

XREF: Entity Linking for Chinese News Comments with Supplementary Article Reference

Xinyu Hua¹ Lei Li² Lifeng Hua³ Lu Wang¹

¹Northeastern University

²ByteDance AI Lab

³Alibaba Group



ByteDance AI Lab
字节跳动人工智能实验室



Motivation

Prime Brazilian Ronaldo vs Prime Cristiano Ronaldo?

People have been debating Ronaldo vs. Messi for the past couple of days and C. Ronaldo vs. Messi for what seems like forever. How about the two Ronaldos?

153 comments [Share](#) [Save](#) [Report](#)

- [deleted] 2 points · 4 years ago

I remember this debate in an all time 11. A lot of people seemed to think Portuguese Ronaldo scored more often. I think they both had 0.68 and 0.69 goals per game on average and Ronaldo had better goals ratio for Brazil. That obviously could change.

Watching (Bra) Ronaldo was just beautiful. His talent was miles above everyone. He out moved, out thought and out played even world class defenders.

At prime peak I'm going for Brazilian Ronaldo.
- Everton ajbizzle12 3 points · 4 years ago

Ronaldo's 03-06 period detracts greatly from his overall record though, he was playing right-midfield in a 4-4-2 system and his m.o. was to beat his man and cross. If you take their best 5 year periods and compare them side by side then it wouldn't even be close in terms of goalscoring.
- [deleted] 4 points · 4 years ago

You're comparing a winger (for most of his career) to one of the greatest out and out strikers. And also Portugal and Brazil have huge difference in quality. Ronaldo Fenomeno had Rivaldo and Ronaldinho when he looked up for a pass. When Cristiano looks up for a pass, he sees Nani and Eder. Big difference.
- blue_whaoo 3 points · 4 years ago

R9 in his prime was the best.
- Jamesbh11 1 point · 4 years ago

One is real other is faked
- [deleted] 1 point · 4 years ago · edited 4 years ago

Cristiano Ronaldo. 50+ goals for 5 consecutive seasons. Ronaldo reached his peak by 19 and then started going down. Mind you, he was still better than most. Cristiano started going up from 18 years old and has now plateaued.

Ronaldo was better at dribbling and that's it. Cristiano has better heading, movement off the ball, shooting from distance, passing (creates a lot of chances for teammates), free kicks.

Cristiano Ronaldo will go down as the best player in Real Madrid history and he has been a better player than Ronaldo of Brazil. If you think better dribblers are better players, I don't know what to say.

I don't think Ronaldo was one of the true greatest players ever. As in top 10 ever. I think Pele, Maradona, Cruyff, Zidane, Beckenbauer, Di Stefano, Puskas, Eusebio, Platini, Maldini were all more

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153 comments Share Save Report



User 12345 · 6 months ago

Prime **BRA Ronaldo** was fun to watch like **Neymar**, full of trickery compared to **CR** who is purely a goal scoring machine nowadays



User 22345 · 1 months ago

R9 is real, **the other** is fake.



User 32345 · 5 months ago

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Motivation

- Entity Linking (EL) benchmarks

Formal style

EU rejects German call to boycott British lamb.

The European Commission said on Thursday it disagreed with German advice to consumers to shun British lamb until scientists determine whether mad cow disease can be transmitted to sheep. Germany's representative to the European Union's veterinary committee Werner Zwingmann said on Wednesday consumers should buy sheepmeat from countries other than Britain (...)

Long context

AIDA-CoNLL [[Hoffart et al, 2011](#)]

Motivation

↑
↓
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Irregular naming variations

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Short context

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Related Work

- EL for long documents: *leveraging rich context; collective predictions* [Francis-Landau+,2016, Gupta+, 2017, Le and Titov, 2018, Sil+, 2018]
- EL for social media: *redundant posts; user information* [Liu+, 2013, Guo+, 2013., Yang and Chang, 2015]
- EL for Chinese language: *cross-lingual approaches over aligned Wikipedia articles* [Tsai and Roth, 2016, Sil+, 2018]

Roadmap

- Motivation
- Related Work
- **Data**
- Model
- Experiments
- Conclusion

Data

• Data format:

News article

Comments

Bingbing Fan did not win the Golden Horse Awards, drawing attacks from Xiaogang Feng. Chen Li joins the fight on Weibo.

Yesterday, the Golden Horse Awards were finally announced. Dongyu Zhou and Sichun Ma won the best lead actress with their performances in "Soul Mate", excites the audiences. (...)



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她真的是明星 算不上演员

She is just a star, not an actress.



User id 2234567

演员多 成为明星的演员少 冰冰却早已经做到了

There are many actresses, but not many became stars.

Bingbing did this early.



