

# Overview of the NTCIR-12

## IMine-2 task

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**Takehiro Yamamoto**

Kyoto University

**Yiqun Liu**

Tsinghua University

**Min Zhang**

Tsinghua University

**Zhicheng Dou**

Renmin University of China

**Ke Zhou**

Yahoo! Labs London

**Ilya Markov**

University of Amsterdam

**Makoto P. Kato**

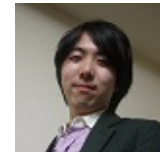
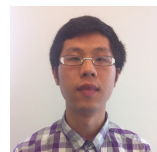
Kyoto University

**Hiroaki Ohshima**

Kyoto University

**Sumio Fujita**

Yahoo! JAPAN Corporation



# iPhone 6



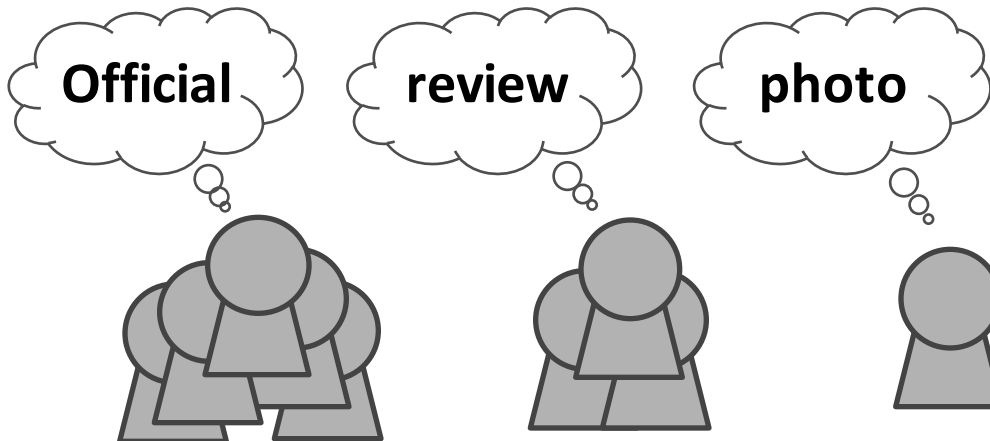
**Understanding  
search intent  
behind the query**

# Search Result Diversification (INTENT, INTENT-2, IMine-1)

4

Given an ambiguous/underspecified query, produce a single result page that **satisfies different user intents**

iPhone 6



## Search Results

1st Apple – iPhone 6

2nd iPhone 6 Reviews

3rd Images of iPhone 6

⋮

- Identify possible **search intents** behind the query
  - review, official, photo, ...
- Generate a **diversified ranked list** that satisfies different search intents

**IMine-2**

**||**

**Search Result  
Diversification**

**+**

**Vertical  
Intent**

# Vertical Intents

7

## iPhone 6



*official*

Apple - iPhone 6

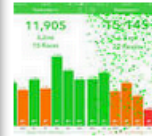
<https://www.apple.com/iphone-6/>

iPhone 6 isn't simply bigger — it's better in every way. Larger, yet dramatically thinner. More powerful, but remarkably power efficient. With a smooth metal ...

[More results from apple.com »](#)

*sales*

In the news



This Is A Life-Changing Application That Every iPhone 6 Owner Should Download

Business Insider - 1 day ago

This means, if you buy an iPhone 5S, an iPhone 6, or an iPhone 6 Plus, you'll be able to ...

iPhone 6, 6 Plus Availability And Wait Time Update: Apple Store, Verizon, Sprint, AT&T, Best Buy, RadioShack, Target

Tech Times - 1 day ago

[More news for iPhone 6](#)

*review*

Apple iPhone 6 review - CNET

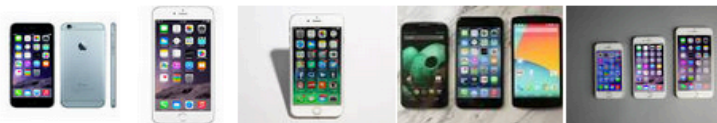
[www.cnet.com](http://www.cnet.com) › Mobile › Phones

Nov 21, 2014 - The iPhone 6 is an exceptional phone in nearly every way except its average battery life: it's thin and fast with a spacious screen and the ...

