



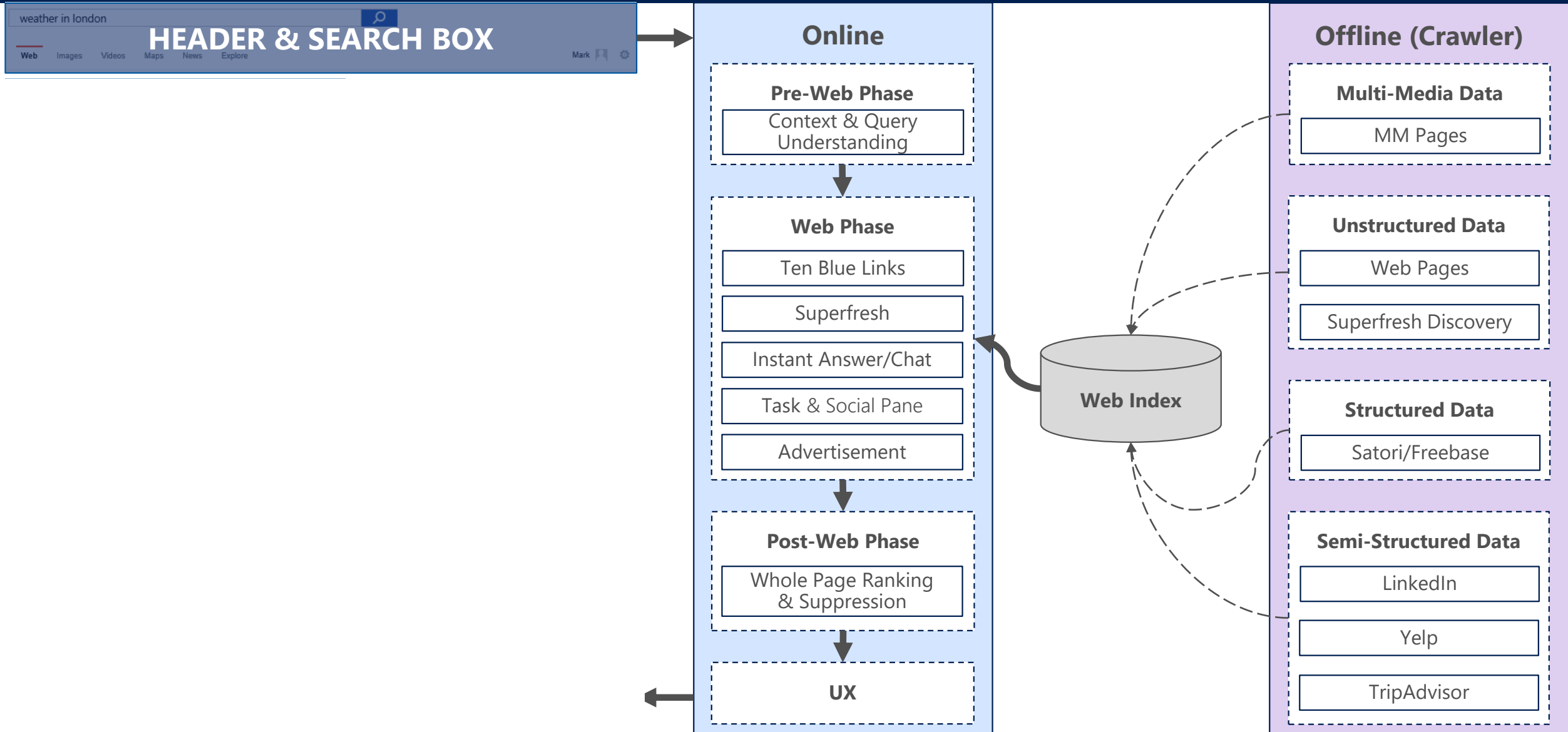
What Will Search Engines be Changed by NLP Advancements

Dr. Ming Zhou
Microsoft Research Asia
ICTIR-2018, Tianjin

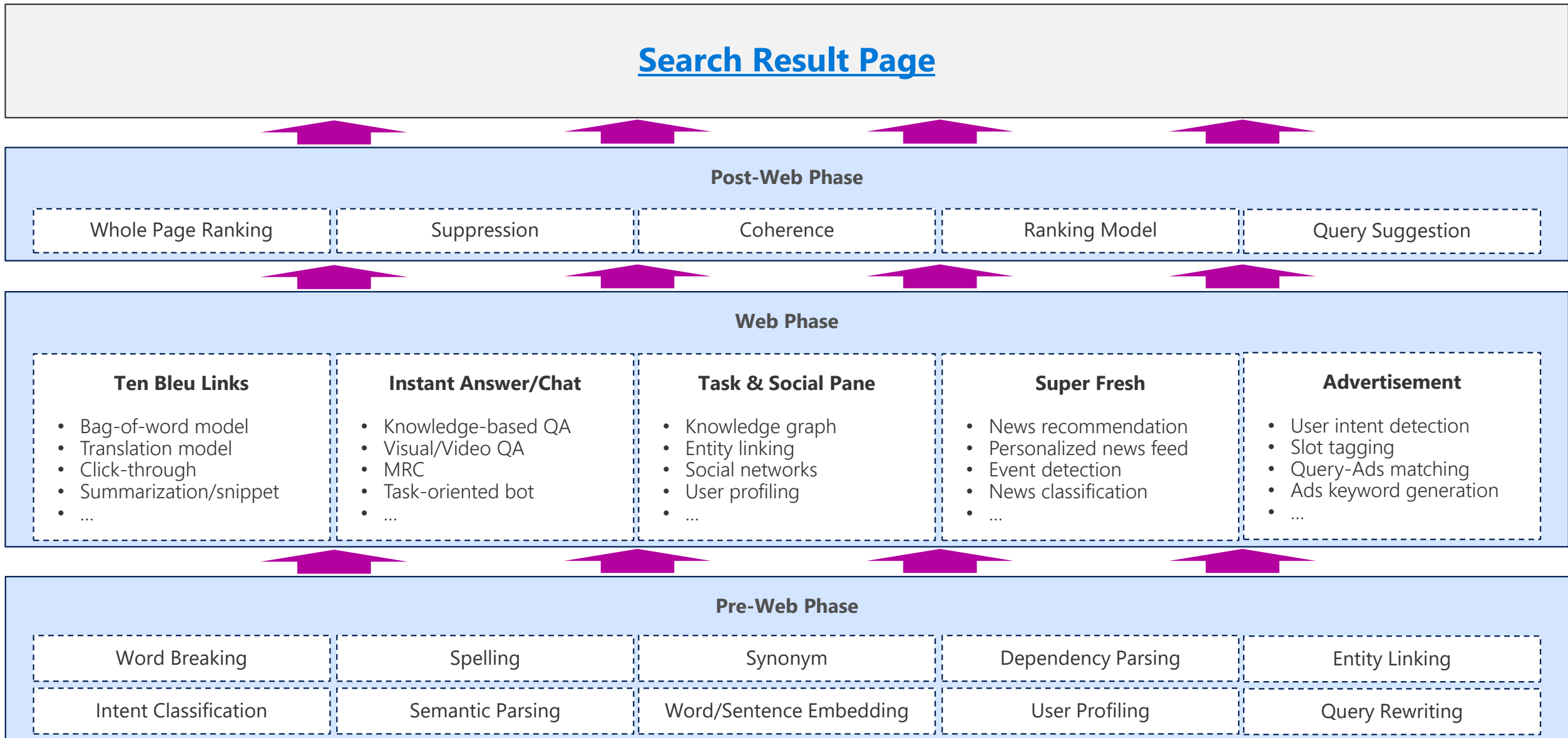
Introduction

- Intelligence and naturalness are two driving forces of a search engine
- Intelligence
Precisely understanding user's intent and finding out accurate answers
- Naturalness
Expressing user's intent and presenting the search results in a natural way
- NLP has been vital (though at shallow level) to both intelligence and naturalness
- With new advancements of NLP, what new changes will be brought to search?

Search engine architecture(Bing)



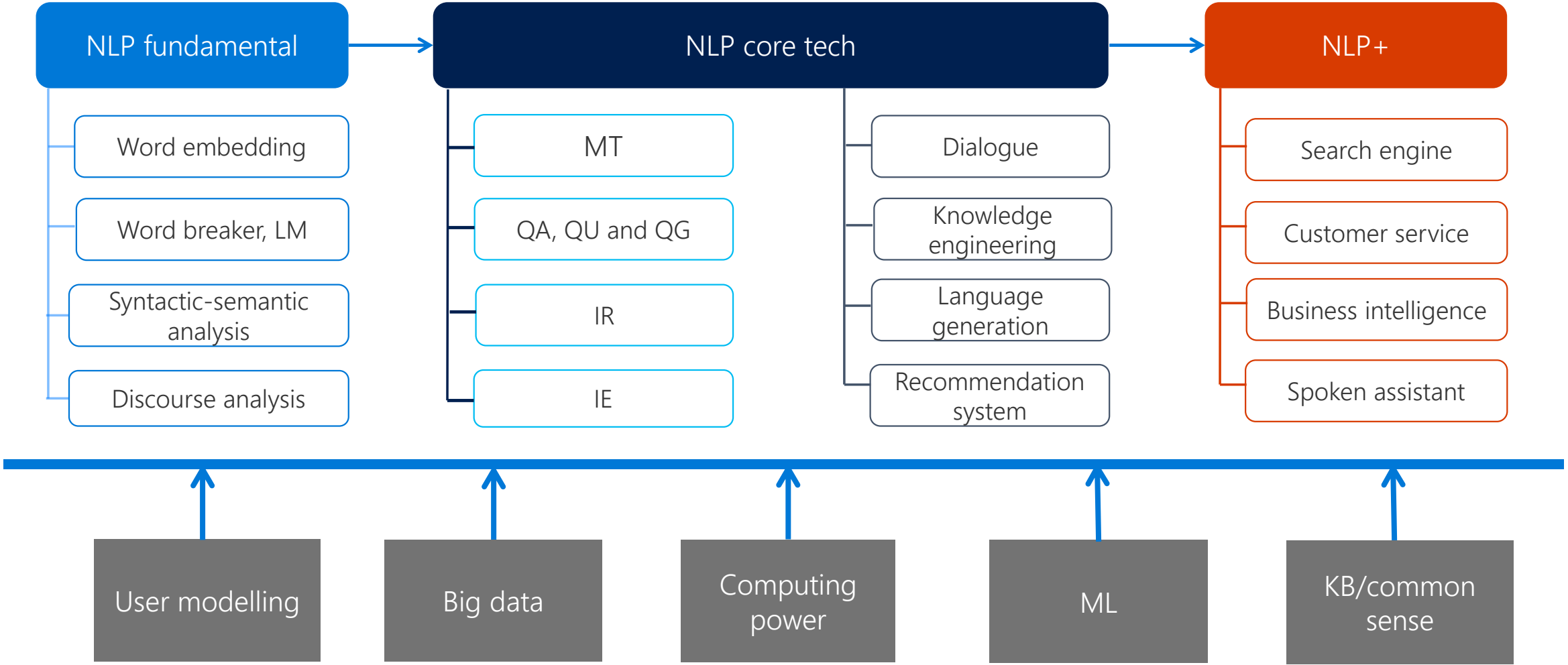
NLP in search engine



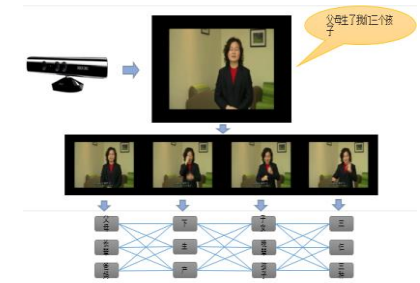
In the following, I try to answer

- What are new advancements of NLP?
- What new changes will be brought to search?

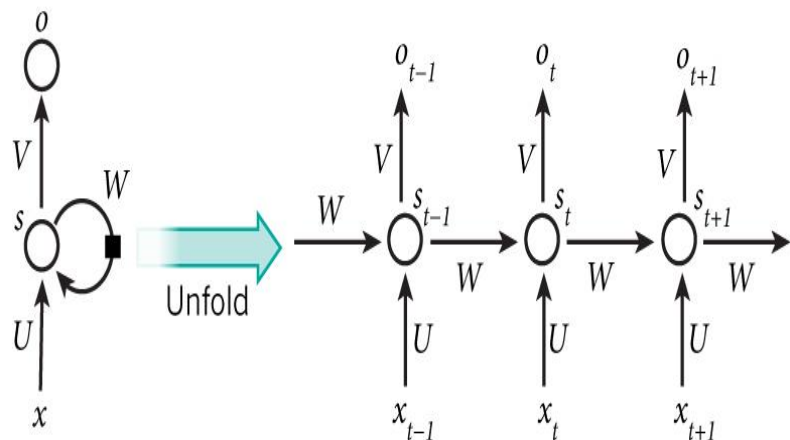
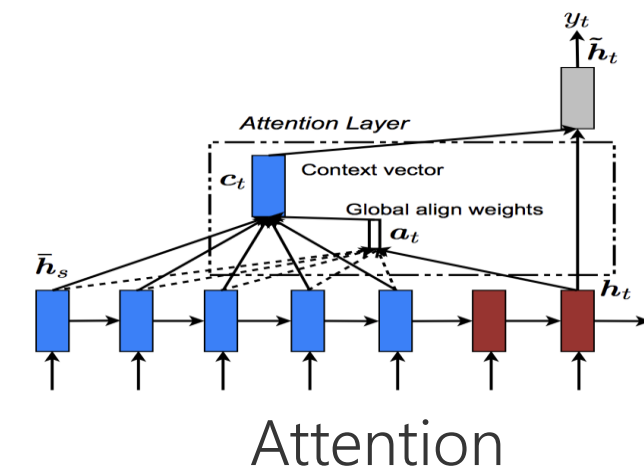
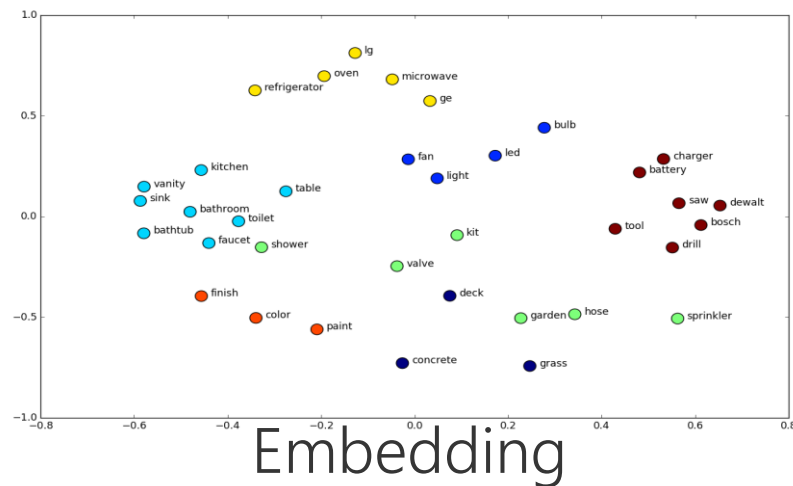
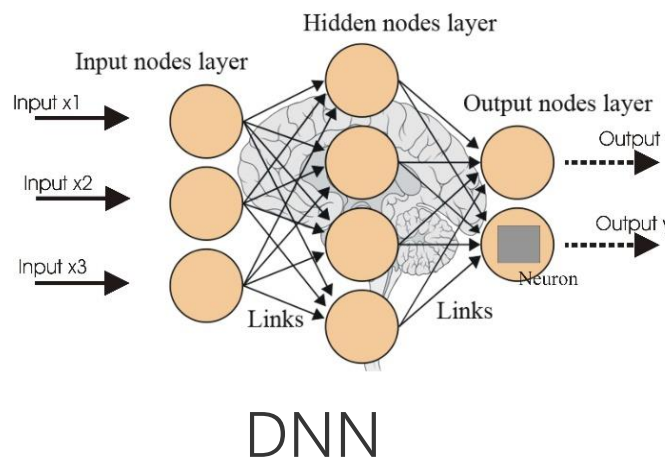
NLP technologies



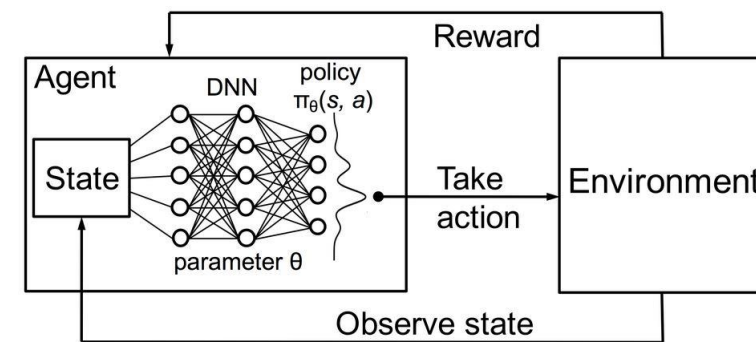
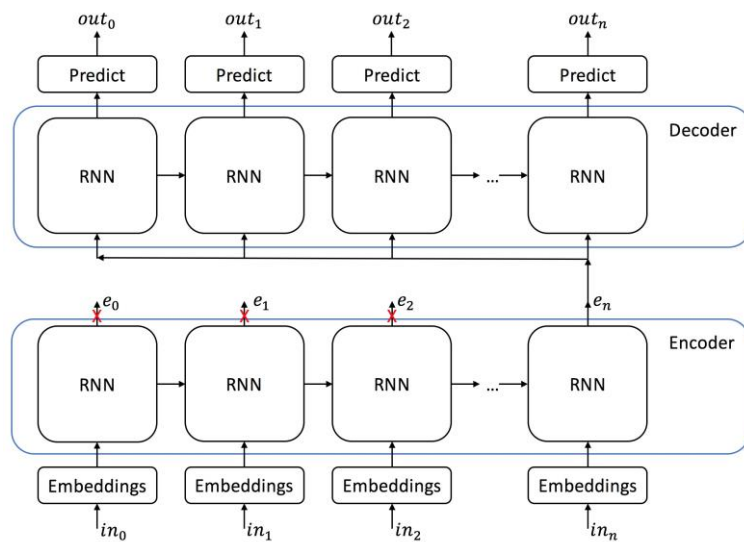
NLP innovations in MS