User id 3234567

冯导为这部电影毁掉了自己的形象，烧掉了自己的人气
电影好坏第一责任 人是导演。

Director Feng ruined his image and reputation for this movie

今日头条

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47



转发



微博



Qzone

范冰冰错失金马影后被冯小刚怼 李晨直接发微博回怼冯小刚!

原创 四斤 2016-11-27 22:45:42

昨日，金马奖尘埃落定，周冬雨与马思纯凭借着《七月与安生》双双获得金马影后，让观众为两人兴奋不已。

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Annotation



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Fan Bingbing

From Wikipedia, the free encyclopedia

Fan Bingbing^[a] (Chinese: 范冰冰, born 16 September 1981) is been listed as the highest-paid celebrity in the *Forbes China Celebrity 100* 2006.^{[2][3][4]} She is one of the highest-paid actresses in the world *red carpet*, at *movie premieres*, and at *fashion shows*.^{[5][6][7][8]}



Li Bingbing

From Wikipedia, the free encyclopedia

This is a Chinese name; the family name is Li.

Li Bingbing (Chinese: 李冰冰; born February 27, 1973) is a Chinese actress and since then received critical acclaim for her roles in *A World Without Thieves* (2008), *The Message* (2009), *Detective Dee and the Mystery of the Dragon King* (2015)



Data

- Annotation Statistics:

	Entertainment	Product
Articles	995	783
avg # Char.	747	684
Comments	30,630	5,189
avg # Char.	21	23
Mentions	46,942	7,497
Unique Entities	1,846	470

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Lack of context

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max dist. ment.	121	48

Lack of context

Diverse mention
variations

Data

• Mention Examples

范冰冰(Bingbing Fan)	冰冰(Bing bing), 冰姐 (sister Bing), 范 (Fan), 国际女神 (international goddess)
王菲 (Faye Wong)	戏子(actress), 菲姐(Sister Faye), 她(he), 单亲妈妈 (single mother), 天后 (queen), 明星 (celebrity)
周星驰(Stephen Chow)	偶像 (idol), 名人 (famous person), 影帝 (film emperor), 艺术家 (artist), 周星驰(Stephen Chow)
索尼 (Sony)	黑科技之父 (father of black tech), 索尼大法 (sony grand magic), 索泥 (so-mud)
苹果 (Apple)	苹果 (apple), 他们公司 (their company), 果果 (fruity), 老产品 (old product), 蘋果 (apple)
马自达(Mazda)	好车 (nice car), 日系宝马 (Japanese BMW), 法拉马 (Frama), 马儿 (horse)

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• Mention Types

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• Mention Types

- Others

Roadmap

- Motivation
- Related Work
- Data
- **Model**
- Experiments
- Conclusion

Model

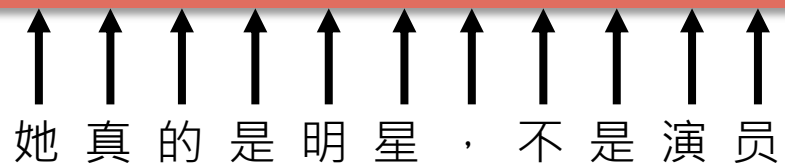
范冰冰错失金马影后被冯小刚怼
Bingbing Fan lost the Golden Horse Awards, drawing attacks from Xiaogang Feng.

昨日 (...) 周冬雨与马思纯凭借着《七月与安生》双双
获得金马影后 (...)
Yesterday (...) Dongyu Zhou and Sichun Ma won the best lead actress with their performances in "Soul Mate"

然后，当镜头切换到范冰冰时，(...)
Later, the camera moved towards Bingbing Fan (...)

她真的是明星，不是演员
[She is just a star, not an actress.]

