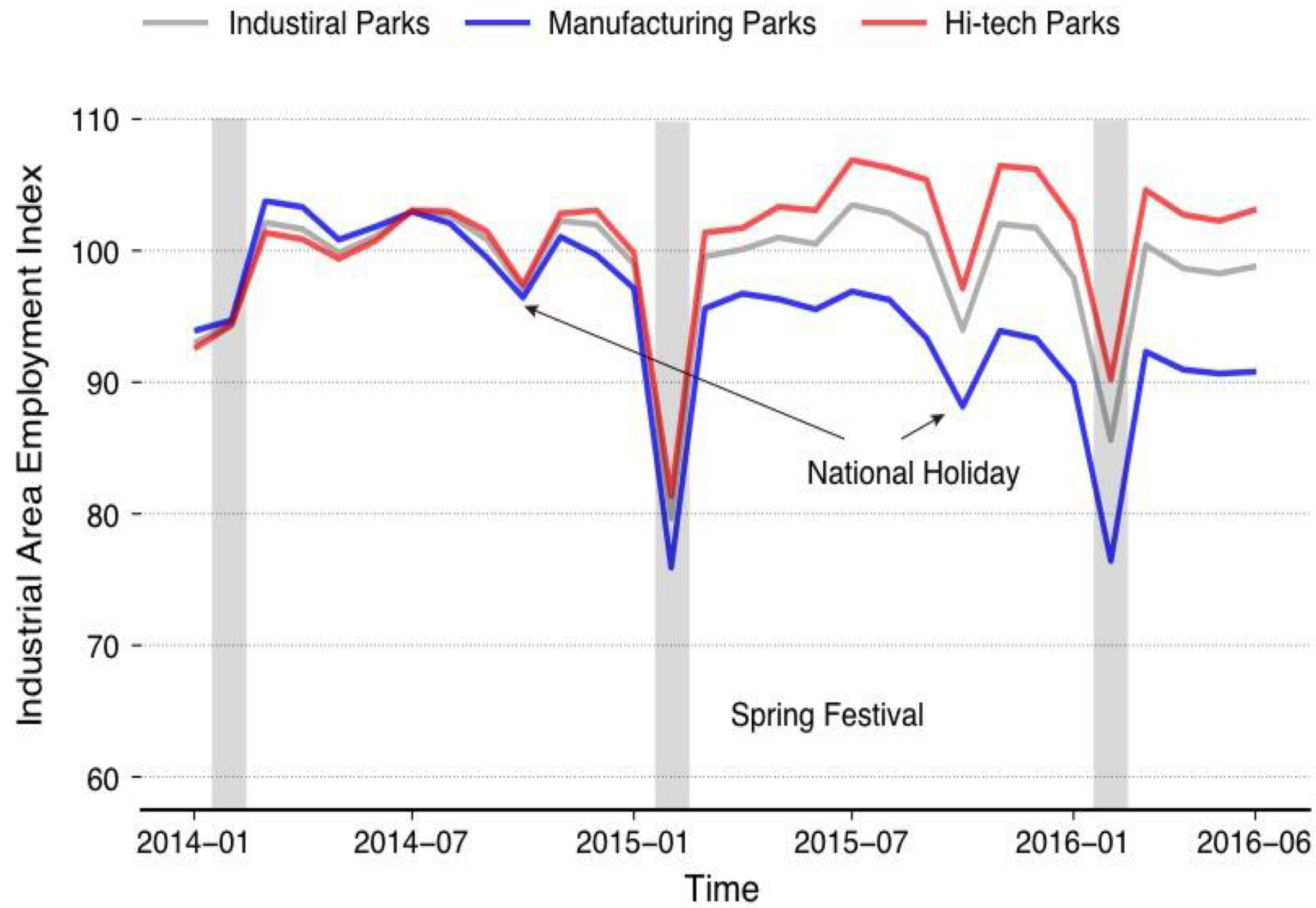
# Store checkin and mobile query data for sales forecasting



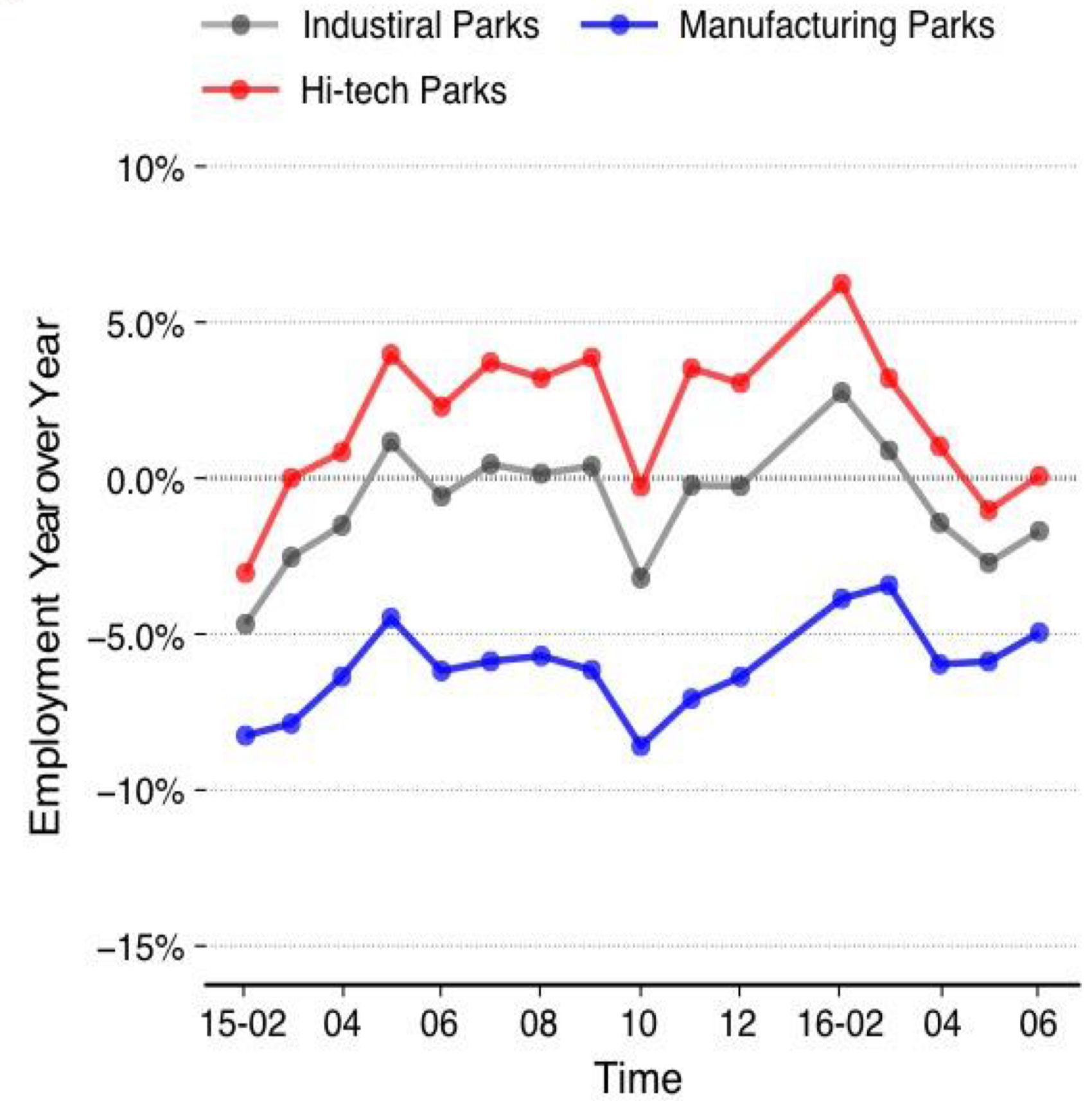


# Employment Index

**A**

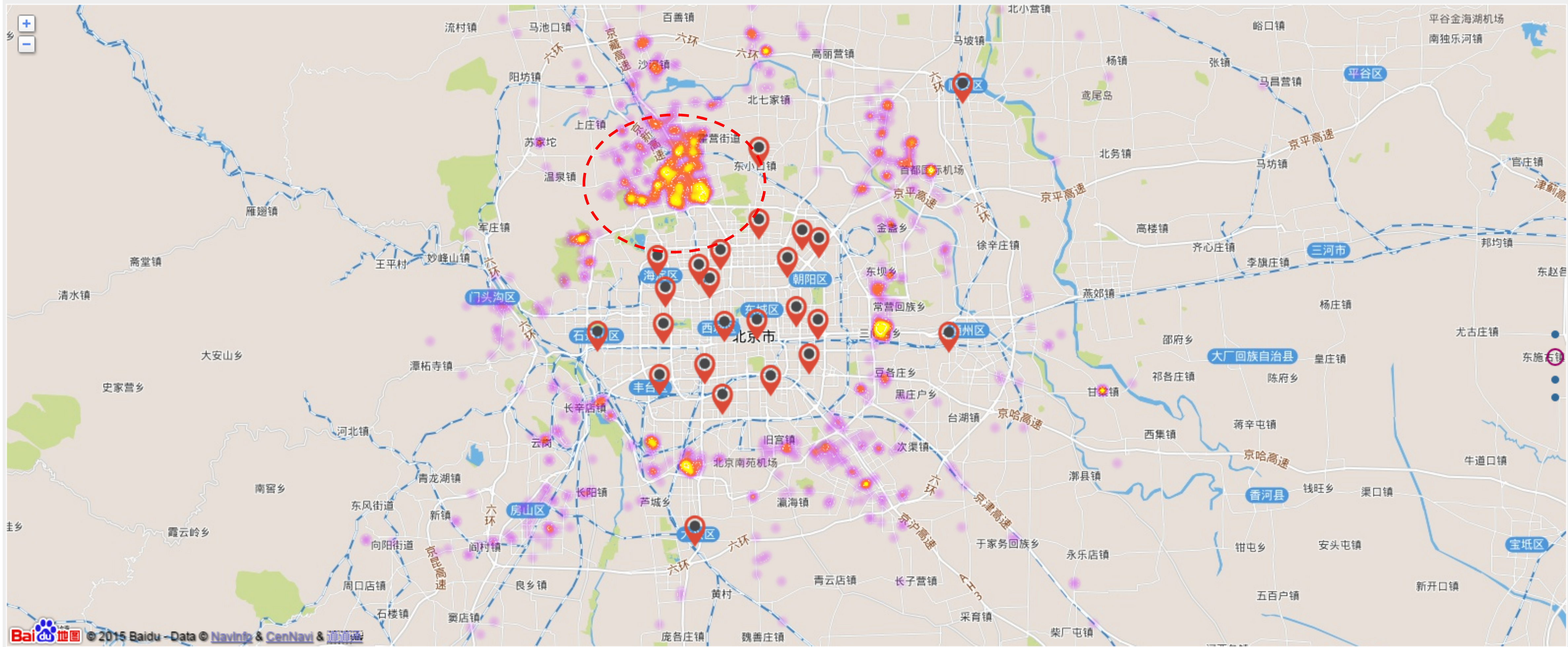


**B**





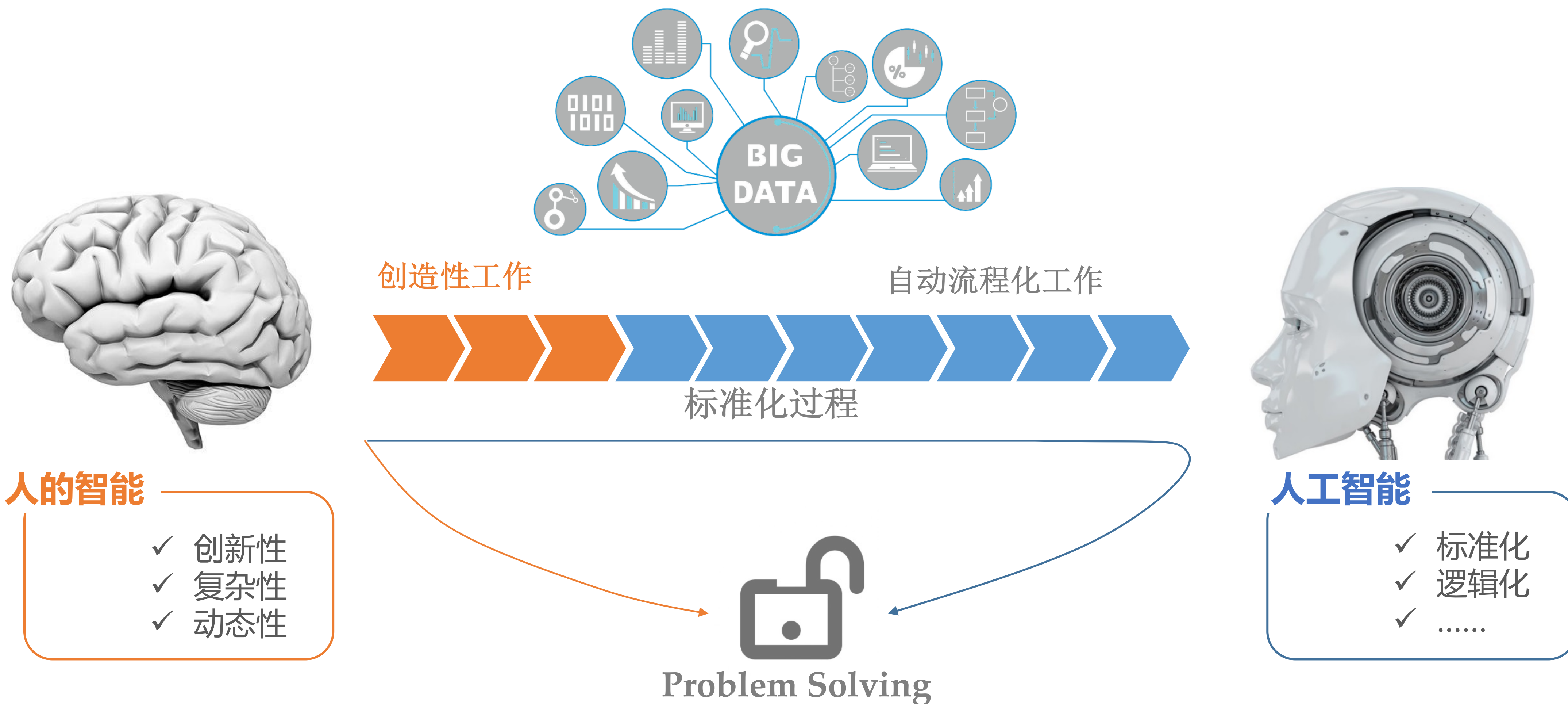
# Identifying the customer demand area (business site selection)