DNN techs that changed NLP



RNN/LSTM/GRU



Recent breakthroughs in MSRA

2017

23 CPS
Chatbot

Xiaoice

2018

82.65%
Machine Reading

SQuAD

2018

69%
Machine Translation

WMT-2017

2018

61.34%
76.88%
62.42%
Grammar check

CoNLL-2014
CoNLL-10
JFLEG

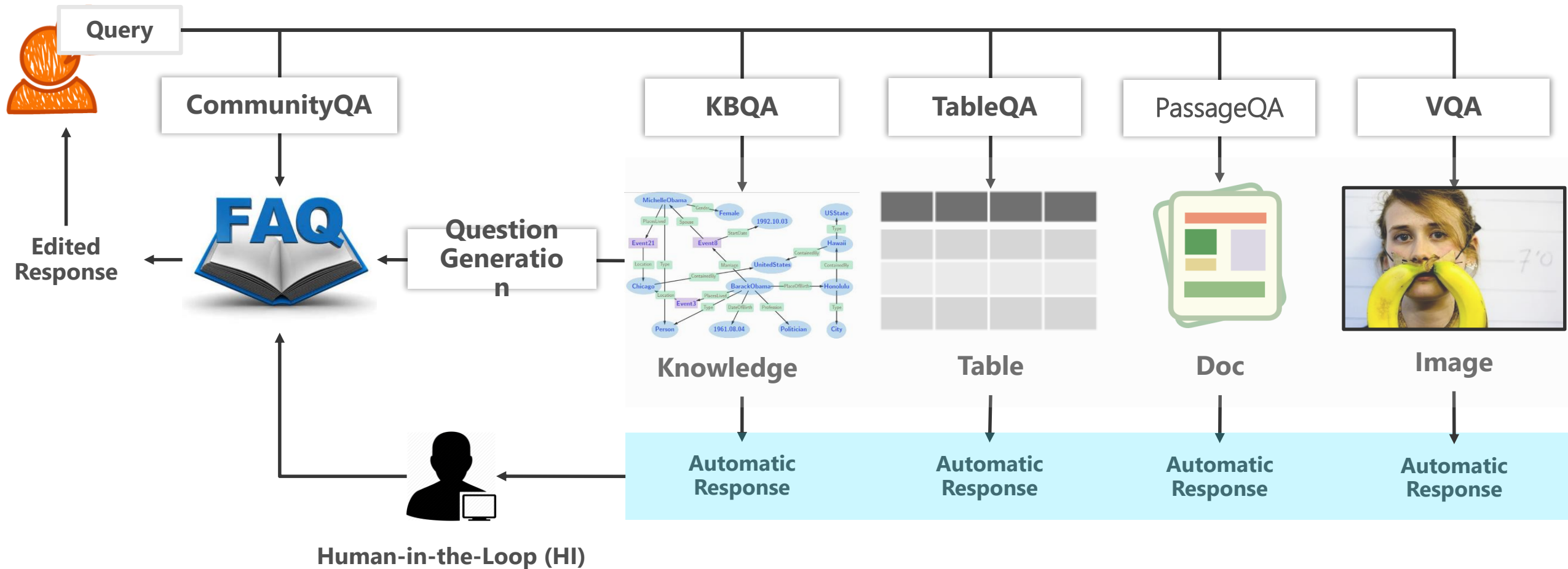
Important trends

- QA
- Multi-lingual
- Multi-modal
- MRC
- Personalized recommendation

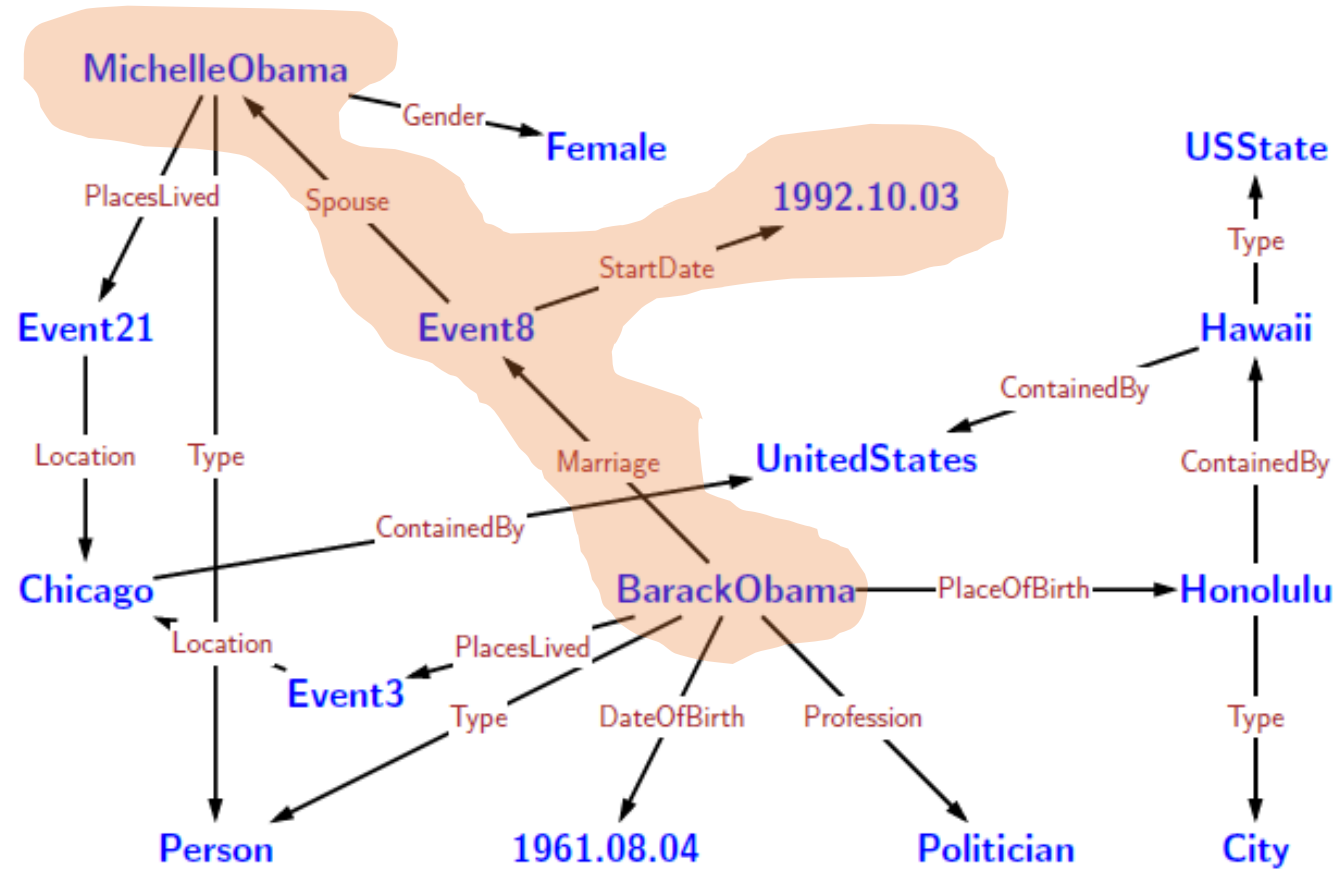
Important trends

- QA
- Multi-lingual
- Multi-modal
- MRC
- Personalized recommendation

Question-Answering



Knowledge-Base



KBQA approaches

Semantic Parsing-based KBQA

Query: where was Barack Obama born ?

Semantic Parsing

CCG

SCFG

DCS

NN

...

Logical Form: $\lambda x. Place_of_Birth(Barack\ Obama, x)$

Answer Lookup
from KB

<Barack Obama, Place_of_Birth, Honolulu>

Answer Ranking-based KBQA

Query: where was Barack Obama born ?

Answer Ranking

Answer Representation

Feature

NLG

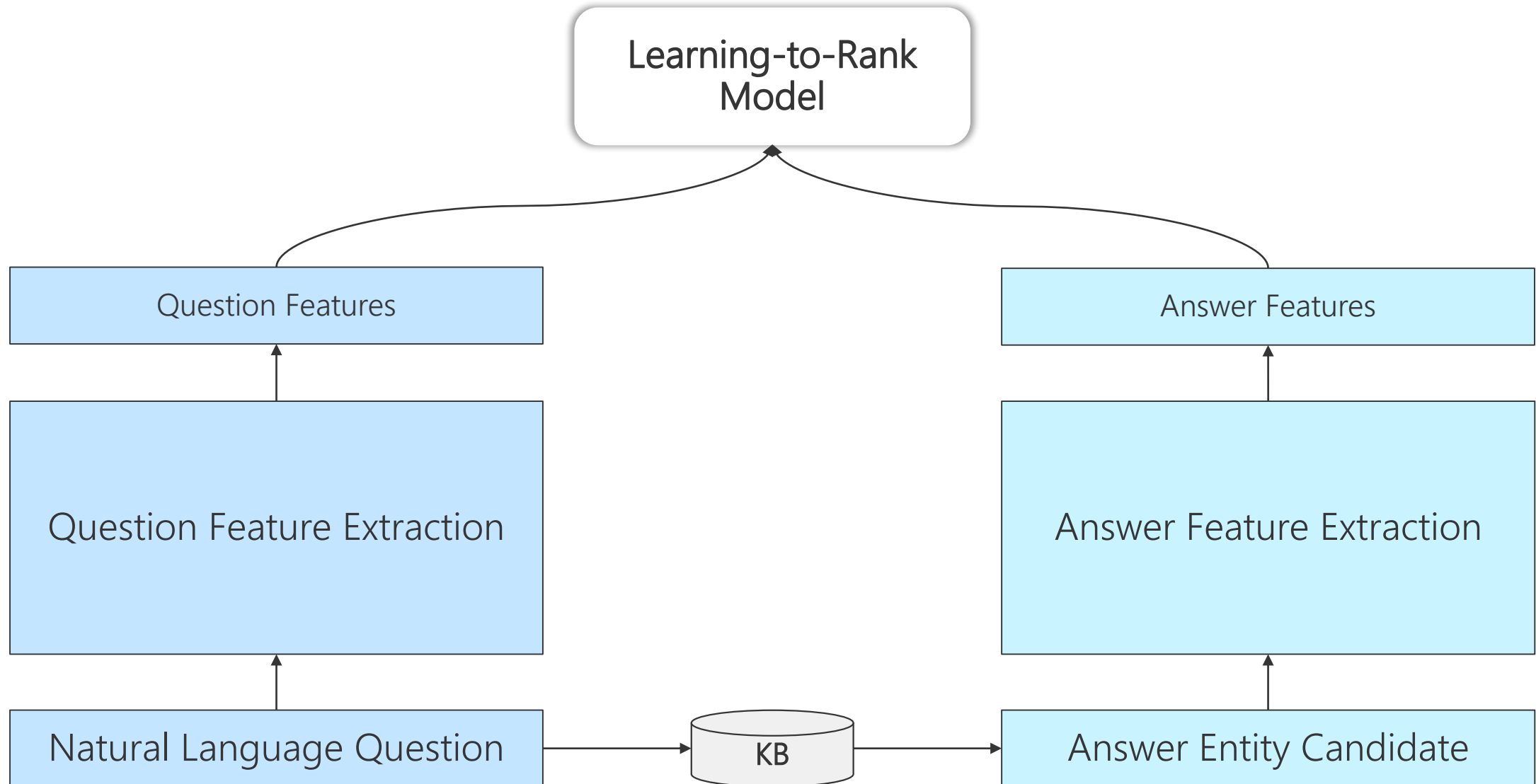
Sub-graph

Embedding

...

<Barack Obama, Place_of_Birth, Honolulu>

Answer Ranking-based KBQA



Ranking with NL description of the candidate answers

(Berant and Liang, 2014)

which city was **Obama** born ?

Ranking Model
(question-generated question)

Predicate POS	Question Generation Pattern
NP	What TYPE is the NP of ENTITY ?
NP VP	What NP is VP by ENTITY ?
...	...

When is the **date of birth** of **Barack Obama** ? ...

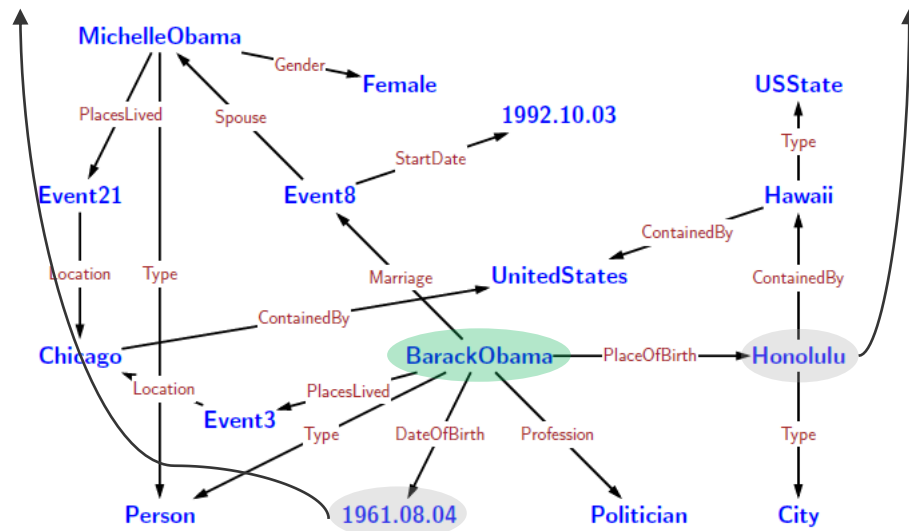
What **city** is the **place of birth** of **Barack Obama** ?

Pattern-based
Question Generation

Pattern-based
Question Generation

DataOfBirth.BarackObama

Type.City \cap PlaceOfBirth.BarackObama

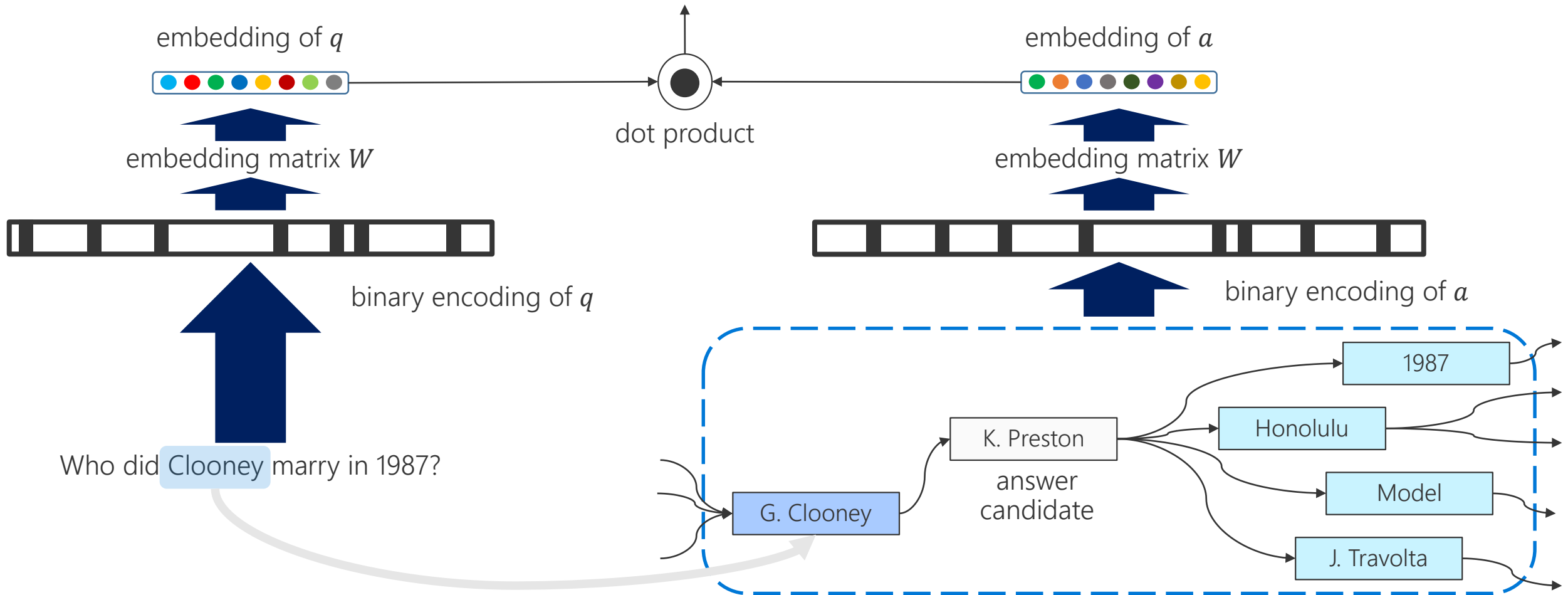


Ranking Model

- Compute similarity between input question and each generated question
- Features
 - Association Model (paraphrasing)
 - Vector Space Model (word embedding)

Ranking with embedding of candidate answers

(Bordes et al., 2014)



Combinatorial Categorical Grammar (CCG)