Bidirectional LSTM



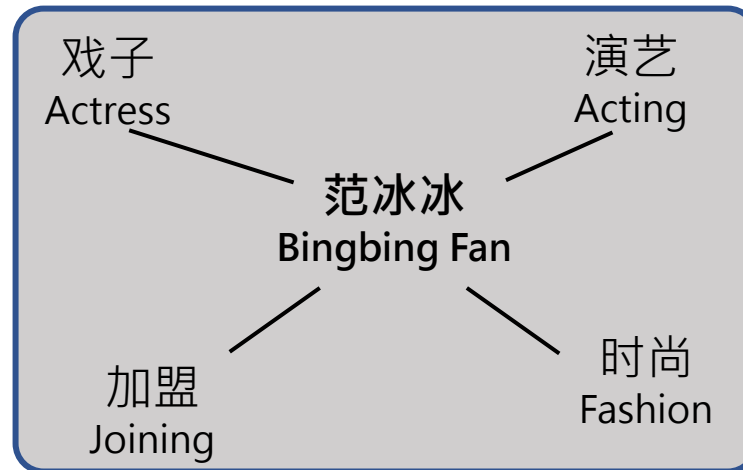
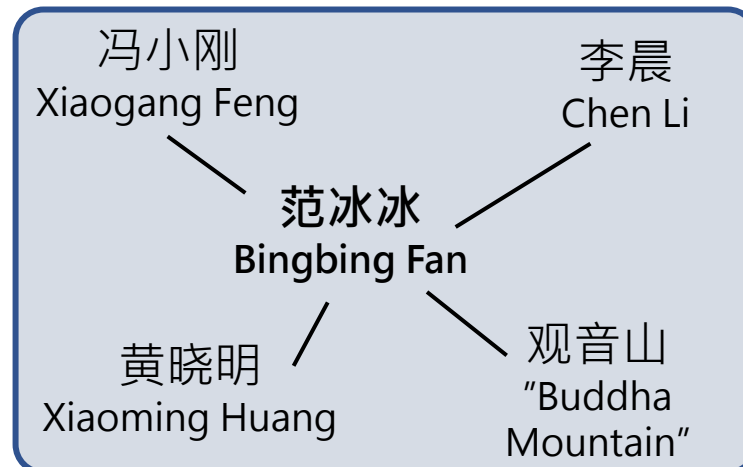
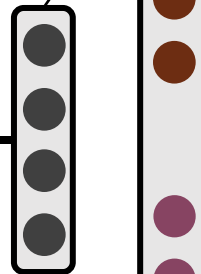
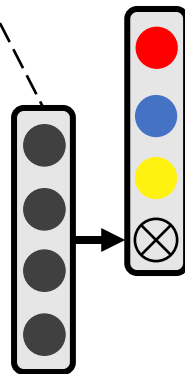
Mention representation

