

Perceiving Societal Risk from On-line Community Concerns

Xijin Tang

Institute of Systems Science (since 1979)

Academy of Mathematics and Systems Science (since 1999)

Chinese Academy of Sciences

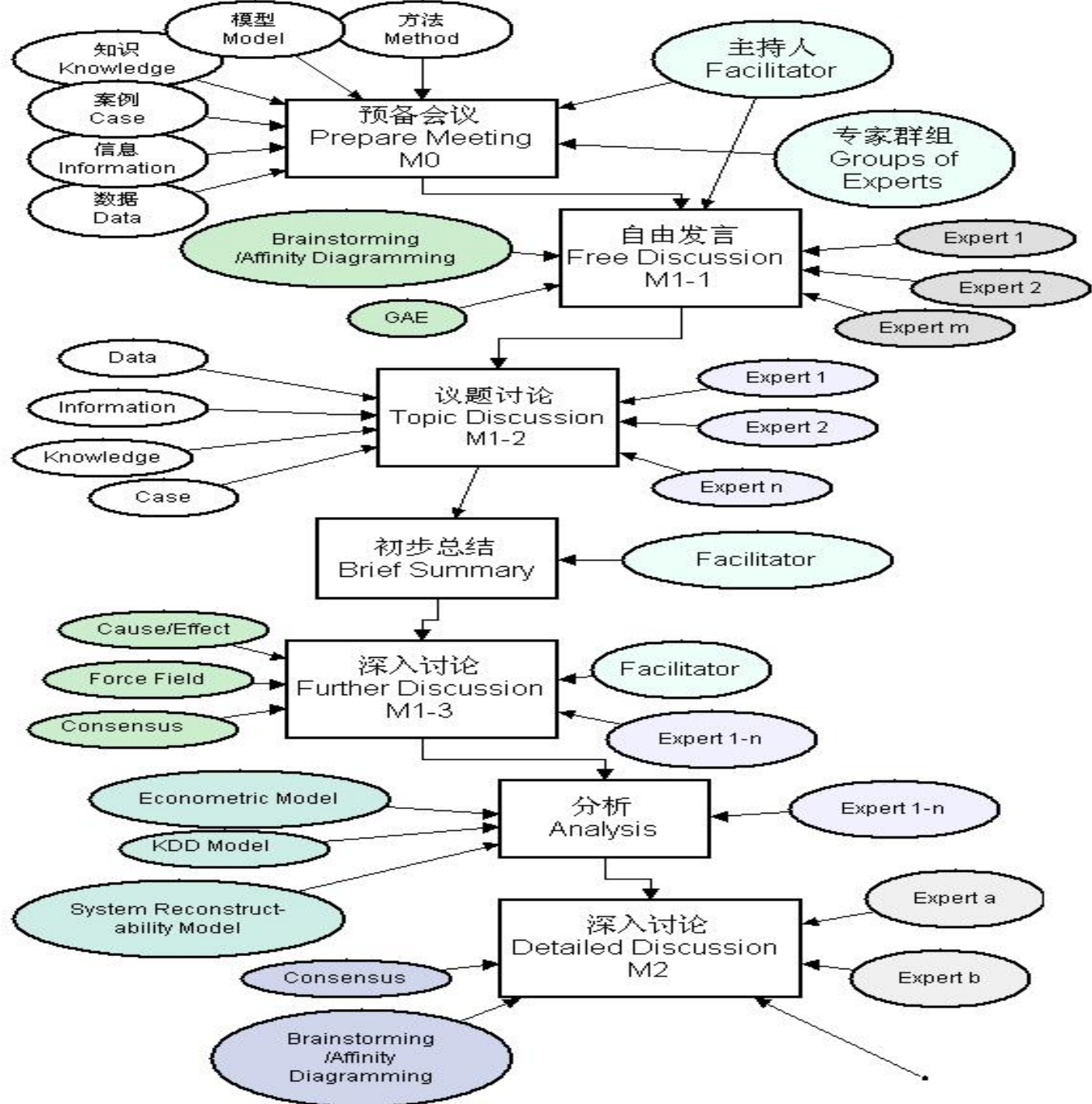
xjtang@iss.ac.cn

IIASA, November 11-13, 2015

JISR-IIASA Complex System Modeling Workshop 2002-2004















- Special Session on *Meta-synthesis Systems Approach* (MSA) was held on Sept 11 following CSM2003
- Demo: **How to evaluate the impact of SARS to China GDP growth by MSA**
- Results of a NSFC major project on MSA (1999-2003, evaluated in January of 2004)

MSA Working Process to Complex Problem Solving




















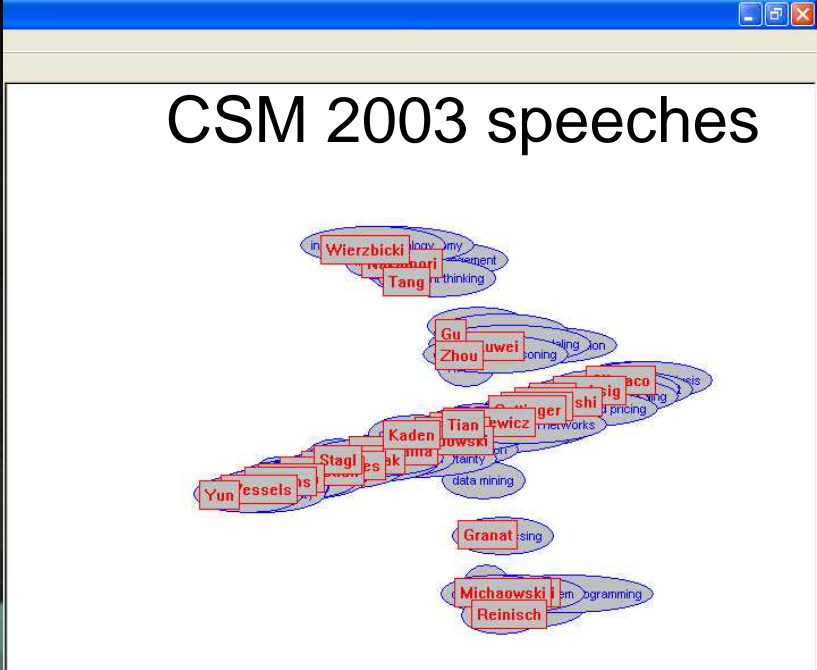
The Pathway of MSA Test on SARS Impact

Project Pathway | Project Information | Team Members | Action Items | Discussion History

	[<input checked="" type="checkbox"/> Open	Description	Assigned To	Deadline
1		<input type="checkbox"/>	ISS-TEST (SARS) May, 2003		
2		<input type="checkbox"/>	■0 Prepare Meeting	xjtang	
3		<input type="checkbox"/> 	<i>Test Agendas</i>	xjtang	
4		<input type="checkbox"/> 	Test working flow	xjtang	2003-5-26
5		<input type="checkbox"/> 	Breif Introduction to Meta-Synthesis		
6		<input type="checkbox"/>	■1-1 Free Discussion		
7		<input type="checkbox"/> 	SARS GIS (China)		
8		<input type="checkbox"/> 	Relevant information -SARS	xjtang	
9		<input type="checkbox"/> 	Free Discussion 1: GDP growth		2003-6-2
10		<input type="checkbox"/> 	Free Discussion 2: How to Overcome SARS' s effect to China Economy		2003-6-3
11		<input type="checkbox"/> 	Group argumentation about GDP growth (GAE)	xjtang	
12		<input type="checkbox"/> 	Free Discussion 3: Economic Growth		
13		<input type="checkbox"/> 	Free Discussion 4: Fiscal Policy		
14		<input type="checkbox"/> 	Free Discussion 5: Monetary Policy		
15		<input type="checkbox"/> 	Free Discussion 6: Agriculture, Famers and Rural Problems		
16		<input type="checkbox"/> 	Free Discussion 7: Iraq War Effects		
17		<input type="checkbox"/>	■1-2 Topics Discussion		
18		<input checked="" type="checkbox"/> 	Further discussion about Economic problem and situation		

The Pathway of MSA Test on SARS Impact/2

18	<input checked="" type="checkbox"/>		Further discussion about Economic problem and situation		
19	<input type="checkbox"/>		Expert Opinion Summary		
20	<input type="checkbox"/>		M1-3 Further Discussion		
21	<input type="checkbox"/>		Design of Scenario about Economic Development		
22	<input type="checkbox"/>		Cause & Effect about Economic Scenario-High Trend		
23	<input type="checkbox"/>		Force Field Analysis - High Trend		
24	<input type="checkbox"/>		Cause & Effect about Economic Scenario - Mid Trend		
25	<input type="checkbox"/>		Force Field Analysis - Mid Trend		
26	<input type="checkbox"/>		Cause & Effect about Economic Scenario - Low Trend		
27	<input type="checkbox"/>		Force Field Analysis - Low Trend		
28	<input type="checkbox"/>		Discussion on Adjustment & Control Factors		
29	<input type="checkbox"/>		Scenario Description		
30	<input type="checkbox"/>		Analysis	jfgu	
31	<input type="checkbox"/>		Macro Economic Forecasting Model	zhou	
32	<input type="checkbox"/>		Macro Economic Forecasting & Policy Model		
33	<input type="checkbox"/>		KDD Model	Tian	
34	<input type="checkbox"/>		System Reconstructability Model	Shu	
35	<input type="checkbox"/>		M2 Synthesis Discussion	jfgu	
36	<input type="checkbox"/>		Discussion on Analytical Results		
37	<input type="checkbox"/>		Consensus of GDP Growth		



