

Real-Time News Verification System on Sina Weibo

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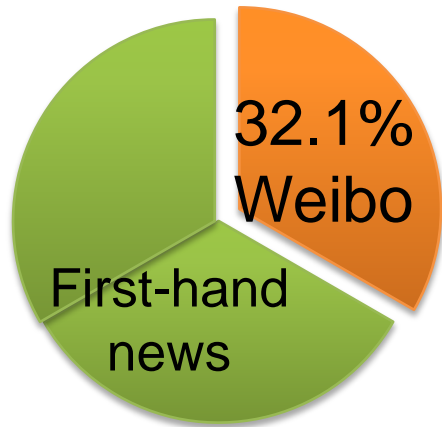
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Motivation---Situation of Web News



Web news is important for our life!

- more than **32.1%** of the first-hand information of major social news are released from Weibo.

We can not believe the web news!



- More than **1/3** information are rumors among a hot news on Weibo.
- During the first two days of event “MH370 Lost Contact”, **92** rumors were spread widely on Sina Weibo.

Motivation---Situation of Web News

Weibo news: litchi dip in soy sauce is super delicious!



Is it true?

Our aims

Real-time response: Is it true?

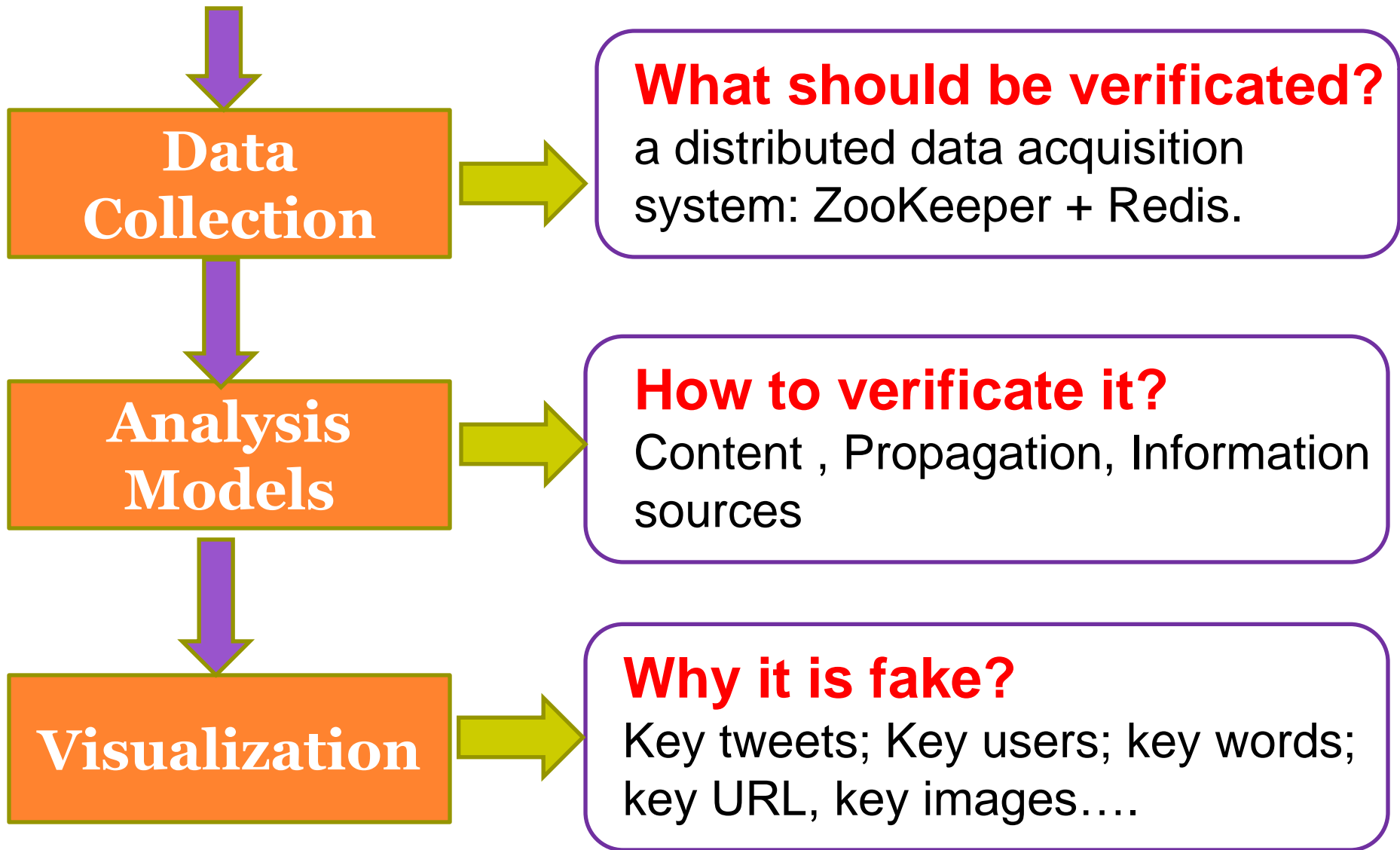
- the **event** is fresh with few hours
- **Data**: collect the latest data in real time.
- **Model**: online