v_m^{art}



v_m^{cmt}

v_m^{base}

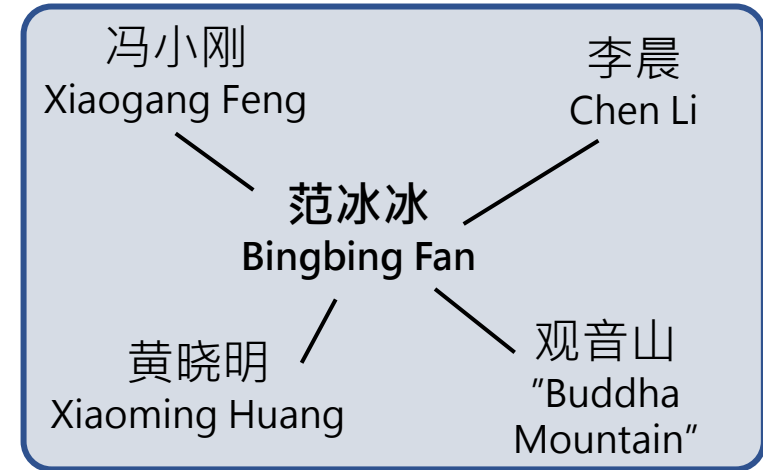


Entity representation

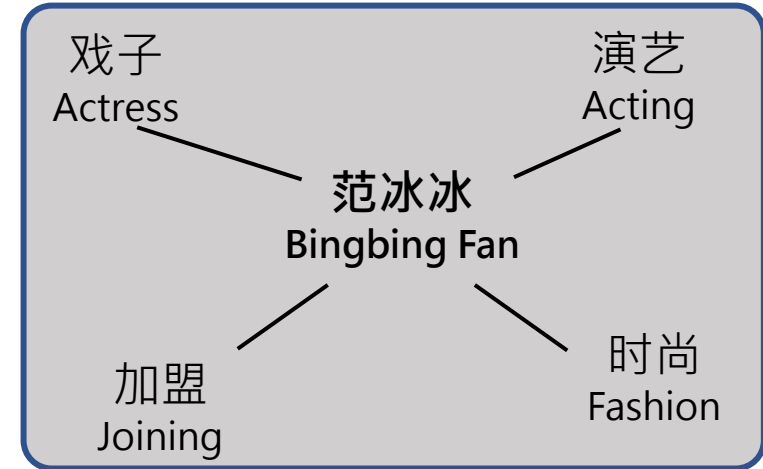
Model

- Entity representation

Entity-entity
co-occurrence



Entity-word
co-occurrence



Model

• Entity representation

News headlines

终于搞懂了李晨与范冰冰分手原因
海滨娱乐 · 100评论 · 3月前

范冰冰为李晨庆祝40岁生日，晒出他小时候照片，8个字甜蜜表白
猫眼娱乐 · 396评论 · 1年前

范冰冰与李晨宣布分手 错在谁？李晨之前所发信息已让范冰冰心寒
北冥有料 · 2153评论 · 11月前

《观音山》：范冰冰的演技巅峰，原来她可以这么美
娱博士 · 32评论 · 7月前

非常静距离：范冰冰爆料演《观音山》，遭家人反对，因角色太狠！
明星的那点事 · 7评论 · 6月前

《观音山》导演李玉回应再与范冰冰合作：正在进行中
新京报 · 18评论 · 5月前

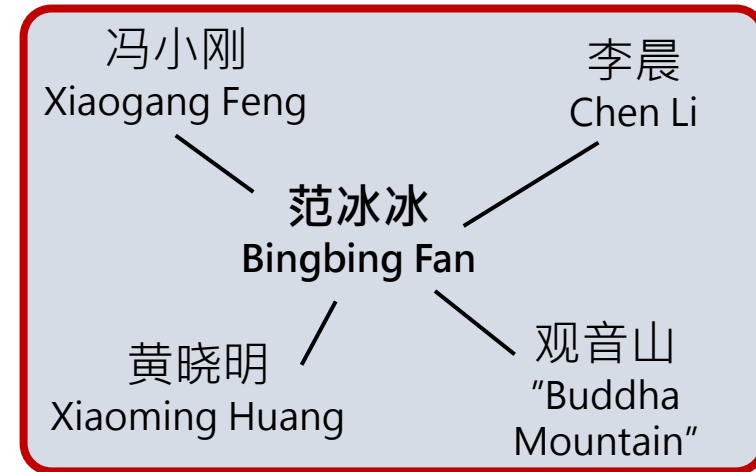


Entity-entity
co-occur matrix

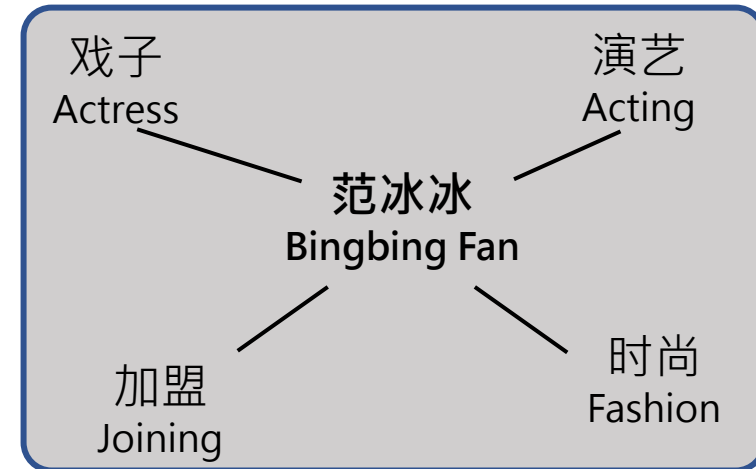


Node2vec
[Grover and Leskovec, 2016]

Entity-entity
co-occurrence



Entity-word
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Model

• Entity representation

News headlines

范冰冰时尚表现力依旧TOP! 一袭东方紫裙美得霸气, 美貌惊艳绝伦
时尚丽人风行 · 1评论 · 8天前

范冰冰时尚资源开挂! 一袭抹胸裙登日本杂志太惊艳, 表现力太强了
时尚丽人风行 · 1评论 · 1月前

范冰冰最新时尚大片曝光, 身穿粉色糖果裙, 犹如十六岁少女
片儿 · 6评论 · 5月前

范冰冰确认加盟东方卫视2018跨年盛典, 星光熠熠很有“范”儿
东方卫视 · 11评论 · 2年前

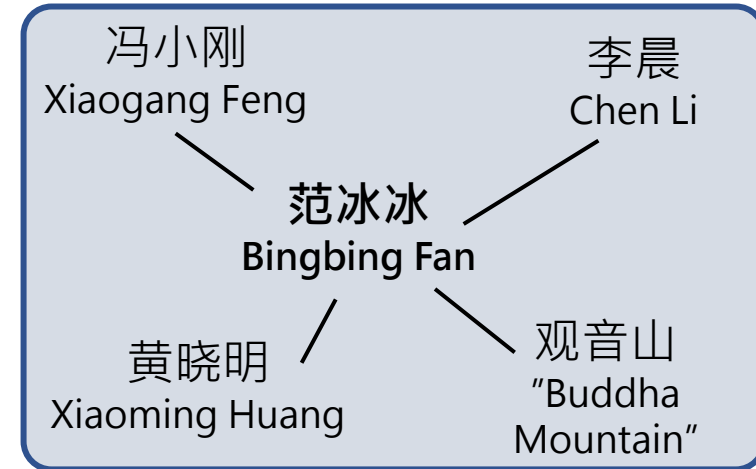
范冰冰加盟《极速挑战4》, 女神包袱真不要了吗?
父母育儿观 · 0评论 · 3年前