Meta-synthesis approach to complex system modeling

Jifa Gu, Xijin Tang *

*Institute of Systems Science, Academy of Mathematics and Systems Sciences, Chinese Academy of Sciences,
55 Zhongguancun Donglu, Beijing 100080, PR China*

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Available online 19 August 2004

Abstract

Meta-synthesis method is proposed to tackle with open complex giant system problems which cannot be effectively solved by traditional reductionism methods by a Chinese system scientist Qian, Xuesen (Tsien HsueShen) around the early 1990s. The method emphasizes the synthesis of collected information and knowledge of various kinds of experts, and combining quantitative methods with qualitative knowledge. Since then, continuous endeavors have been taken to put those ideas into practice. In this paper, firstly we review meta-synthesis approach and other research relevant to complex system modeling briefly. Then we discuss two main issues, model integration and opinion synthesis, which are often confronted when applying meta-synthesis approach, together with an exhibit of the development of an embryonic meta-synthetic support prototype. Such a demonstration shows how to model complex problems, such as macro-economic problems in Hall for Workshop on Meta-Synthetic Engineering with versatile resources in information collection, model integration and opinion synthesis. Finally, some future work is indicated.

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Keywords: Decision support systems; Meta-synthesis; Complex system; Modeling

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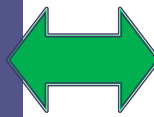
The blind and the elephant

Framework of MSA Study

Unstructured, wicked, OCGS problems; **issues**

MSA

Problem Structuring Methods



Qualitative MS

Expert Opinion Synthesis

Meta-synthetic Systems Modeling

Creativity Support System

Hypothesis generation

Consensus METHOD

Brainstorming, Vote, Delphi, AHP, MCDM, NGT, etc.

MODELING

6 Strategies, mechanism based, analog based, data based, rule-based, scenario based & learning based

Opinion Dynamics

Consensus Process

GSS, CSCW, Knowledge management systems

Model integration

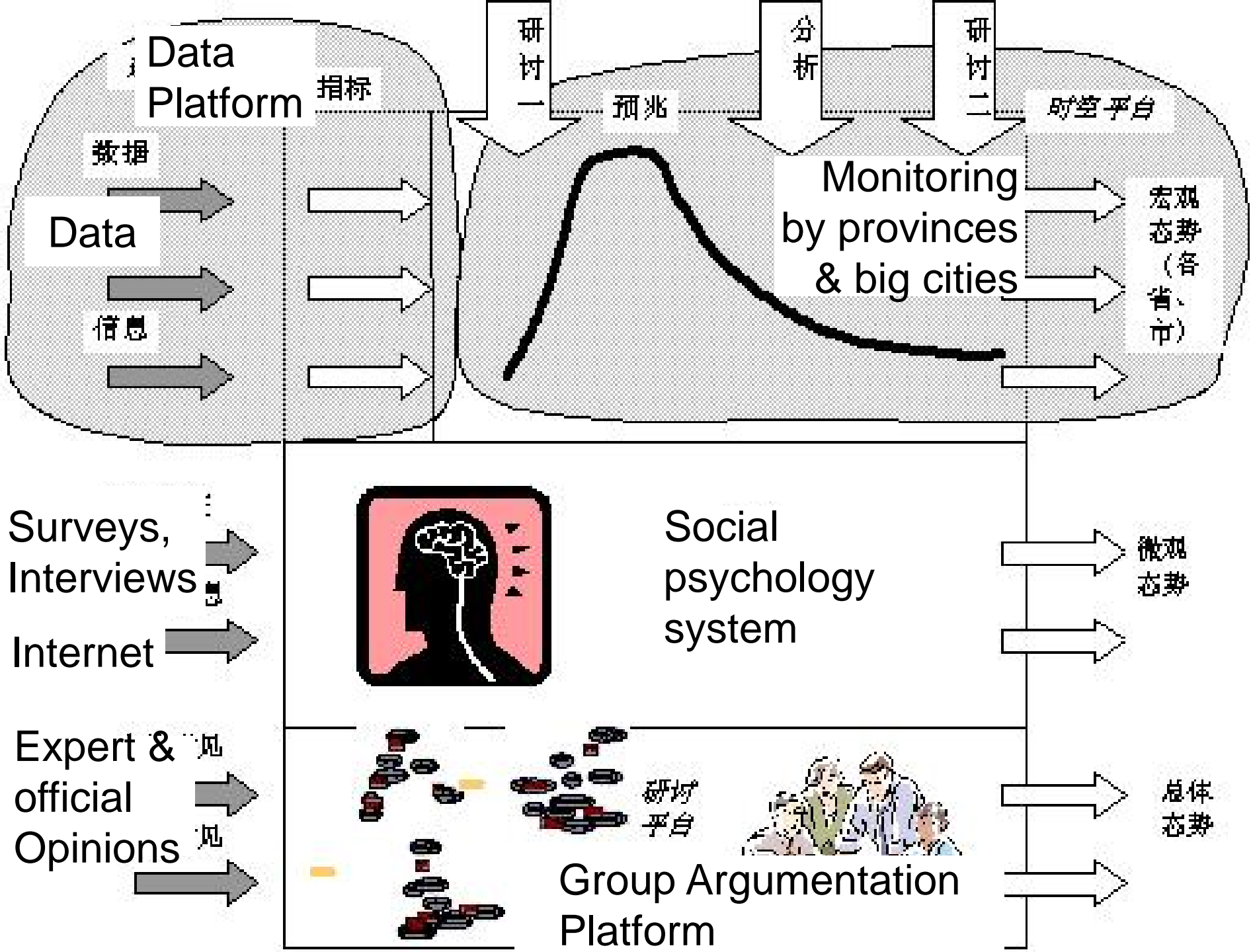
On-line Opinion Mining

About Opinions

- **Expert opinions**
 - Expert may tend to follow policy-makers.....
- **Community /public opinions**
 - BBS, On-line Forum, Social Media
 - Genuine experts?

Challenges in Societal Management during Society Transformation

- ◎ Social Alarming System by Chinese social scientists, 1995
 - “China averaged 500 large-scale protests per day” in 2011
 - Many wicked problems: environment pollution & safety (air, water, soil, etc.), family planning -> labor shortage,...
- ◎ 2004 (2005) Scientific Development Concept; *Harmonious Society* (Xiaokang Society)
 - A research project on Social Stability Alarming System (2004-2006) by Chinese Academy of Sciences
 - CAS involved institutes (4): Policy & Management, Geography, Psychology, Systems Science



No data!

Data inaccessible!

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How to measure the state of a Societal System

- **The Gini coefficient/index (since 2008)**
- **The Legatum Prosperity Index**
 - **Average Life Satisfaction Ranking (2011, 80/142),**
 - **Per Capita GDP Ranking (2010, 77/142),**
 - **WEF Global Competitiveness Index (2011, 26/142),**
 - **UN Human Development Index (2011, 101/187),**
 - **Heritage/WSJ Economic Freedom Index (2011, 135/179),**
 - **Transparency International Corruption Perceptions Index (2011, 75/182)**
 - **World Bank Doing Business Index (2012, 91/183)**

Happiness Index

- 1972, King of Bhutan (40 square km), *Gross National Happiness*
- World Happiness Report (yearly)
 - Gallup World Poll (GWP)
 - World Values Survey (WVS)
 - European Social Survey (ESS)

Domestic Research Comparison

- **Chinese Revitalization Index**
- **Progress in Xiaokang Society Construction**
(National Statistics Bureau)
- **Chinese Family Happiness Development Index** (sociologist)

Harmony Index by provinces

- Report on 2001-2005 Harmonious Society Index (HSI) by **Beijing Bureau of Statistics**, October of 2006
- 34 indicators by 3 categories
 - **reality of social conflicts** (13: the poor-rich gap (3), social stability (5), resources & environment (5))
 - **social intervention capabilities** (15: social security(4), public opinions (2), legal system (4), emergency responses (2), and community services (3))
 - **social attitudes and requests** (6)
- 2006 Beijing's HSI was 115.77 with measurement of 21 indicators. The annual average growth between 2001 and 2006 was 2.47%.