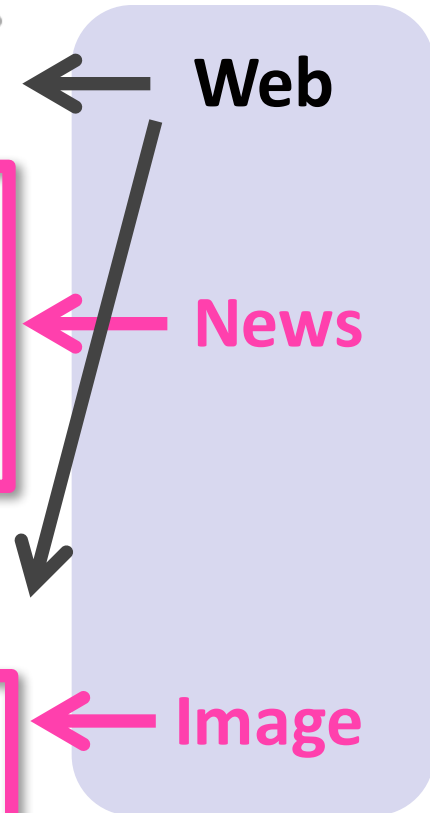
*photo*

Images for iPhone 6

Report images



[More images for iPhone 6](#)



||  
Verticals

# Vertical Intents

8

*official*

## iPhone 6



Apple - iPhone 6

<https://www.apple.com/iphone-6/>

iPhone 6 isn't simply bigger — it's better in every way. Larger, yet dramatically thinner. More powerful, but remarkably power efficient. With a smooth metal ...

[More results from apple.com »](#)

*sales*

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iPhone 6, 6 Plus Availability And Wait Time Update: Apple Store, Verizon, Sprint, AT&T, Best Buy, RadioShack, Target

Tech Times - 1 day ago

[More news for iPhone 6](#)

*review*

Apple iPhone 6 review - CNET

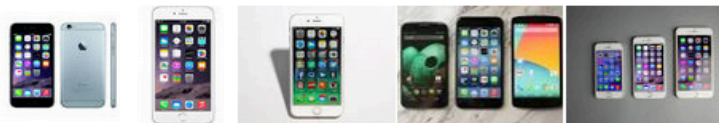
[www.cnet.com](http://www.cnet.com) › Mobile › Phones

Nov 21, 2014 - The iPhone 6 is an exceptional phone in nearly every way except its average battery life: it's thin and fast with a spacious screen and the ...

*photo*

Images for iPhone 6

Report images



[More images for iPhone 6](#)

Web

News

Image

We have to **identify relevant verticals** as well as search intents of a query



# SUBTASKS

- Query Understanding subtask

≡ Subtopic Mining subtask

- Vertical Incorporating subtask

≡ Document ranking subtask

# Query Understanding Subtask (EN, CN, JA)

11

Given a query, the system is required to generate a diversified ranked list of subtopics with their relevant vertical intents.

iPhone 6



Subtopic	Importance	Vertical Intent
<i>iPhone 6 Apple</i>	<i>0.95</i>	<i>Web</i>
<i>iPhone 6 sales</i>	<i>0.80</i>	<i>News</i>
<i>iPhone 6 image</i>	<i>0.73</i>	<i>Image</i>
<i>iPhone 6 review</i>	<i>0.65</i>	<i>Web</i>
⋮	⋮	⋮

# Query Understanding Subtask (EN, CN, JA)

12

Given a query, the system is required to generate a diversified ranked list of subtopics with their relevant vertical intents.

iPhone 6



Subtopic	Importance	Vertical Intent
<i>iPhone 6 Apple</i>	<i>0.95</i>	<i>Web</i>
<i>iPhone 6 sales</i>	<i>0.80</i>	<i>News</i>
<i>iPhone 6 image</i>	<i>0.72</i>	<i>Image</i>