# 人的智能 vs. 人工智能

在科学技术发展的推动下，机器不断将人脑创新性思维标准化





# Human Capital



## 人员

- 标准化 / 流程化工作
- 知识结构要求简单



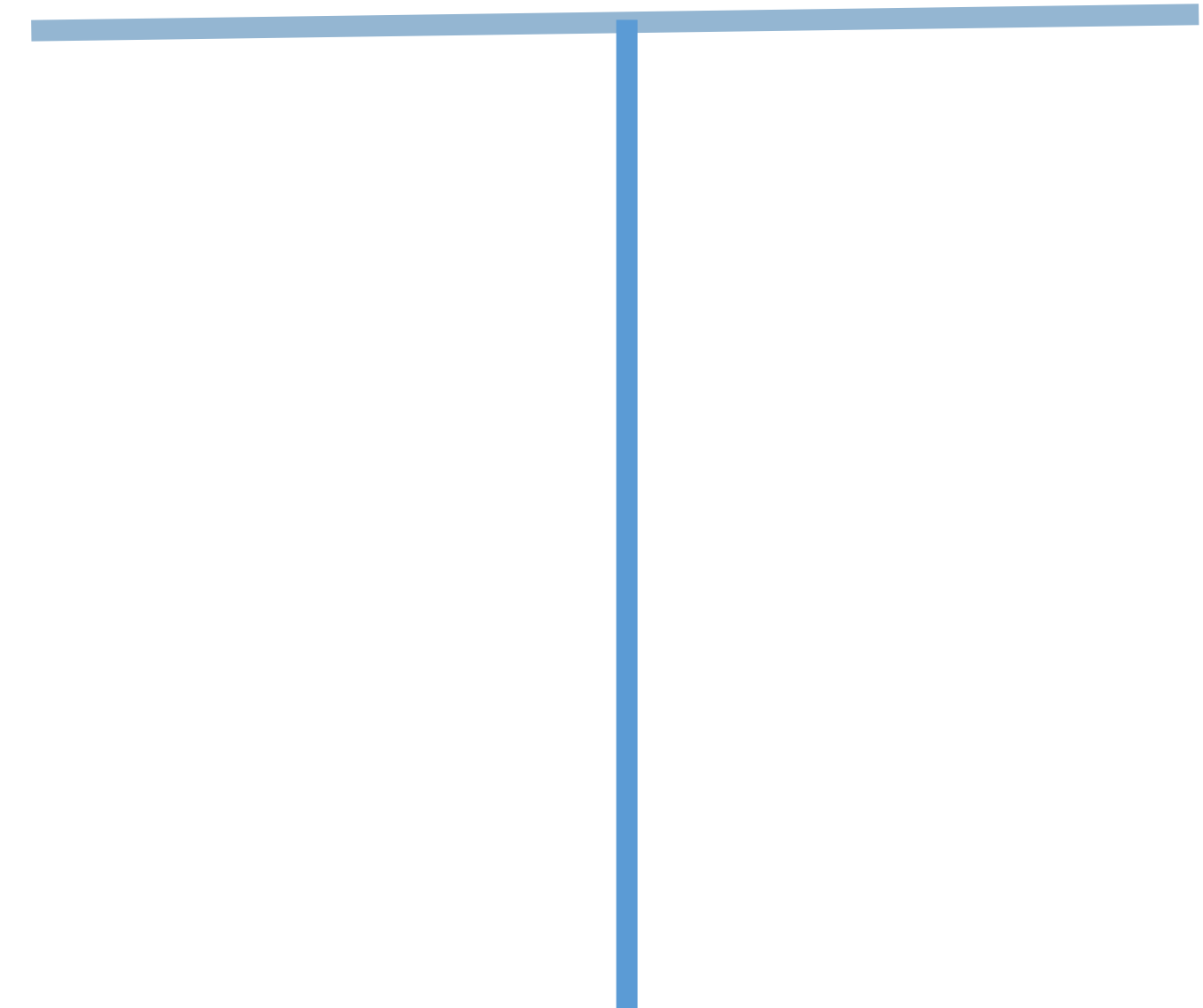
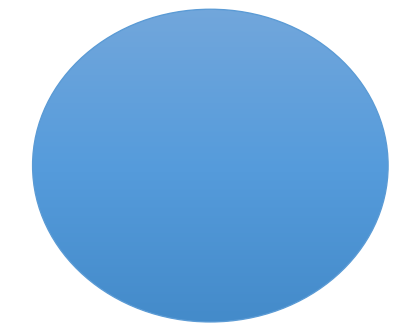
## 人才

- 具有团队协作精神
- 掌握专项技能，知识结构要求复杂



## 人物

- 首先是人才
- 具有领导力



# 人物的领导力

## ◆ Vision (视野)

- ❖ 能看远 (未来)
- ❖ 能看宽 (现状)

## ◆ Team Management (团队建设／团队管理能力)

- ❖ 懂识人
- ❖ 会用人
- ❖ 有胸怀
- ❖ 能放手

## ◆ Risk Control/Risk Management (风险控制能力)

- ❖ 有理智
- ❖ 有常识
- ❖ 有韧劲
- ❖ 有担当

# 传统HR分析 VS 智能人才管理

## 传统HR分析

### 经验性

对人才的判断与管理动作的采取严重依赖主管过去积累的管理经验

### 主观性

不同经验背景的主管对同一问题会有不同判断，管理动作通常基于个人判断做出

### 碎片化

通常基于主管获取的片面数据进行判断，对不同问题往往进行重复性独立决策

### 模糊化

仅能进行感性判断，对复杂问题通常进行模糊化决策，缺乏衡量标准

### 滞后性

通常在大量实践后才能总结出合理的规则指导未来管理动作，永远在解决问题

## 智能人才管理

### 科学性

针对不同分析主题开发大数据模型，科学应用分析方法，结果可检验

### 客观性

提供人才的客观衡量指标与决策建议，智能分析有效性不受个人影响

### 完整性

根据完整数据集综合分析提供智能建议，呈现对人才的通用判断

### 清晰化

能够针对复杂问题给出明确的智能分析指标，结果可量化对标

### 前瞻性

针对人才主题提供预测性分析，能够未雨绸缪，预先采取管理动作



# 大数据驱动智能化人才管理



用数据说话

用数据决策

用数据管理

用数据创新

# 易经有三易： 三大原则

## ◆ 不易

- ❖ 宇宙万物有不变的理
- ❖ 大数据／人工智能的发展是一种必然 - 长时间维持朝阳
- ❖ 人工智能的技术复杂性不断增加 - 进入的门槛高



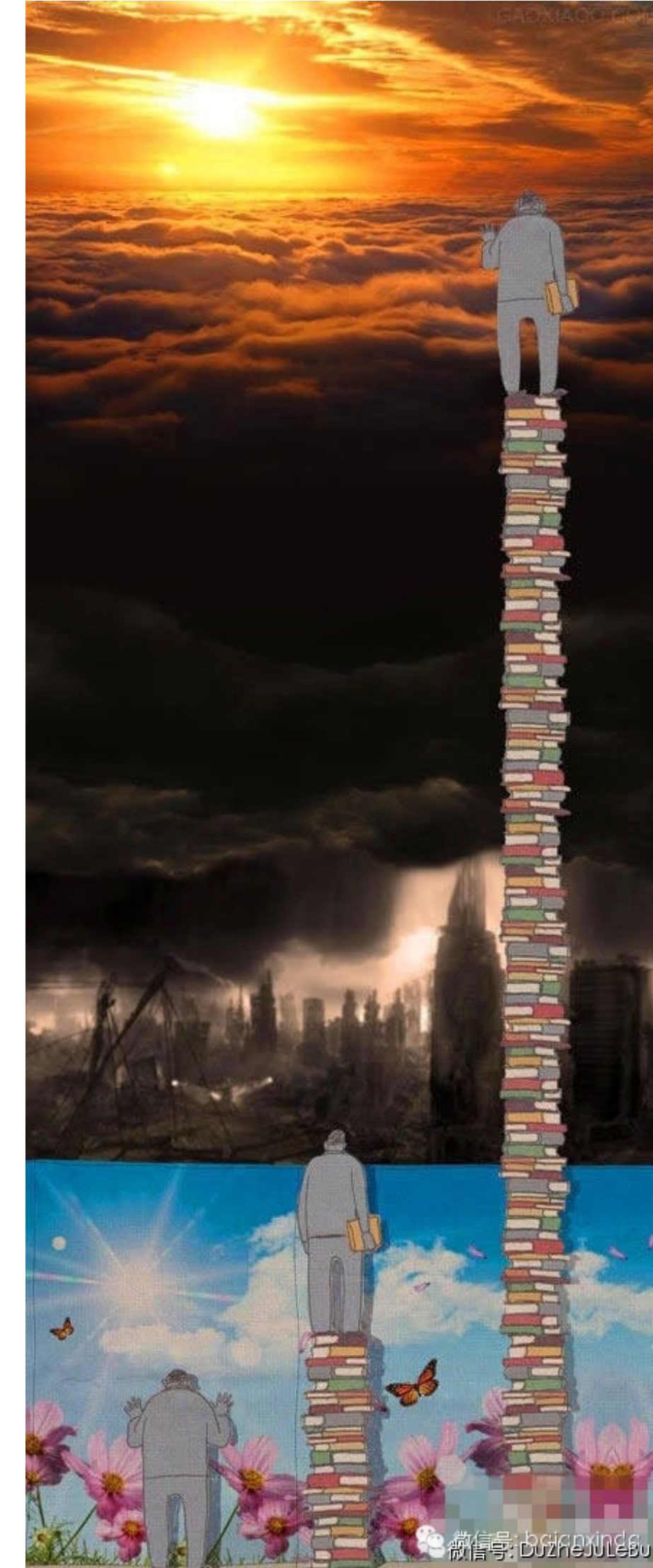
## ◆ 变易

- ❖ 一切的变化都是交换中来的
- ❖ 变化遵循一种固定的法则
- ❖ 发展道路和方向必然是不断变化的



## ◆ 简易

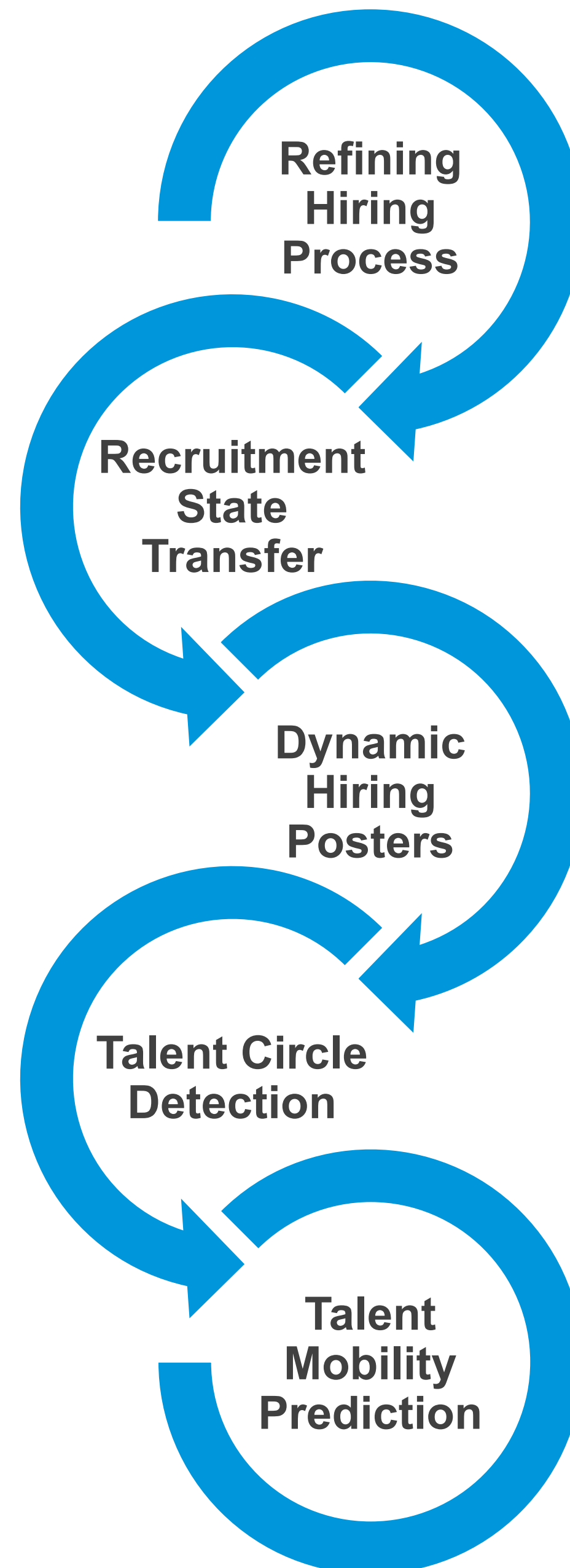
- ❖ 大道至简
- ❖ 有其理无其事（经验／观察不够）
- ❖ 有其事不知其理（智慧不够）





# Big Data Driven Intelligent Tools for Recruitment

In traditional recruitment process, bringing in qualified talents highly relies on personal experience and judgment.



## Interviewer's Guidance

Help to detect characteristics of efficient interviewers and candidates, and to recommend the appropriate interviewers

## Job Market Trend Analysis

Help to find the hidden recruitment state of market and major competitors, and to predict the next talent demand

## Auto Job Posters

Help to convert the ambiguous talent demand to complete and explicit job descriptions

## Talent Circle Detection

Digging out hidden talent circles from professional social network. Help to locate the talents needs

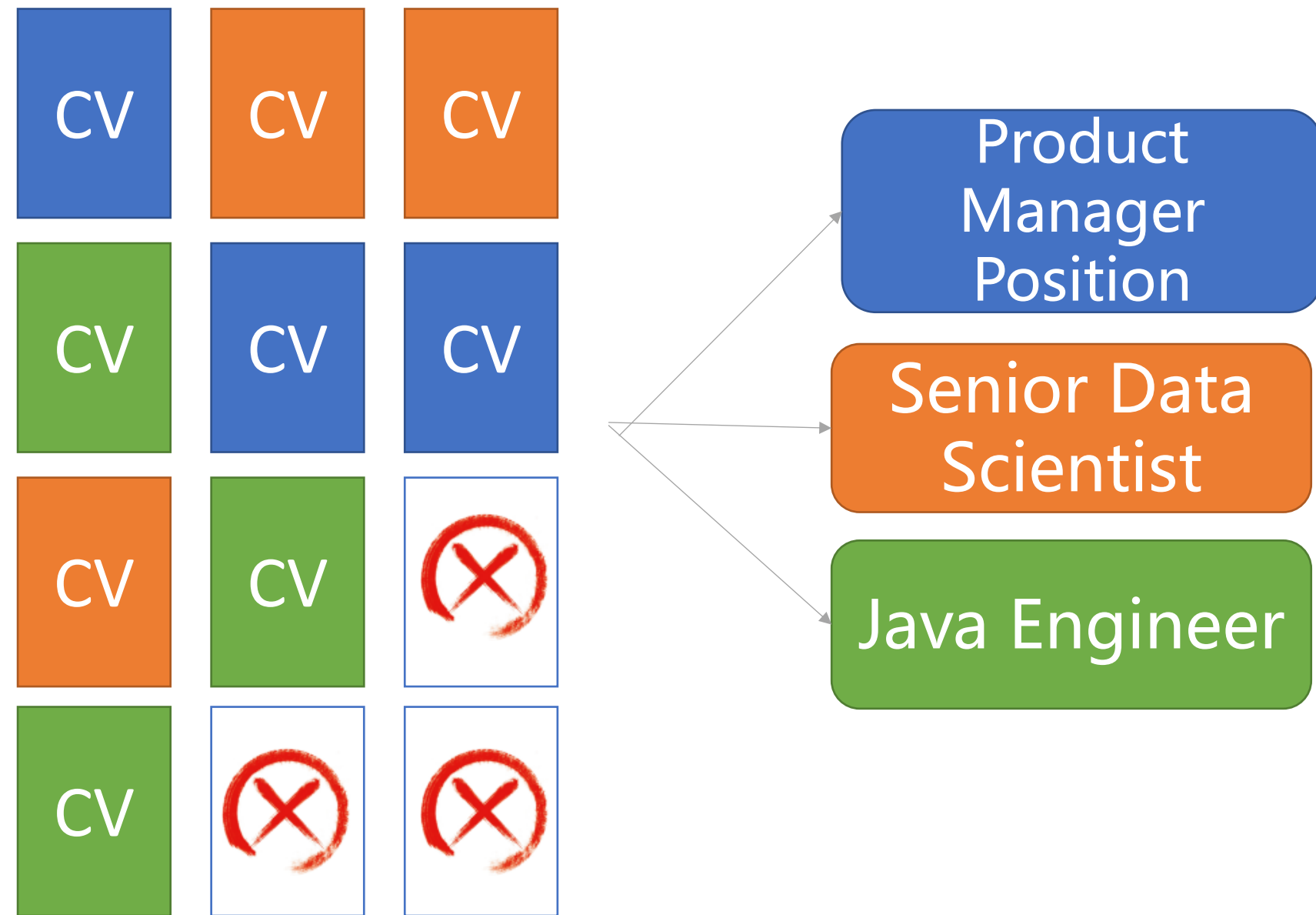
## Job-hopping Prediction

Predicting outside talents' desire to change jobs. Help to contact with candidates with greater chances

# A.D.R—Talent Acquisition

## Smart Resume Screening and Distribution

- ✓ Accurate resume distribution
- ✓ Quickly supply high quality talent
- ✓ Improve recruitment efficiency



Automatically distribute millions of CVs from multiple sources

The screenshot shows a recruitment interface with two job recommendations and a table of matching results.