- CCG captures **syntactic** and **semantic** information jointly

A CCG Rule Example

border := (S\NP)/NP : $\lambda x \lambda y. \text{Border}(x, y)$

- Match natural language input

natural
language

syntactic

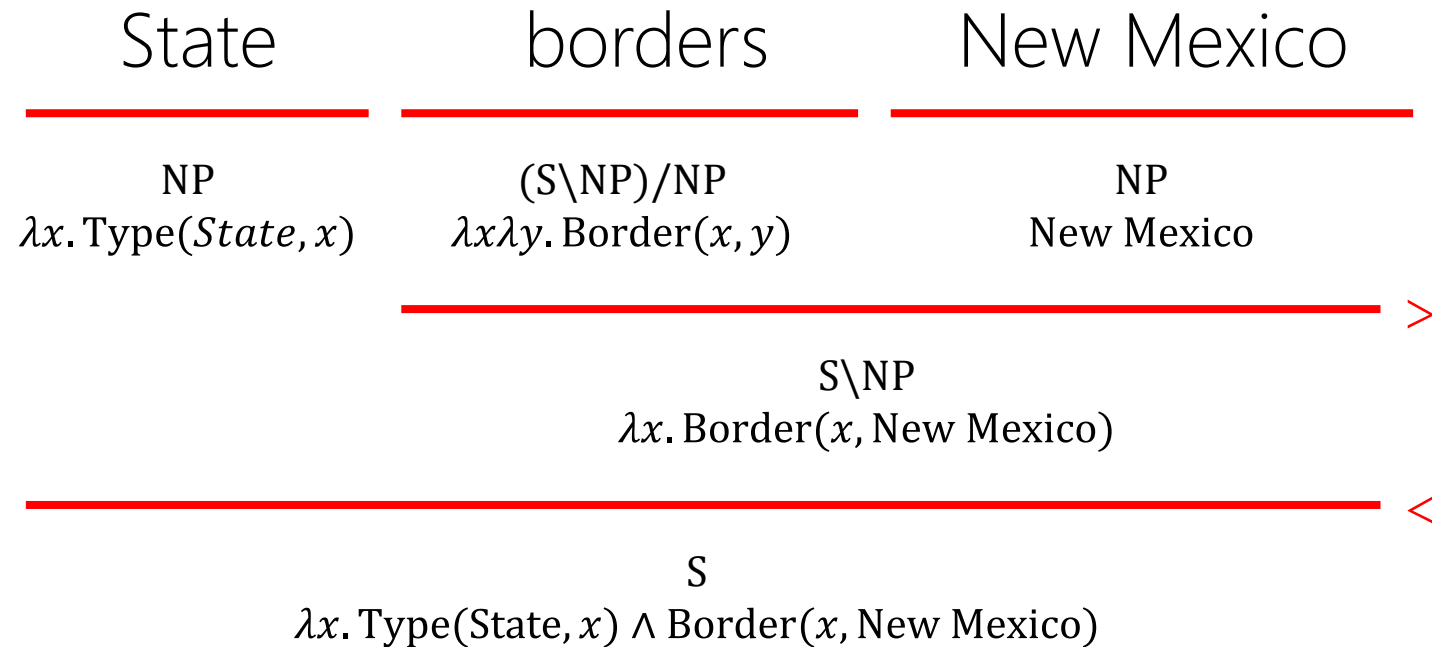
semantic

- Syntactic symbols: S, N, NP, ADJ and PP
- Syntactic combinator: / and \ which specify combination orders and directions

- λ -Calculus expression

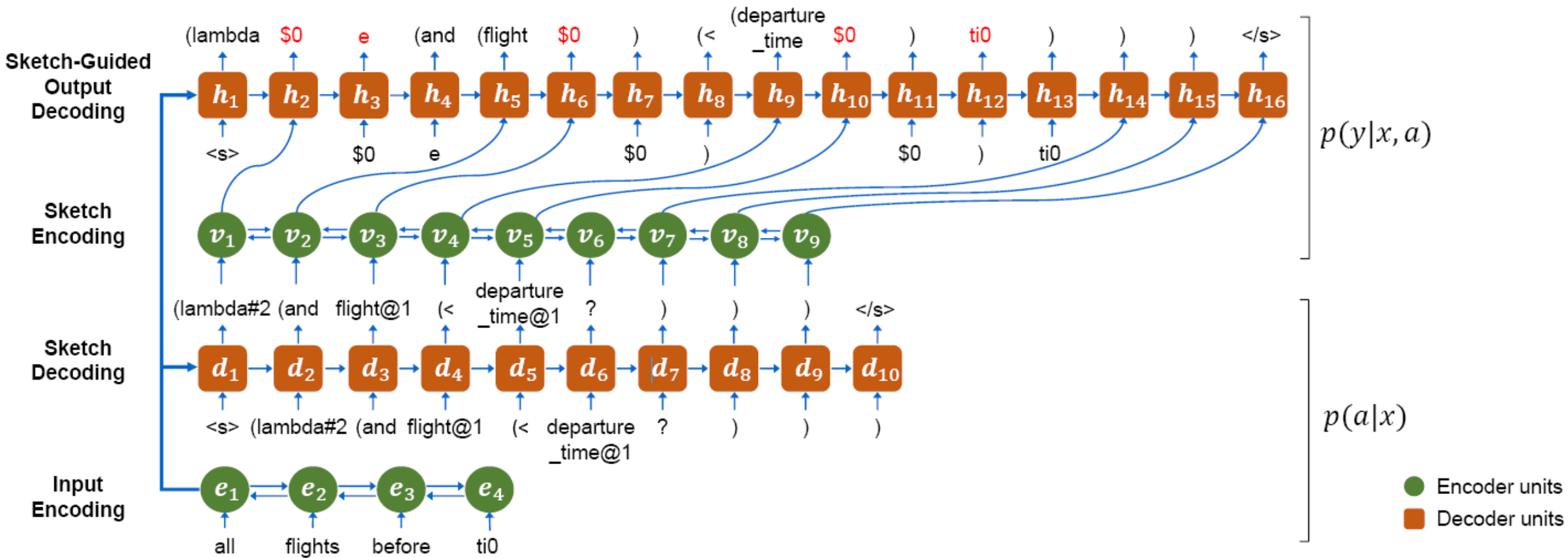
CCG-based semantic parsing for KBQA

(Zettlemoyer and Collins, 2007; Kwiatkowski et al., 2011)



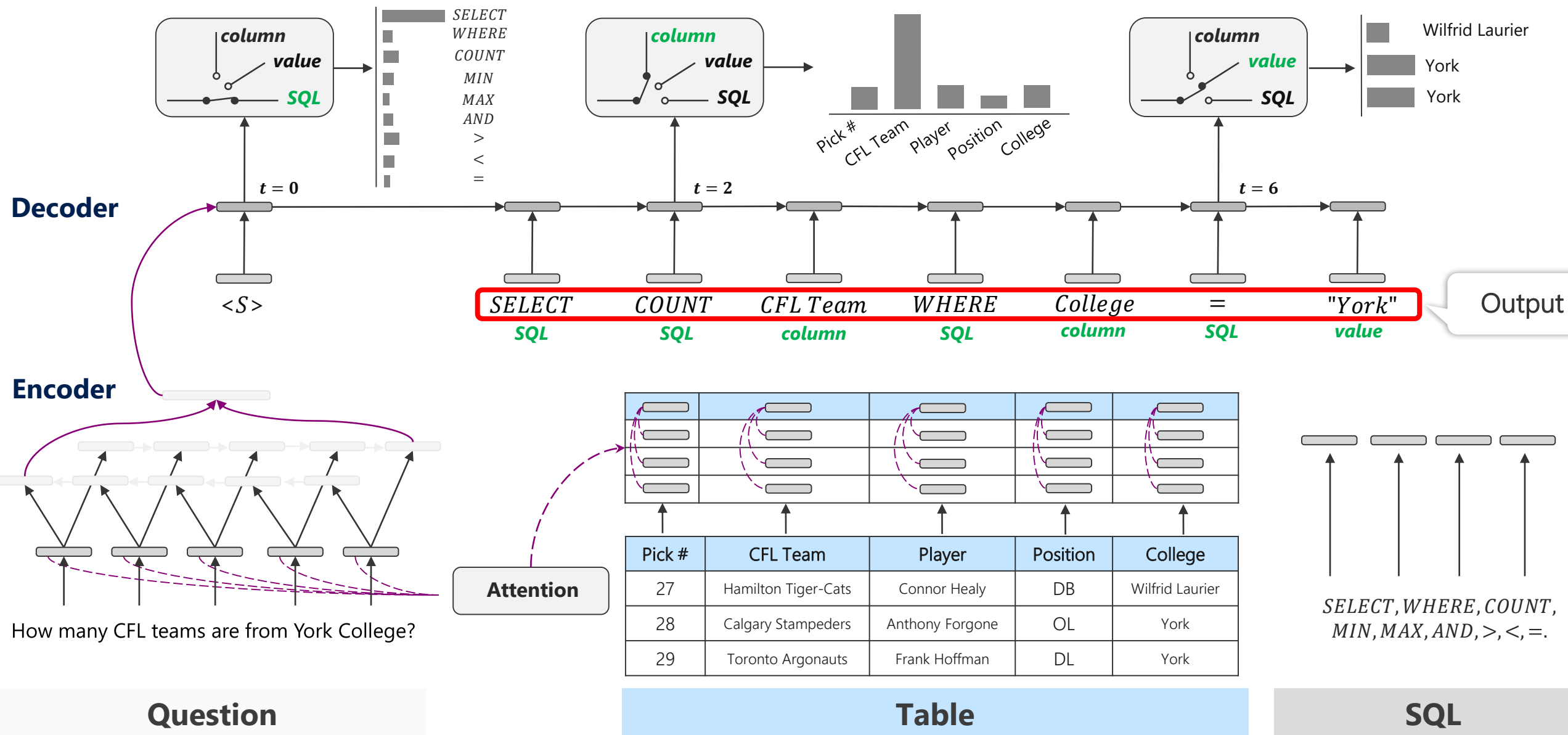
Semantic parsing with encoder-decoder

(Dong and Lapata, 2018)



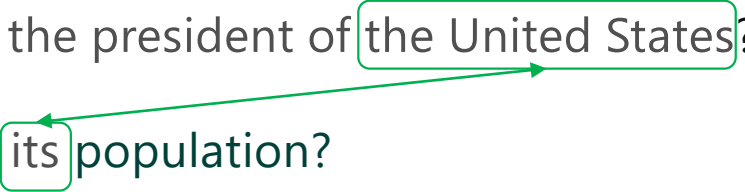
Semantic parsing with multi-gates and syntax constraints

MSRA-NLC @ ACL 2018



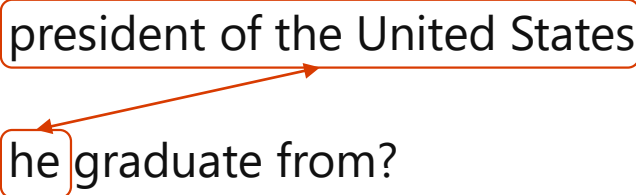
Conversational QA

Entity Coreference

- Who is the president of the United States?
 - what is its population?
- 
- A green box highlights the phrase "the United States" in the first question. A green arrow points from this box to a green box highlighting the word "its" in the second question.

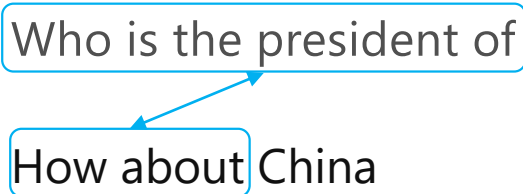
- Donald Trump

Subsequence Coreference

- Where did president of the United States born?
 - Where did he graduate from?
- 
- A red box highlights the phrase "president of the United States" in the first question. A red arrow points from this box to a red box highlighting the word "he" in the second question.

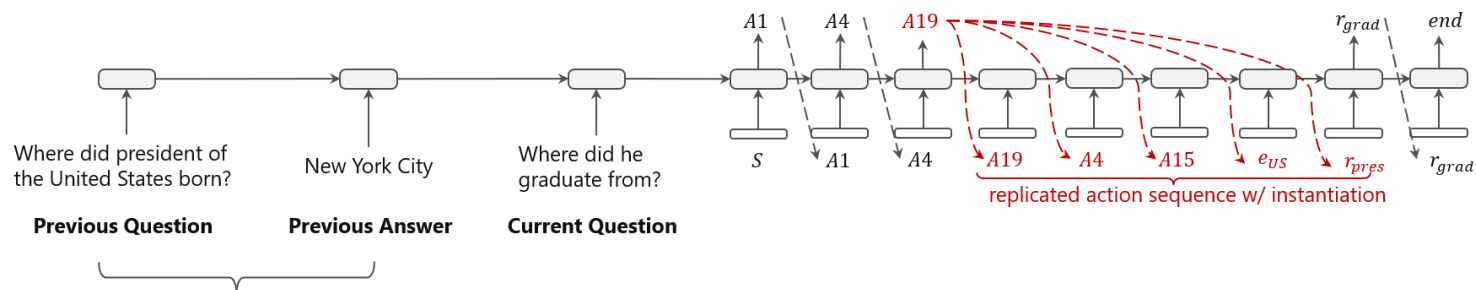
- New York City

Relation Ellipsis

- Who is the president of the United States?
 - How about China
- 
- A blue box highlights the phrase "Who is the president of" in the first question. A blue arrow points from this box to a blue box highlighting the phrase "How about" in the second question.

- New York City

Context-aware semantic parser



Action	Operation	Note
A1-A3	$start \rightarrow set num bool$	
A4	$set \rightarrow find(set, r)$	set of entities with a r edge to e
A5	$num \rightarrow count(set)$	total number of set
A6	$bool \rightarrow in(e, set)$	whether e is in set
A7	$set \rightarrow union(set_1, set_2)$	union of set_1 and set_2
A8	$set \rightarrow inter(set_1, set_2)$	intersection of set_1 and set_2
A9	$set \rightarrow diff(set_1, set_2)$	instances included in set_1 but not included in set_2
A10	$set \rightarrow larger(set, r, num)$	subset of set linking to more than num entities with relation r
A11	$set \rightarrow less(set, r, num)$	subset of set linking to less than num with relation r
A12	$set \rightarrow equal(set, r, num)$	subset of set linking to num entities with relation r
A13	$set \rightarrow argmax(set, r)$	subset of set linking to most entities with relation r
A14	$set \rightarrow argmin(set, r)$	subset of set linking to least entities with relation r
A15	$set \rightarrow \{e\}$	
A16-A18	$elr num \rightarrow constant$	instantiation for entity e , predicate r or number num
A19-A21	$set num bool \rightarrow action_{i-1}$	replicate previous action sequence (w/o or w/ instantiation)

Dialog Memory	
Entity	{United States, tag=utterance} {New York City, tag=answer}
Predicate	{isPresidentOf} {placeOfBirth}
Action Subsequence	$set \rightarrow A4 A15 e_{US} r_{pres}$ $set \rightarrow A4 A15 A16 A17$

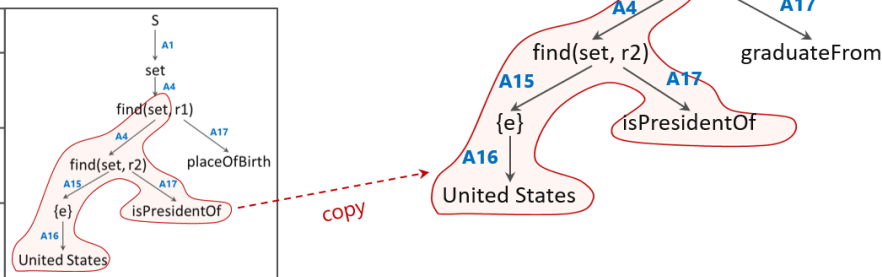


Table 2: Performance of different approaches on the CSQA dataset.

Methods	HRED+KV mem		ContxIndp-SP		D2A (our approach)	
	Recall	Precision	Recall	Precision	Recall	Precision
Overall	18.40%	6.30%	42.18%	40.88%	64.04%	61.76%
Simple Question (Direct)	33.30%	8.58%	94.04%	88.32%	93.67%	89.26%
Simple Question (Co-referenced)	12.67%	5.09%	40.29%	38.55%	71.31%	68.41%
Simple Question (Ellipsis)	17.30%	6.98%	14.09%	13.28%	86.58%	77.85%
Logical Reasoning (All)	15.11%	5.75%	36.23%	35.91%	42.49%	44.82%
Quantitative Reasoning (All)	0.91%	1.01%	43.75%	49.91%	48.59%	52.03%
Comparative Reasoning (All)	2.11%	4.97%	41.49%	38.91%	44.73%	43.69%
Clarification	25.09%	12.13%	0.01%	0.01%	19.36%	17.36%
Question Type	Accuracy		Accuracy		Accuracy	
Verification (Boolean)	21.04%		20.38%		45.05%	
Quantitative Reasoning (Count)	12.13%		30.60%		40.94%	
Comparative Reasoning (Count)	8.67%		15.54%		17.78%	

Neural Network-based Semantic Parsing for Conversational KBQA
(MSRA-NLC @ NIPS 2018)


Applications in Bing

which is the highest mountain in the world

All Images Videos Maps News Shopping | My saves

Microsoft Show results from Microsoft

162,000,000 Results Any time

 The highest mountain in the world by elevation
Mount Everest
29,029 feet

RANK	MOUNTAIN	ELEVATION (FEET)	PROMINENCE (FEET)
1	Mount Everest	29,029	29,029
2	K2	28,251	13,179
3	Kangchenjunga	28,169	12,867
4	Lhotse	27,940	2,001
5	Makalu	27,838	7,828
6	Cho Oyu	26,864	7,677
7	Dhaulagiri	26,795	11,014
8	Manaslu	26,781	10,144
9	Nanga Parbat	26,660	15,118
10	Annapurna Massif	26,545	9,790

Bing Table QA

who is president of united states in 2000

All Images Videos Maps News Shopping | My saves

Microsoft Show results from Microsoft

18,300,000 Results Any time

 President in 2000
Bill Clinton


Bing Knowledge QA


how high is yao ming's wife


All Images Videos Maps News Shopping | My saves


Microsoft Show results from Microsoft


4,920,000 Results Any time

 Ye Li · Height
6' 3"
(1.90 m)

 Yao Ming
7' 6"

 LeBron James
6' 8"

 Yi Jianlian
6' 11"

 Wang Zhizhi
7' 1"

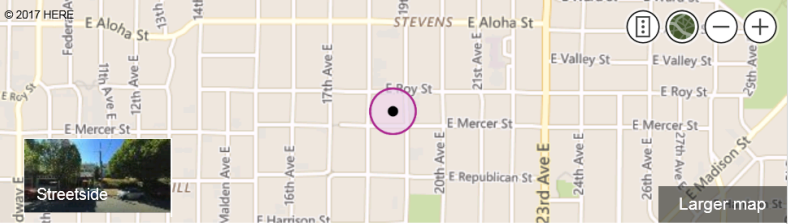
Conversational search starts to appear

monsoon restaurant seattle

日本のBingへ Nan 0

Web Images Videos Maps News My saves Work results

1,090,000 RESULTS Any time



Monsoon Restaurant
www.monsoonrestaurants.com
615 19th Ave E, Seattle, WA 98112
(206) 325-2111
Open until 11:30 PM
★★★★★ 480 Yelp reviews · \$\$\$\$
Save Suggest an edit

Directions Menu Order online


Questions? Ask Monsoon Restaurant bot for help **Chat**

Seattle — MONSOON
www.monsoonrestaurants.com/seattle
Monsoon offers traditional Vietnamese cuisine in a contemporary setting with Pacific Northwest ingredients.