Challenges

- Subtopic **Relevance**
- Subtopic **Diversity**
- **Vertical** Relevance

## Images of iPhone

bing.com/images



See more images of iPhone

(a) Image

## News about iPhone 6 News

bing.com/news



The best iPhone 6 and iPhone 6 Plus battery cases

Engadget · 2 days ago

This post was done in partnership with The Wirecutter, a list of the best technology to buy. Read the full article below at TheWirecutter.com. We've spent more...

iPhone 6 vs. iPhone 6 Plus specs: similar look but does the design hide better specs?

Ecumenical News · 3 hours ago

IDC Confirms Apple Takes Samsung's Market Share Lead in Another Country

The Motley Fool · 1 hour ago

(b) News

## iPhone 6 - Wikipedia, the free encyclopedia

en.wikipedia.org/wiki/iPhone\_6

The iPhone 6 and iPhone 6 Plus are smartphones running iOS developed by Apple Inc.

The devices are part of the iPhone series and were unveiled on ...

History of the iPhone - Exmor - Apple M7 - Image stabilization

(c) Encyclopedia

## Newest Free iTunes 12.1.2.27 Official Download - yesky Download



Version: 12.1.2.27 Version

OS: WinXP/2000/Vista/Win7/Win8/Win8.1

Size: 103 MB

Update: 2015-04-13

Safe

Download

mydown.yesky.com

(d) Download

## When is the iPhone 6 coming out? | Yahoo Answers

answers.yahoo.com › ... › Cell Phones & Plans › Next

Resolved · 8 posts · 7 total answers · Published Nov 17, 2012

My daughter is going to get an iPhone, but wants to wait until the iPhone 6 is coming out. We would like to know when this is (A general month would be ...

iphone 5s or iphone 6? | Yahoo Answers

iphone 6? | Yahoo Answers

iPhone 6 questions? | Yahoo Answers

Question about iPhone 6? | Yahoo Answers

Resolved

Resolved

Open

Resolved

(e) QA

## iPhone 6 Case - Leather Wallet Case with Lifetime ...



www.amazon.com › ... › Cases, Holsters & Clips › Flip Cases

★★★★★ Rating: 4.4/5 · 316 reviews · Snugg

Amazon.com: Snugg® iPhone 6 Case - Leather Wallet Case with Lifetime Guarantee (Black) for Apple iPhone 6: Cell Phones & Accessories

(f) Shopping

# Vertical Incorporating subtask (EN, CN) <sup>14</sup>

Given a query and the document collection, the system is required to return a diversified ranked list of documents

iPhone 6



Documents	Importance
<i>doc-011</i>	<i>0.95</i>
<i>Vertical-news</i>	<i>0.80</i>
<i>doc-021</i>	<i>0.73</i>
<i>Vertical-image</i>	<i>0.65</i>
<i>⋮</i>	<i>⋮</i>

## Virtual vertical document

= virtual document that represents *ideal* vertical result of the query

= Participants can focus on which vertical and where it should be incorporated into the ranked list

# Vertical Incorporating subtask (EN, CN) 15

Given a query and the document collection, the system is required to return a diversified ranked list of documents

iPhone 6



Documents	Importance
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<i>doc-011</i>	<i>0.95</i>
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<i>Vertical-news</i>	<i>0.80</i>
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**Virtual vertical document**

= virtual document that  
represents *ideal vertical*

Challenges

- Document **Relevance**
- Document **Diversity**
- **Vertical** Relevance

**DATA**



- **100 queries** for each language
  - 50 queries in IMine-1
- **Five types**
  - Ambiguous (e.g. *jaguar*)
  - Faceted (e.g. *iPhone6*)
  - Very clear (e.g. *NII address*)
  - Task-oriented (e.g. *lose weight*)
  - Vertical-oriented (e.g., *iPhone photo*)