**Job Recommendation 1:** Data Scientist (Save button)  
2016-09-01 Beijing xx Department

**Job Recommendation 2:** NLP Algorithm Developer (Save button)  
2016-09-01 New York xx Company

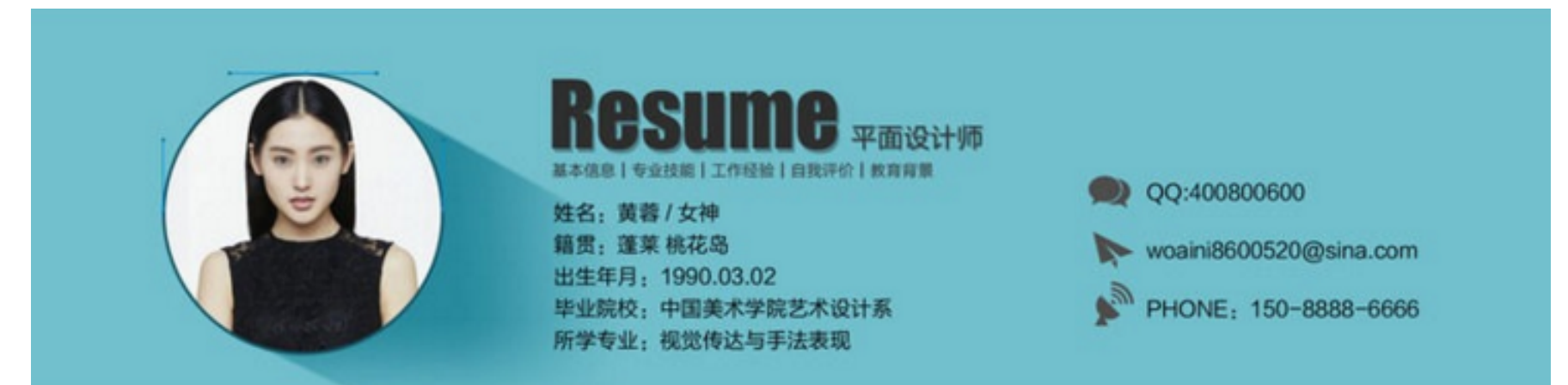
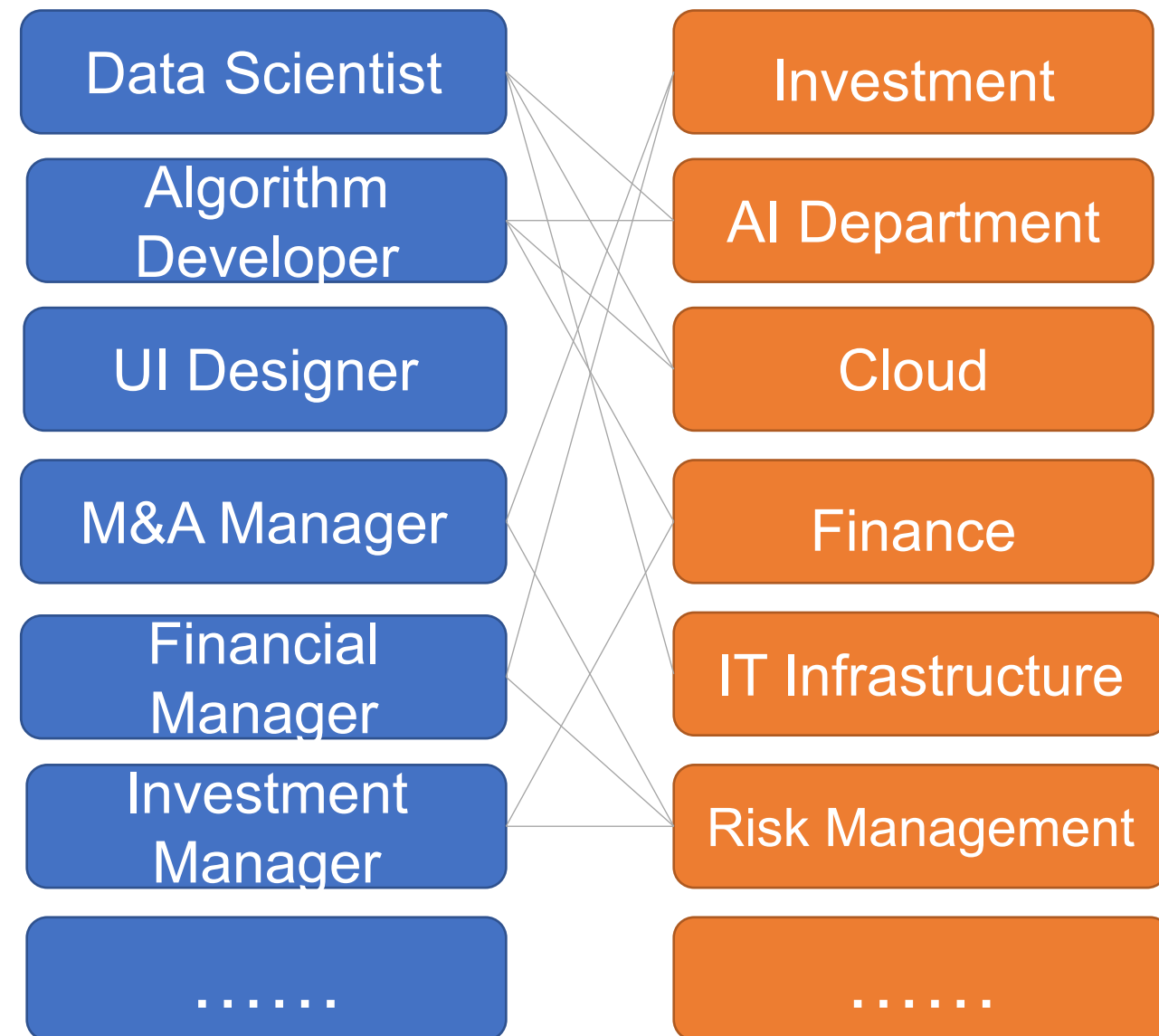
Matching Index	Name	Position	App Time	Recommended Position
0.9	Steve	Data Scientist	2016-03-02	NLP Algorithm Developer
0.8	Peter	Software Engineer	2016-05-20	Java Engineer
.....	.....	.....	.....	.....



# A.D.R——Talent-Job Matching

**Talent – job matching** : recommending the positions based on the resume content of the candidates

- ✓ Career Development Planning
- ✓ Accurate Talent-Job Matching
- ✓ Promoting Talent Acquisition



## Job Orientation



- UI Design
- Java Engineer
- Investment Manager

## Department Orientation



- User Experience Department
- AD Search Department
- Finance Department

# Interviewer's Guidance



## How a good interviewer act?

Digging out what characteristics good interviewers share, what questions they may raise and how they judge candidates' performance. Helping to allocate the right interviewers for a certain post

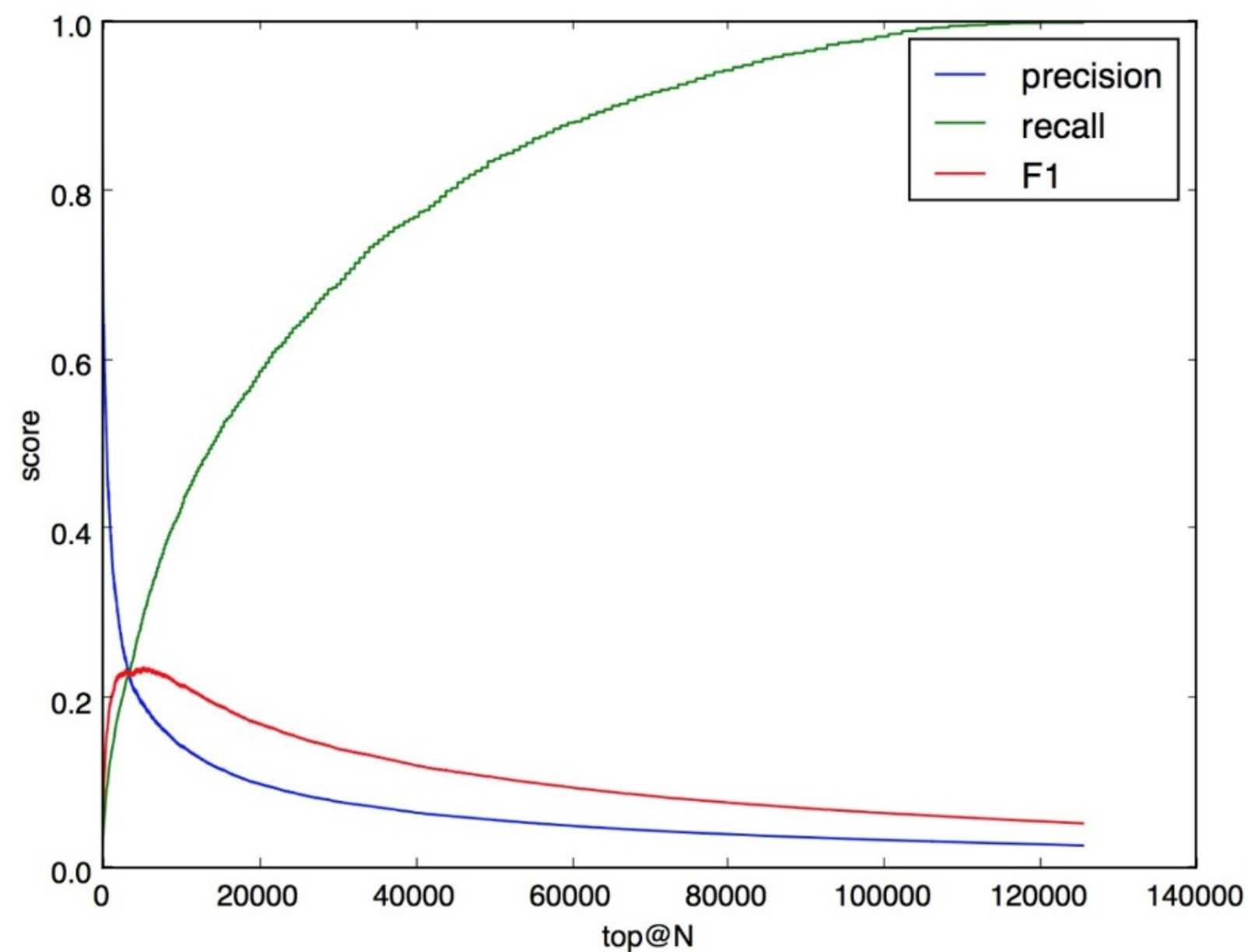
## How a qualified candidate is like?

Finding out how candidates with better subsequent performance act differs from other in interviews, what assessment they may receive and what qualities deserve more attention for a certain post

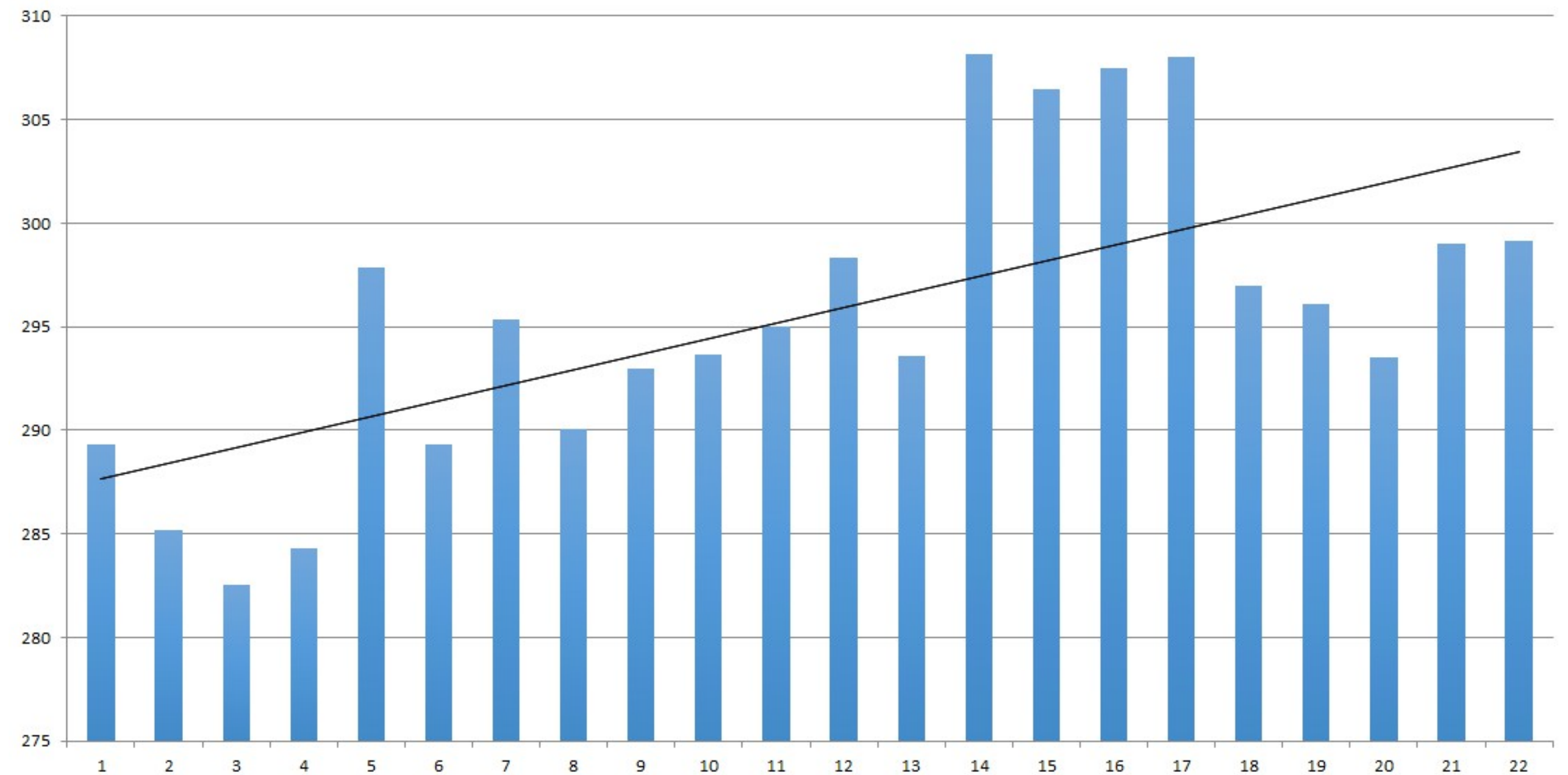


# A.D.R.—Smart CV Screening and distribution

Intelligent CV Distribution, automatically matching job seekers and positions



- ✓ Out of top 30, 26 received offers
- ✓ Out of top 50, 44 received offers
- ✓ Out of top 100, 81 received offers