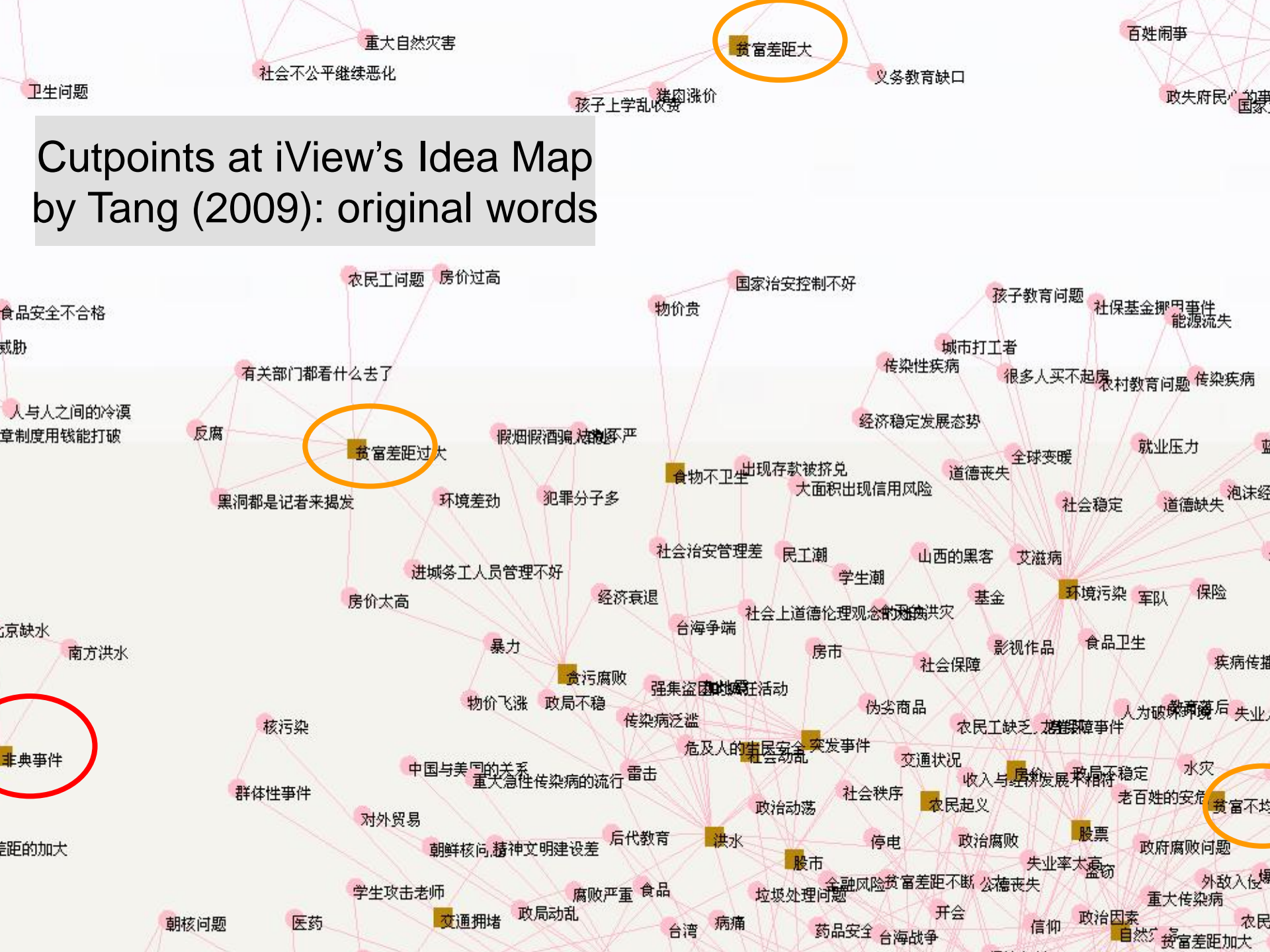
Psychological Harmony Levels

- CAS Institute of Psychology
- **Periodical survey** on socio psychological harmony indicators to monitor public attitudes and sensed symptoms of the mass incidents in **Guangdong province** (spent a lot of money!)
- Aim to build one **social management decision support system** and platforms to monitor **public attitudes** across the country for **early warning** of social conflicts.

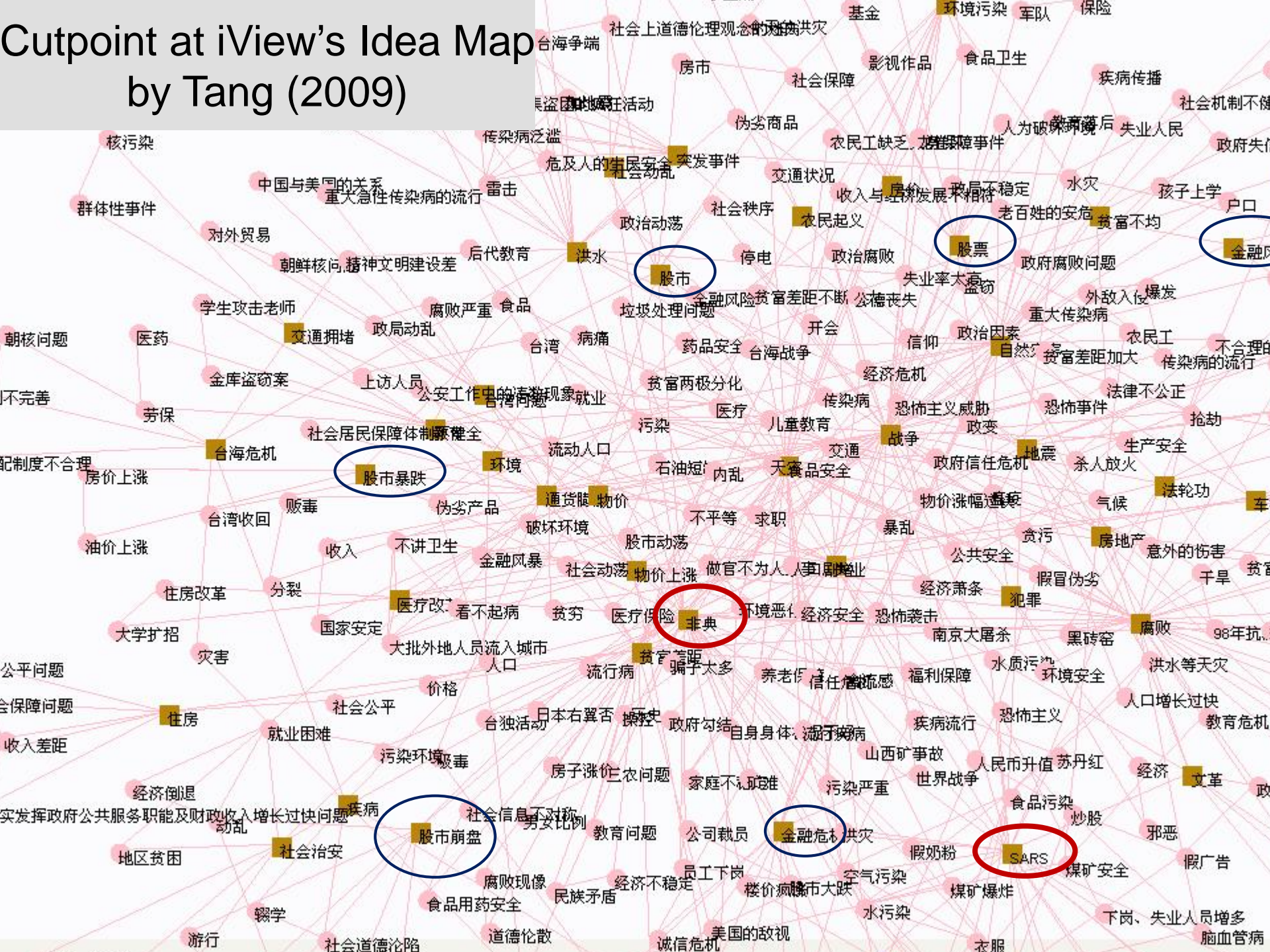
Societal Risk Perception: Approach

- ▶ **Word association about societal risk in Beijing
(Subjects: 321; Words: 585; 2007)**
- ▶ **Traditional social psychological way: questionnaire**
 - **Conduct word coding and build a Societal Risk framework by socio psychology specialists**
 - **Conduct further comprehensive survey**
 - **Construct structural equations (qualitative modeling) and validation**
- ▶ **Try qualitative meta-synthesis iView analysis
(CorMap/iView)**

Cutpoints at iView's Idea Map by Tang (2009): original words



Cutpoint at iView's Idea Map by Tang (2009)



Critical risky events

- ▶ 30 categories of risky events/hazards by (human) coding;
- ▶ Cutpoints (computer): stock, natural disaster, epistemic, pollution, war, crime, food safety, corruption, goods price, education, price of household, terrorism, social events, safe production, health, traffic, population, governance, etc.