- Document Corpus
  - for Vertical Incorporating subtask
  - 500 search results of a commercial search engine for each query
- Query suggestions
  - collected by several commercial search engines
- Sogou search user behavior data
- Yahoo! JAPAN related search query data



# NEWS RELEASE



平成 27 年（2015 年）7 月 17 日

## NII と Yahoo! JAPAN が検索技術研究のために新たな提携 「Yahoo!検索」の検索クエリデータを NII のワークショップに無償提供

ヤフー株式会社（以下 Yahoo! JAPAN、代表取締役社長：宮坂 学、東京都港区）と大学共同利用機関法人 情報・システム研究機構 国立情報学研究所（以下 NII、所長：喜連川 優、東京都千代田区）は、情報学研究の一層の推進に寄与するために、Yahoo! JAPAN より NII に「Yahoo!検索」の検索クエリデータを無償提供することになりました。本データは、情報アクセス技術の評価ワークショップ「NTCIR（エンティサイル）」（\*1）の参加者向けに提供され、同ワークショップに参加する研究グループは無償で活用できます。

Yahoo! JAPAN が提供するデータは、平成 21 年（2009 年）7 月から平成 25 年（2013 年）6 月の期間に「Yahoo!検索」で検索された全クエリ（ユーザーが検索時に入力した単語やフレーズ）の中から、現在進行している NTCIR の第 12 サイクル（NTCIR-12）で設定された研究課題に対する関連度の高い

# EVALUATION

iPhone 6



**Intent<sub>1</sub>**

*review*  
*reviews*  
*Quora*

0.60

**Intent<sub>2</sub>**

*accessory*  
*case* *bumper*  
*accessories*

0.30

NonRel

Rel

**Per-intent Relevance**



**Vertical Importance**

Web	0.30
Image	0.10
News	0.00
Encyclopedia	0.00
QA	0.10
Shopping	0.50

# Clustering Pooled Subtopics into Intents

22

Cluster Creator - cvs

9, NONREL

- cvs 1945年竣工船
- cvs ソフトウェア開発ツール
- cvs 規模の経済
- cvs 経済地理学
- cvs 人物
- cvs280e2
- cvsとは
- NonRelevant
- 価格

2, cvs メディアサービス会社

- cvs コンピュータ
- cvs 企業

1, cvs 専門資格

- cvs エンジニアリング

1, cvs タイヤ

- ハイパリアンcvs

27, cvs バージョン管理システム

- commit
- cvs id
- cvs kde
- cvs オープンソース
- cvs コマンド
- cvs ソフトウェア
- cvs ディレクトリ削除
- cvs バージョン管理システム
- cvsサーバ
- eclipse
- target
- windows
- インストール
- コマンド
- サーバ
- ダウンロード
- タグ
- バージョン
- バージョン管理
- ファイル
- ブランチ
- モジュール
- 開発
- 起動
- 削除
- 選択
- 変換

9, cvs 薬局

- ad,weekly
- caremark
- cvs caremark
- cvs floss
- cvs pharmacy
- cvs 薬局・薬店
- cvsファーマシー
- pharmacy
- walmart

2, cvs 激変星

- cvs 白色矮星
- cvs 連星

2, cvs NPO法人

- cvs リーダーシップ
- セミナー

6, cvs ホテル

- bay,ホテル
- cvs bay ホテル
- cvs.bay hotel
- cvsバイホテル
- cvsホテル
- ホテル

5, cvs コンビニエンスストア

- cvs コンビニ
- cvs 製造
- cvs 日本のコンビニ
- cvsバイエリア
- コンビニ

1, cvs 対潜空母

- cvs イセックス級航空母艦

1, cvs 掃除機

- cvs85e2h

Relocate Clusters

topic

ID: IMINE2-J-001

cvs

Type: multi

# of subtopics = 65

# of relevant clusters = 11

Save Results

TopicID: IMINE2-J-001

Jump

Prev 1 / 100 Next






E.g. 6,119 subtopics for Chinese subtask

**Intent<sub>2</sub>**


*accessory*

*case bumper*

*accessories*

						
Web	✓	✓				0.30
Image			✓			0.10
News						0.00
Encyclopedia						0.00
QA						0.10
Shopping	✓	✓	✓			0.50

...