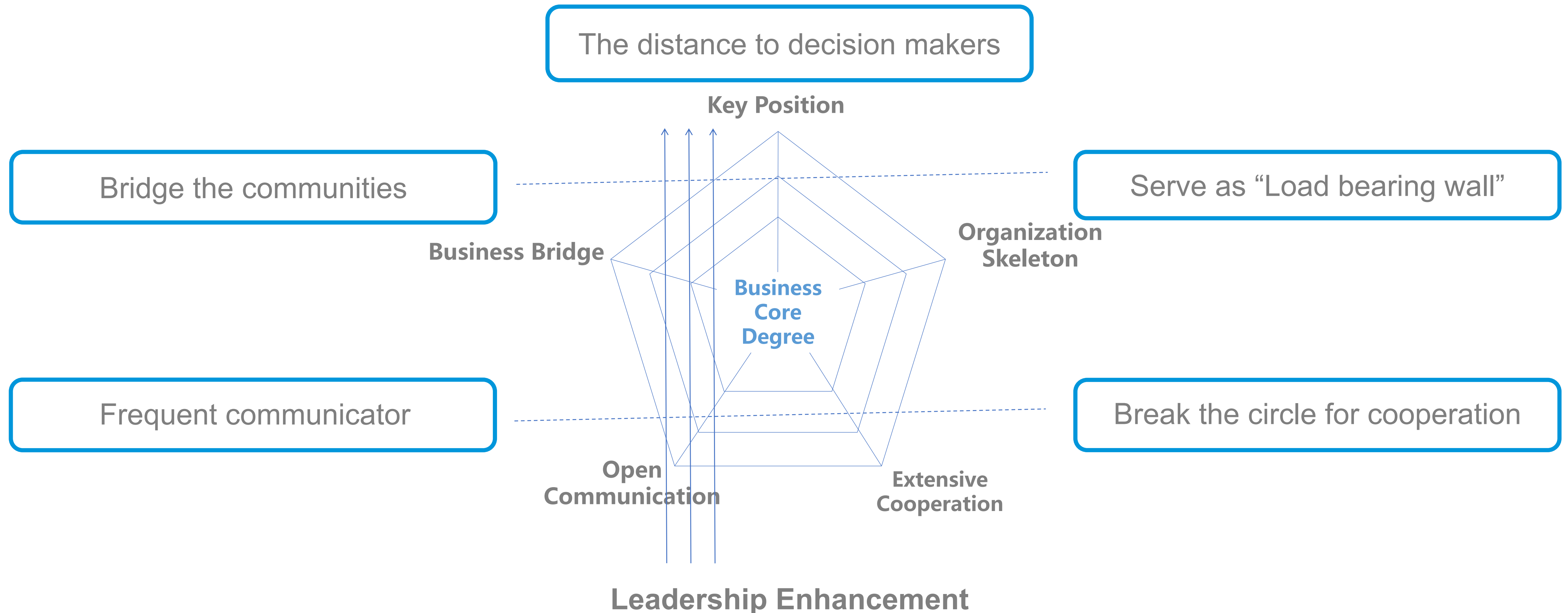


- ✓ the performance of the employees is positively correlated with the rank in the selection list.



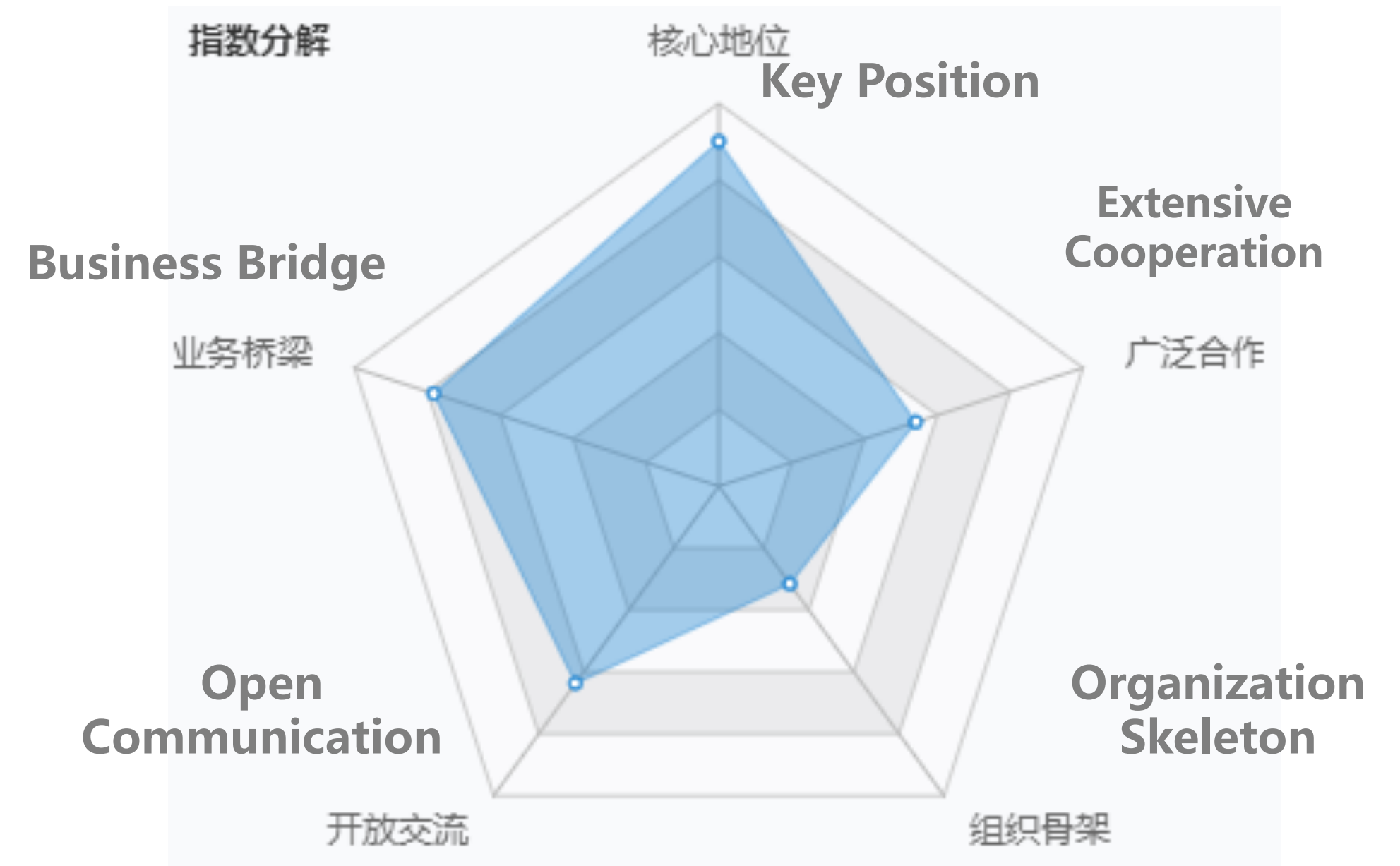
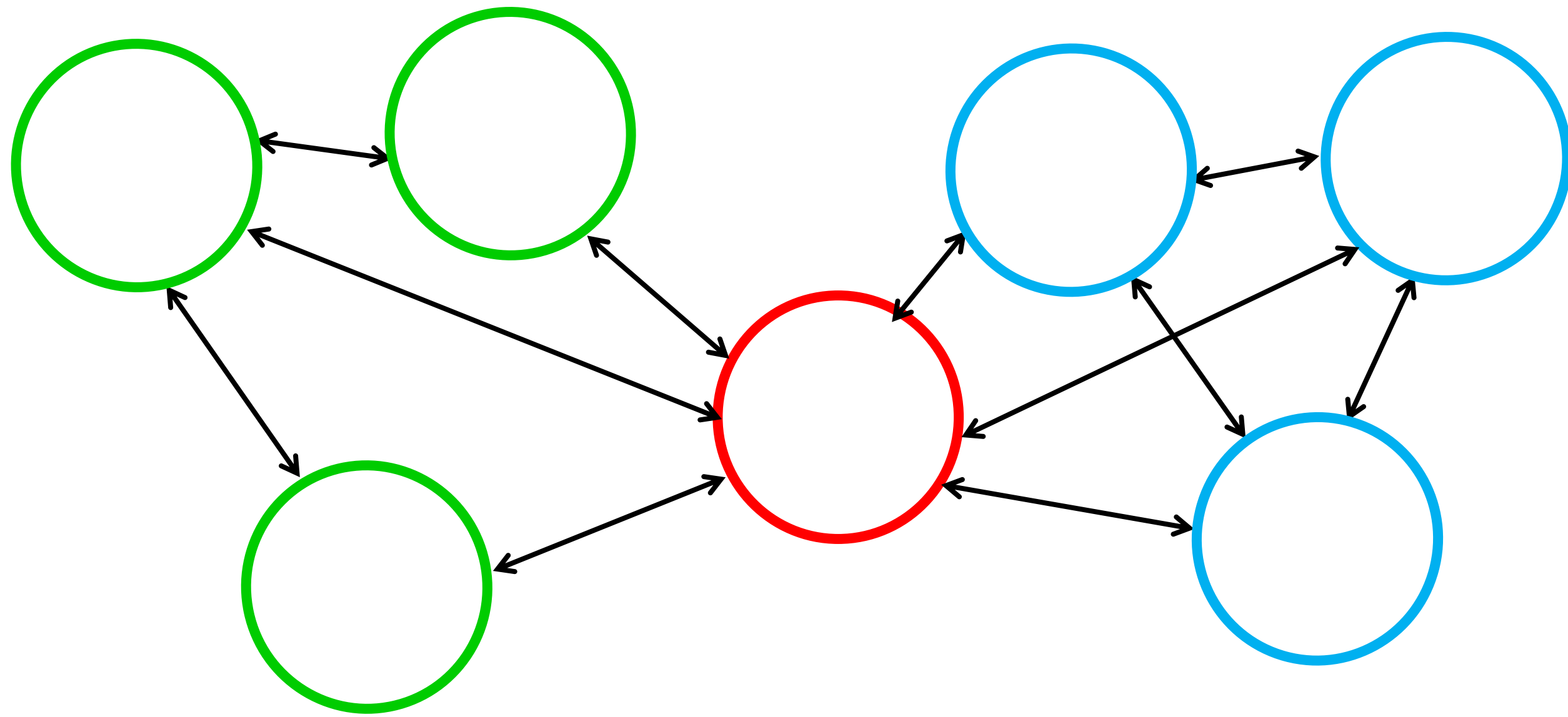
# Elite Identification

- Business collaboration network , every node represents one employee
- Business Core Degree: decompose into five dimensions