- **Message-level**: analyze the credibility of one tweet
- **Event-level**: a lot of tweets related to the same event.

Keywords: “kind girl, homeless man, Shenzhen”

Time: “2013-03-25”

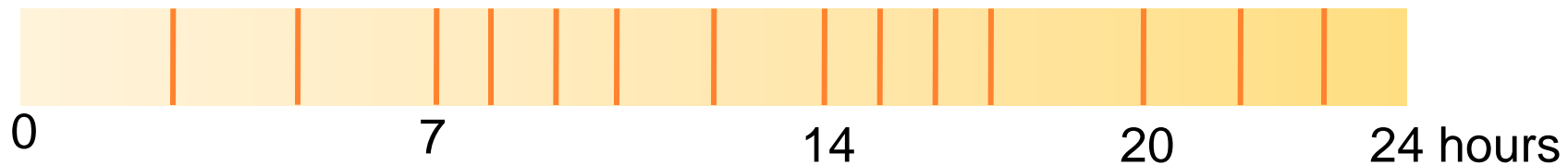
Real Time News Certification System



Data Collection

- How to find useful messages?

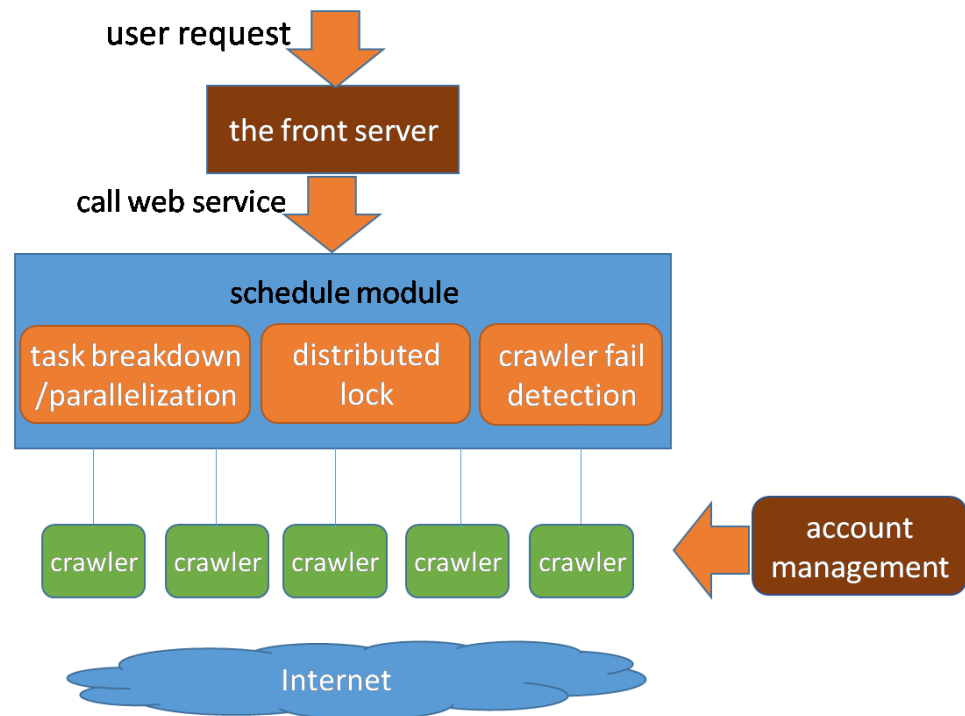
Given some keywords, we sample microblog data by time slots.