NTCIR-12 IMine-2 Evaluation

Topic: cvs Document: IMINE2-E-001-0009.html (1 / 32)

Relevance for Topic

**cvs**


☐ Spam(-1)  
☐ NonRelevant(0)  
☒ Relevant(1)  
☐ Highly Relevant(2)





Relevance for Intent

**cvs CVS pharmacy location:**

☐ NonRelevant(0)  
☒ Relevant(1)  
☐ Highly Relevant(2)

[Feedback](#)



 Pharmacy  Shop  Deals  ExtraCare®

Close  
Close

[Home](#) | Sign Up for Exclusive Email Offers and More

**Sign Up for Exclusive Email Offers and More**

Per-Intent  
Relevance

Document

E.g. 6,778 documents for Chinese subtask



# EVALUATION METRIC

# Query Understanding Subtask (again)

26

INPUT

query

OUTPUT

subtopics and their vertical intents

iPhone 6



Subtopic	Importance	Vertical Intent
<i>iPhone 6 Apple</i>	<i>0.95</i>	<i>Web</i>
<i>iPhone 6 sales</i>	<i>0.80</i>	<i>News</i>
<i>iPhone 6 image</i>	<i>0.73</i>	<i>Image</i>
<i>iPhone 6 review</i>	<i>0.65</i>	<i>Web</i>
⋮	⋮	⋮

- **Subtopic Diversity**

- D# proposed by [Sakai+2011]

$$D\#-nDCG = \underbrace{\gamma I-rec}_{\text{How many intents are covered by the subtopics?}} + (1 - \gamma) \underbrace{D-nDCG}_{\text{How much relevant are the subtopics?}}$$

How many intents  
are covered by the  
subtopics?

How much relevant  
are the subtopics?

- **Vertical Prediction Accuracy**

- How accurate are the predicted verticals?

$$V\text{-score}@l = \frac{1}{l} \sum_{r=1}^l Accuracy(r)$$

- Subtopic Diversity
  - D#-nDCG proposed by [Sakai+2011]

$$\text{QU-score} = \lambda \text{D\#-nDCG@}l + (1 - \lambda) \text{V-score@}l$$

**Subtopic  
Diversity**

**Vertical  
Prediction  
Accuracy**

$$\text{V-score@}l = \frac{1}{l} \sum_{r=1}^l \text{Accuracy}(r)$$

# Vertical Incorporating subtask (EN, CN) 29

Given a query and the document collection, the system is required to return a diversified ranked list documents including verticals

iPhone 6



Documents	Importance
<i>doc-011</i>	<i>0.95</i>
<i>Vertical-news</i>	<i>0.80</i>
<i>doc-021</i>	<i>0.73</i>
<i>Vertical-image</i>	<i>0.65</i>
<i>⋮</i>	<i>⋮</i>

- D# proposed by [Sakai+2011]

$$D\#-nDCG = \underbrace{\gamma I-rec}_{\text{How many intents are covered by the documents?}} + (1 - \gamma) \underbrace{D-nDCG}_{\text{How much relevant are the documents?}}$$

How many intents  
are covered by the  
documents?

How much relevant  
are the documents?

$$g_i(d) = \sum_{v \in V} \underbrace{\delta_v(d)}_{\text{Vertical type}} \underbrace{P(v|i)}_{\text{Vertical importance}} \underbrace{rel_i(d)}_{\text{Document Relevance}},$$

Gain for intent  $i$

**We received 42 runs from 9 teams**

- **Techniques**

- Topic Modeling
- Syntactic Pattern
- Word Embedding (e.g. word2vec)
- Learning to Rank

- **Resources**

- Web pages
- Queries
- Encyclopedia (e.g. Wikipedia, Baidu Baike, Hudong Baike ...)