范冰冰演艺事业下滑, 频拍杂志封面, 希望复出国发展
一花一世界 · 3评论 · 1月前

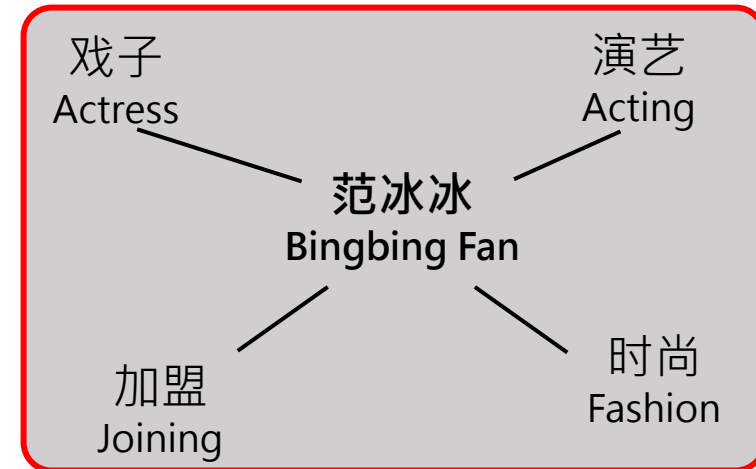
Entity word
co-occur matrix

Singular Vector
Decomposition (SVD)