- Real-time response?

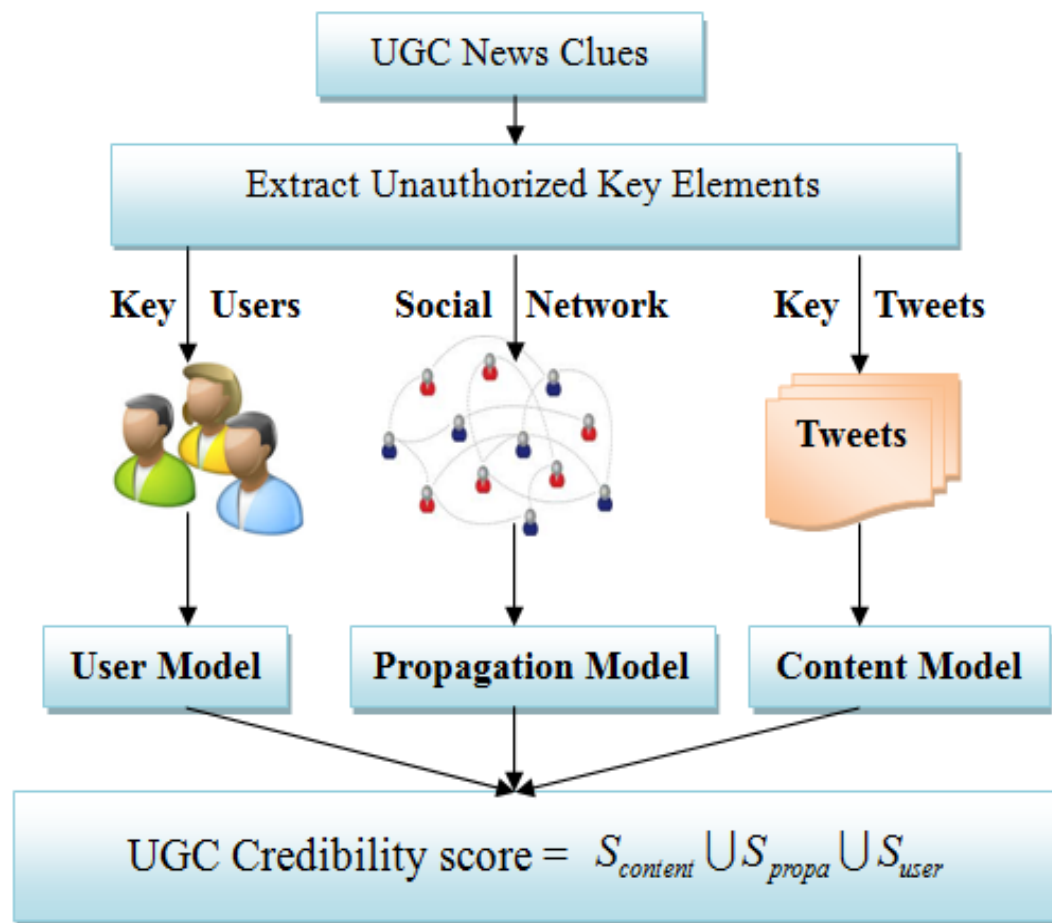
A distributed data
crawling system:

26 servers.