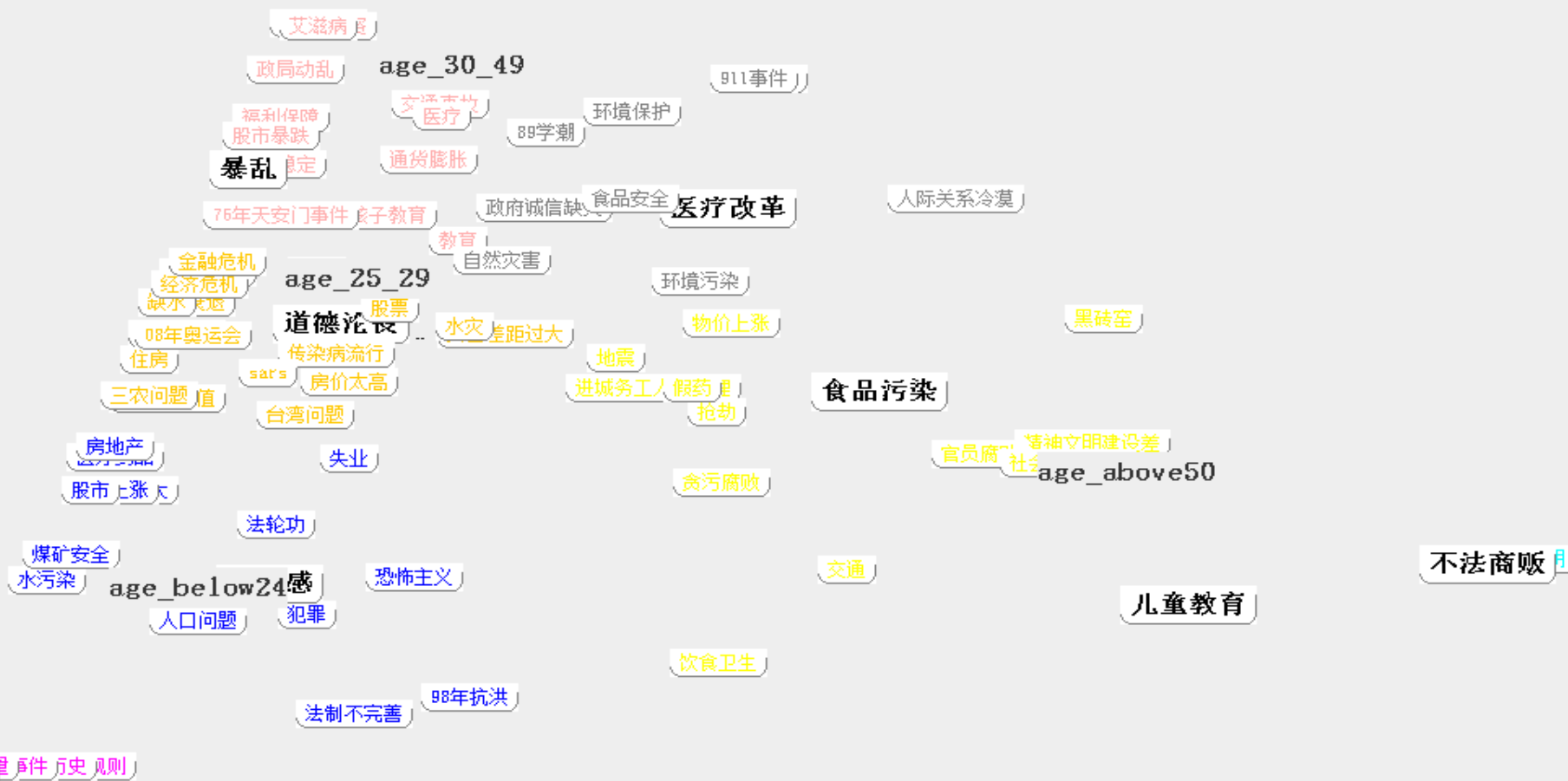
<i>Risk (7)</i>	<i>Sub Category (30)</i>
National Security	Terrorism & Cults, Taiwan Issue, Political Stability, National security and foreign relations, Beijing Olympic Games*
Economy & Finance	Financial Problems, Economic Problems
Public Morals	Ethics & Morality, Integrity & Reputation, General Mood of Society
Daily Life	Health, Education, Employment, Prices, Transportation, Food and Medicine Safety, Housing, Fake & Shoddy Goods
Social Stability	Serious Epidemic, Poor-Rich Gap, Safety at Work, Crime & Mass Incidents, Issues on agriculture, farmer and rural area
Government Management	Corruption and Degeneration, Governance Ability, Legal System, Social Security & Social Warfare
Resources & Environments	Natural Disaster, Population, Energy Shortage & Environment Pollution

Difference between different variables

- ▶ Age
- ▶ Profession

CorMap: Difference in Age (original words 585)

巴林银行倒闭 程 辰 自 示



CorMap: Difference in Age (30 categories of risks)

信用与诚信

社会福利与保障

金融问题

经济问题

08年奥运会

国家安全与对外关系

重大传染性疾病

三农问题

社会人口问题

恐怖主义

台湾问题

安全生产

食品与药品安全

医疗与疾病

社会风气与精神文明建设

交通问题

age_30 age_25_29

能源短缺与环境污染

政府执政能力

假冒伪劣

物价上涨

教育

age_above50

伦理道德

贫富与城乡差距

贪污腐败

治安犯罪与群体性事件

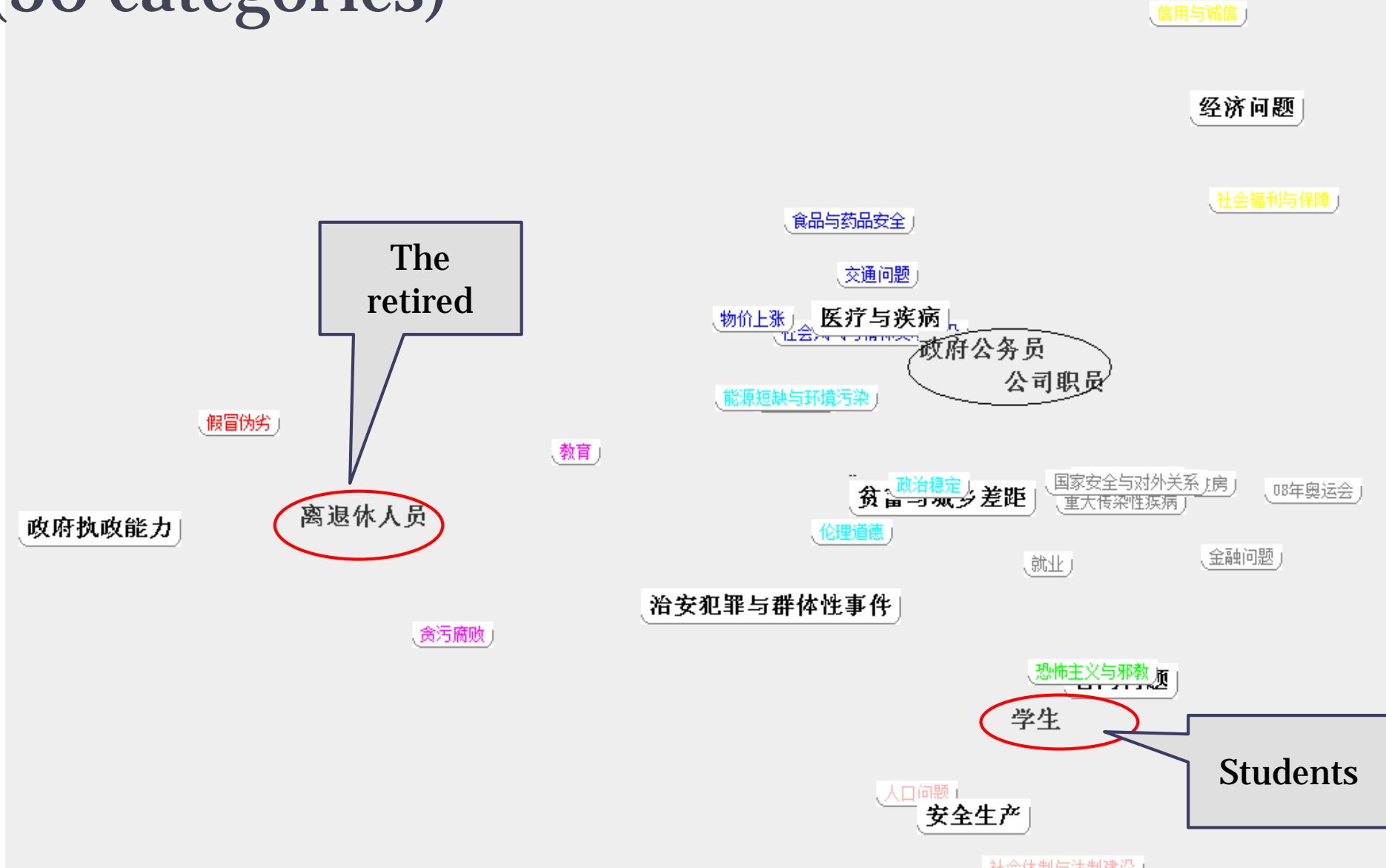
慈善

社会人口问题

age_below24

台湾问题

CorMap: Differences in Profession (30 categories)



- **Many relevant social indicators**
- **Problems in computing social indicators**
 - **Yearly report**
 - **Both objective and subjective assessment**
 - **Data access issue**
 - **Big contrast between official published results and community understanding**
- **Try other ways !**

On-line Information - Community concerns

- Hot search words (search engine, eg. Baidu)
- BBS (eg. Tianya Forum)
- Social Media (twitter-like Weibo)

Tang X J. Exploring On-line Societal Risk Perception for Harmonious Society Measurement. **Journal of Systems Science and Systems Engineering**, 22(4):469-486, December 2013.