Entity-entity
co-occurrence

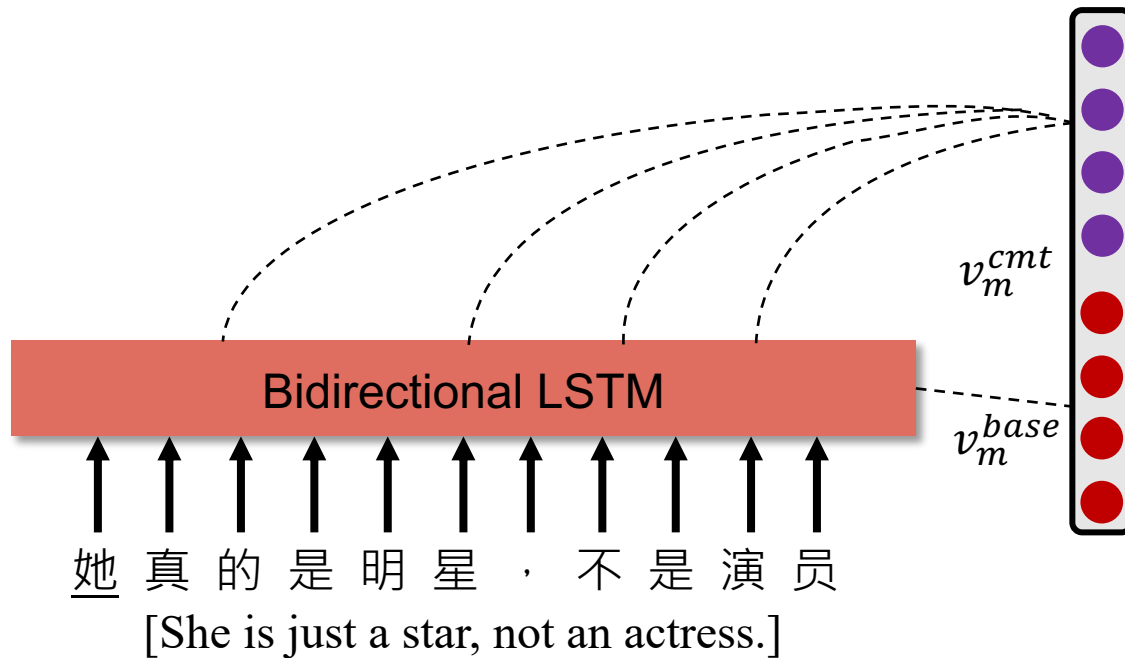


Entity-word
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Model

- Character-level comment encoding

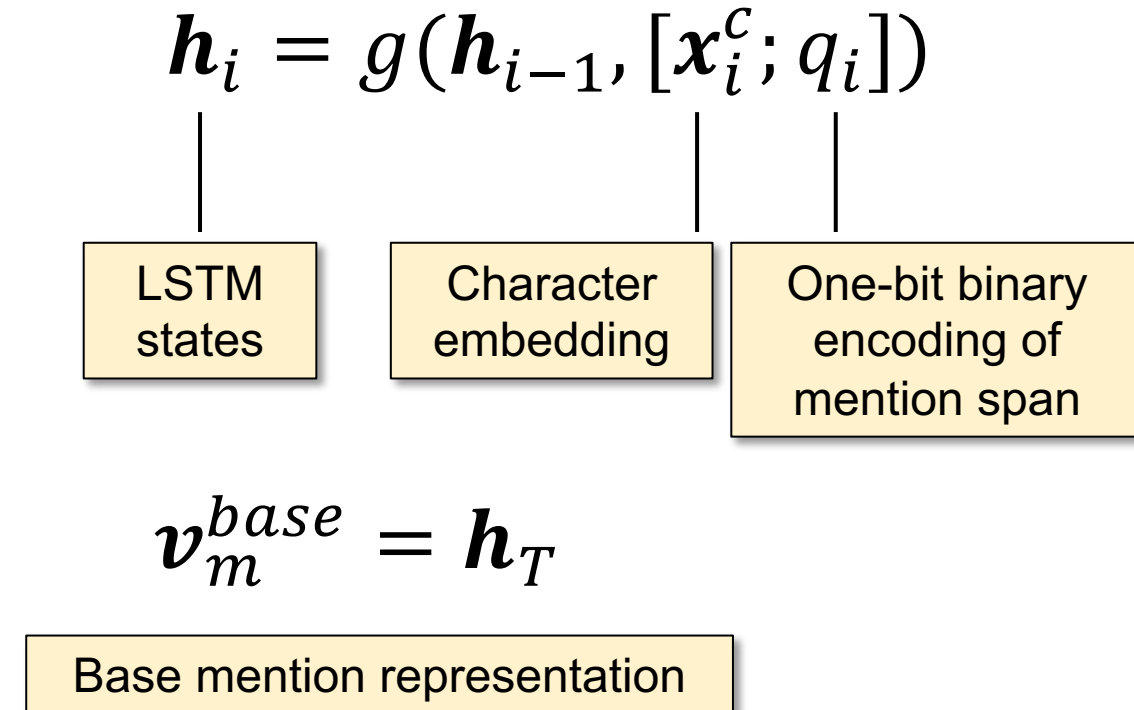
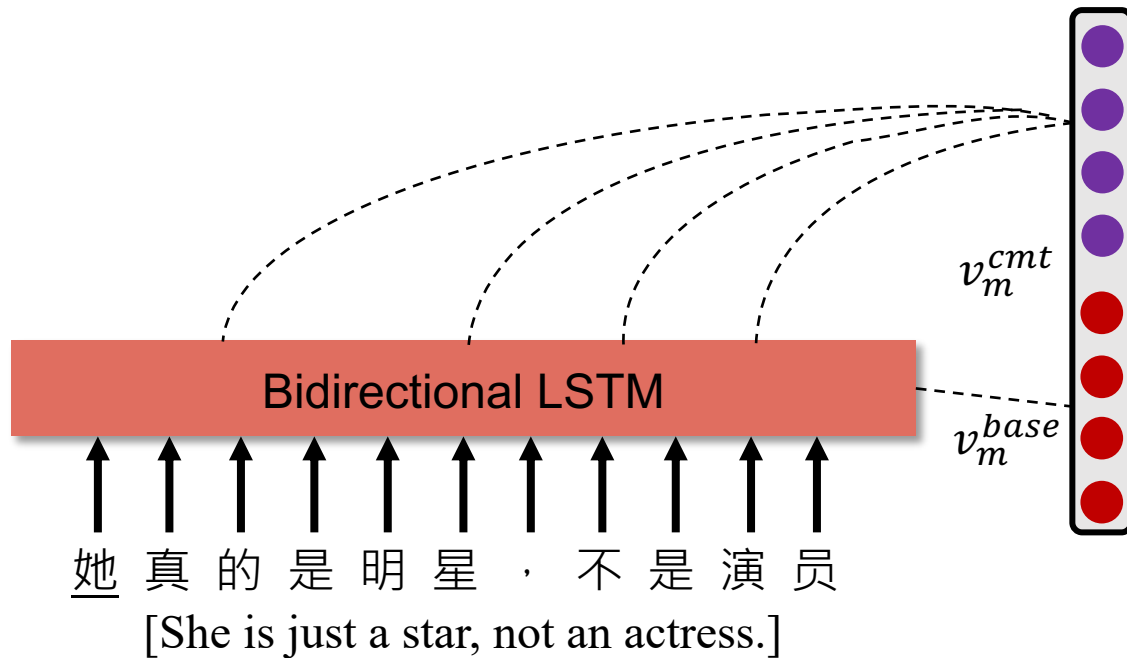


$$h_i = g(h_{i-1}, [x_i^c; q_i])$$

The equation is supported by three boxes: "LSTM states" points to h_{i-1} , "Character embedding" points to x_i^c , and "One-bit binary encoding of mention span" points to q_i .