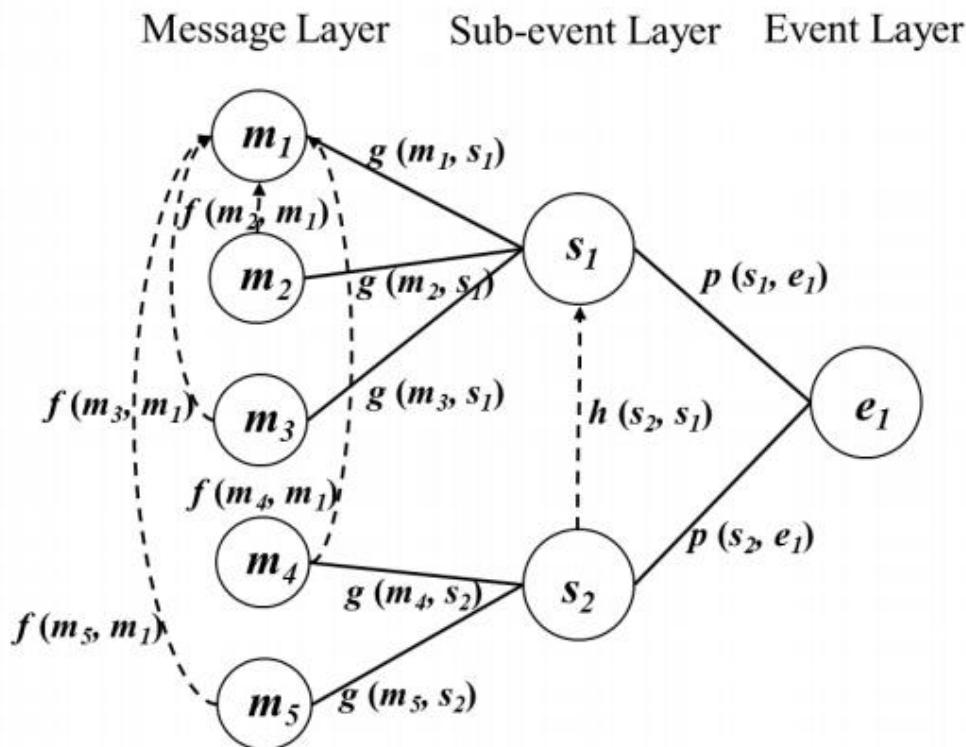
Analysis Model Framework

- We model the rumor detection problem from three aspects: content, propagation and information source.



Content based method

- A hierarchical credibility propagation model: message layer, sub-event layer and event layer.



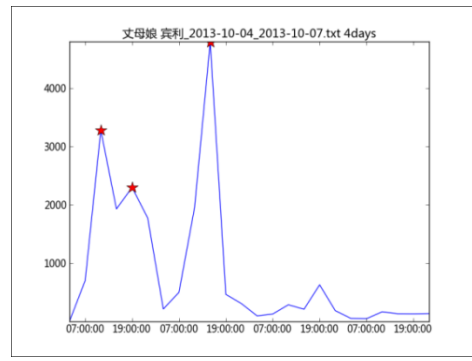
Links are computed by semantic features.

Zh-W Jin, **J. Cao**, Y-G Jiang, Y-D Zhang, News Credibility Evaluation on Microblog with a Hierarchical Propagation Model, ICDM 2014, ShenZhen, China.

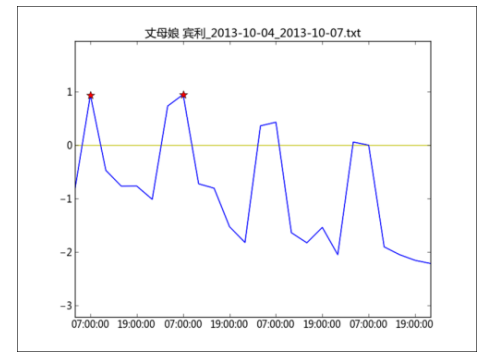
Propagation based model

- the propagation pattern is different between rumor and normal news. Our model captures the abnormal peak points to compute the propagation credibility.