Baidu Hot News search words

Baidu 新闻

新闻 网页 贴吧 知道 MP3 图片 视频 地图

百度一下

[帮助](#) | [高级搜索](#) | [设置](#)

新闻全文 新闻标题

以下新闻由机器每5分钟自动选取更新

新闻首页 国内 国际 军事 财经 互联网 房产 汽车 体育 娱乐 游戏 教育 女人 科技 社会 视频 图片 最新 定制 更多>>

焦点新闻

动车脱轨: 动车事故遇难司机之子画出父亲出事场景

热点100 博洋乐+婚庆节满399减100

甬温线动车出现大面积延误 大批旅客滞留

[动车事故致21份遇难者理赔协议] [铁路职工扣工资用于赔偿纯属谣言]
[铁道部人士称信号设备缺陷不是事故结论] [信号设备已全国整改]

故宫文物损坏后处理违规 内部禁接受采访

[网友质疑其故意瞒报] [故宫称文物损坏未隐瞒 摸清原因才能上报]

汇丰宣布2013年之前裁员30000人

- 中国红十字会回应“捐款时间早于地震”等疑问 08-01 21:13
- 美国违约警报暂时解除 “驴”“象”各有得失 08-01 19:33
- 德国对美提高债务上限达成一致表示欢迎 00:52
- 审计署: 黄河流域污水处理设施两成未完工 08-01 19:20
- 媒体称重庆2200元“天价榨菜”成本仅4元 08-01 18:04
- 广州至太原列车上演惊险一幕 两乘客大把撒现金 08-01 19:44
- 国内航空公司周二上调800公里以上燃油附加费 08-01 22:20



动车遇难司机之子画出出事场景



汪峰献歌动车
遇难者 乐迷默哀



利比亚反对派
开妇女武装训练营

新闻热搜词

动车追尾·中国首艘航母·美债危机

汇丰大裁员 甬温线 延误 故宫 否认瞒报
孙杨破纪录 美债 上限 中国农大 味千
国安1-1恒大 广西 严重电荒 篮协 NBA短工
红十字 查询平台

南京换路牌 1亿 锋芝婚变 转机
周立波 金钟奖 科比 CBA 草地哥 涉造假
皇马 广州 印度火车事故 富士康 机器人
超强台风 梅花 江苏 全民放贷

为您推荐

博客·论坛

- 曼城3800万先生前途生变 曼乔逼高层另购神锋
- 英国女王外孙女与橄榄球员完婚(组图)
- 揭秘北京口腔溃疡疾病症疗法技术发展的“日本足球模
- 阿奎罗转会引发蝴蝶效应 标王恐逼走曼城四主力
- 阿圭罗宣称融入曼城没问题 前辈看好福兰送去祝福

Hot News
Search
Words

国内 进入>>

D3115动车脱轨 | 时政要闻 | 台湾 | 港澳

红十字会平台试运行被喻早产:是靶子,还是盾牌? 00:34

- 红十字会收钱的时候怎么不嫌麻烦
- 玉树地震成灾只捐了6毛钱?



上海新闻 [更换城市]

更多>>

- 雷暴雨昨袭沪 3号线故障两个半小时
- 故宫又出人祸: 哥窑宋瓷因失误成碎片
- 京沪高铁满月风光不再 最多七成空座

e 百度掘金

On-line opinion mining

- **On-line opinion mining**
 - Topic model: LDA, DTM, ...(Tianya Forum Topic mining)
 - Behavior Analysis
 - Sentiment vs. Stance
- **Systems to acquire data**
 - Baidu Vision 1.0
 - Tianya Vision 2.0

- Web 1.0
 - Search query eg. Baidu Hot News Search Words
 - BBS posts, eg. Tianya Forum
- Web 2.0
 - Blogs, microblog



On-line Societal Risks
Perception?

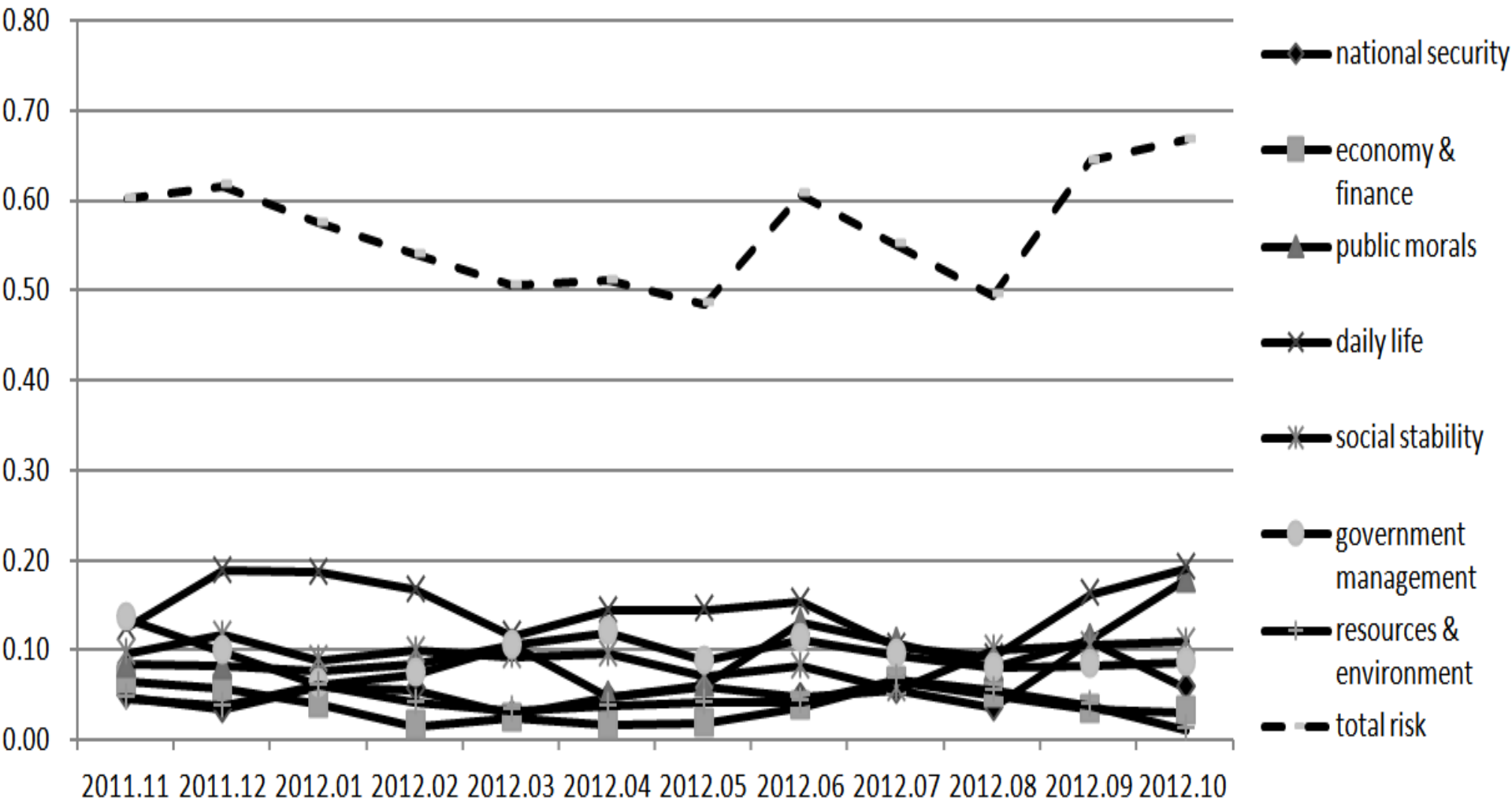
Category of Societal Risks
National Security
Economy & Finance
Public Morals
Daily Life
Social Stability
Government Management
Resources & Environments