# Business Bridge

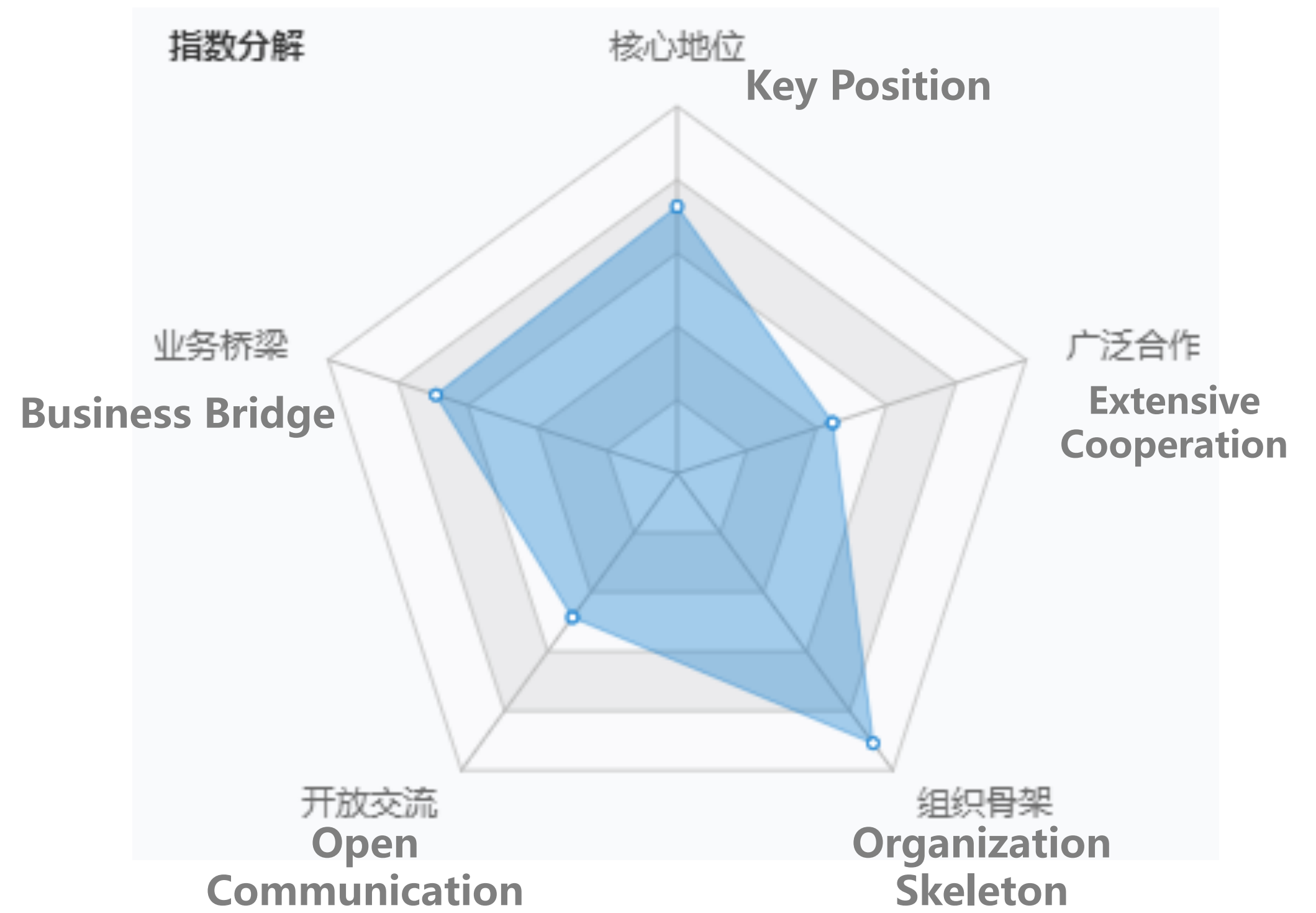
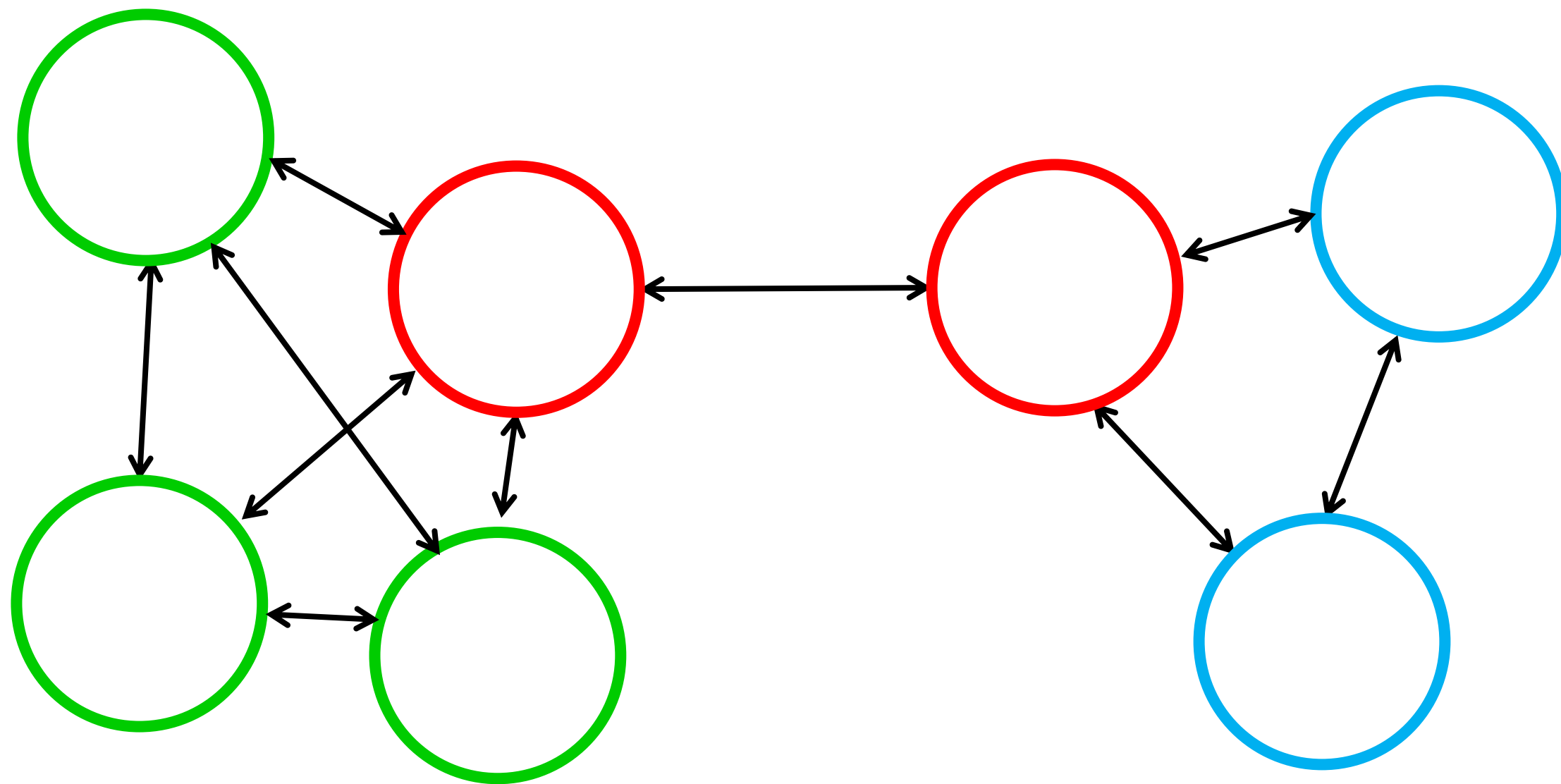
Bridge the communities





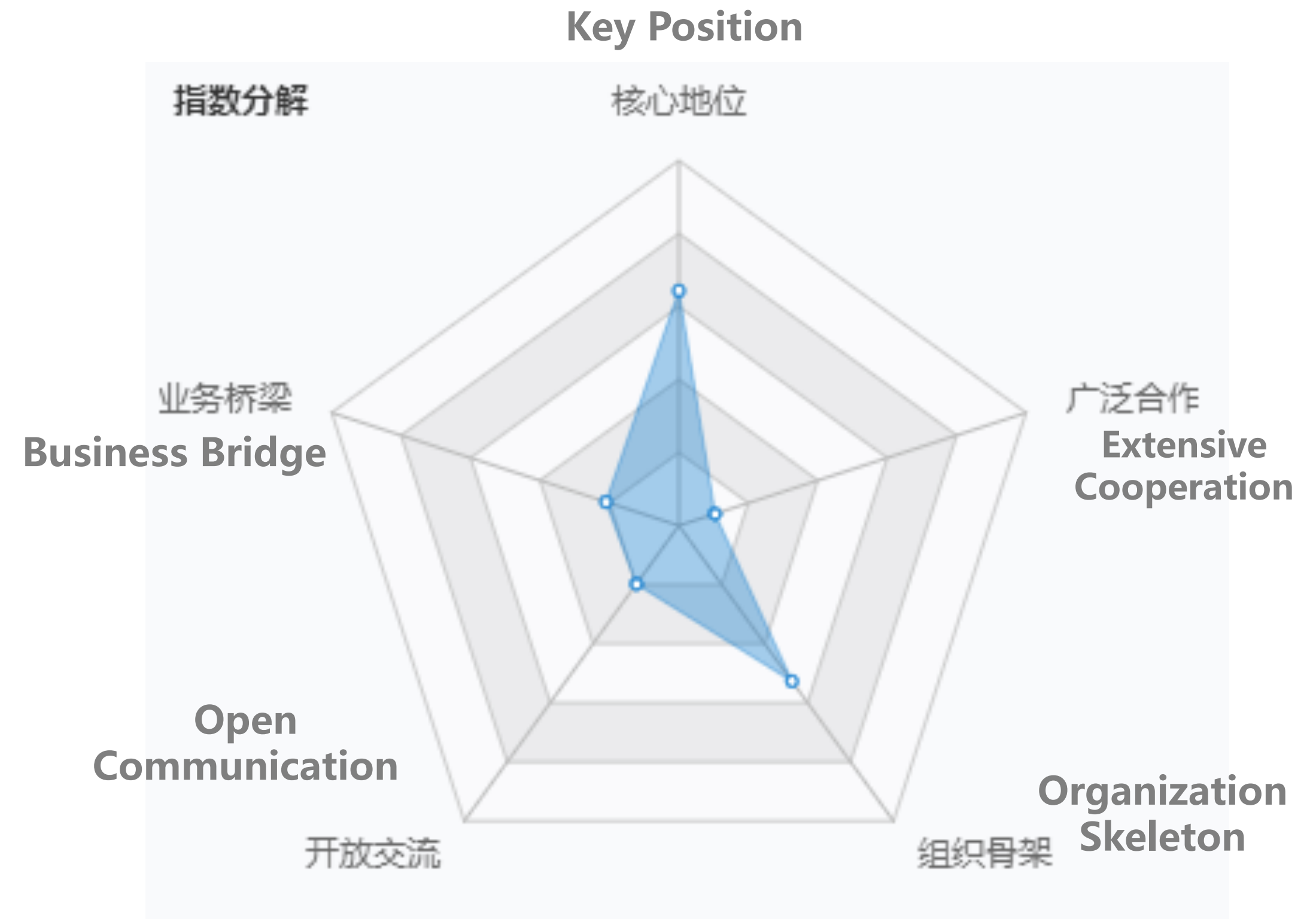
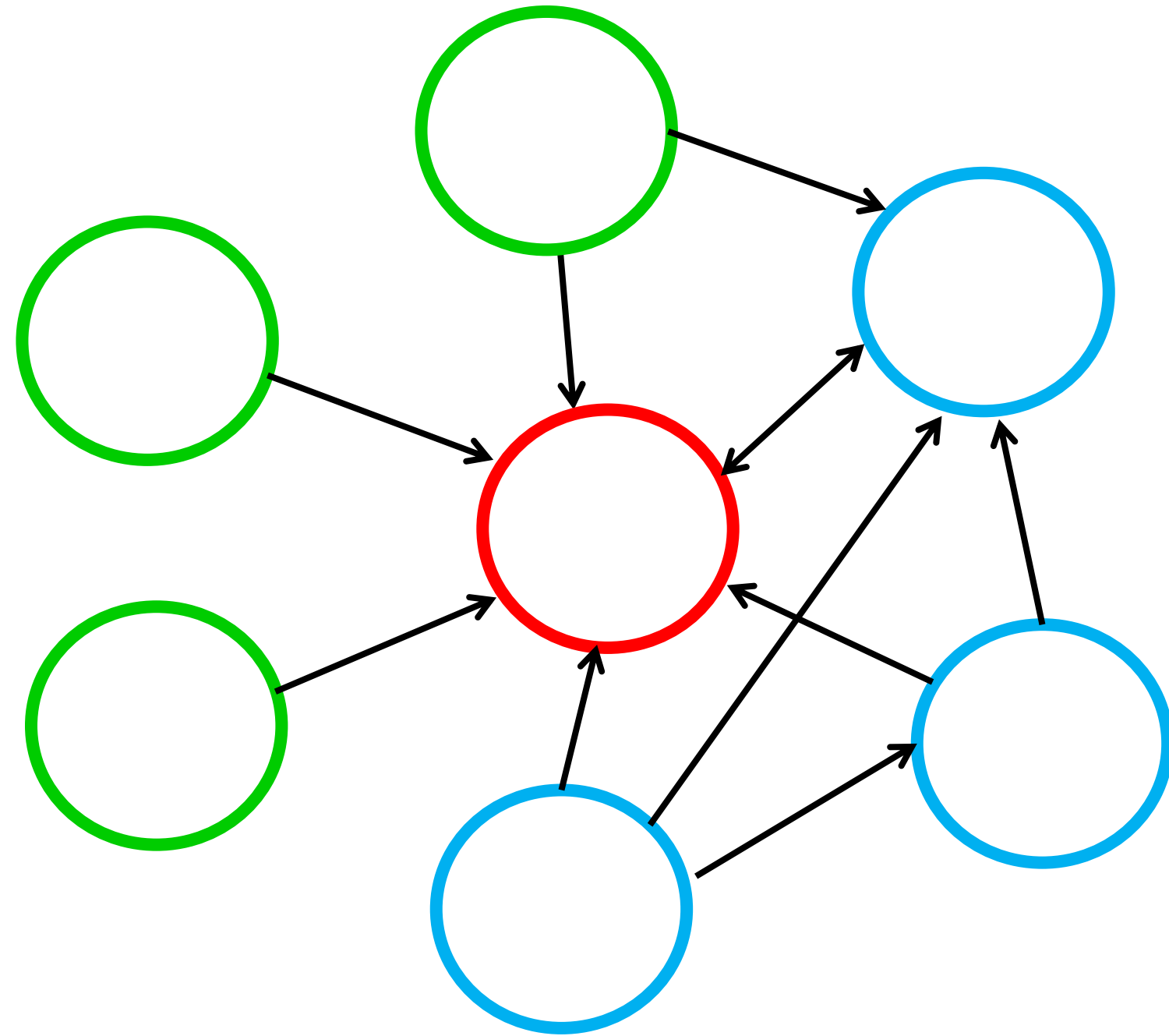
# Organization Skeleton