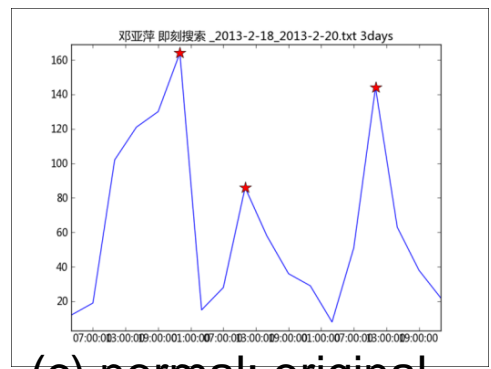
basic propagation line on Sina Weibo



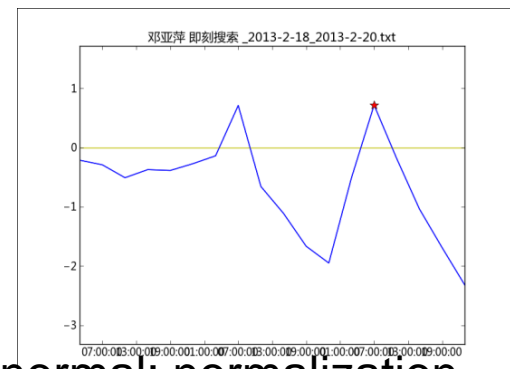
(a) rumor: original



(b) rumor: normalization



(c) normal: original



(d) normal: normalization

Information source based model

- We build a user-based model to measure the credibility of information source. Features:
 - **personal dependent:** gender, location , verify information etc.
 - **Personal independent:** number of followers, the number of friends, etc.
 - **advanced feature:** sentiment feature and active feature.
- We train a SVM classifier for user classification., and get a user credibility score denoted as S_{user} .

Model combination

- From above individual models, we can get three credibility scores $S_{content}$; S_{prop} ; S_{user} , which measure the influence of each part.
- In this work, we apply Logistic Regression to blend these individual models. Given input data x and weights w , it models the classification problem by the following probability distribution:

$$P(y = \pm 1 | \mathbf{x}, \mathbf{w}) = \frac{1}{1 + \exp(-y(\mathbf{w}^T \mathbf{x}))}$$

Experiments

- To evaluate the proposed model framework, we collect a real news dataset from Sina Weibo.
 - The fake news collected from several top fake news rank list¹ selected by authoritative news agencies from 2013 to 2014.
 - The true news are hot ones collected from XinHua Agency from 2013 to 2014.

	Fake News	True News	All
Count	73	73	146
#Images	10231	15282	25513
#Messages	23456	26257	49713
#Distinct User	21136	22584	42310

¹http://news.xinhuanet.com/zgjx/2014-01/08/c_133024019.htm;
<http://opinion.haiwainet.cn/n/2013/1220/c232601-20062341.html>

Performance

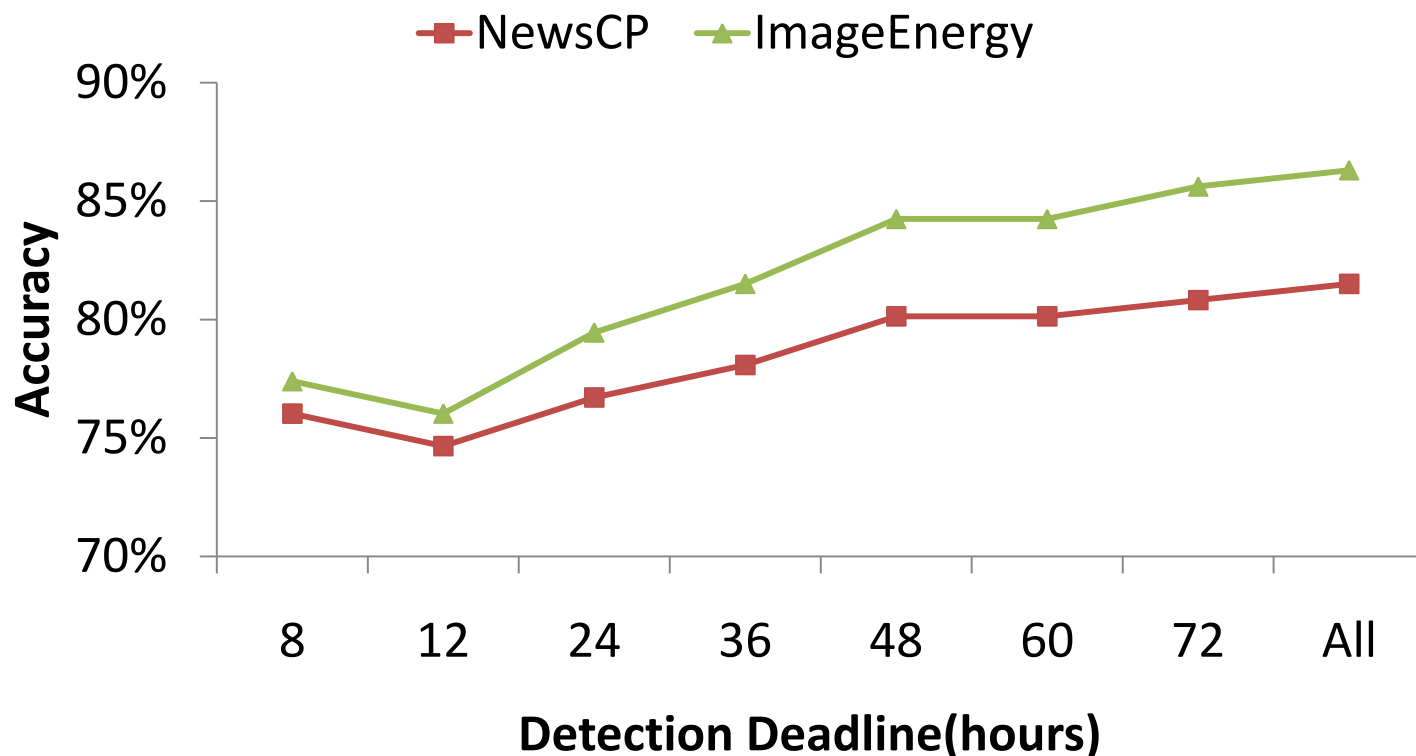
- Based on our dataset, we compare the performance of different model combinations.