Monitoring societal risk levels by search words and BBS posts

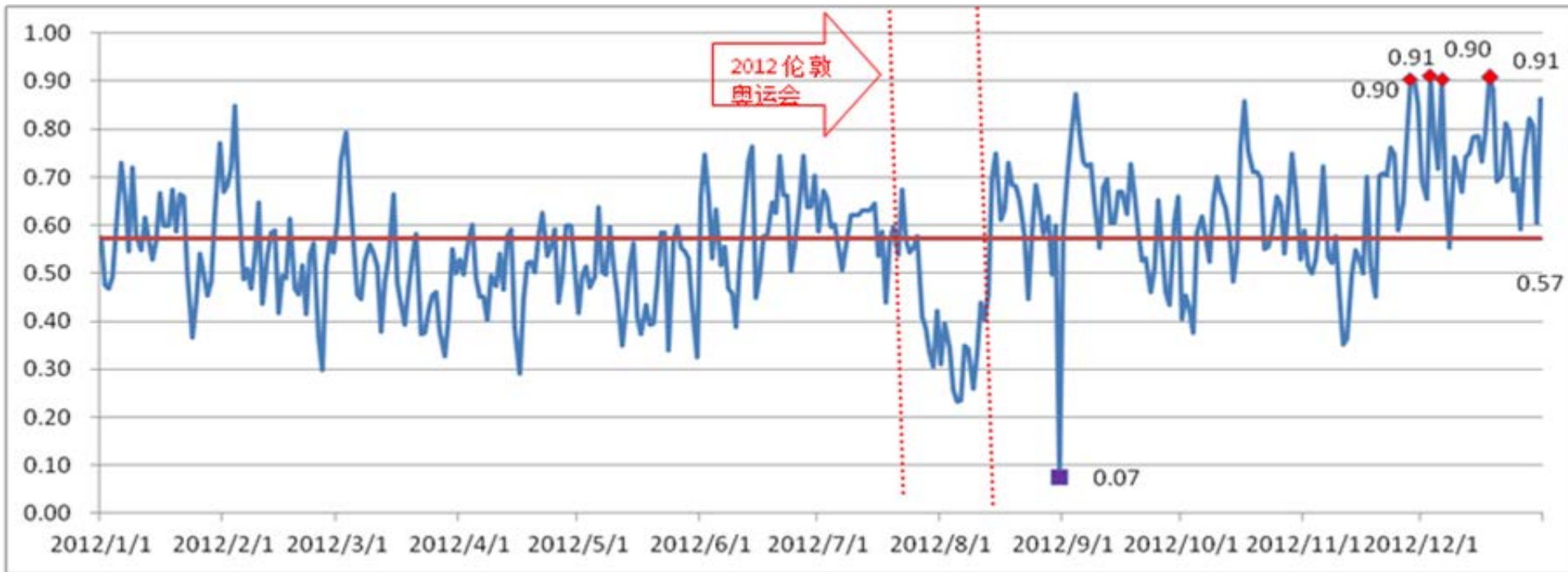
- Crawl Baidu hot search words every hour and BBS posts every day;
- Relate/Map hot search words/posts to societal risks manually (later machine learning + human revision)
- Rank the whole day words by hot degree or frequency, and highlighted events by clustering of posts
- Risk level = sum of frequency of risky words / total frequency of daily words

(since March of 2011)

Monthly Risk Level by Baidu Hot News Search Words (Nov of 2011 to October of 2012)

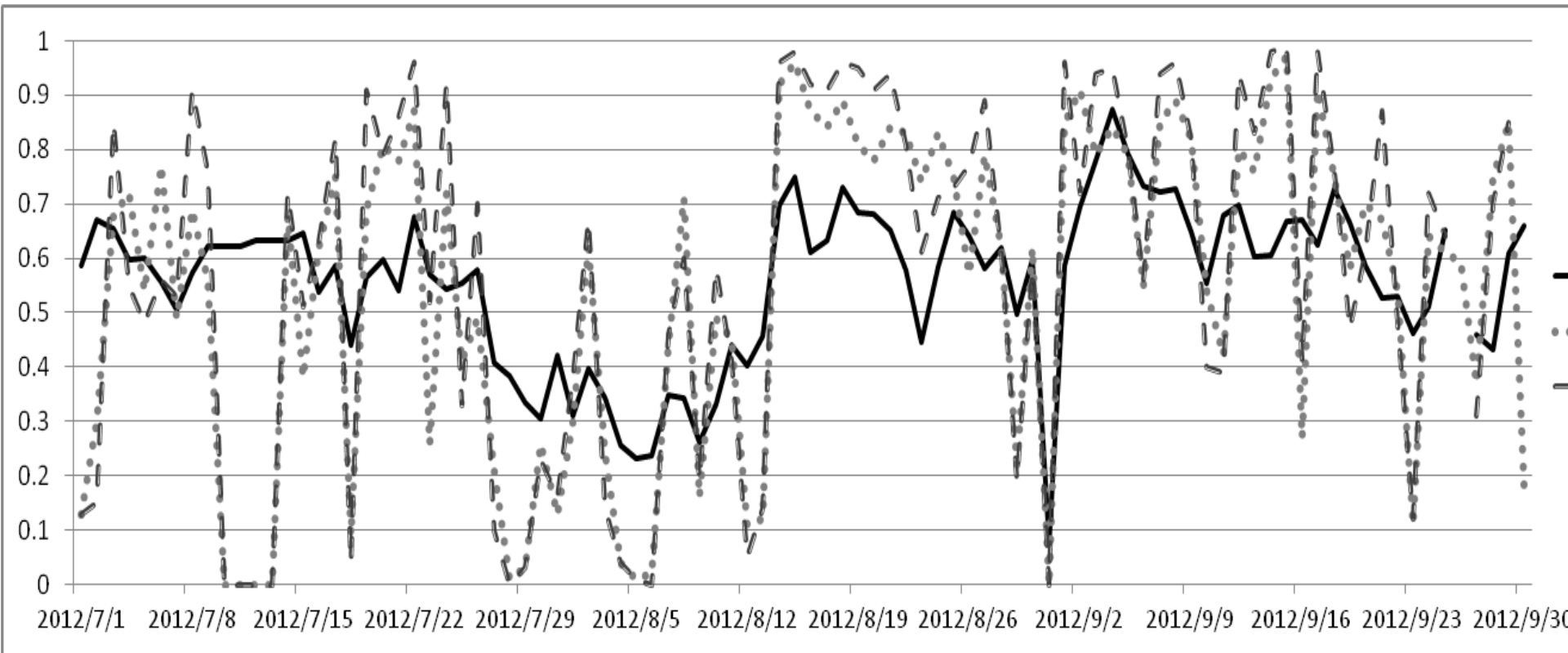


2012 Societal risk levels by Baidu Hot New Words (daily)

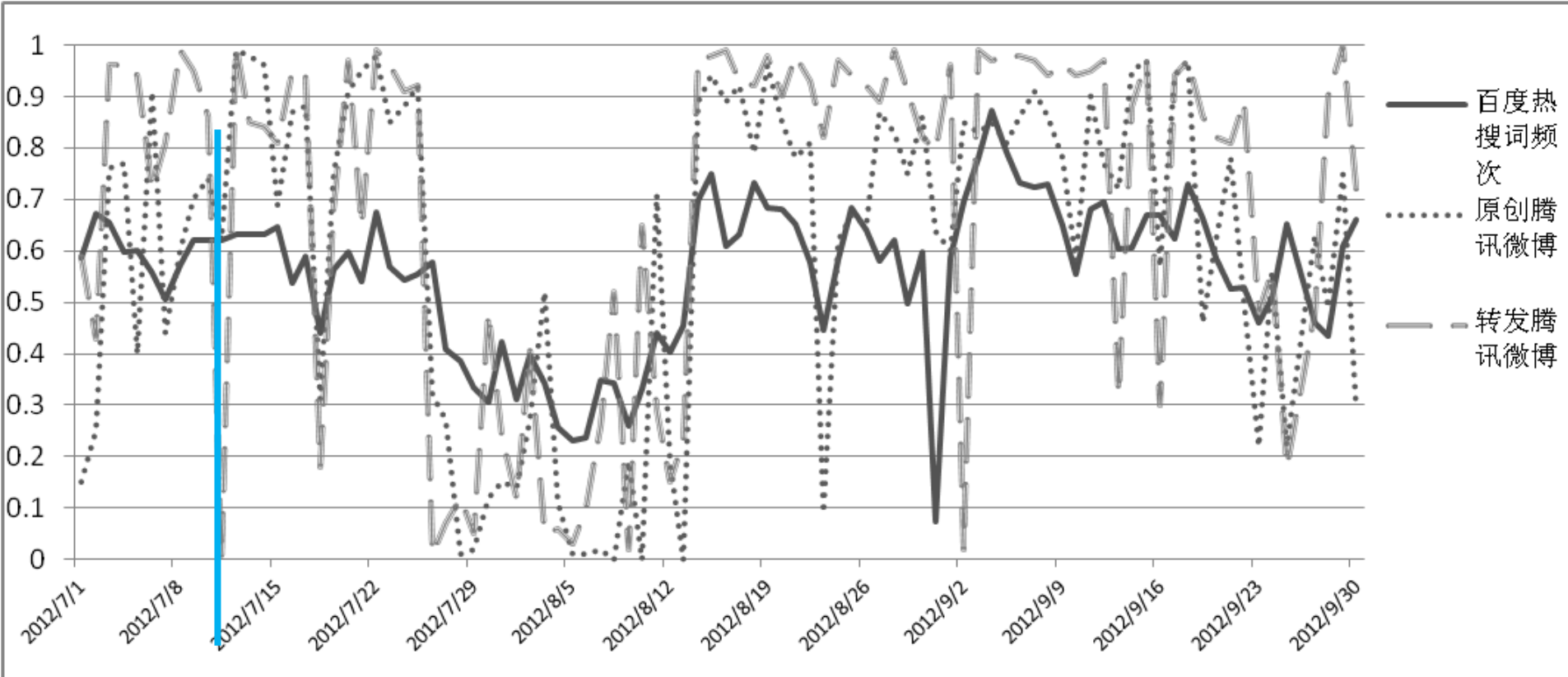


Amplified Effects by Weibo: Sina Weibo

Daily risk level through Baidu hot word, original Sina Weibo and retweeting Sina Weibo