Monsoon - Seattle - 247 Photos & 480 Reviews - Vietnamese ...
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★★★★★ 4/5 · 480 Yelp reviews · Seattle, WA · (206) 325-2111
480 reviews of **Monsoon - Seattle** "I was REALLY skeptical about this place because it's an Asian fusion shop and there was only one Asian employee working. I was ..."

Monsoon, Seattle - Menu, Prices & Restaurant Reviews ...
www.tripadvisor.com · Seattle · Seattle Restaurants
Aug 22, 2017 · **Monsoon, Seattle**: See 97 unbiased reviews of Monsoon, rated 4.5 of 5 on TripAdvisor and ranked #320 of 4,169 restaurants in Seattle.

Monsoon - Seattle Restaurant - Seattle, WA | OpenTable
<https://www.opentable.com/r/monsoon-seattle>
Get menu, photos and location information for **Monsoon - Seattle** in seattle, WA. Or book now at one of



See all images

More about Monsoon Restaurant
Cuisine: Vietnamese · Chinese

Open 10:00 AM - 11:30 PM

Menu favorites

Caramelized Idaho Catfish Claypot (Seafood)	55
Crispy Local Drunken Chicken	64
Crispy Imperial Rolls	34
Bo la Lot	24
Carlton Farm Pork Spare Ribs	14

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- Z** 10 Vietnamese Dishes You Need to Know
Zagat

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A summary about QA

1. Big progress was made in question understanding, knowledge graph and answer extraction. QA for simple question has been successfully used in search engine.
2. Traditionally, grammar-based semantic parser was applied, but now encoder-decoder approach becomes mainstreams. But I think that no conclusion can be made on which method is the best.
3. Context-aware semantic parser, as a vital technologies for conversational QA, has achieved promising result, but it needs more efforts in data annotation, modeling and testing.

New trends brought by NLP

- QA
- Multi-lingual
- Multi-modal
- MRC
- Personalized recommendation

Cross language search

Live Search for Olympics

西雅图

Web results 1-10 of 149,759,000
See also: [Images](#), [Video](#), [News](#), [Maps](#), [MSN](#), [More](#) ▼

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西雅图超音速
西雅图超音速 Seattle Supersonics 主场所在城市: 华盛顿州 西雅图人数: 17072人
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西雅图 百度百科
Seattle 西雅图坐落于美国华盛顿州, 是美国西北部重要工商业城市、(1984), 大市区(包括 ...
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Seattle's Convention and Visitors Bureau www.visitseattle.org



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Non-English Language Info on Seattle.Gov
The City of Seattle provides many types of public information in 26 different languages on its web site.

Seattle 101 - A Guide for Travelers and Tourists
Our Guide is designed to give travelers and tourists all the most necessary information they will need to travel to and in Seattle and the United States.

Virtual Tour
Explore Seattle and our most popular areas and attractions. Also available in Spanish!

Points of Interest
Links to the websites of many tourist attractions and other interesting places to visit.

Seattle Icons
These are the places you really want to see - Bruce Lee's grave, the original Starbucks, Bill Gates House and other special places.

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Photo collections of Seattle and Washington State.

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Business Community Arts & Rec Climate Government Public Safety Transportation Utilities Visiting

Visiting

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- 照片珍藏
- 地图和方向
- 意见
- 须知和指引
- 步行团
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- 地区旅游
- 西雅图历史学
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要求在西雅图的游客包的资料 **Seattle metronatural**
Seattle's Convention and Visitors Bureau www.visitseattle.org



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许多在我们的网页是游客的联系外部的联系。可节省该幅土地在你宫: 或书签所以容易回到这里。

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西雅图的城市在其网址上26种不同语言提供许多类型的公共信息。

西雅图101指导旅客和游客
我们的指引是为了使旅客及游客的所有最新资料, 他们将前往欧洲和在西雅图和美国。

图片
探索西雅图和我们最流行的地区和景点。 还可在西班牙!

点利息
许多有趣的旅游景点及其他地方联系的网站的访问。

西雅图雕像
这些地方你真想看见李小龙严重 有独创性的星巴克 盖茨之家和其他特别的地方。

照片珍藏
照片收藏的西雅图和华盛顿的国家。

方向和地图
在这里, 以及如何解决如何。

意见
做地方官我们的心和我们的意见

HIGHLIGHTS

- 来访的西雅图的巴士 船 铁路或...
使用公共交通 客人不驾驶便可以看到西雅图的许多景点 交通和停车场。
- 西雅图公共图书馆
新的公共图书馆在市中心西雅图是世界著名的建立和社会的一个重要资源。
- 西雅图提出
西雅图的音乐家表演享有自由地在香港大会堂。
- 博物馆的飞行
独立 非盈利性飞行博物馆是世界最大的航空和空间的博物馆之一。
- Seattle Aquarium
See, touch and explore our amazing underwater world. Also enjoy a stroll on the Seattle Waterfront.
- Seattle Center
The original grounds of the Seattle World's Fair have been transformed into a center for arts and cultural there is always something going on.
- Woodland Park Zoo
The Zoo is a conservation and education institution demonstrating the value, beauty and interdependence of all living things.

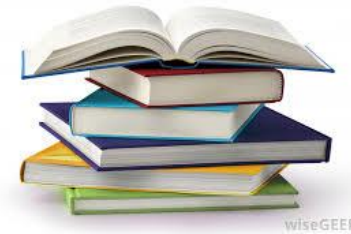
NMT research

Rich Resource MT
(Zh-En, Fr-En, De-En,...)



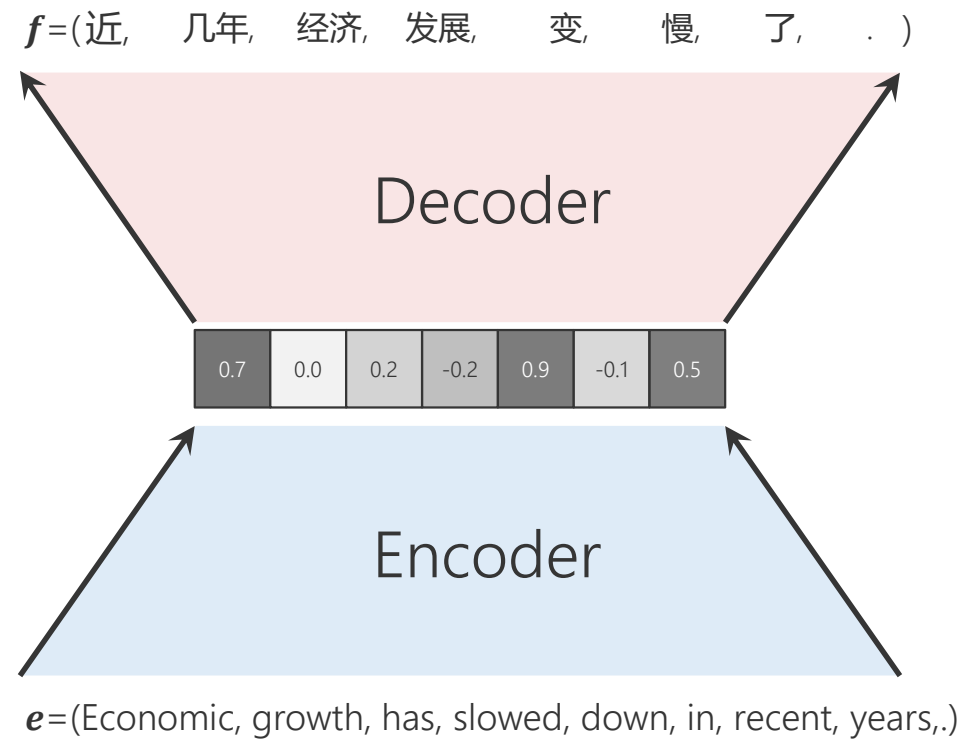
Large Bilingual Corpus

Low Resource MT
(En-He, Fr-Ro, He-Ro,...)

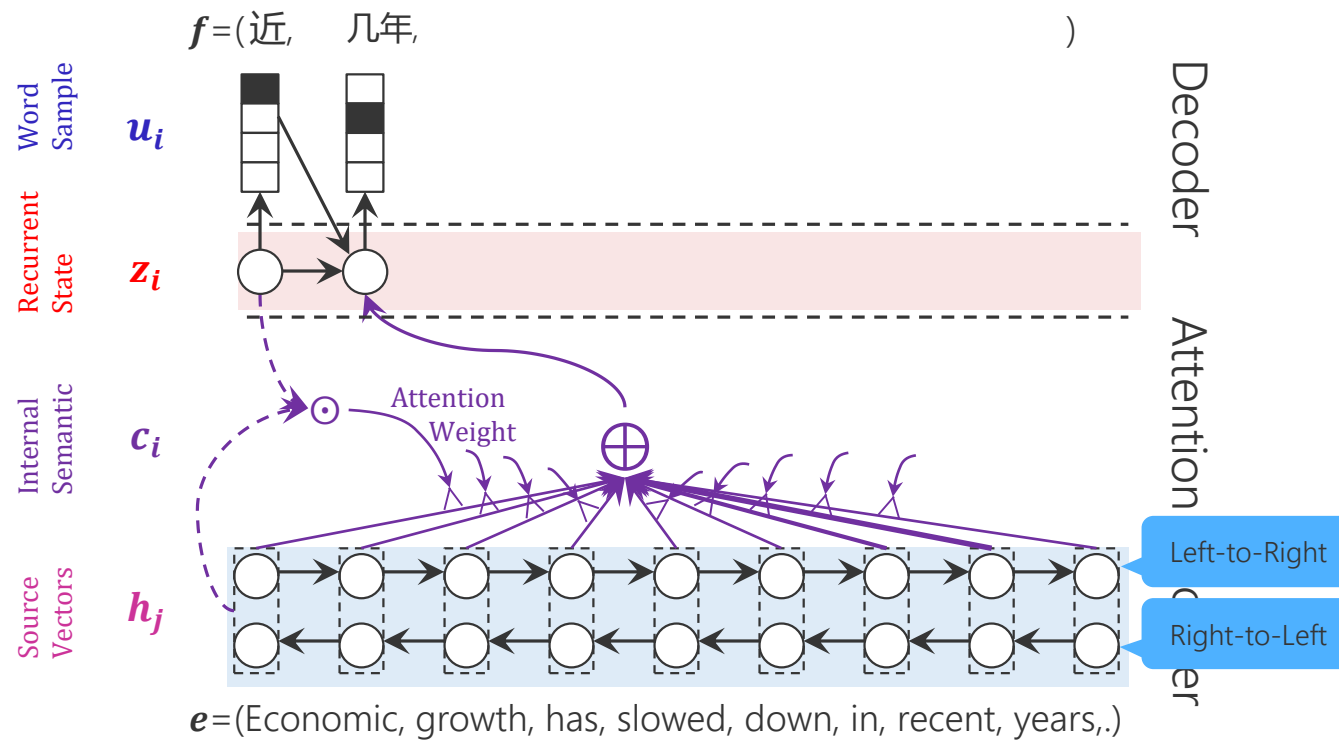


Small or No Bilingual Corpus

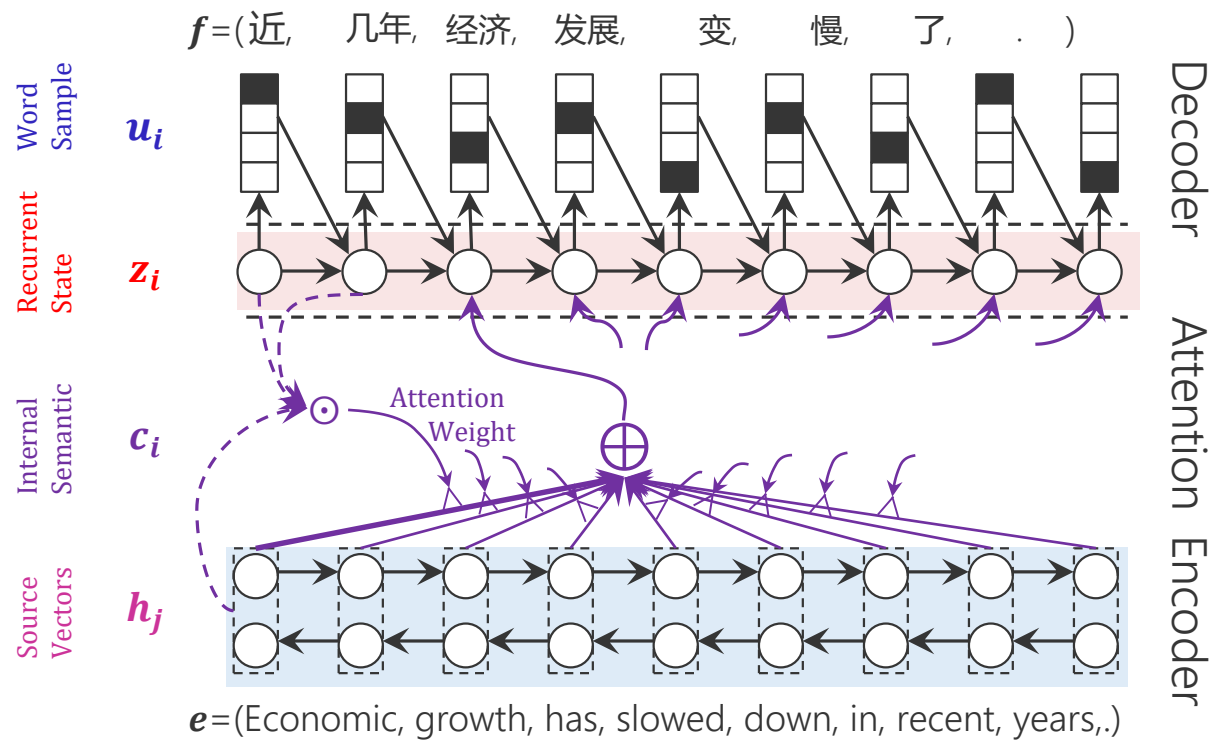
Neural machine translation



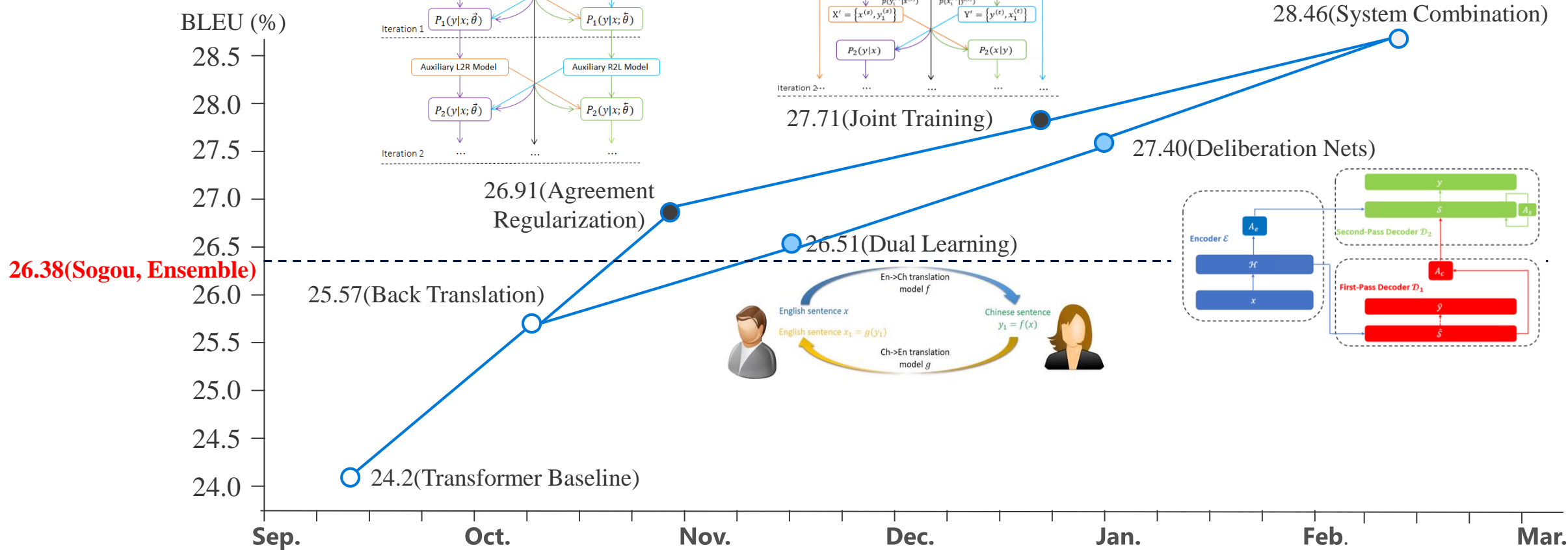
Neural machine translation



Neural machine translation



Human-Parity results on WMT 2017



News translation results

- Sampled from WMT2017 Chinese-English task

Source input	有 线索 人士 请 拨打 旧金山 警察局 举报电话 4 15- 575 - 44 44 。
NMT output	For clues , call the San Francisco Police Department at 415-575 - 4444.
Human reference	Anyone with information is asked to call the SFPD Tip Line at 415-575-4444 .