Models	Accuracy
Content	0.740
Content+ Propagation	0.787
Content+ Propagation + User	0.801
Content+ Propagation + User+ ImageEnergy	0.863

J. Cao, Y.D Zhang, News Credibility Evaluation on Microblog by Image Energy Model, MM2015, submitted.

Fake News Early Detection

- It aims to detect fake news with limited information before detection deadline (information of only the first several hours of a news event).



Efficiency

For an event:

- Data crawling: **20s**
 - 600+ tweets, 600+ users,
 - 2000+ forward relationships
- Model: **10s**
 - Certification results
 - visualization

Visualization--overview

Event Overview

Alert



新华社UGC新闻认证预警系统

事件认证

时间脉络

传播模式

重要用户

外部URL源

相关图片

事件描述	不是一只骆驼去乞讨
事件关键词	骆驼 乞讨 四肢 有关部门 出现
时间	2014-10-17 22:56:8--2014-10-19 23:59:49
关键用户	@广州日报 @斯库里 @老阿姨在看着你 @边走边射
可疑源头	@被鬼畜骚扰过的Gentle--若娜 @鹿狗妞妞妈 @一见ERIC误终
地点	广州 江西 佛山 广东 嘉定

Key words

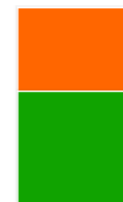
Time

Key users

Information source

Key locations

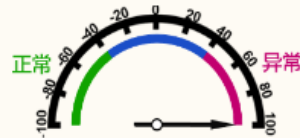
橙色预警



预警



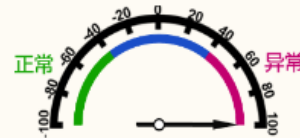
事件认证预警指数



希望 痛快 解救 不 厉害 助长 残害 惩罚 乞讨
如



传播认证预警指数



羞耻 王八 手段 卑劣



人物认证预警指数



希望 兴奋 高兴 恭喜



参与用户认证预警指数



喜欢 清晰 陪伴 美 厉害 麻痹 傲气 霸道
好 完美 道 热泪盈眶

Visualization—Key opinions

- Event evolution with different opinions.

事件进展

不是一只骆驼去乞讨

2014-10-17 22:56:8

被电击骚扰过的Gentle--若娜： //@厦门脚丫:回复@泰迪收藏家:太可怕了！广州江西等各地都有！不是一只骆驼去乞讨！是很多只！有的没有被砍去四肢！图片我找了别人拍的比较清楚的！感谢您的转发！希望有关部门尽快解救！！//@泰迪收藏家:太可怜了 怎么会这样
2014-10-17 22:56:8 转发(10) 评论(0)