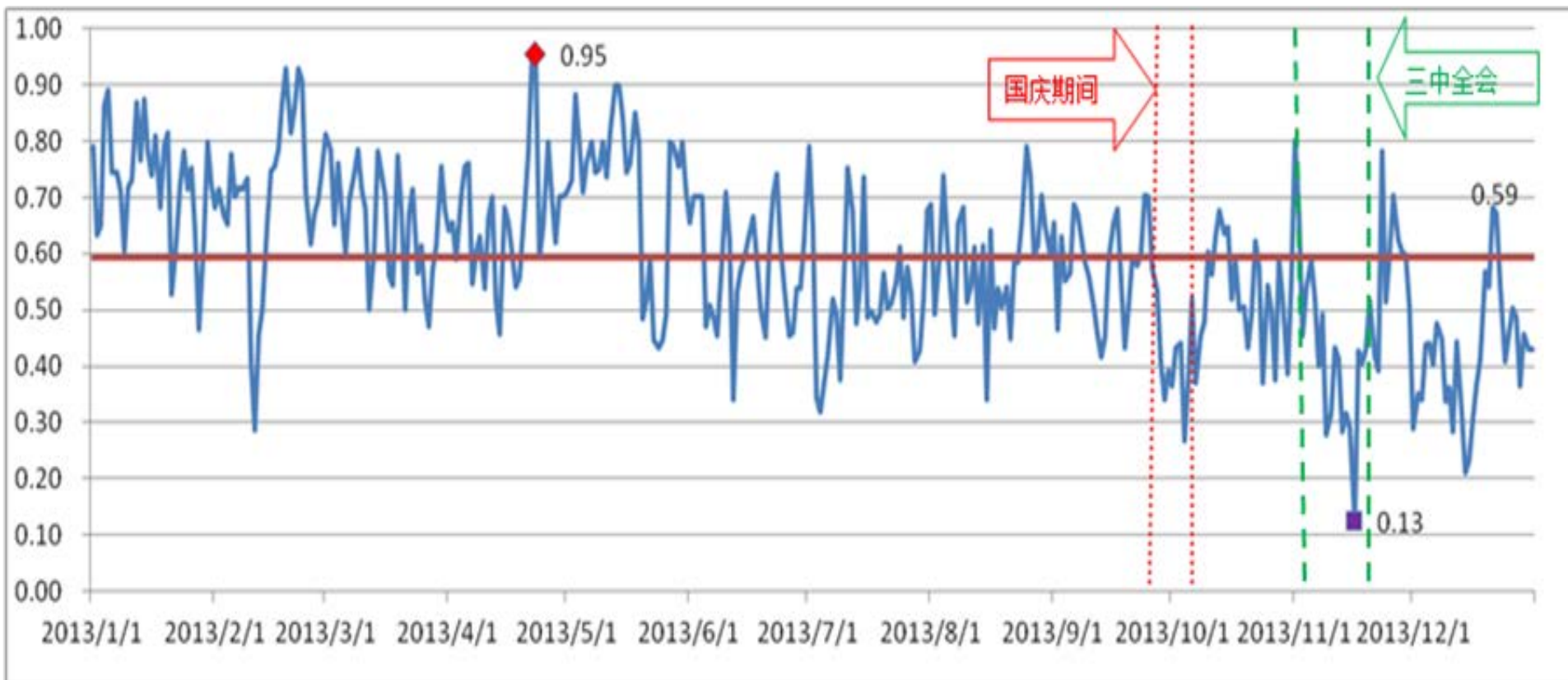


Amplified Effects by Tencent Weibo



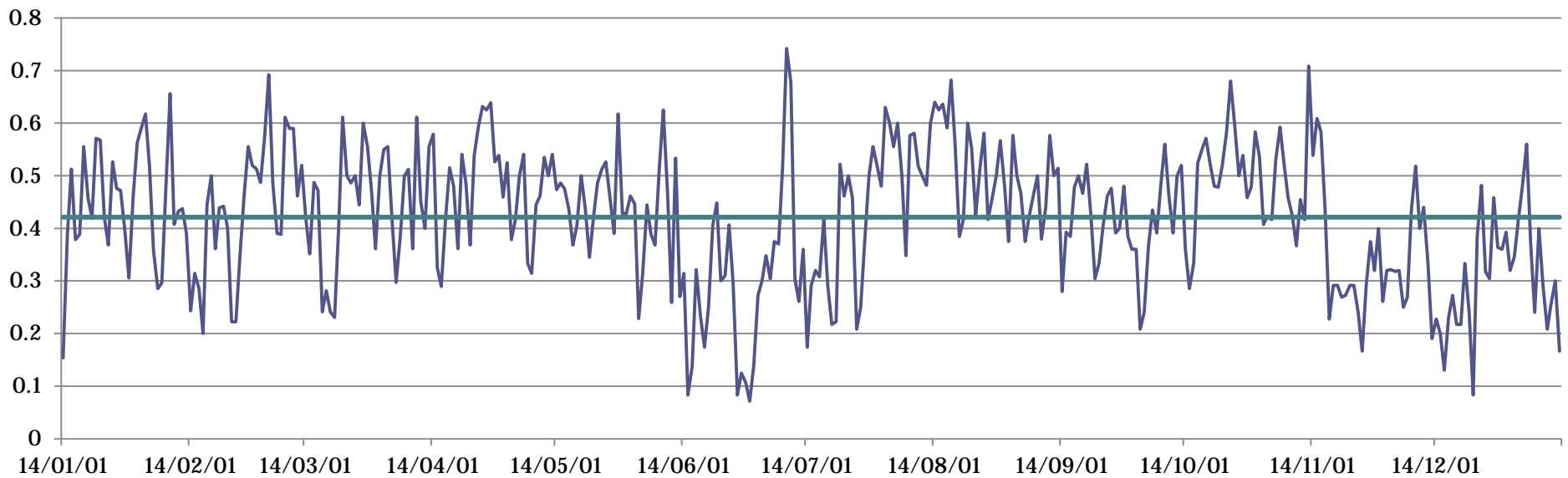
2013 Societal risk levels by Baidu

Hot New Words

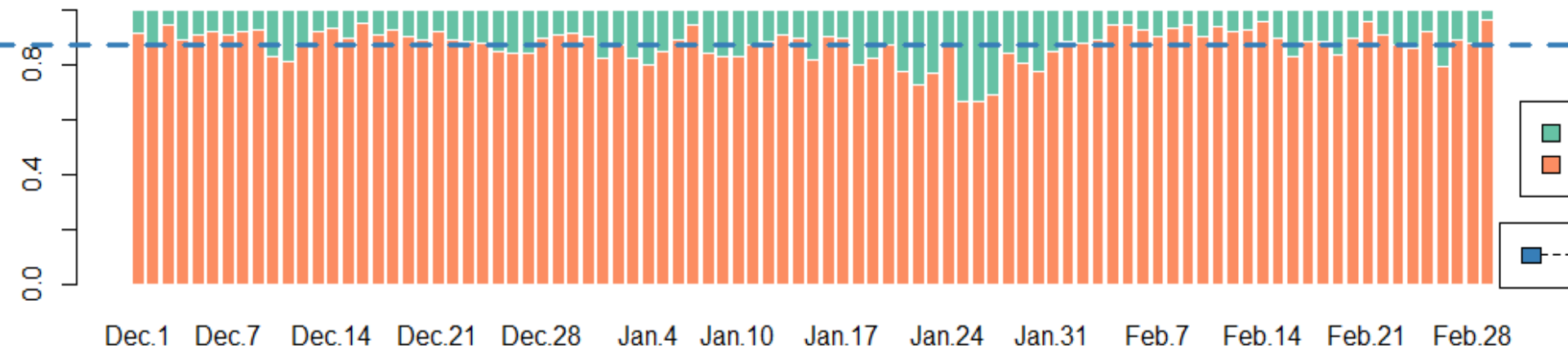


2014 Societal risk levels by Baidu Hot New Words

- World Football Cup; APEC



Daily Risk Level by Tianya Zatan Board posts (Dec of 2011 to Feb of 2012)



2011年11月份-2012年2月份

Challenges to *Automatic Risk Identification* of Hot words or Tianya posts: Text Mining & Machine Learning

- Machine Learning results by SVM
 - Baidu Hot Search Words (around 40~70 words per day), 70%
 - Tianya Zatan (over 1000 new posts per day) , 50%
- Try other methods
 - ANN: up to 55%
 - Deep Learning

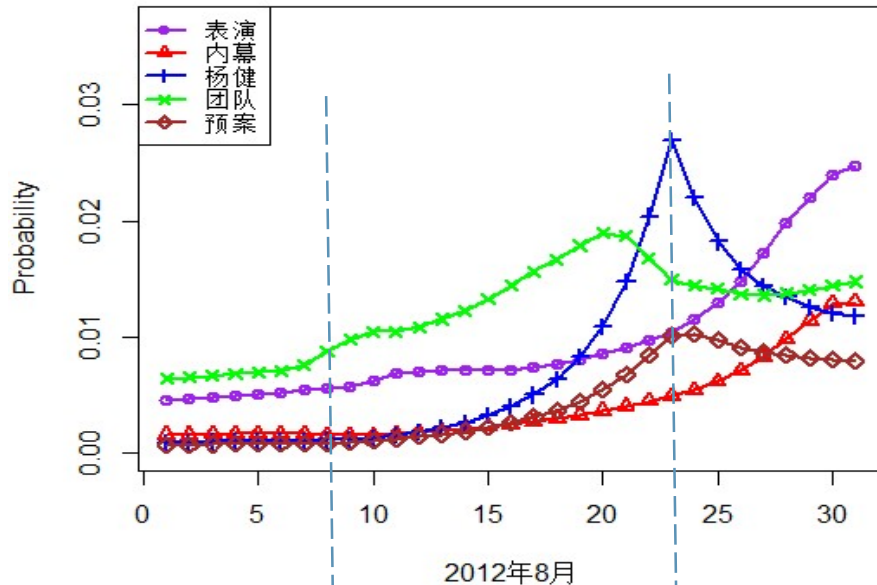
Challenges to *Automatic Risk Identification* of Hot words or Tianya posts