Source input	他的 职业 生涯 如 过山车 一般 。
NMT output	It has been a rollercoaster ride .
Human reference	His career is like a roller coaster.

Source input	霍夫 施泰特尔 表示 : " 这 将 由 检 察 官 来 确 定 " 。
NMT output	" That 's what the prosecutor must determine , " said Hofstetter .
Human reference	Mr Hoff Steitel said: " It will be up to the prosecutors to determine.

Term translation mining

个人档案

紫色薰衣草 >> 英语词汇 (29)

海鲜英文菜谱

1. 红烧海参 sea slugs with brown sauce
2. 鸡球海参 sea slugs with chicken cream
3. 海参锅巴 sea slugs with crisp rice
4. 什锦海参 mixed sea slugs
5. 虾子海参 shrimp eggs & sea slugs
6. 红烧明虾 fried prawns with brown sauce
7. 炸明虾 prawn cutlets
8. 焗明虾 broiled Prawns with chili sauce
9. 椒盐明虾 prawns with spiced salt
10. 煎明虾段 fried prawns sections
11. 干烧龙虾 broiled lobster with chili sauce
12. ...

阅读全文>>>

类别: 英语词汇 | 浏览 (59) | 留言 (3) | 日记标签: 英文, 双语, 词汇

“八荣八耻”的英文翻译

以热爱祖国为荣, 以危害祖国为耻;
Love; do not harm the motherland.

以服务人民为荣, 以背离人民为耻;
Serve; don't disserve the people.

以崇尚科学为荣, 以愚昧无知为耻;
Uphold science; don't be ignorant And unenlightened.

以辛勤劳动为荣, 以好逸恶劳为耻;
Work hard; don't sh...

阅读全文>>>

Baidu 百科 金刚狼

金刚狼 (漫威漫画出版物中的英雄角色)

金刚狼是漫威漫画公司创造出的虚拟人物, 首次登场是《不义养父》后金刚狼的超能力就开始显现出来, 之后在一场实验中被洗刷的利爪, 他有一个儿子叫戴肯, 真人版金刚狼由澳洲演员“狼叔”休·杰克曼饰演。

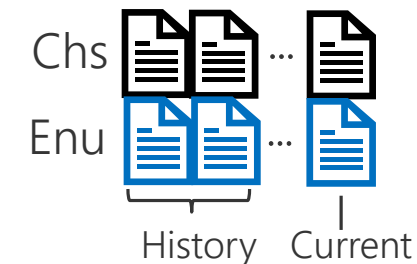
中文名	罗根
外文名	Logan
别名	金刚狼(Wolverine)
出生地	加拿大

豆瓣电影 电影、影人、影评完、

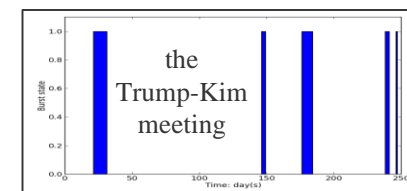
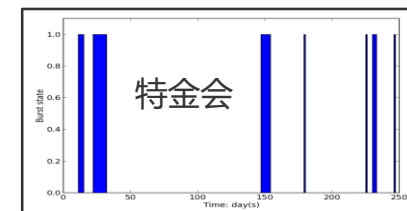
金刚狼2 The Wolverine

导演: 詹姆斯·曼高德
编剧: 马克·鲍姆贝克 / 斯科特·弗里斯
主演: 休·杰克曼 / 冈本多绪 / 福岛莉娜 / 斯维特拉纳·库德钦科娃 / 布鲁斯·坎贝尔 / 法米克·詹森 / 李威尹
类型: 动作 / 科幻 / 冒险
官方网站: www.thewolverinem.com
制片国家/地区: 美国

News stream data

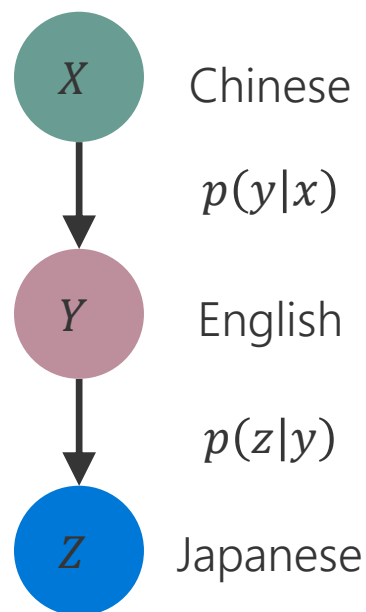


Burst distribution



Low-resource neural machine translation

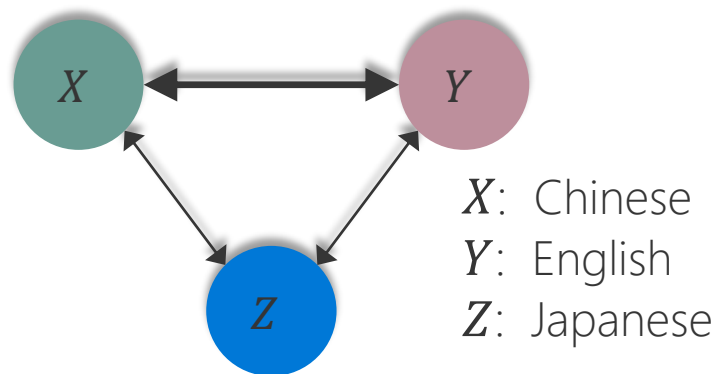
Pivot-based NMT



To translate a Chinese sentence x to a Japanese sentence z , we first translate x to an English sentence y , then translation y to Japanese z .

Chen, et al., 2017. A teacher-student framework for zero-resource neural machine translation.

Tri-Language NMT



Language Z is the hidden space between language X and language Y .

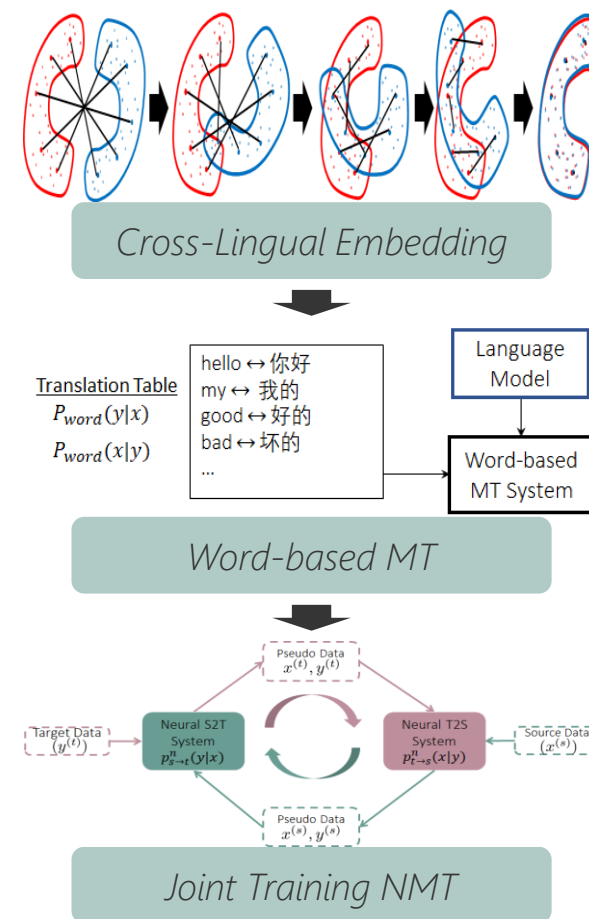
$$p(y|x) = \sum_{z \in Z} p(z|x)p(y|z)$$

$$p(x|y) = \sum_{z \in Z} p(z|y)p(x|z)$$

EM training is leveraged for fine tuning.

Ren, et al., 2018. Triangular architecture for rare language translation.

Unsupervised NMT



Lample, et al., 2018. Phrase-based & neural unsupervised machine translation.

Ren, et al., 2018. Unsupervised neural machine translation with SMT as posterior regularization. Submitted

A summary about multi-lingual search

1. Amazing progress in rich language translation at single-sentence level, such as news translation.
2. We have witnessed some progress in low-resource language translation, but it is still at very early stage. I think that it will be the most important topic in NMT.
3. We need to develop better models for term translation and query translation.

New trends brought by NLP

- QA
- Multi-lingual
- Multi-modal
- MRC
- Personalized recommendation

ImageNet

The ImageNet Large Scale Visual Recognition Challenge (ILSVRC) evaluates algorithms for object detection and image classification at large scale.



Image

mite

container ship

motor scooter

leopard

Ground Truth

	mite	container ship	motor scooter	leopard
	black widow	lifeboat	go-kart	jaguar
	cockroach	amphibian	moped	cheetah
	tick	fireboat	bumper car	snow leopard
	starfish	drilling platform	golfcart	Egyptian cat

Predication

Image captioning



I think it's a man flying a kite on the beach.



I think it's a colorful bird perched on a tree branch.



I think it's a boat that is lit up at night in a city.



I think it's a little boy sitting in front of a birthday cake and he seems 😊.



Video captioning



A car is running



A man is cutting a piece of meat



A man is performing on a stage



A man is riding a bike



A man is singing



A panda is walking



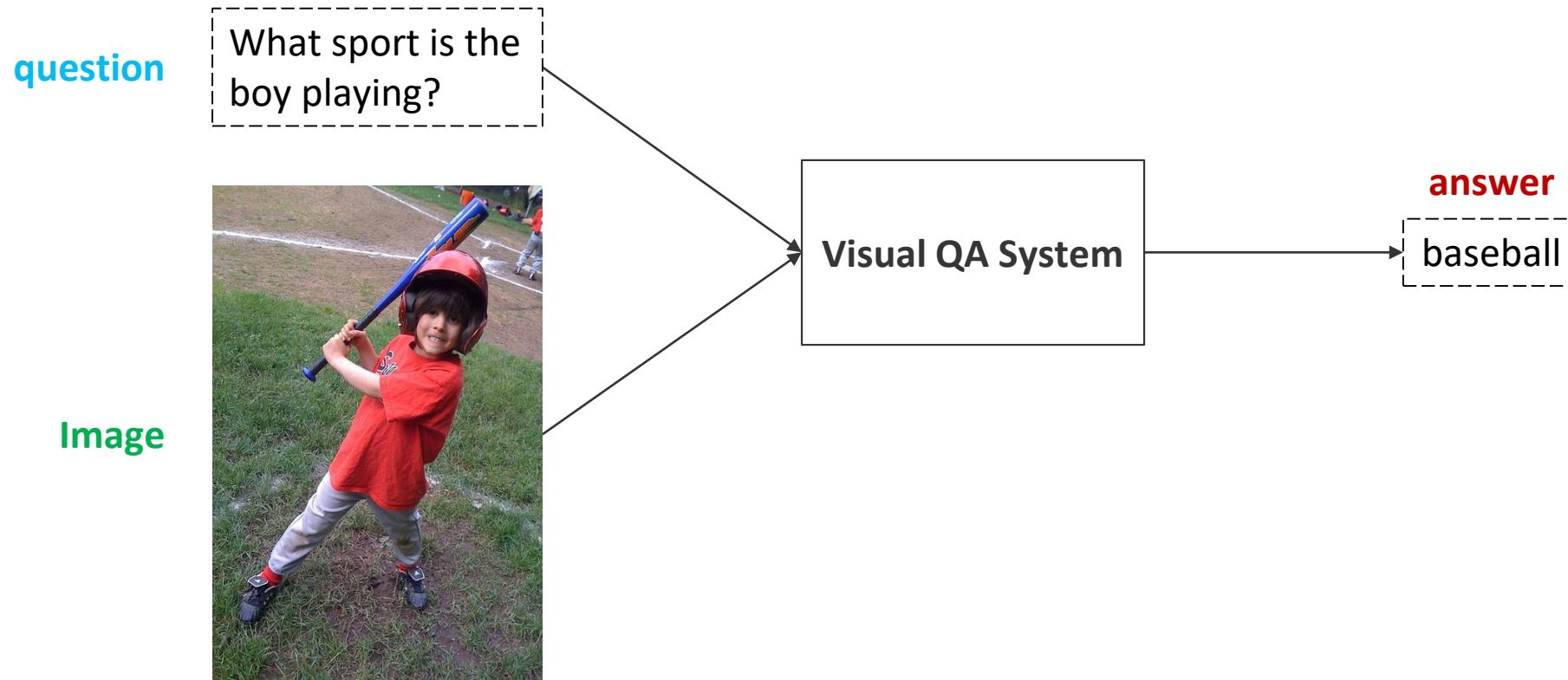
A woman is riding a horse



A man is flying in a field

Visual question answering (VQA)

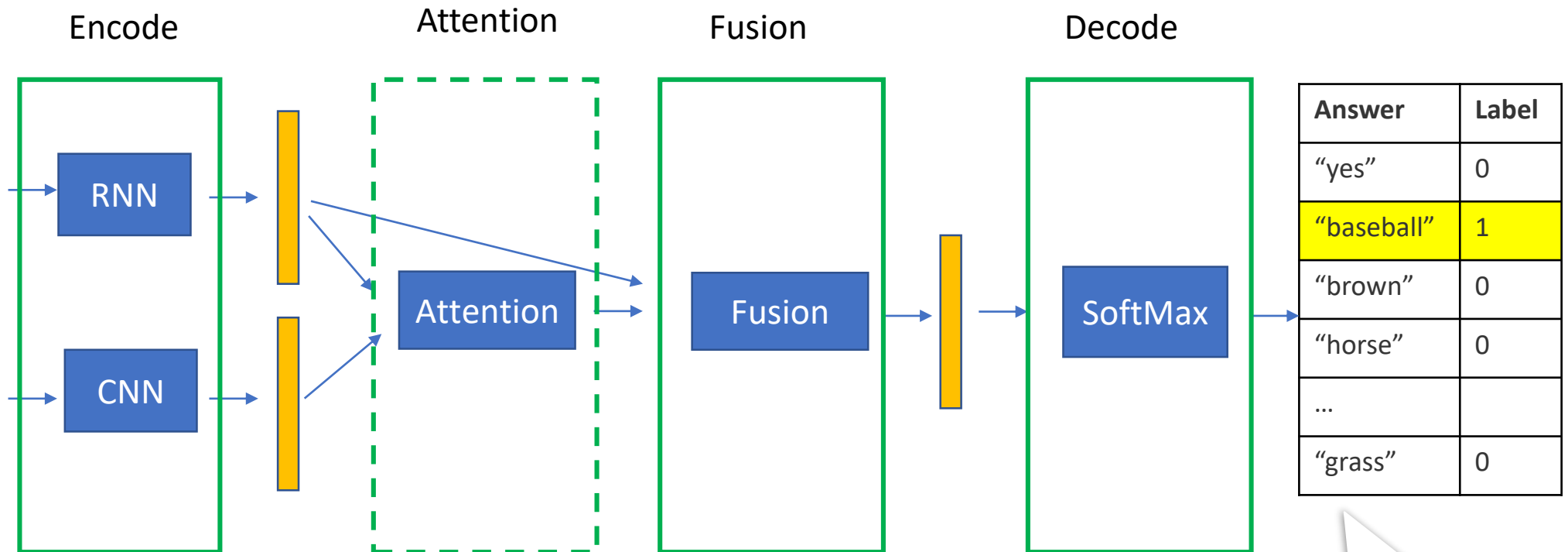
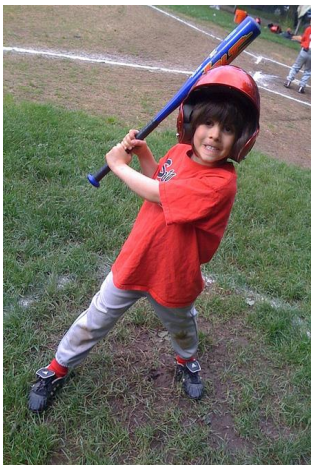
Given an **image** and a related **question**, predict the most possible **answer**



VQA dataset (Agrawal et al., 2016), which contains ~0.25M images, ~0.76M questions, and ~10M answers.

A typical VQA framework

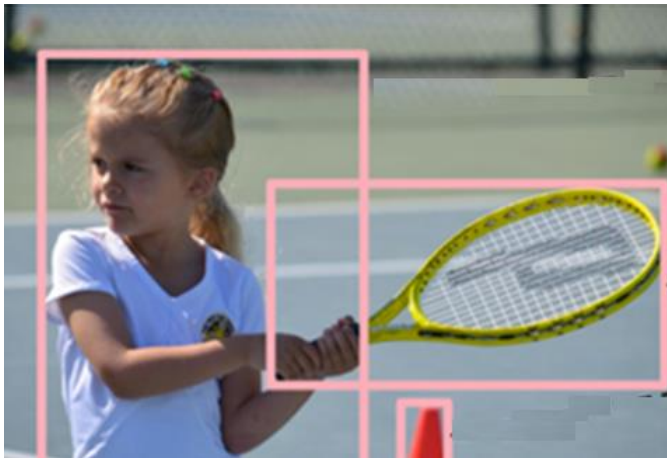
“What sport is the boy playing?”



The size of answer candidates is ~3,000.

Motivating example of using knowledge

- Image mis-understanding due to relation missing



Question: what is the girl holding?