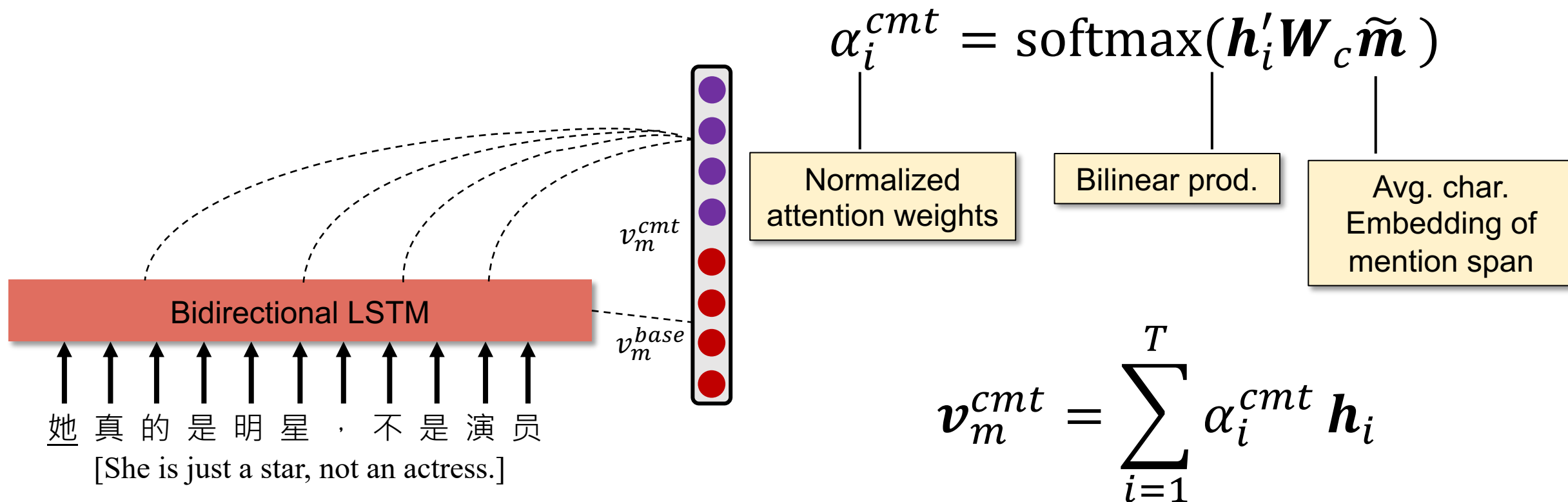
Model

- Character-level comment encoding



Model

- Character-level comment encoding
- Comment attention



Model

范冰冰错失金马影后被冯小刚怼

Bingbing Fan lost the Golden Horse Awards, drawing attacks from Xiaogang Feng.

昨日 (...) 周冬雨与马思纯凭借着《七月与安生》双双获得金马影后 (...)

Yesterday (...) Dongyu Zhou and Sichun Ma won the best lead actress with their performances in "Soul Mate"

然后，当镜头切换到范冰冰时，(...)

Later, the camera moved towards Bingbing Fan (...)

v_m^{art}



v_m^{cmt}

v_m^{base}

Bidirectional LSTM

她 真 的 是 明 星 ， 不 是 演 员

[She is just a star, not an actress.]

- Article entity attention
 - String matched entity canonical names $\rightarrow \epsilon_a$

Model

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- Article entity attention

$$\beta_j^{art} = \text{softmax}(\mathbf{u}_j' \mathbf{W}_a \tilde{\mathbf{m}})$$