## “Load Bearing Wall”



# Key Position

The distance to decision makers





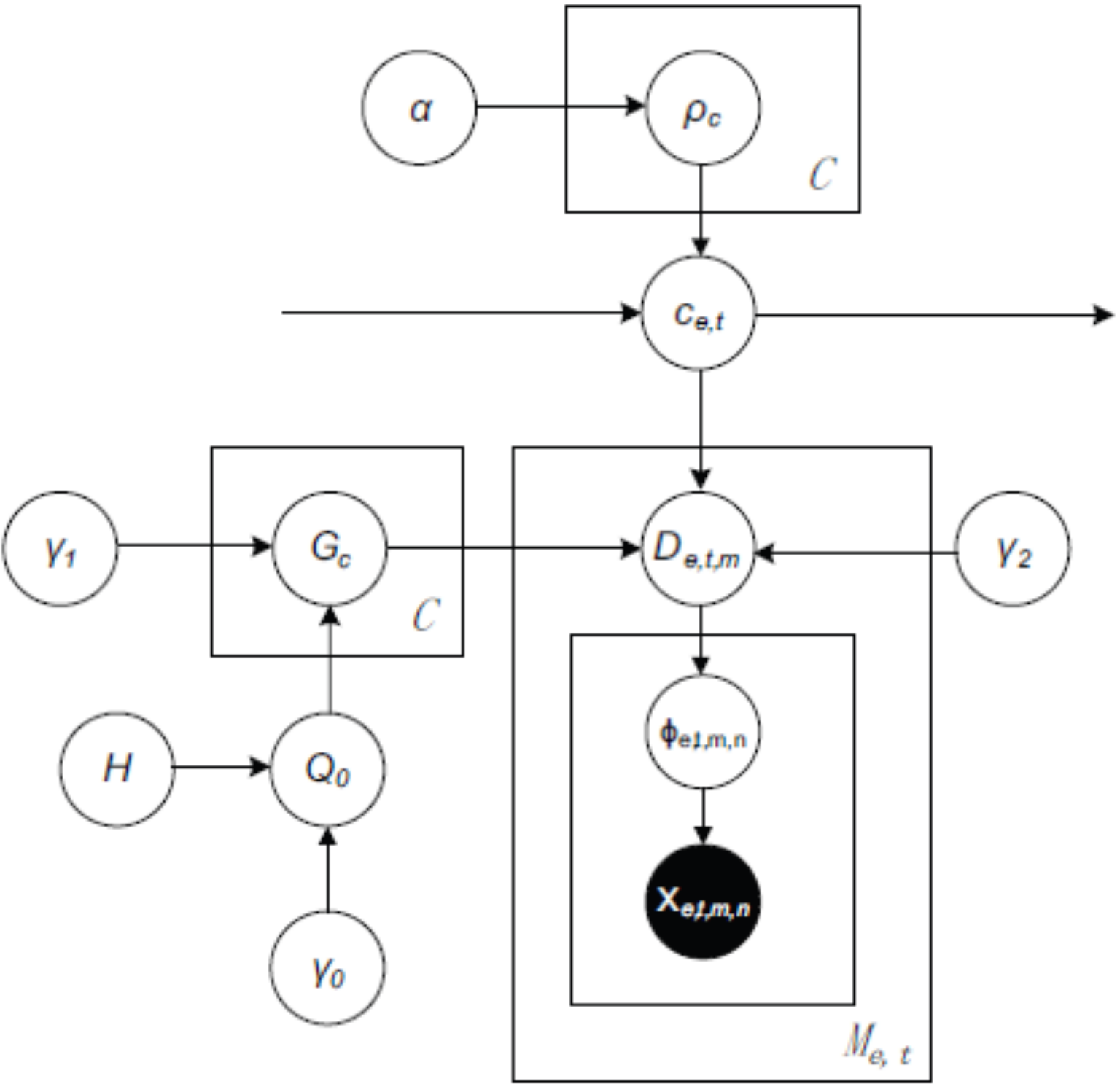
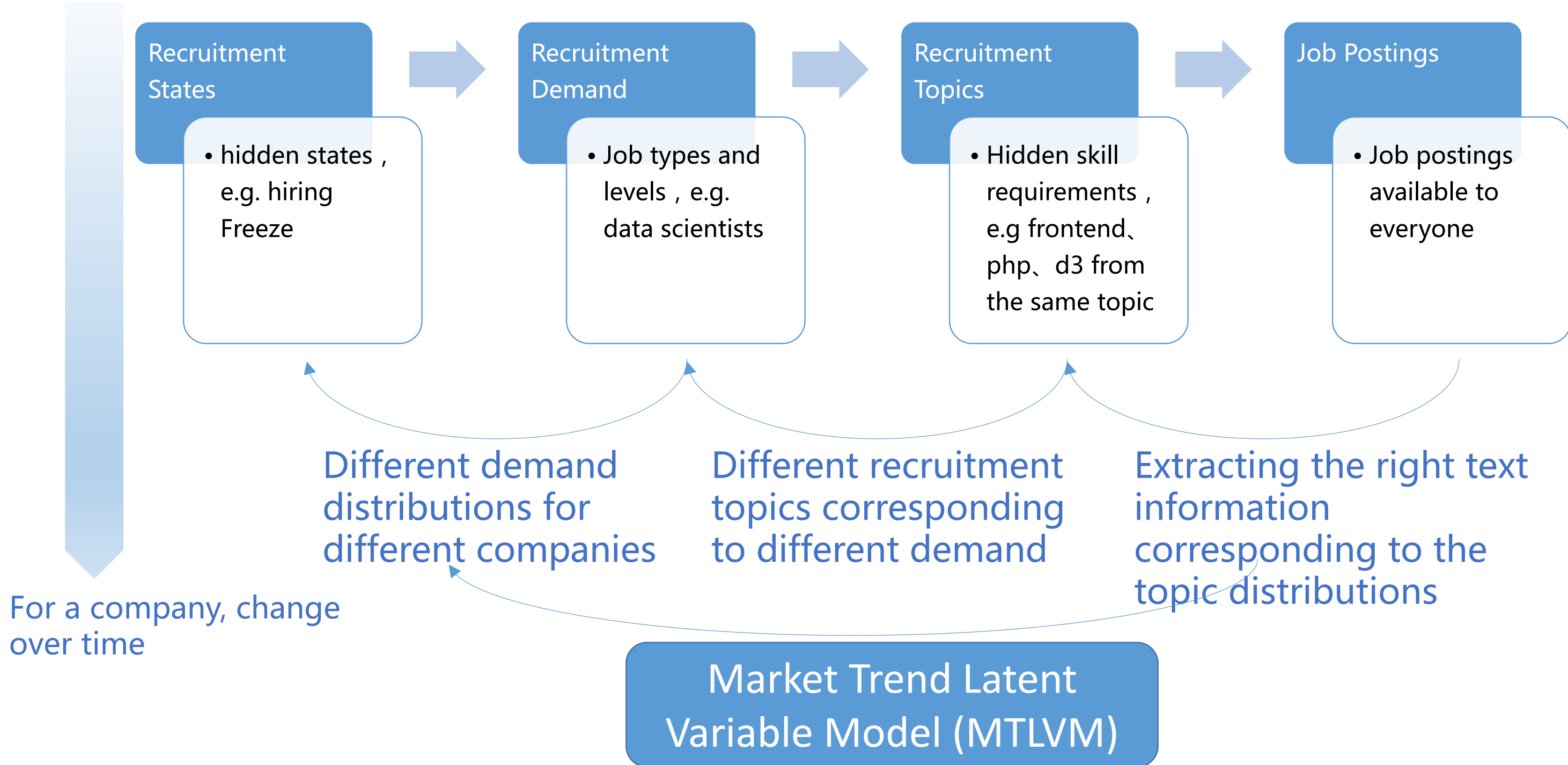
# Recruitment Market Trend Analysis

## Recruitment Market Trend Analysis with Sequential Latent Variable Models

KDD 2016

Chen Zhu, Hengshu Zhu, Hui Xiong, Pengliang Ding, Fang Xie

- To develop unsupervised models to learn the recruitment states for a company from massive recruitment data, and thus understand recruitment demand and extract the corresponding recruitment topics.
- Modeling the intrinsically sequential dependency of recruitment states, and thus predicting the market trend



# Evaluation of Recruitment States

- State #3 keeps a relative high popularity over the long period.
- State #4 rise and drop down as time goes on.

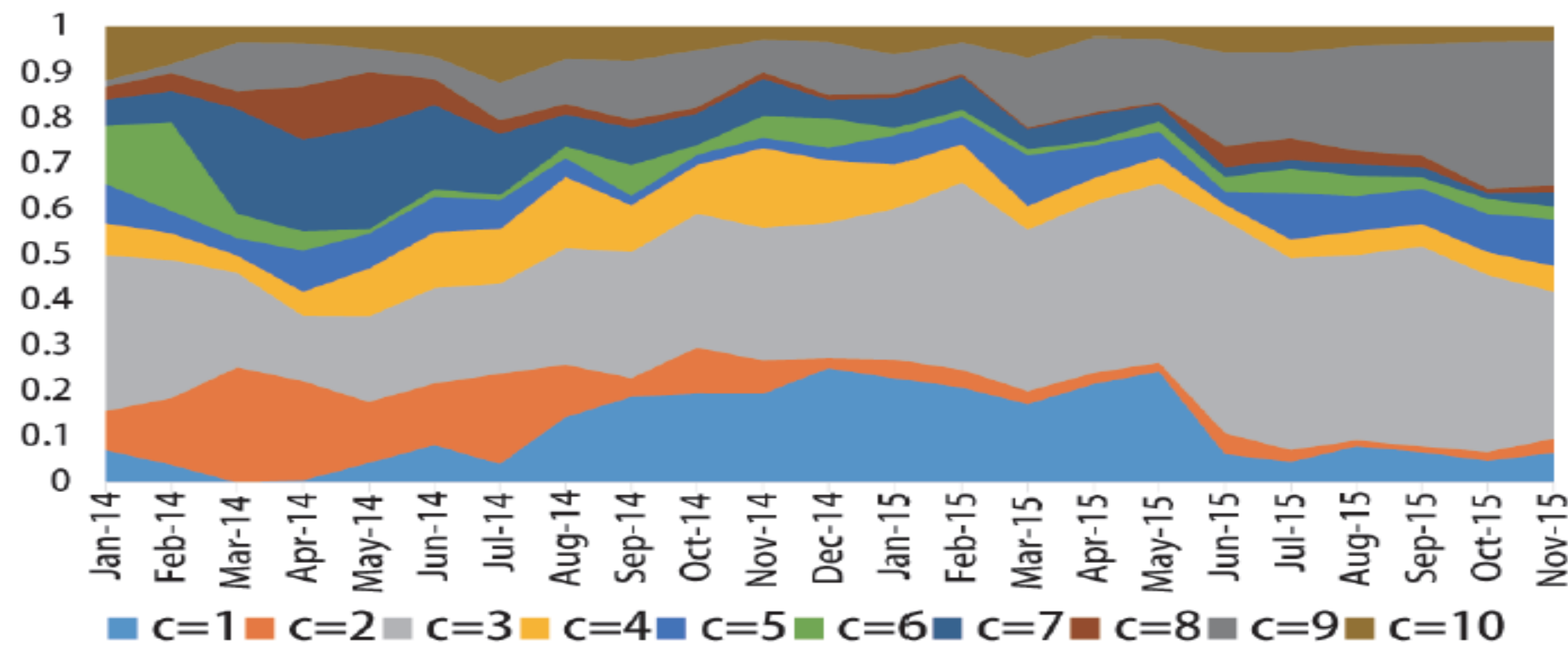


Figure 6: The trend of popularity of recruitment states discovered by our model over time.

- All states have the highest transition probabilities to themselves.
- The transition probabilities to state #1, #3, and #9 are high.

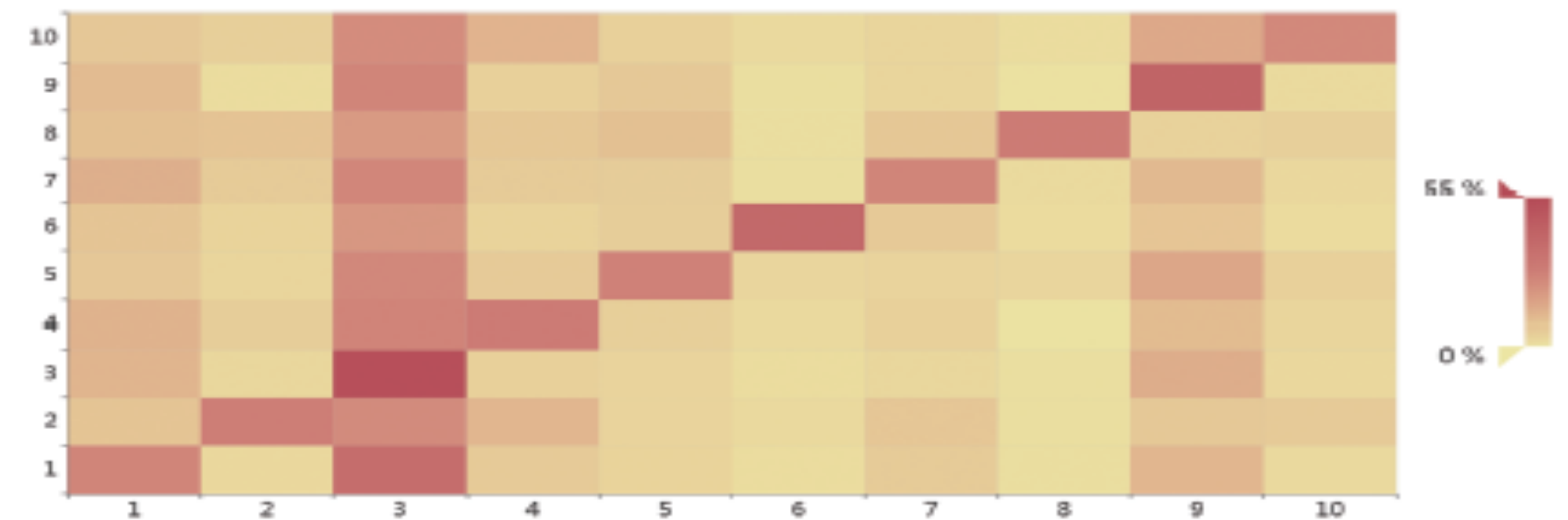
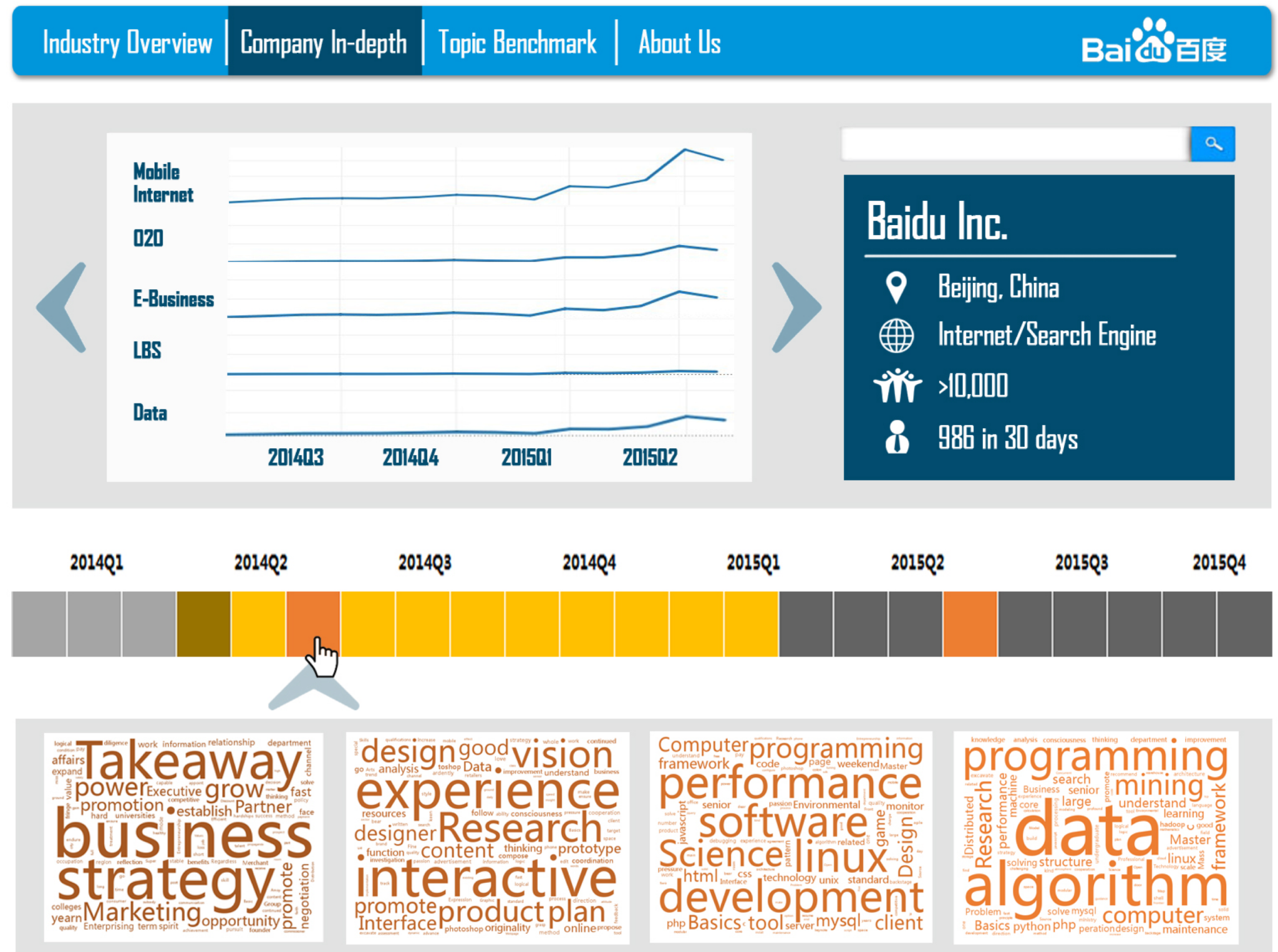


Figure 7: The transition matrix of recruitment states, where the  $i, j$  element means the transition probability from  $i$ -th state to  $j$ -th state, and deeper color means higher probability.