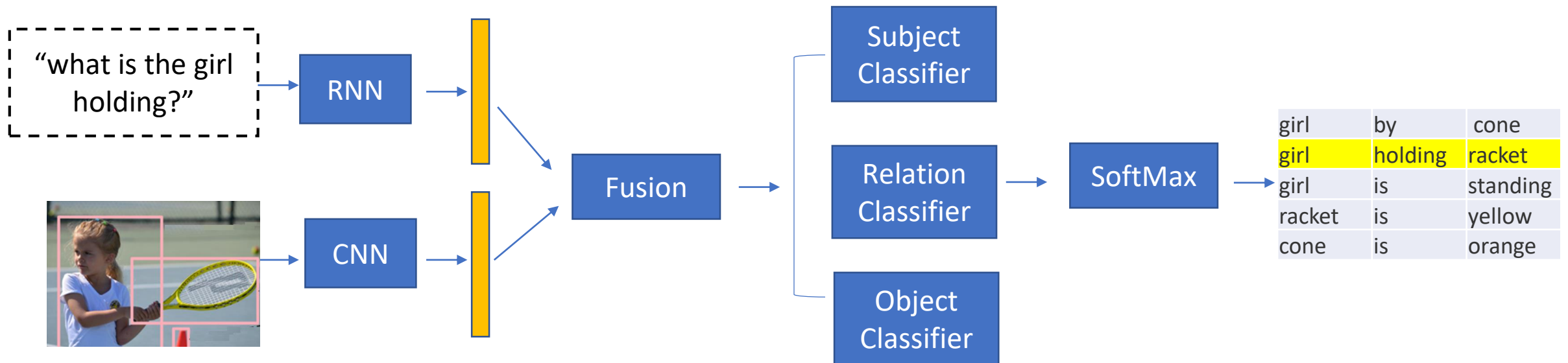
Ground Truth Answer: racket

Predicted Answer: [hand: 0.630] [racket: 0.21] [cone: 0.072] [mouse: 0.004]

If we know (girl, hold, racket) is valid, and (girl, hold, hand) is not valid, we probably can infer “racket” as a better answer.

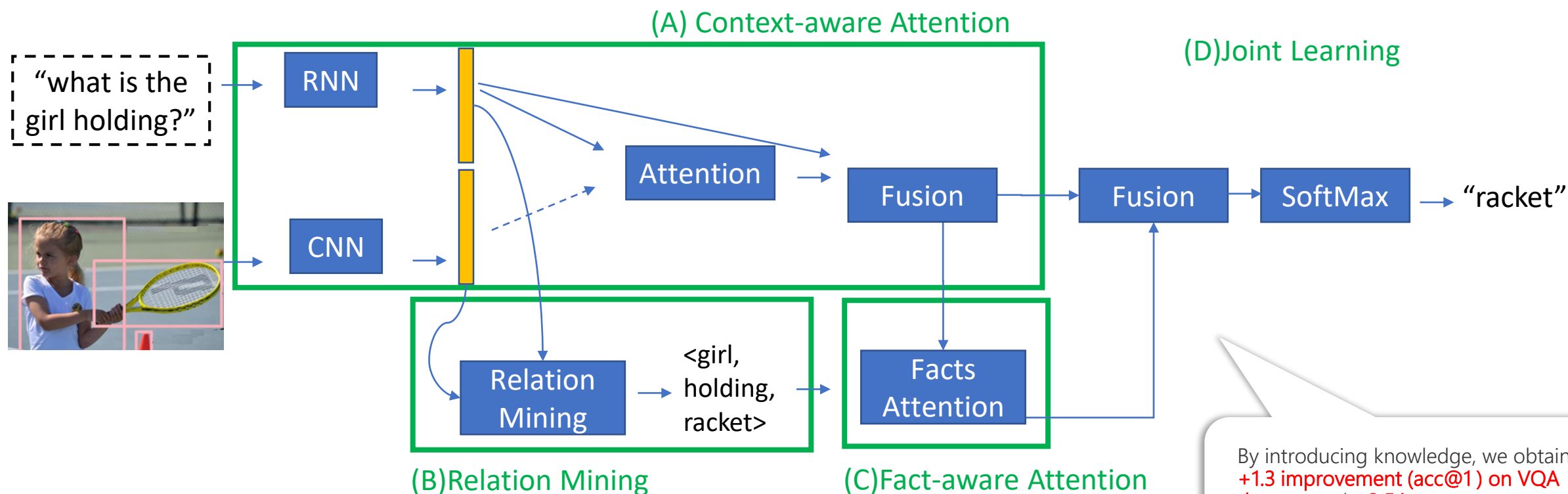
Knowledge mining from image

Training data comes from **Visual Genome dataset** (Krishna et al., 2017)



$$L_t = \lambda_s L(s, \hat{s}) + \lambda_r L(r, \hat{r}) + \lambda_o L(o, \hat{o}) + \lambda_w \|W\|_2$$

VQA with knowledge



By introducing knowledge, we obtain **+1.3 improvement (acc@1) on VQA dataset**, and **+2.5 improvement (acc@1) on COCO QA dataset**.

VQA with knowledge mining examples



Q: Does this building have a clock ?

A: **yes**

R: *(clock, on, building)* 0.81
(window, on, building) 0.07
(building, has, clock) 0.03
(clock, near, tower) 0.01
(clock tower, near, building) 0.01

(a)



Q: What are the animals standing on ?

A: **grass**

R: *(animal, standing on, grass)* 0.27
(animal, standing on, field) 0.20
(zebra, standing on, grass) 0.19
(zebra, standing on, field) 0.14
(animal, standing on, gazing) 0.13

(b)



Q: What color is the ball ?

A: **yellow**

R: *(ball, is, yellow)* 0.43
(tennis ball, is, yellow) 0.36
(ball, is, green) 0.12
(there, is, tennis ball) 0.05
(ball, in, air) 0.02

(c)



Q: What kind of court is this ?

A: **tennis court**

R: *(there, is, tennis court)* 0.52
(white lines, in, tennis court) 0.21
(line, in, tennis court) 0.09
(grass, in, tennis court) 0.08
(court, is, orange) 0.03

(d)

Image retrieval

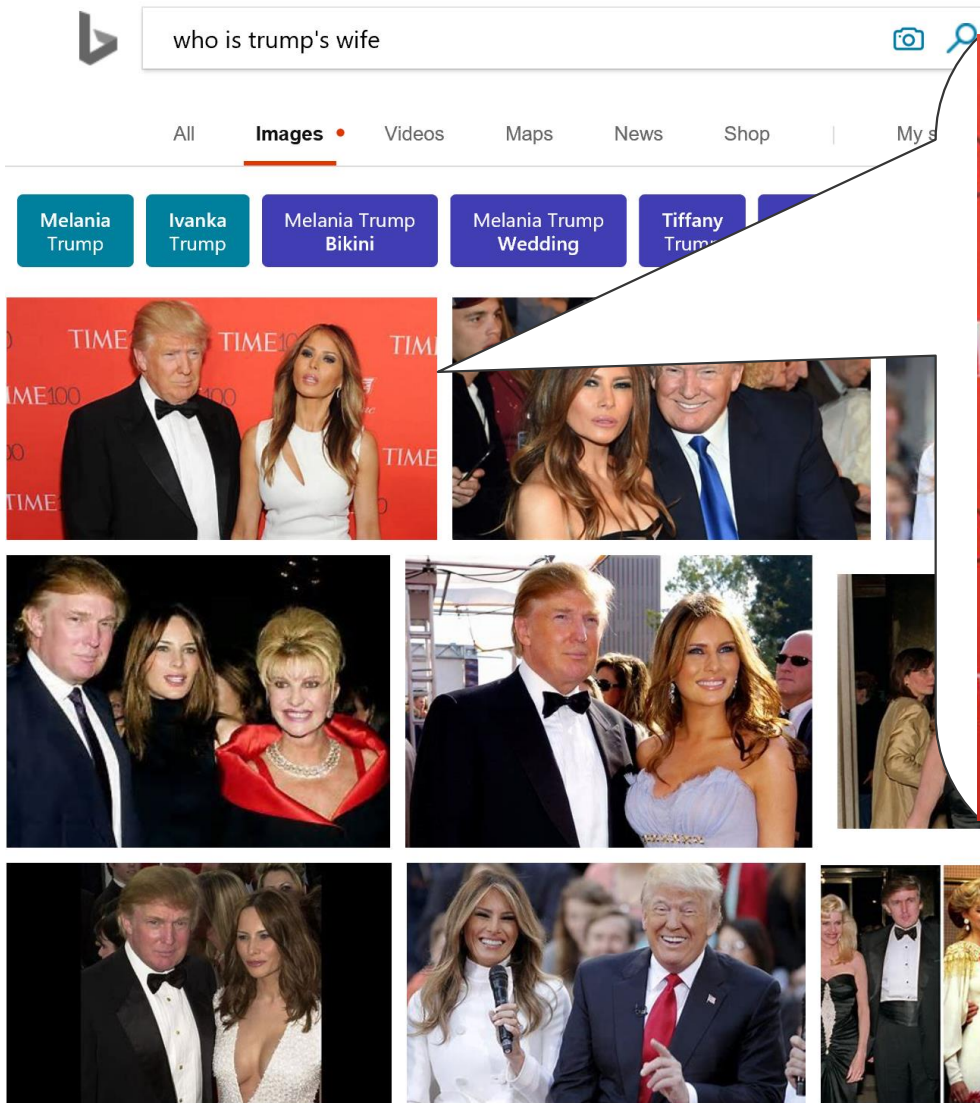
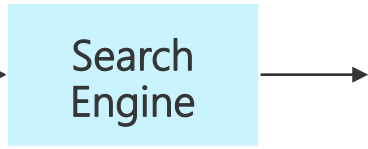


Image query

Image query:



The screenshot shows a search engine interface with the query "white house". The results include a featured snippet for "The White House" with a link to the official website, followed by sections for "Contact", "Live", "Statements & Releases", "Tours & Events", "News", and "Articles". A map of the White House is also visible. On the right side, there is a detailed information card for the White House, including its address, contact information, and social media links.

The White House
<https://www.whitehouse.gov>
History of The White House. Our first president, George Washington, selected the site for the White House in 1791. Every president since John Adams has occupied the White House, and the history of ...

Contact
Keep me posted with regular updates from the White House. required ...

Live
Tune in to White House events and statements as they happen

Statements & Releases
Statements & Releases Statement from the ... Press Briefings · Presidential Actions

Tours & Events
Anyone visiting DC can experience the ... Presidents · Air Force One · Apply

News
Statements & Releases Statement from the Press Secretary on the Visit of His ...

Articles
Last summer, President Donald J. Trump had a simple message for Americans as he ...

White House
Official Residence and Workplace
The White House is the official residence and workplace of the President of the United States. It is located at 1600 Pennsylvania Avenue NW in Washington, D.C. and has been the residence of every U.S. President since John Adams in 1800. The term is often used as a metonym for the president and his advisers.

1600 Pennsylvania Ave NW, Washington, DC 20500 - (202) 456-1414
Directions · Details · 7156 TripAdvisor reviews

White House - Wikipedia
https://en.wikipedia.org/wiki/White_House
Address: 1600 Pennsylvania Avenue NW, Wa... Current tenants: Donald Trump, President of the ...

Overview · Contents · Early history · Evolution of the White House · The ...

The White House is the official residence and workplace of the President of the United States. It is located at 1600 Pennsylvania Avenue NW in Washington, D.C. and has been the residence of every U.S. President since John Adams in 1800. The term is often used as a metonym for the president and his advisers. The residence was designed by Irish-born architect James Hoban in the neoclassical style. Construction took place between 1792 and 1800 using Aquia Creek sandstone painted white. When Th...

See more on en.wikipedia.org · Text under CC-BY-SA license

Enrich search with images



what do elephants eat



Web

Images

Videos

Maps

News

My saves

57,700,000 RESULTS

Any time ▾

What Elephants Eat. An elephants size means that, when it is fully grown, it is safe from all predators other than humans. To support its large size it needs huge amounts of food. An adult elephant eats about 150 kg (300 lb) of grass, **leaves**, twigs and **fruit** each day.



Image: elephantfacts.net

[What Elephants Eat And Drink - Live Animals List](#)

www.liveanimalslist.com/mammals/what-elephants-eat-and-drink.php

Improve this answer · Is this answer helpful?  

A summary about multi-modal search

1. Recent progress of ImageNet and image captioning inspires researchers to conduct research on multi-modal understanding and search.
2. VQA is still at very early stage. There are many challenging topics such as use of knowledge and common sense.
3. There are a few applications in search engine but all are very simple. We expect that with the technologies continually advance, new scenarios will appear.

New trends brought by NLP

- QA
- Multi-lingual
- Multi-modal
- MRC
- Personalized recommendation

Machine reading comprehension

Read a document (passage) and then answer questions about it

Passage (*P*)

+

Question (*Q*)

Answer (*A*)

P

Tesla later approached Morgan to ask for more funds to build a more powerful transmitter. **When asked where all the money had gone, Tesla responded by saying that he was affected by the Panic of 1901**, which he (Morgan) had caused. Morgan was shocked by the reminder of his part in the stock market crash and by Tesla's breach of contract by asking for more funds.

Q

On what did Tesla blame for the loss of the initial money?

A

Panic of 1901

SQuAD

The Stanford Question Answering Dataset

SQuAD: 100,000+ Questions for Machine Comprehension of Text

Best Resource Paper in EMNLP 2016

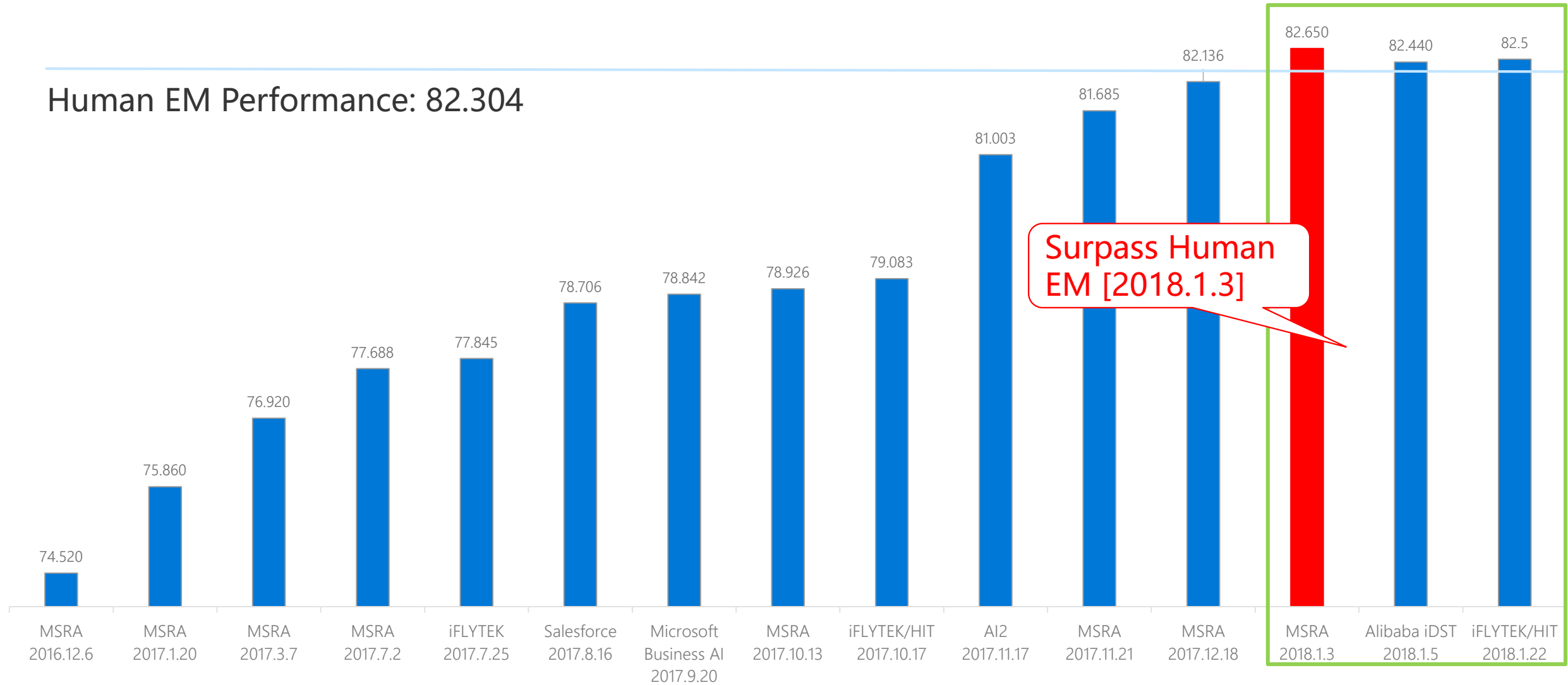
Pranav Rajpurkar and Jian Zhang and Konstantin Lopyrev and Percy Liang
{pranavs, zjian, klopyrev, pliang}@cs.stanford.edu
Computer Science Department
Stanford University

passage	→	In meteorology, precipitation is any product of the condensation of atmospheric water vapor that falls under gravity . The main forms of precipitation include drizzle, rain, sleet, snow, graupel and hail... Precipitation forms as smaller droplets coalesce via collision with other rain drops or ice crystals within a cloud . Short, intense periods of rain in scattered locations are called "showers".
query	→	What causes precipitation to fall?
answer	→	gravity
		What is another main form of precipitation besides drizzle, rain, snow, sleet and hail? graupel
		Where do water droplets collide with ice crystals to form precipitation? within a cloud

Dataset	# of <question, passage> pairs
Training	87,599
Dev	10,570
Test (not available to participants)	> 10K