鹿狗姐姐妈：这种变态一分钱都不能给，就是因为有人给钱获得利益，他们才会这么残忍的利用动物挣钱！ //@月光下滴露 //@厦门脚丫:回复@泰迪收藏家:太可怕了！广州江西等各地都有！不是一只骆驼去乞讨！是很多只！有的没有被砍去四肢！图片我找了别人拍的比较清楚的！感谢您的转发！希望有关部门尽快解救！！
2014-10-17 23:3:30 转发(3) 评论(0)



2014-10-18 3:23:33 2014-10-18 3:23:33 2014-10-18 3:23:33 2014-10-18 3:23:33 2014-10-18 3:23:33

上海哪里见过这样的骆驼

2014-10-17 23:7:18

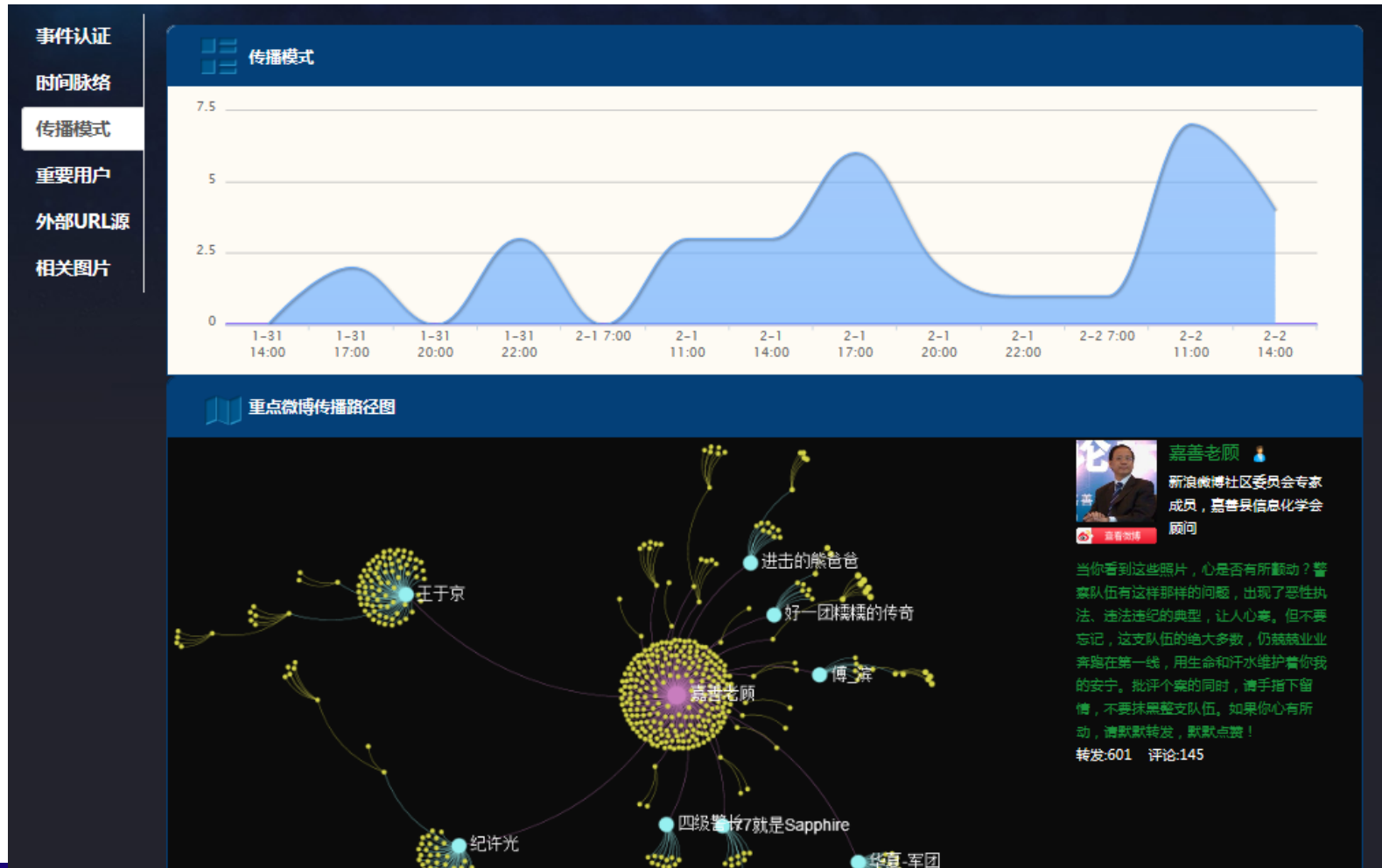
Bibi嘍呢：为啥要利用骆驼为你们乞讨的工具妈的，人至贱则无敌了。 //@问问麻麻:看到这样的也不会给一分!不要脸的
2014-10-17 23:7:18 转发(0) 评论(0)