# The change of recruitment states over several companies



A visualization system for supporting dynamic demonstration and queries

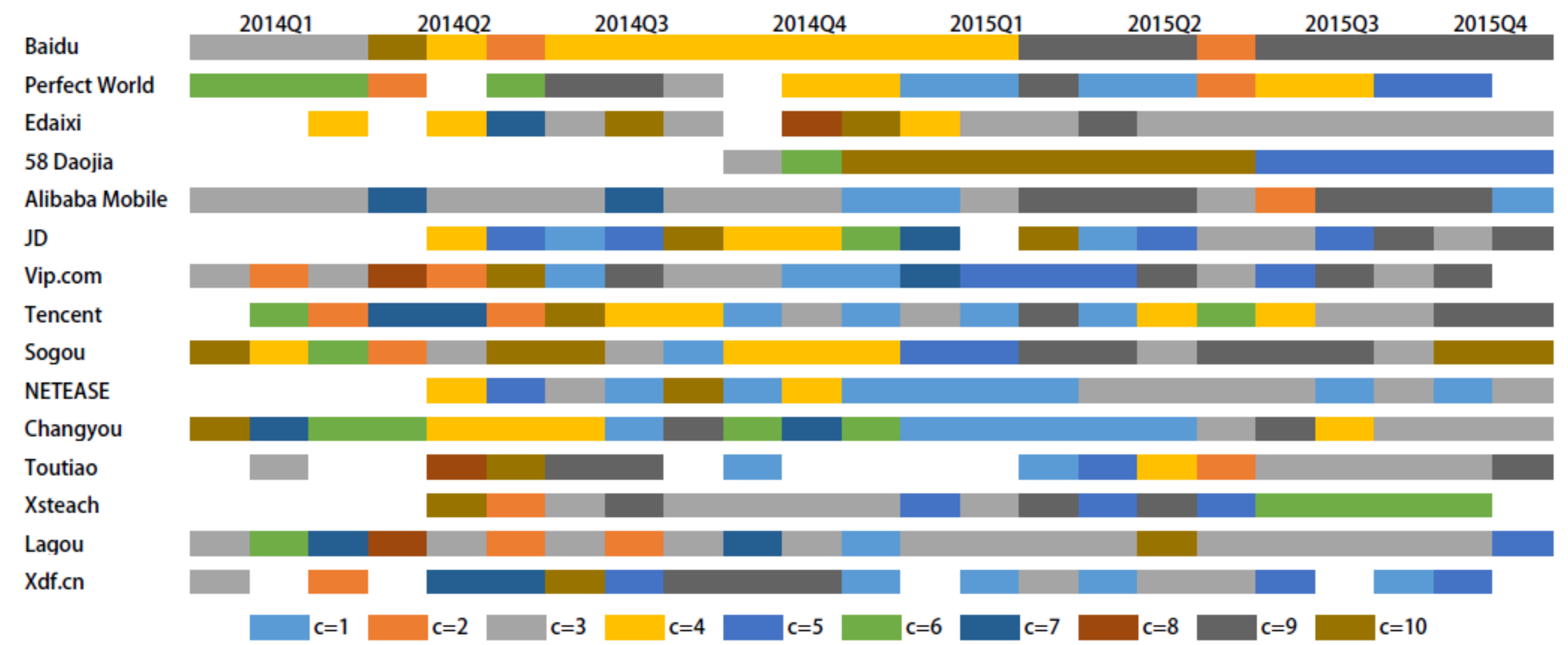
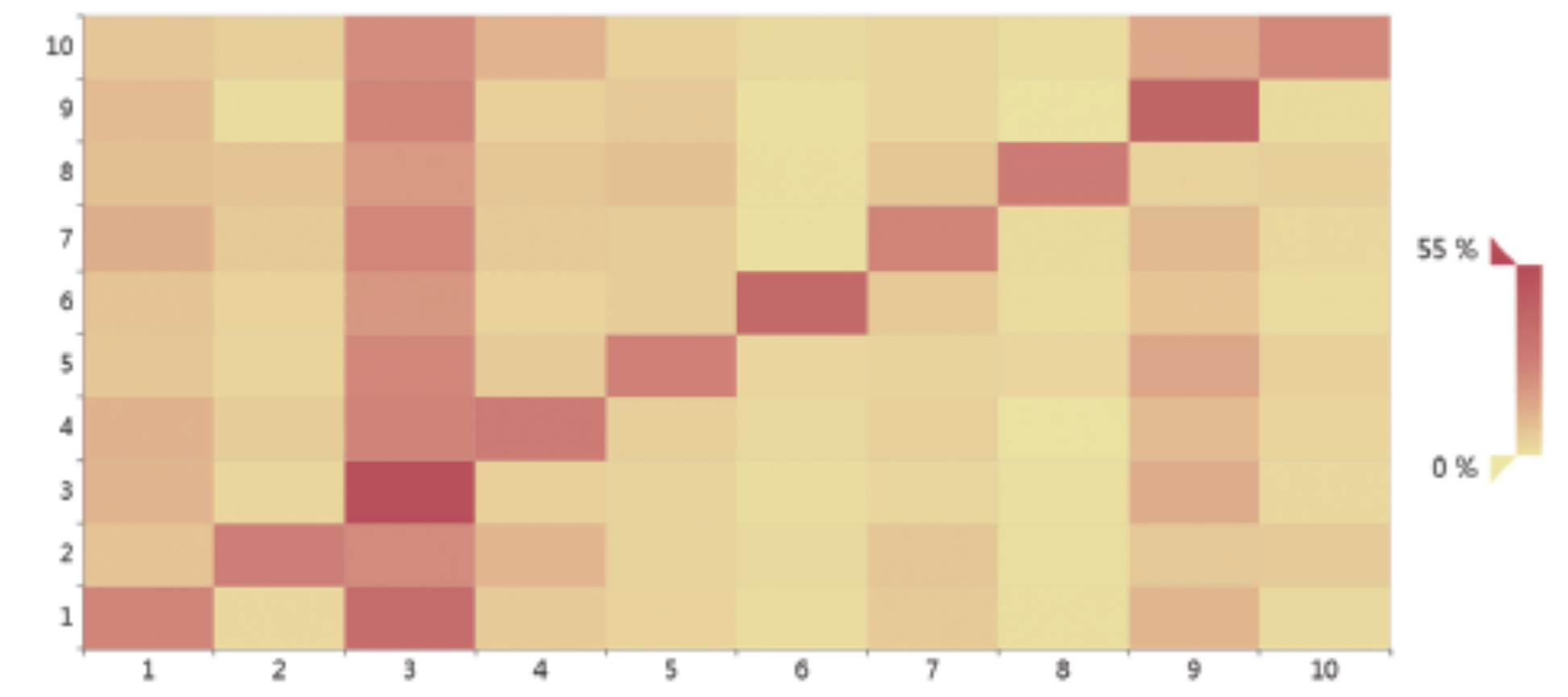


Figure 9: Visualization of the change of recruitment states over several companies, with different colors representing different states.

# Talent Circle Detection

## Talent Circle Detection in Job Transition Networks

KDD 2016

Huang Xu, Jingyuan Yang, Zhiwen Yu, Hui Xiong, Hengshu Zhu

With employing massive data from OPNs, we build job transition network and extract talent circles from it. The detected talent circles can support a more pointed recruitment strategy, and predict the potential talent transfer

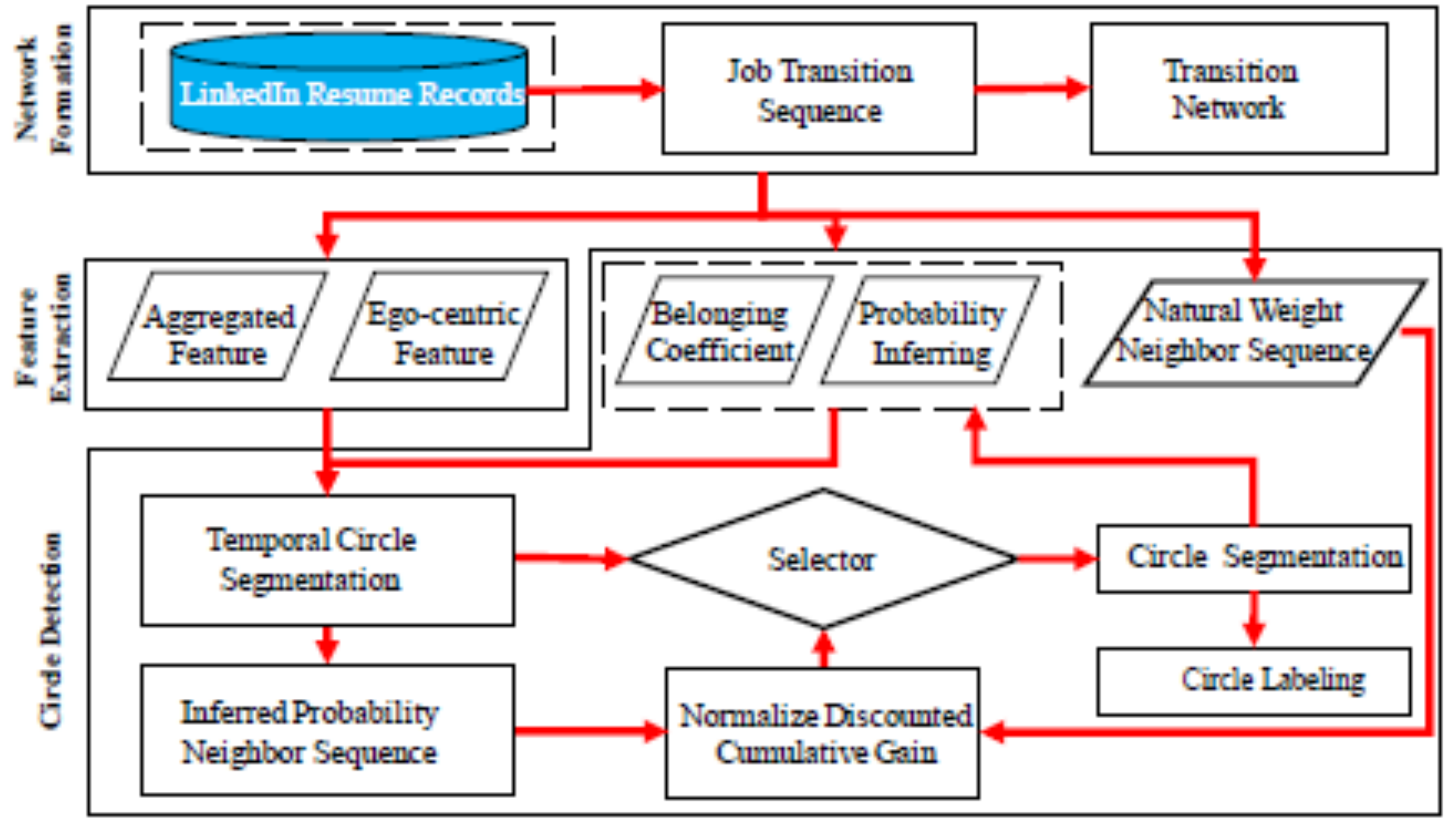
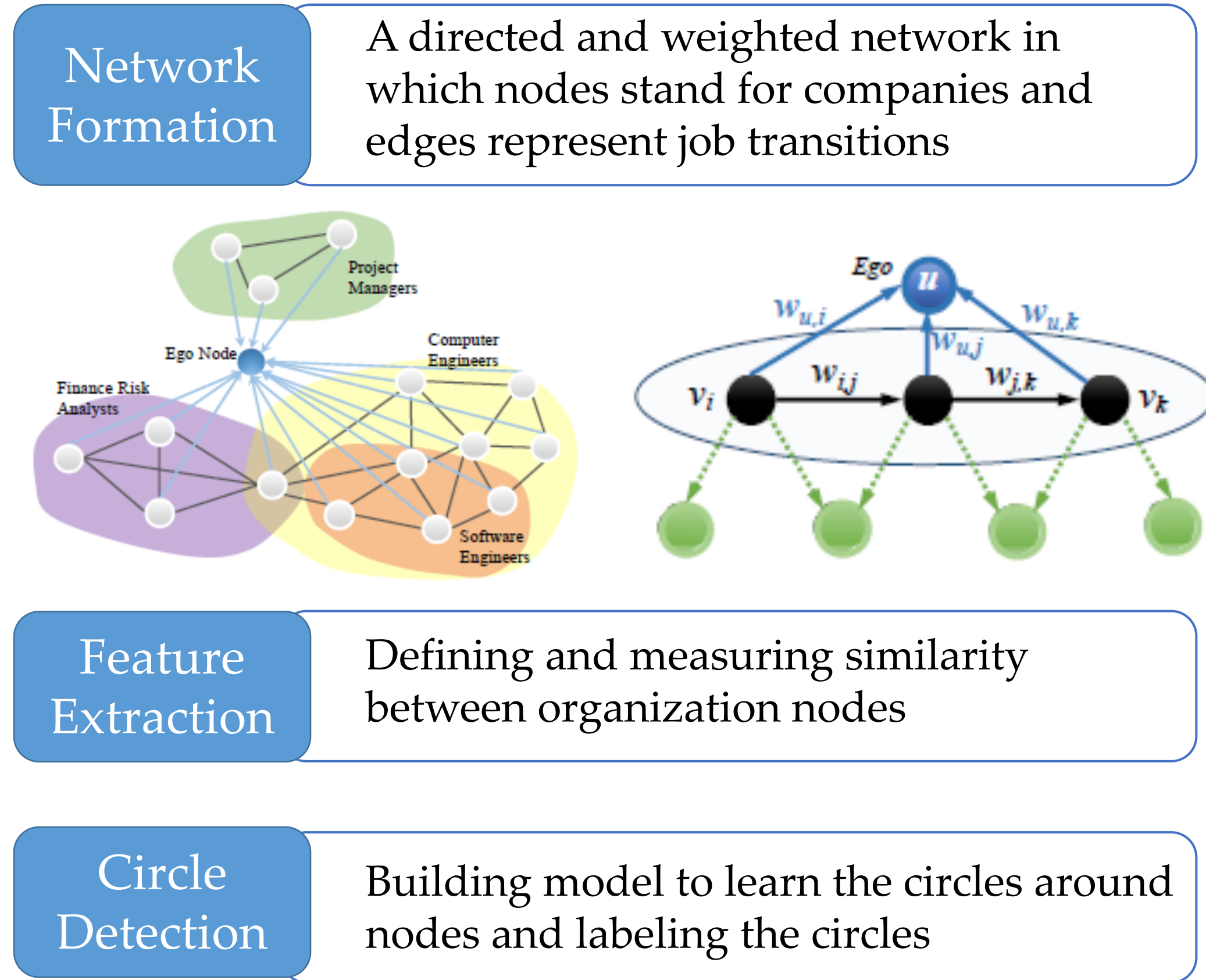
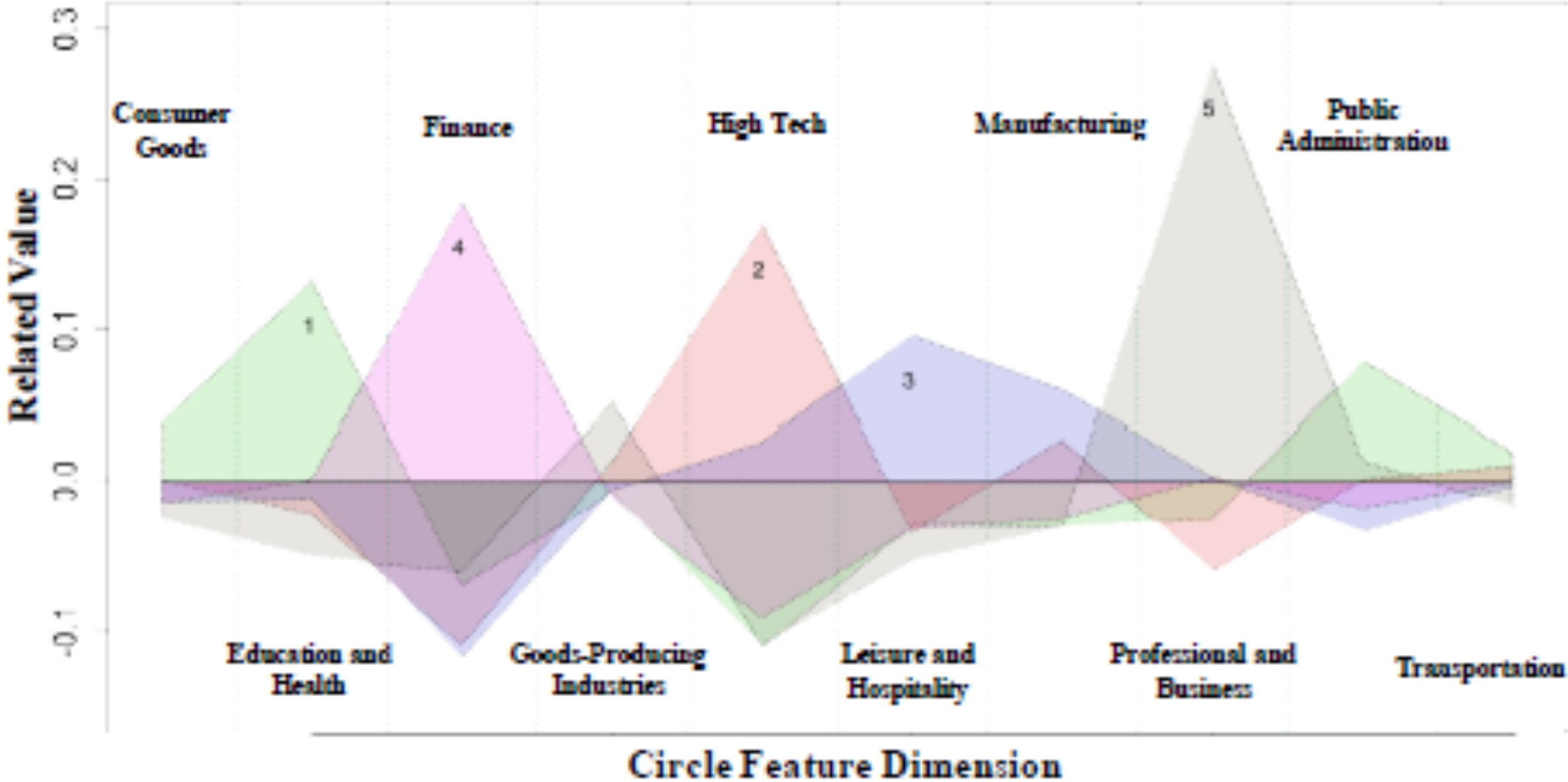
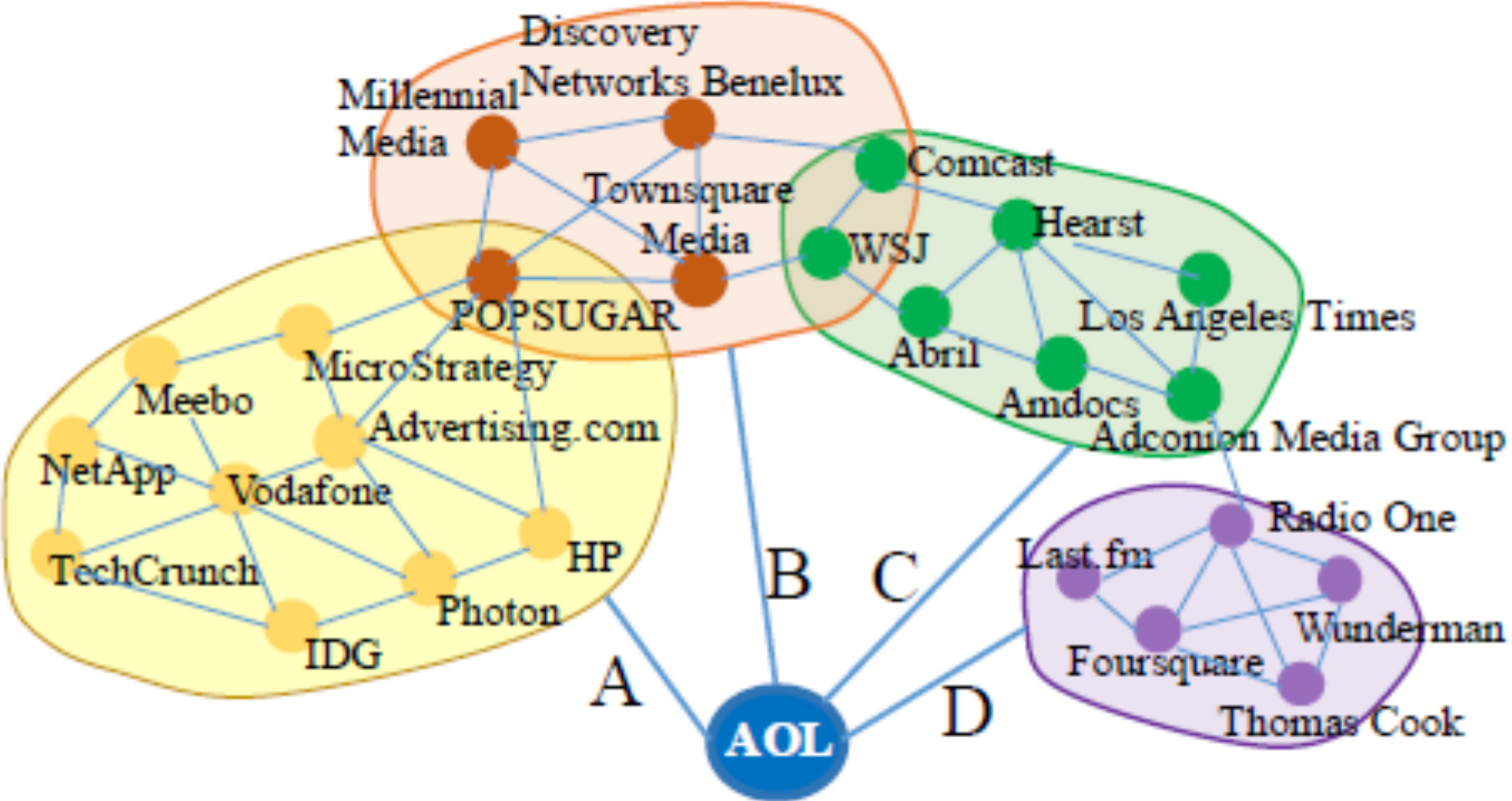