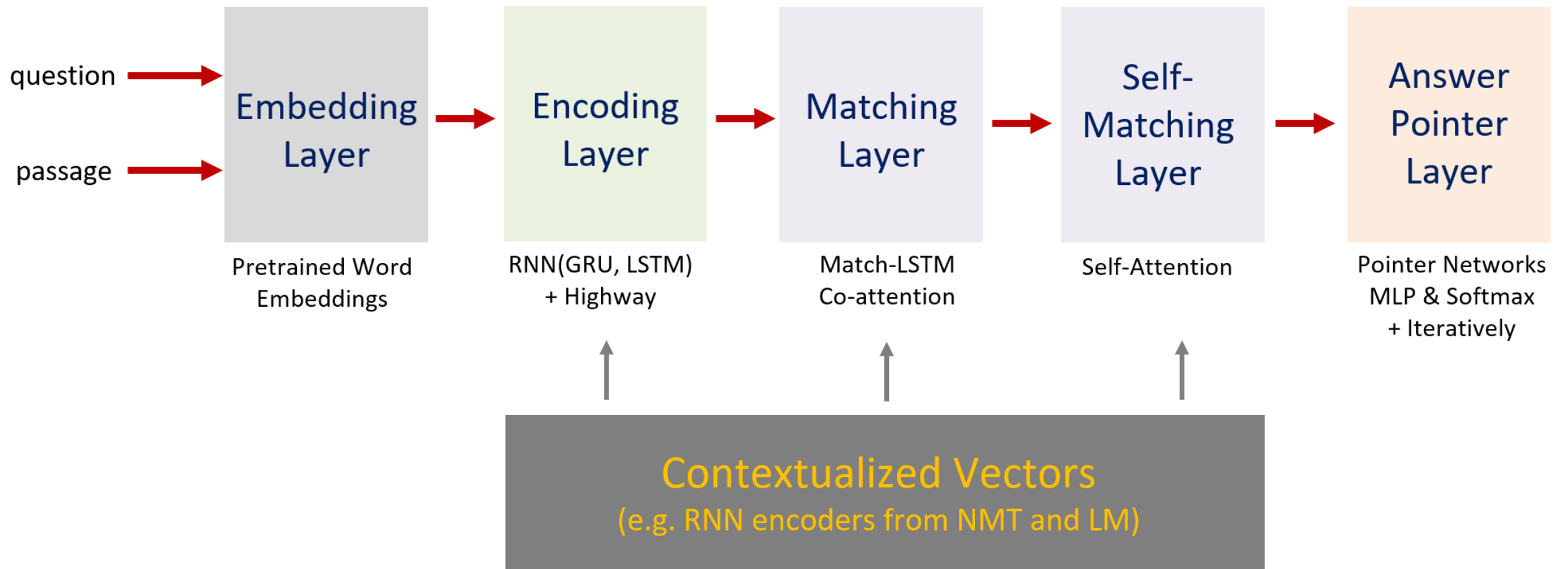
ImageNet style competition for machine reading comprehension

Progress of MRC experiments



Best System EM Scores on SQuAD Machine Reading Comprehension Dataset (Dec. 6, 2016-Jan. 26, 2018)

MRC architecture (r-net)



e.g., ELMo – Embeddings from Language Models

Improved snippet

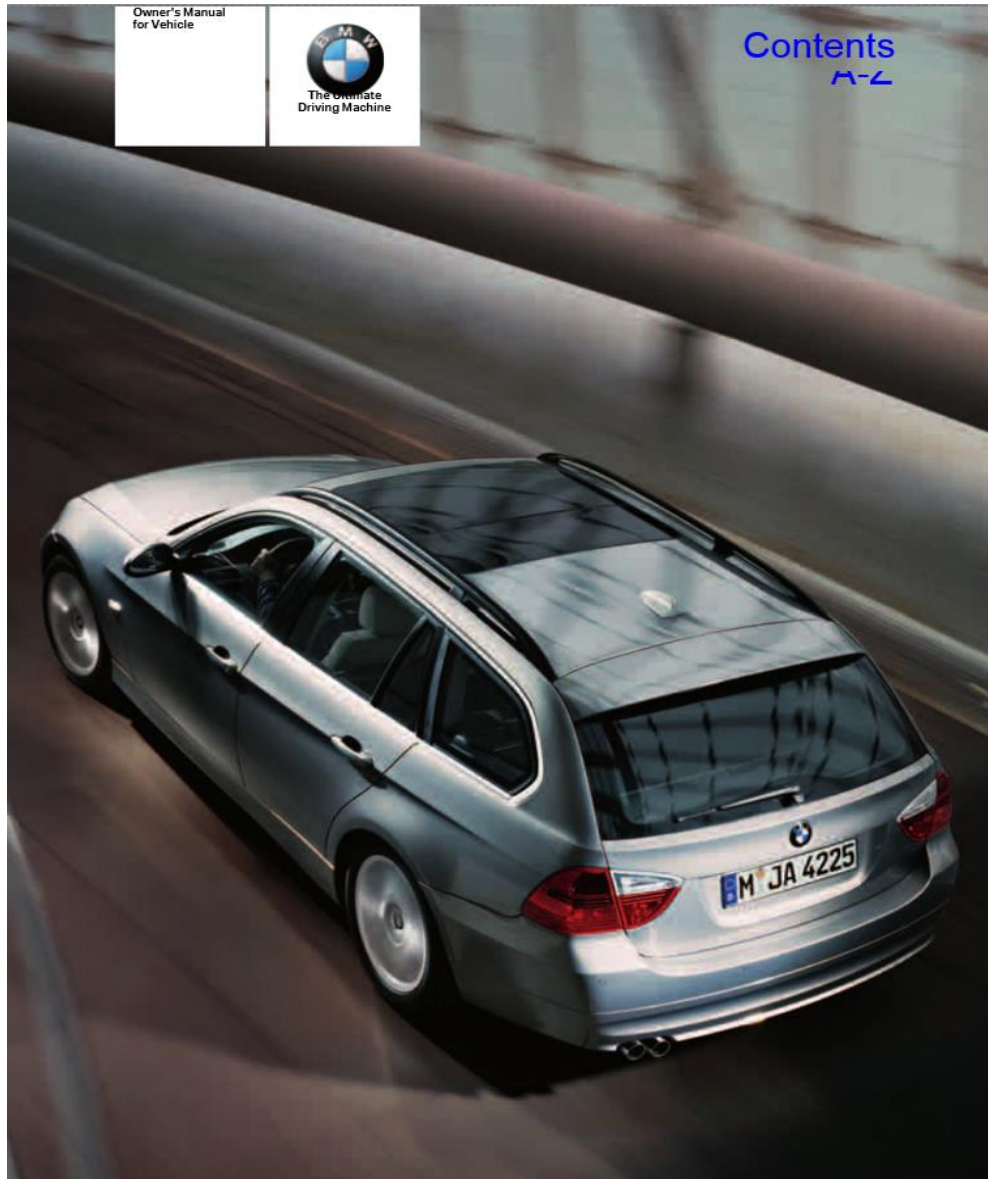


The image shows a search engine interface with a search bar containing the text "who created microsoft word". Below the search bar are navigation tabs for "All", "Images", "Videos", "Maps", "News", "Shop", and "My saves". A Microsoft advertisement is displayed, featuring the Microsoft logo and the text "Show business results" with a dropdown arrow. Below the ad, the search results show "86,600,000 Results" and "Any time" with a dropdown arrow. The main result is a snippet titled "Who created Microsoft Word?" with the text: "The first version of Microsoft Word was developed by **Charles Simonyi and Richard Brodie**, former Xerox programmers hired by Bill Gates and Paul Allen in 1981." Below the snippet is a link to "History of Microsoft Word - Wikipedia" with the URL "en.wikipedia.org/wiki/History_of_Microsoft_Word". At the bottom of the snippet, there are two buttons: "Improve this answer" and "Is this answer helpful?" with thumbs up and thumbs down icons.

Passage selection

Answer span

Manual search



Contents

The fastest way to find information on a particular topic or item is by using the index, refer to page 146.

Using this Owner's Manual

- 4 Notes
- 6 Reporting safety defects

At a glance

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Controls

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- 74 Lamps
- 78 Climate
- 84 Practical interior accessories

Driving tips

- 96 Things to remember when driving

Mobility

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- 117 Maintenance
- 119 Replacing components
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- 130 Indicator and warning lamps

Reference

- 142 Technical data
- 146 Everything from A to Z

At a glance

Controls

Driving tips

Mobility

Reference

Manual search

What is the phone number of BMW north Ameri >

Prod

Int

You can also call BMW of North America at **1-800-831-1117** or visit the website www.bmwusa.com to obtain this information.


[Viscosity ratings](#)

North America, LLC.

To contact NHTSA, you may call the Vehicle Safety Hotline toll-free at 1-800-327-4236 (TTY: 1-800-424-9153); go to

114

If BMW High Performance Synthetic Oil is not available, you can add small quantities of other synthetic oils in between oil changes. Only use oils with the API SH specification or higher.


 Your BMW Center will be glad to answer any questions regarding BMW High Performance Synthetic Oil or approved synthetic oils. ◀

You can also call BMW of North America at **1-800-831-1117** or visit the website www.bmwusa.com to obtain this information.

Viscosity ratings


Viscosity is a measure of an oil's flow rating and is categorized in SAE classes.

Selecting the appropriate SAE class depends on the regional climatic conditions in which you normally drive your BMW.


 Approved oils belong to the 5W-40 and 5W-30 classes. ◀


These oils can be used for driving at all outside temperatures.

Coolant

 Do not add coolant to the cooling system when the engine is hot. Escaping coolant can cause burns. ◀

Coolant is a mixture of water and an additive. Not all commercially available additives are suitable for your BMW. Ask your BMW Center for suitable additives.

 Only use suitable additives, otherwise engine damage may result. The additives are hazardous to your health. ◀

 Comply with the appropriate environmental protection regulations when dis-

in its vehicles with extensive testing.

Only use approved BMW High Performance Synthetic Oil.

pressure to escape, then continue turning to open.

3. The coolant level is correct if it is between the maximum and minimum marks in the filler neck, refer also to the diagram next to the filler neck.




4. If the coolant is low, slowly add coolant up to the specified level; do not overfill.
5. Turn the cap until there is an audible click.
6. Have the reason for the coolant loss eliminated as soon as possible.


Brake system

Malfunctions

Brake fluid

 The warning lamps light up in red even though the handbrake has been released. Stop immediately.

The brake fluid in the reservoir has fallen to below the minimum level. At the same time, a considerably longer brake pedal travel may be noticeable. Have the system checked without delay.

 Display of this malfunction on Canadian models.

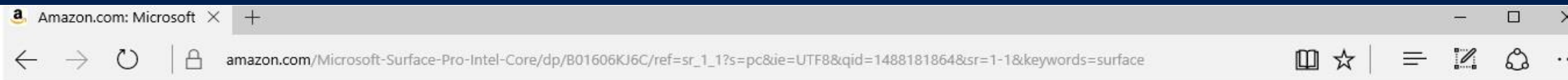
At a glance

Controls

Driving tips

Ability

Site chat with MRC



Microsoft Surface Pro 4 (128 GB, 4 GB RAM, Intel Core i5)

by Microsoft



1,623 customer reviews | 820 answered questions

Price: **\$775.00** & FREE Shipping

In Stock.

Get it as soon as **Wednesday, March 1** when you choose **Two-Day Shipping** at checkout.

Ships from and sold by **PcBase USA**.

Style: **Device Only**

Size: **Intel Core i5, 4GB RAM, 4GB**

Used & new (78) from \$629.99 & FREE shipping.



Share 240+ Shares

Buy new: **\$775.00**

Qty:

Super Agent

2/27/2017 3:52:26 PM

Hello. I'm super agent. The current product is Microsoft-Surface-Pro-Intel-Core. Feel free to ask your question and I'll look for the best answer for you.

what is the max screen resolution?

The screen resolution is 2736 x 1824 for Microsoft Surface Pro 4 (128 GB, 4 GB RAM, Intel Core i5)

Does it have a hdmi port?

It has a mini display port, but through the use of an adapter this will allow an HDMI connection.

Product Information

Style: Device Only | Size: Intel Core i5, 4GB RAM, 4GB

Technical Details

Summary

Screen Size	12.3 inches
Screen Resolution	2736 x 1824
Max Screen Resolution	2736x1824 pixels
Processor	3 GHz Intel Core i5
RAM	4 GB SDRAM DD
Hard Drive	128 GB SSD
Wireless Type	802.11abg
Number of USB 3.0 Ports	1
Average Battery Life (in hours)	9 hours

Other Technical Details

Customer Questions & Answers

Have a question? Search for answers

▲
29
votes

Question: [should I buy one with 8gb](#)
Answer: I think if you're a regular 128gb card in for \$60. I g getting a newer model ne
By Devon on November 1
See more answers (9)

▲
18
votes

Question: [So if I want more storage](#)
Answer: Yes. I am using SP4 with point, for now, unless you this feature in the future,
By WX on October 30, 20

Customer Reviews

4.5 stars out of 5, 1,623

Top Customer Reviews

5 stars out of 5, I love it, but you might not.

By Joshua Oh on October 28, 2015

Style Name: Device Only | Size: Intel Core i5, 8GB RAM, 256GB

It seems like the big question right now is, "Do I get the Surface

I'll explain why I chose the Surface Pro 4, but first, a quick about having a light backpack is important to me.

The S.Book is almost two times heavier than the SP4. It packs extra power that the S.Book has. I don't plan to play any intensi has a \$400 higher price tag (\$270 if you get the Type Cover for S.Book's keyboard, but the SP4's keyboard feels great to type o other PDF's feels much more natural with the SP4's tablet



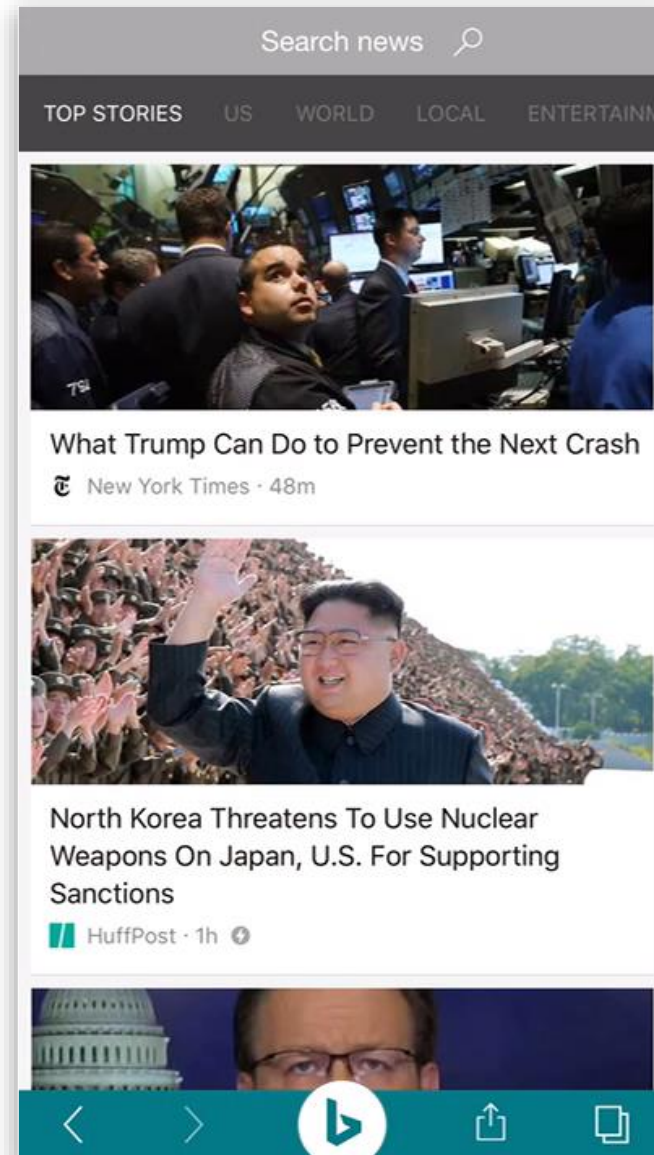
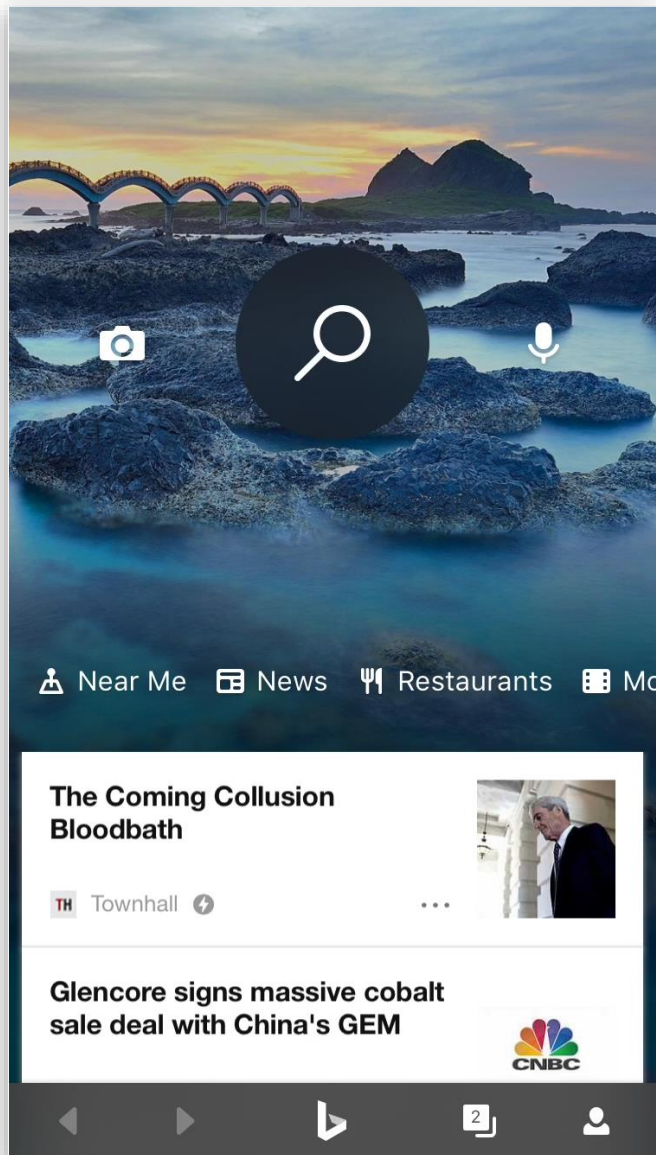
A summary about MRC

1. Recently we've seen a big progress in MRC, such as SQuAD evaluation. End-end training, pre-trained models, contextualized vectors from other tasks contribute to the growth of MRC.
2. MRC will significantly change search engine with better relevance and accuracy. New scenarios such as manual search are promising.
3. Further developing MRC needs contextual inference supported by knowledge and common sense. This would be very challenging and exciting.