爱心牛妈：无耻之徒可怜的骆驼 //@晓粒1982: 利用动物来乞讨，太可耻
2014-10-18 10:53:36 转发(0) 评论(0)

萌萌兔兔：养的起骆驼会去乞讨？就不该可怜这些人(chu sheng)。
2014-10-18 12:15:0 转发(0) 评论(0)

Visualization—key propagation

- The propagation of the event in time line;
- The propagation of the key microblog in space.



Visualization—key users

- The information for the key users. **Behavior is abnormal?**

Geolocation distribution of friends

influence



事件认证

时间脉络

传播模式

重要用户

外部URL源

相关图片

用户分类	用户名	认证信息	个人资料	个人描述	粉丝数	关注数	微博数	主要分布	行为异常指数	用户影响率
关键传播者	@薯片咔嚓	普通用户	地点: 辽宁	无可救药猫咪控~~	272	224	8854	海外:31.0% 北京:29.0% 其他:16.0%	无异常	3
关键传播者	@巴甫洛夫的 doge	普通用户	地点: 上海 徐汇区		155	409	1582	北京:32.0% 上海:17.0% 海外:9.0%	3	2
关键传播者	@丸子君酱	普通用户	地点: 上海 黄浦区		111	485	749	北京:29.0% 上海:21.0% 其他:11.0%	3	2
关键传播者	@老阿姨在看 着你	普通用户	职业: 山口山部落拆船厂 地点: 北京 东城区	Unknown to...	119803	184	2691	北京:37.0% 海外:18.0% 其他:12.0%	无异常	4
关键传播者	@丝拉丝啦	普通用户	地点: 湖南 长沙		177	570	2539	北京:35.0% 海外:14.0% 上海:10.0%	7	4
信息源	@被鬼畜骚扰 过的 Gentle--若娜	微博达人	职业: 北京贝塔斯曼 地点: 北京 朝阳区	我是菲姐! 啦啦啦! 哎...	653	751	3591	北京:41.4% 海外:13.1% 上海:10.1%	6	3
信息源	@鹿狗妞妞妈	普通用户	地点: 北京 海淀区	如果不爱, 请勿伤害! ...	1747	754	20508	北京:46.9% 上海:11.2% 广东:7.1%	无异常	5

Visualization—key images

- The key images concerned in this event.

UGG 新华社UGC新闻认证预警系统

事件认证
时间脉络
传播模式
重要用户
外部URL源
相关图片



2014-10-18 3:23:33



2014-10-18 3:23:33



2014-10-18 3:23:33



2014-10-18 3:23:33



2014-10-18 3:23:33



2014-10-18 3:23:33



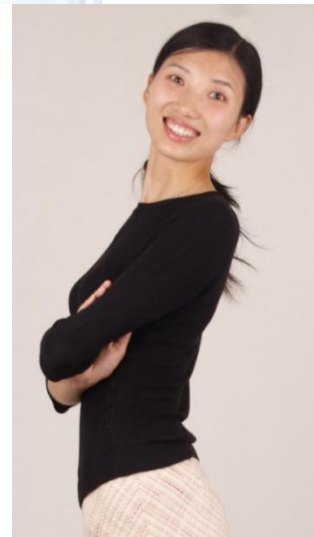
2014-10-18 3:31:46



2014-10-18 3:31:46

Conclusion

- The system is Real-time .
 - The event should be fresh
 - The data should be the latest
 - The model should be online
- The system is explainable.
 - Mining the conflict data and key clues.
 - Visualize the key users , key opinions, key locations



Thank You!

contact us: caojuan@ict.ac.cn
<http://mcg.ict.ac.cn/people/caojuan.html>