- Risk Transfer

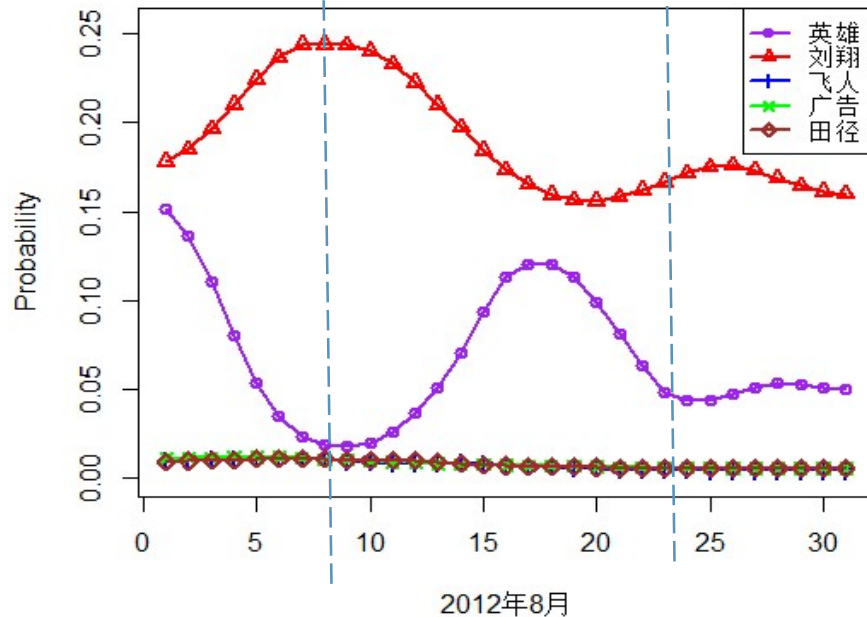
- LIU Xiang, a famous hurdles athlete

- “Liu Xiang’s failure in hurdles due to feet problem” (Aug 8 of 2012)/ “**daily life/health**”
 - “Liu Xiang’s show”/“**public morals**” with sub category of “**integrity & reputation**”.
 - “Liu Xiang went USA for surgery” as “**daily life/health**” in October of 2012 (while the texts of the news still address the process of whole events)

话题“刘翔比赛”下的热门词语



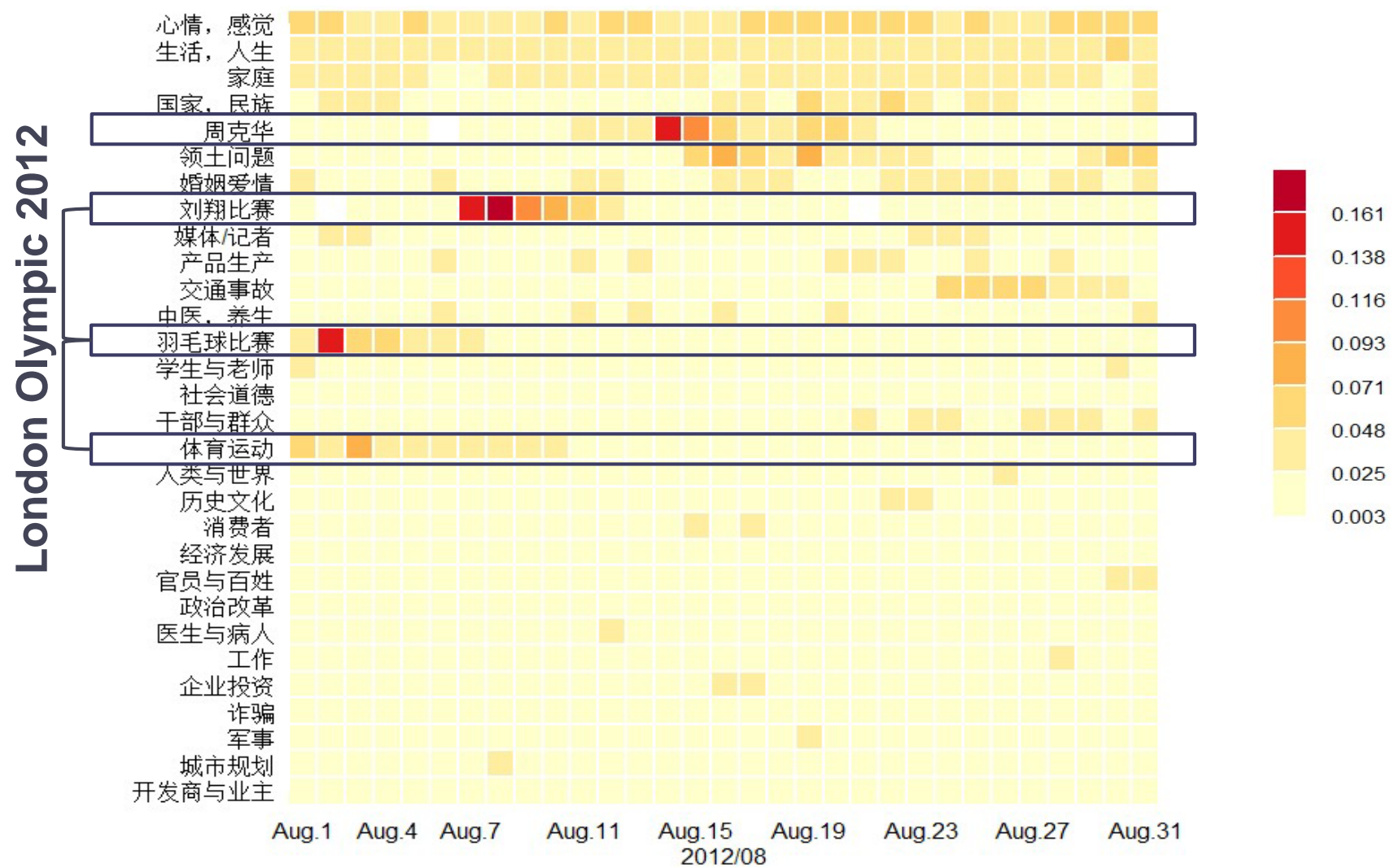
话题“刘翔比赛”下的冷门词语



Words Evolution by case of Liu Xiang's Competition

时间戳	话题“刘翔比赛”下的前十个词语
8月1日	刘翔, 英雄, 比赛, 广告, 运动员, 飞人, 田径, 伤病, 成绩, 冠军
8月4日	刘翔, 英雄, 比赛, 运动员, 广告, 飞人, 田径, 伤病, 成绩, 终点
8月7日	刘翔, 比赛, 英雄, 运动员, 广告, 飞人, 田径, 伤病, 赛场, 终点
8月10日	刘翔, 比赛, 英雄, 运动员, 跟腱, 赛场, 团队, 田径, 广告, 时间
8月13日	刘翔, 英雄, 比赛, 运动员, 团队, 终点, 时间, 赛场, 田径, 冠军
8月16日	刘翔, 英雄, 比赛, 团队, 运动员, 终点, 时间, 体育, 国人, 广告
8月19日	刘翔, 英雄, 比赛, 团队, 运动员, 终点, 体育, 杨健, 表演, 时间
8月22日	刘翔, 英雄, 比赛, 杨健, 团队, 运动员, 终点, 表演, 体育, 伤情
8月25日	刘翔, 英雄, 比赛, 杨健, 团队, 运动员, 表演, 终点, 伤情, 状态
8月28日	刘翔, 英雄, 比赛, 表演, 运动员, 团队, 杨健, 终点, 内幕, 体育
8月31日	刘翔, 英雄, 表演, 比赛, 运动员, 团队, 内幕, 杨健, 终点, 体育

Topics: new posts published in August of 2012 Tianya Zatan Board



Cao and Tang (2014): **Topics and Trends of the On-line Public Concerns based on Tianya Forum**, Journal of Systems Science and Systems Engineering. 23(2): 212-230

Different ways to improvement

- By daily topics (100)
- By sentiments:
negative means risky?
- Difference in individual cognition
 - Time
 - Place
 - Context

Big Challenge!****

Application : Correlation

- **Weibo's emotion**
- **Shanghai Stock Market Index**

IEEE BESEC'2015 Best Paper Award

Summary

- Meta-synthesis Approach to Complex Problem Solving
- From group argumentation to on-line opinion analysis
- Issues when measuring a Harmonious Society
 - Data
 - Method: time consuming, high cost
- On-line concerns (Search words / BBS posts) :
augment to traditional social psychological approach
 - Map search words and BBS posts into the respective societal risk (**big labor!**)
 - Monitor daily/weekly/month risk levels
 - Improving machine learning performance



Thank you!
Comments?