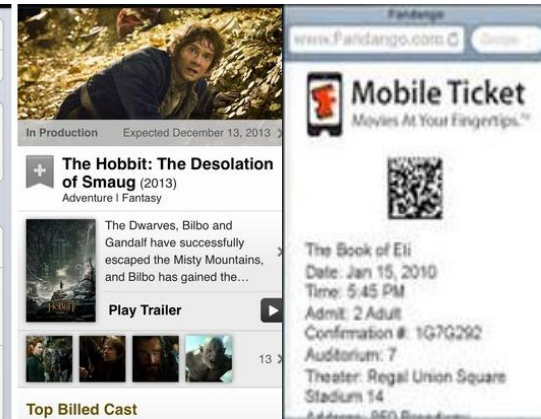
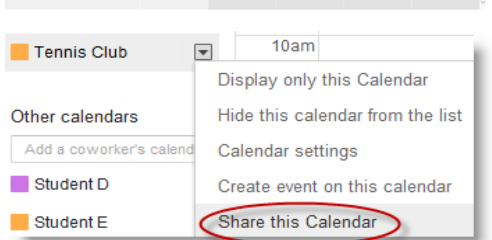
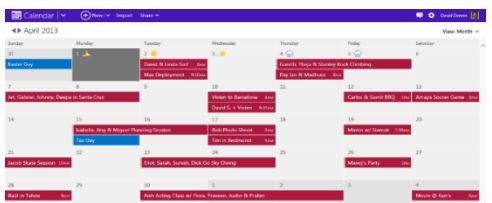
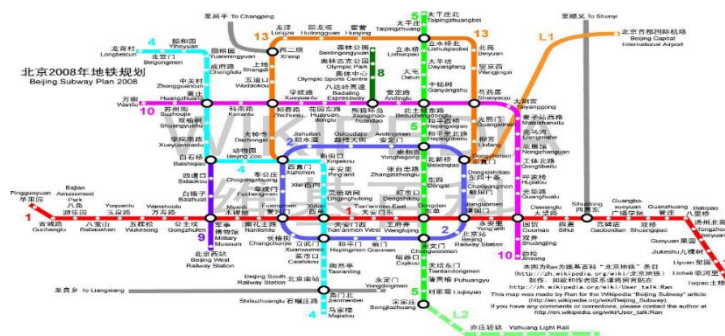
New trends brought by NLP

- QA
- Multi-lingual
- Multi-modal
- MRC
- Personalized recommendation

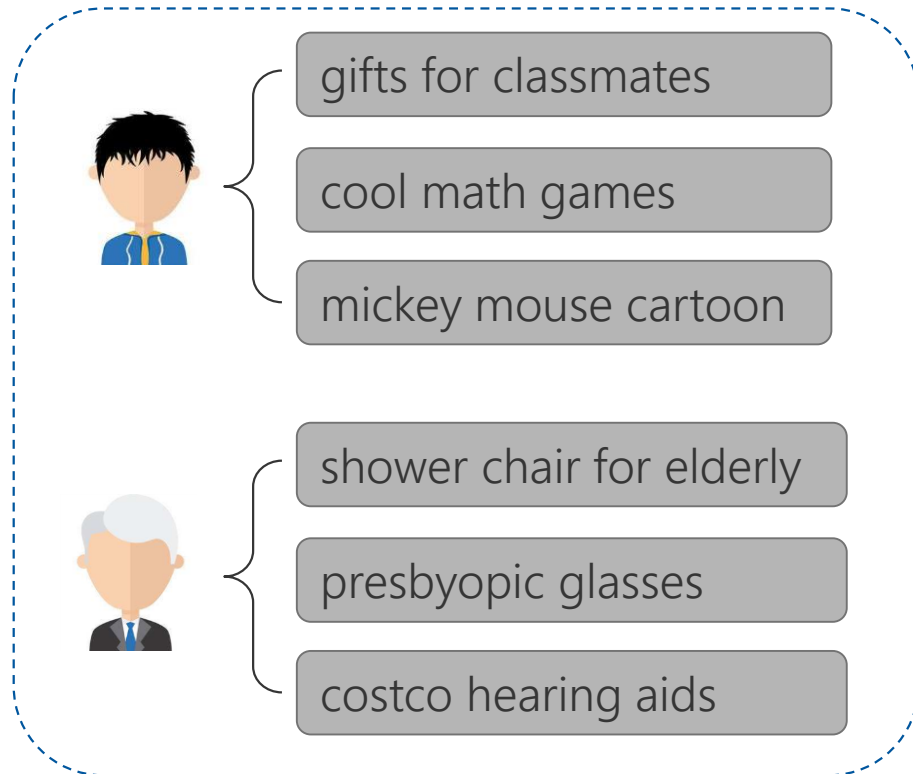
Personalized feed: go beyond search



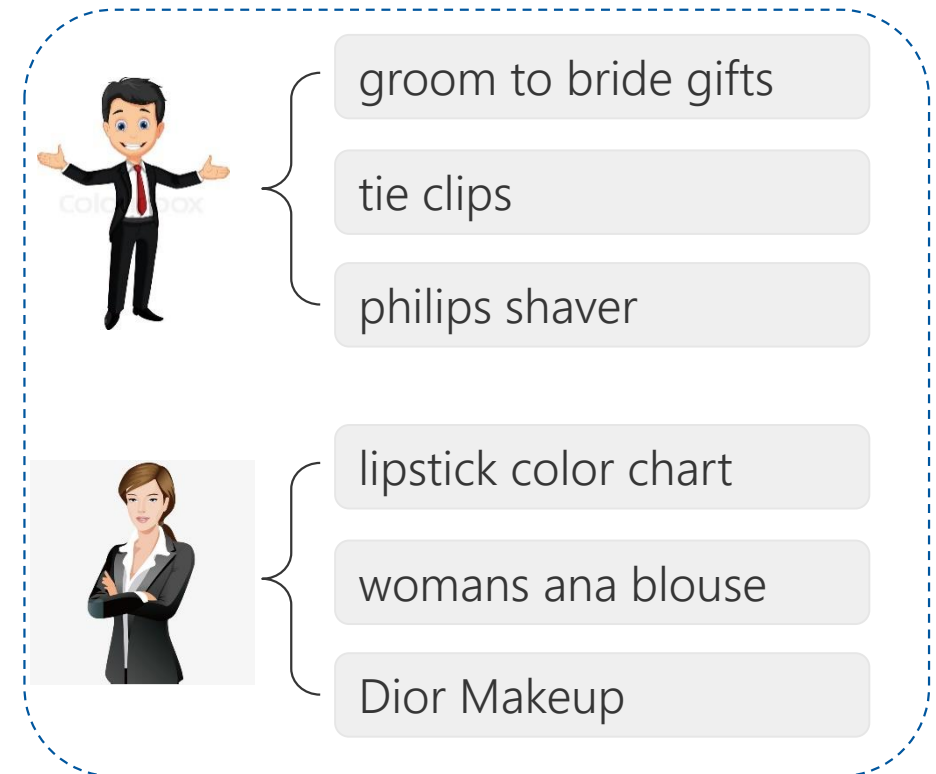
User modeling with behavioral data



Explicit/implicit user modeling

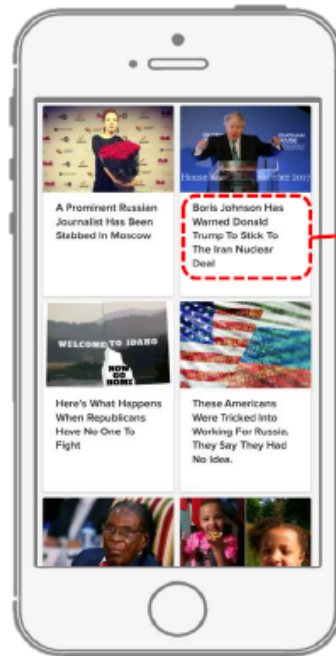


Age Inference



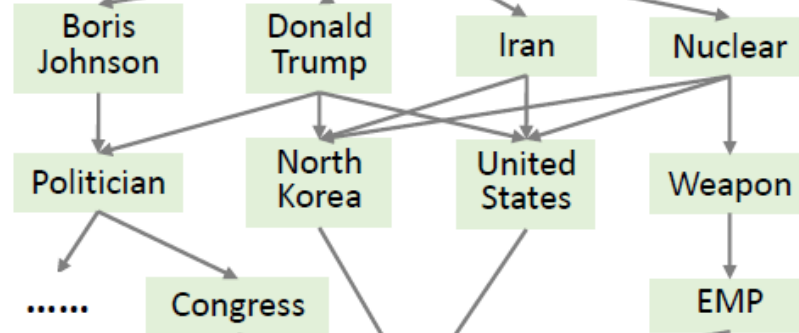
Gender Inference

Candidate news detection



News the user have read

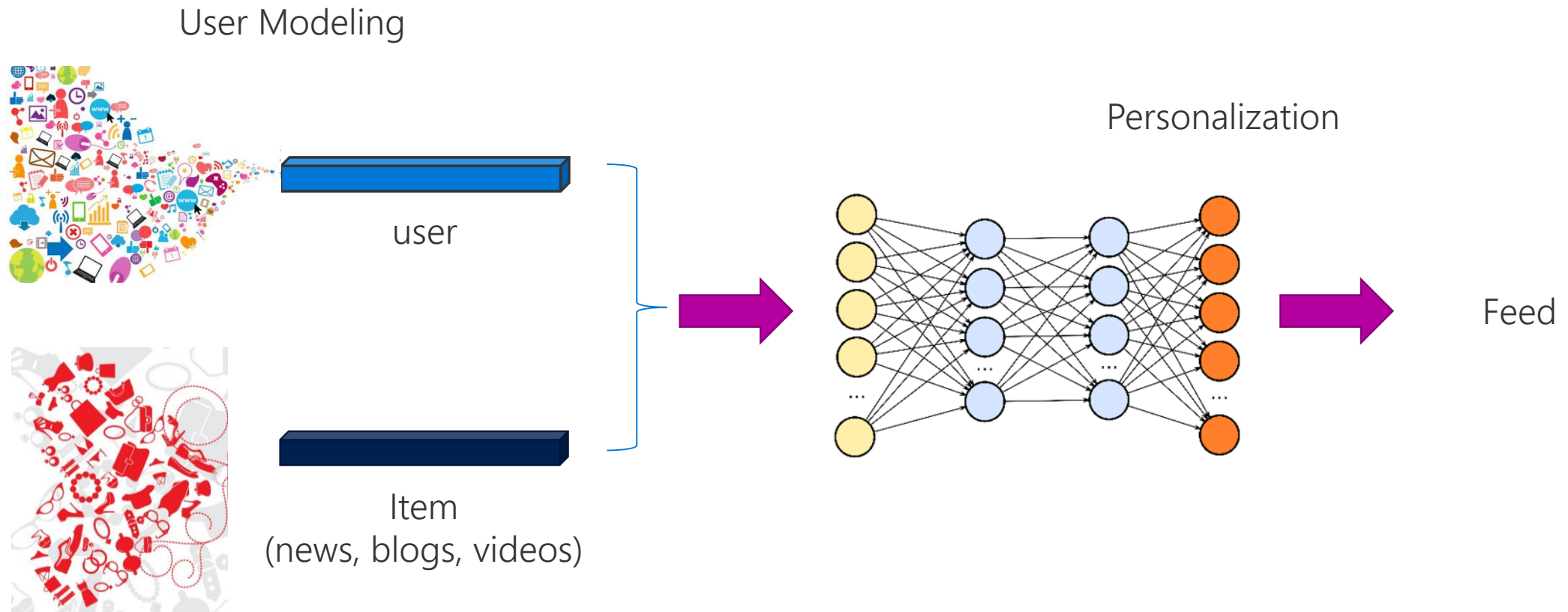
Boris Johnson Has Warned **Donald Trump** To Stick To The **Iran Nuclear** Deal



News the user may also like

North Korean EMP Attack Would Cause Mass **U.S.** Starvation, Says **Congressional** Report

Personalized recommendation

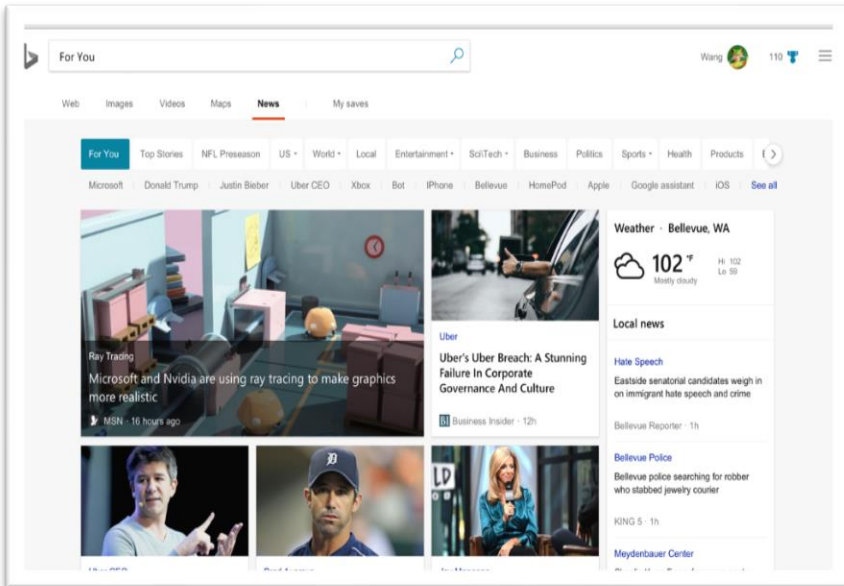


Text Understanding in User and Item Modeling

Knowledge Aware Recommendation

Text Generation

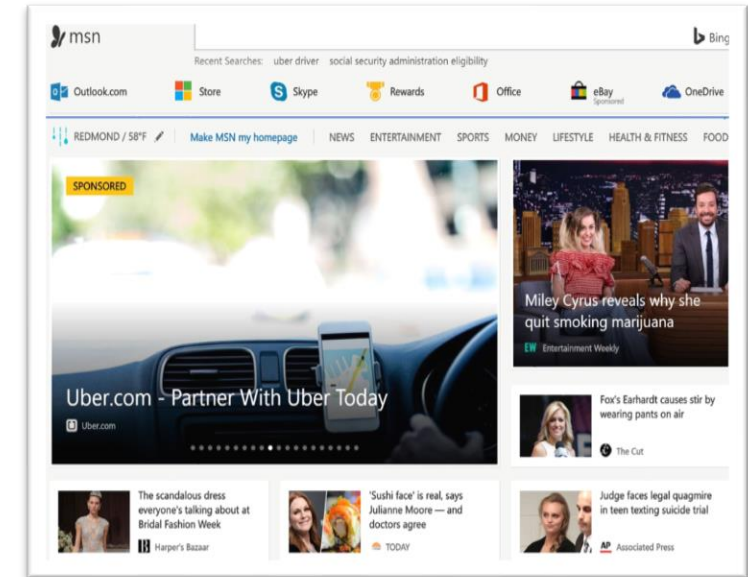
Applications



Personalized News Feed



Xiaolce Music Recommendation



Native Ads Ranking

- Xiting Wang, Yiru Chen, Jie Yang, etc. A Reinforcement Learning Framework for Explainable Recommendation, ICDM 2018
- Hongwei Wang, Fuzheng Zhang, Jialin Wang, etc. Ripple Network: Propagating User Preferences on the Knowledge Graph for Recommender Systems, CIKM 2018
- Jianxun Lian, Xiaohuan Zhou, etc., xDeepFM: Combining Explicit and Implicit Feature Interactions for Recommender Systems, KDD 2018
- Zheng Liu, Xing Xie, Lei Chen, Context-aware Academic Collaborator Recommendation, KDD 2018
- Jianxun Lian, etc. Towards Better Representation Learning for Personalized News Recommendation: a Multi-Channel Deep Fusion Approach, IJCAI 2018
- Guanjie Zheng, Fuzheng Zhang, Zihan Zheng, etc. DRN: A Deep Reinforcement Learning Framework for News Recommendation, WWW 2018
- Hongwei Wang, Fuzheng Zhang, Xing Xie, Minyi Guo, DKN: Deep Knowledge-Aware Network for News Recommendation, WWW 2018

A summary about personalized recommendation

1. Personalized recommendation has become the strategically important for search companies.
2. There are many interesting research topics in user modelling with various user behavior data, timely recommendation of user-like contents, providing personalized recommendation comments.

Summary

With new advancements of NLP, what new changes will be brought to search?

- QA
- Multi-lingual
- Multi-modal
- MRC
- Personalized recommendation

However, there are many challenges to each of these tasks and there are still long way to make them convincingly become the integral parts of search engine to reach good user experience. We should have enough patience in pushing forward these directions.

Future research topics

- **Knowledge acquisition and representation**
 - word/sentence embedding, commonsense knowledge, specific domain knowledge, knowledge graph
- **New learning methods**
 - Multi-task and transfer learning, reinforcement learning, semi and unsupervised learning for low-resource tasks, reasoning for MRC
- **Context modeling**
 - Multi-turn modeling, context-aware semantic parser, dialogue system
- **New search modality**
 - Conversational search, multi-modal search
- **Search results generation and summarization**
 - Auto-generation of a comprehensive report for certain type of queries
- **Feeds**
 - User modelling, content generation, recommendation, comments

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