$$\mathbf{v}_m^{art} = \sum_{j=1}^{|\epsilon_a|} \beta_j^{art} \mathbf{u}_j$$

Model

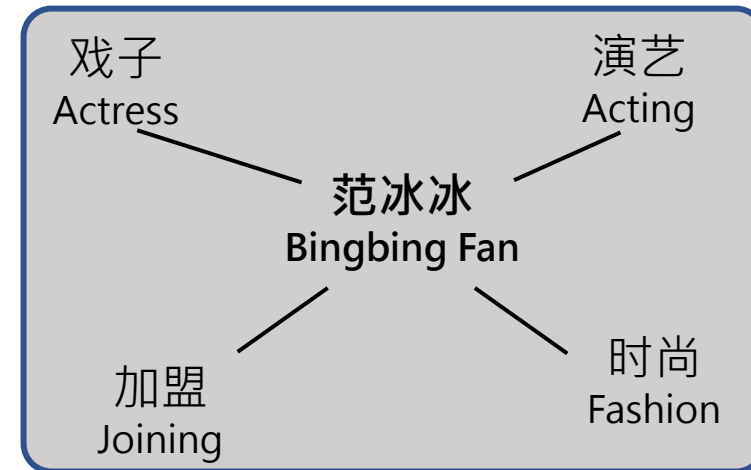
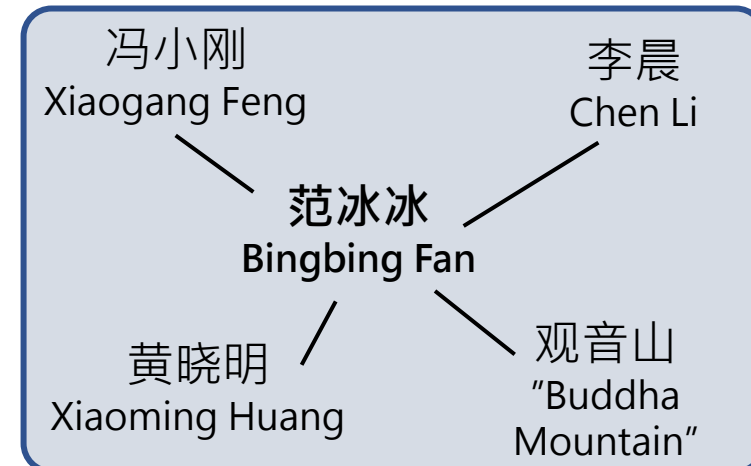
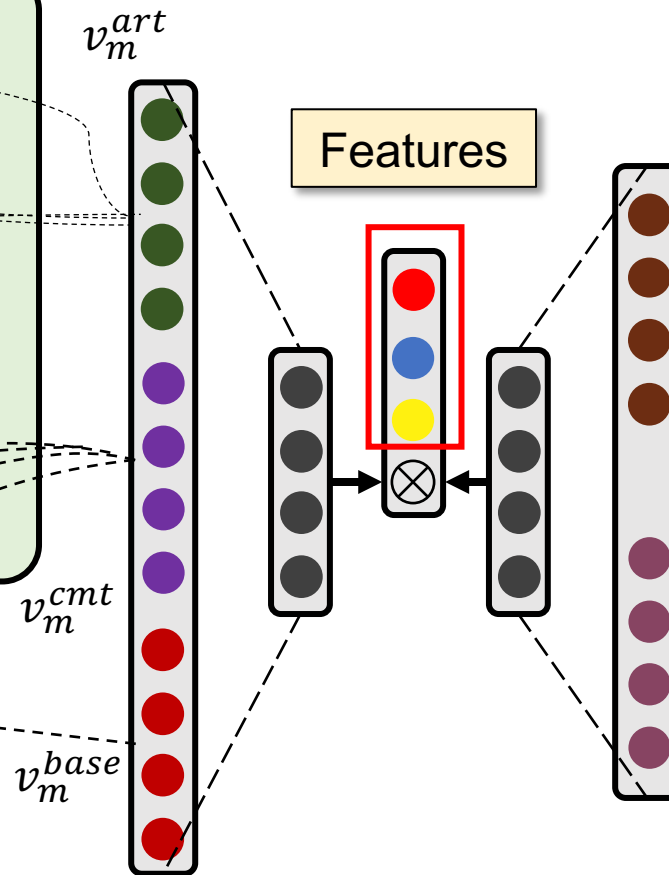
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Later, the camera moved towards Bingbing Fan (...)

她真的是明星，不是演员
[She is just a star, not an actress.]

Mention representation



Entity representation

Model

- Weakly Supervised Pre-training

Unlabeled data

除了范冰冰，其他很常人
Except for Bingbing Fan, everybody else is mediocre.



Canonical name
mention



Pronominal
substitution

除了**范冰冰**，其他很常人
Except for **Bingbing Fan**, everybody else is mediocre.

除了**她**，其他很常人
Except **her**, everybody else is mediocre.

Experiments

	Entertainment		Product	
	Accuracy	MRR	Accuracy	MRR
MatchCanonAndNick	42.70	-	54.97	-
PriorProb	54.22	-	77.71	-
VectorSpaceModel	26.04	34.70	33.57	42.72
LogReg	57.69	62.76	61.37	63.11
Ment-norm [Le and Titov, 2018]	58.60	63.69	68.56	71.32
XREF	67.22	73.92	77.26	81.52

Experiments

Matching based	Entertainment		Product	
	Accuracy	MRR	Accuracy	MRR
MatchCanonAndNick	42.70	-	54.97	-
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Learning based

Experiments

	Entertainment		Product	
	Accuracy	MRR	Accuracy	MRR
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PriorProb	54.22	-	77.71	-
VectorSpaceModel	26.04	34.70	33.57	42.72
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Experiments

- Ablations

	Entertainment	Product
XREF	57.93	65.33
w/o comment attention	51.94 (-5.99)	62.22 (-3.11)

Experiments

- Ablations

	Entertainment	Product
XREF	57.93	65.33
w/o comment attention	51.94 (-5.99)	62.22 (-3.11)
w/o comment and article attention	44.90 (-13.03)	55.33 (-10.00)

Experiments

- Effect of Article Attention

	Prediction correct	Prediction wrong
Attention correct	4,366 (72.3%)	1,599 (26.8%)
Attention wrong	397 (18.5%)	1,749 (81.5%)

Conclusion

- We propose XREF, an EL framework designed for social media news comments.
- We construct a dataset for Chinese EL study.
- Experiments show strong performance over competitive benchmarks.