Figure 2: The framework of talent circle detection.



# Talent Circle Detection



Detected talent circles of AOL Inc.'s Ego network. Companies in Circle A share employees offering financial services for instance

Different circles have distinct distributions on job topics. For example the circles of Citi is shown above

Ego	Circle	Top Organization	Top Keywords	Job Title Summary
Citi Bank	1	Capco, RBS Markets and International Banking, HSBC, PwC, Lehman Brothers, HSBC Global Banking and Markets, USAA	project, process, management, finance, back office, retail, firmwide, mssql, query, infrastructure	Corporate finance, Project management, Change management
	2	UBS, Credit Suisse, Barclays Investment Bank, Bank of Montreal, Newmark Grubb Knight Frank	stock, corporate, cash, compensation, extract, matlab, realtime, portfolio, oracle, model, data	Corporate/financial risk management
	3	YES Bank, John Hancock Financial Services, HSBC Private Bank, CHASE	finance, insurance, banker, private, systematic, equity, mortgage, rate, risk, business	Trading and Capital markets, Investment banking
	4	Sun Microsystems, Google, Palantir Technologies, D+H, Intel Corporation	visual, linear, predict, calculate, curve, java, system, algebra, compute, diagram, variable	Quantitative analytics, Desk strategist

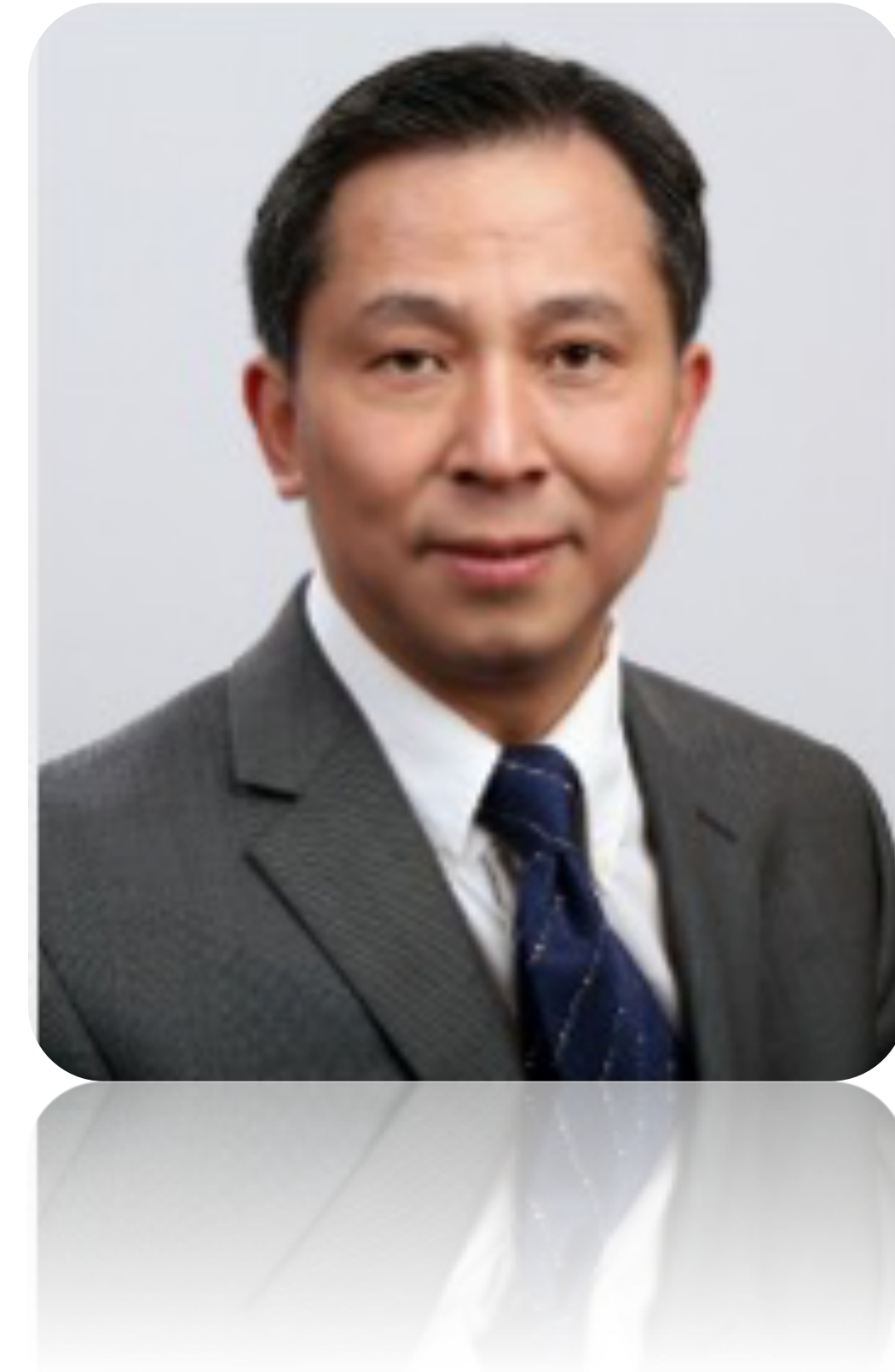
The 4 major circles of Citi Bank, and the talent type of each circle

# Take-home thoughts

- The combined power of big data and small data
- long term regular patterns vs. real-time evolving patterns
- Domain Knowledge + Technical Knowledge  $\alpha + \lambda \beta$



Q&A  
THANKS



<http://datamining.rutgers.edu>

Email: [xionghui@gmail.com](mailto:xionghui@gmail.com)

# Publication

- Chen Zhu, Hengshu Zhu, Hui Xiong, Chao Ma, Fang Xie, Pengliang Ding, Pan Li, Person-Job Fit: Adapting the Right Talent for the Right Job with Joint Representation Learning, ACM Transactions on Management Information Systems (**ACM TMIS**), 2018.
- Chuan Qin, Hengshu Zhu, Tong Xu, Chen Zhu, Liang Jiang, Enhong Chen, Hui Xiong, Enhancing Person-Job Fit for Talent Recruitment: An Ability-aware Neural Network Approach, In the 41st International ACM SIGIR Conference on Research and Development in Information Retrieval (**SIGIR-2018**) , San Francisco, CA, USA, 2018.
- Dazhong Shen, Hengshu Zhu, Chen Zhu, Tong Xu, Chao Ma, Hui Xiong, A Joint Learning Approach to Intelligent Job Interview Assessment, In Proceedings of the 27th International Joint Conference on Artificial Intelligence (**IJCAI-2018**) , Stocholm, Sweden, 2018,
- Tong Xu, Hengshu Zhu, Chen Zhu, Pan Li, Hui Xiong, Measuring the Popularity of Job Skills in Recruitment Market: A Multi-Criteria Approach, The 32nd AAAI Conference on Artificial Intelligence (**AAAI-2018**) , New Orleans, LA, USA, 2018.
- Ying Sun, Hengshu Zhu, Fuzhen Zhuang, Jingjing Gu, Qing He, Exploring the Urban Regionof-Interest through the Analysis of Online Map Search Queries, In Proceedings of the 24th ACM SIGKDD International Conference on Knowledge Discovery and Data Mining (**KDD-2018**) , London, United Kindom, 2018
- Huayu Li, Yong Ge, Hengshu Zhu, Hui Xiong, Hongke Zhao, Prospecting the Career Development of Talents: A Survival Analysis Perspective, The 23rd ACM SIGKDD International Conference on Knowledge Discovery and Data Mining (**KDD-2017**) , Halifax, Nova Scotia, Canada, 2017.
- Hao Lin, Hengshu Zhu, Yuan Zuo, Chen Zhu, Hui Xiong, Junjie Wu, Collaborative Company Profiling: Insights from an Employee's Perspective, The 31st AAAI Conference on Artificial Intelligence (**AAAI-2017**) , San Francisco, CA, USA, 2017.
- Chen Zhu, Hengshu Zhu, Hui Xiong, Pengliang Ding, Fang Xie, Trend Analysis of Recruitment Market with Sequential Latent Variable Model, The 22nd ACM SIGKDD International Conference on Knowledge Discovery and Data Mining (**KDD-2016**) , San Francisco, CA, USA, 2016.
- Huang Xu, Jingyuan Yang, Zhiwen Yu, Hui Xiong, Hengshu Zhu, Talent Circle Detection in Job Transition Networks, The 22nd ACM SIGKDD International Conference on Knowledge Discovery and Data Mining (**KDD-2016**) , San Francisco, CA, USA, 2016.