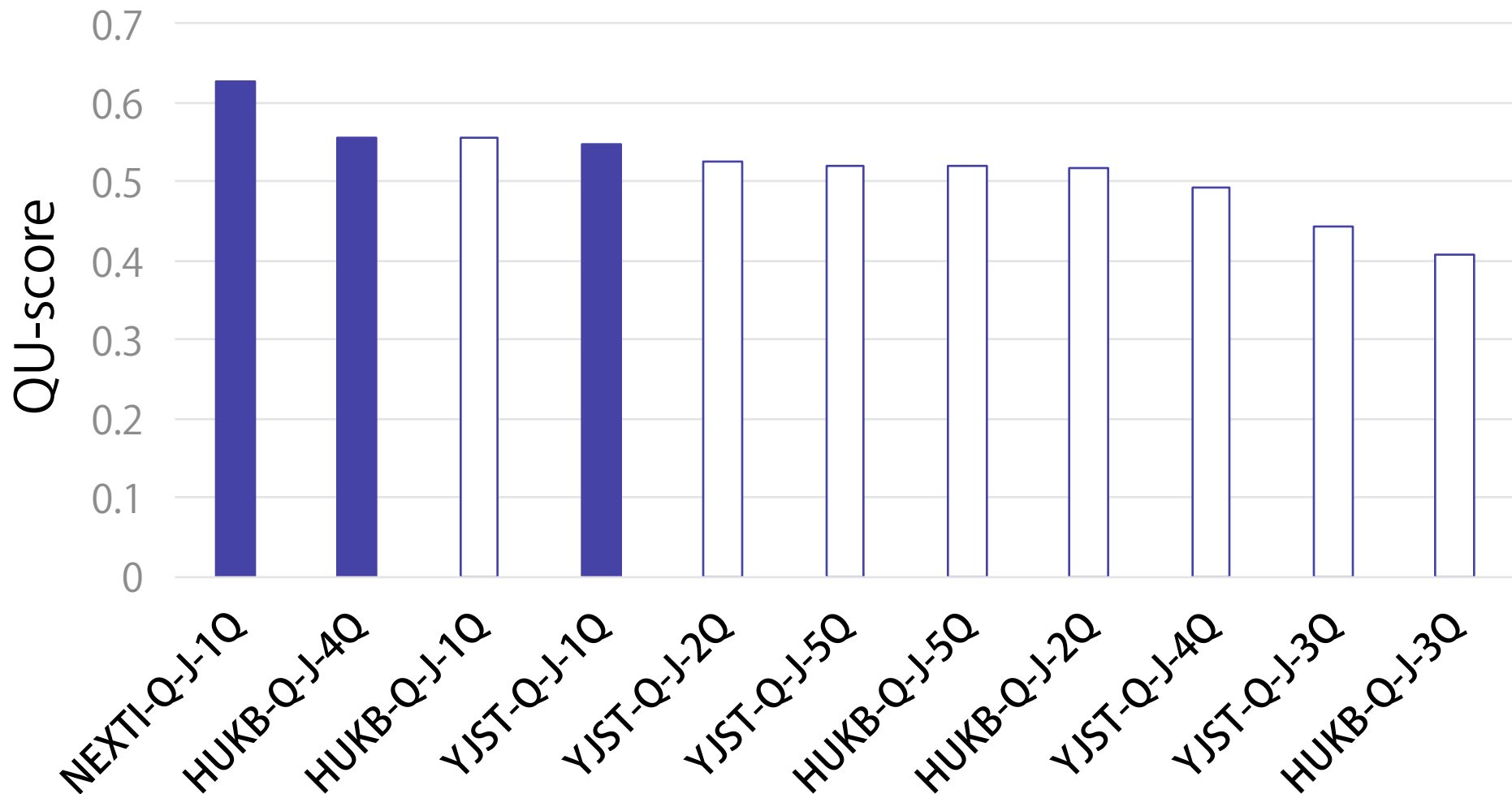
**Please join IMine-2 session at  
June 9<sup>th</sup> 11:00~12:30 !**

# RESULTS



# Japanese Query Understanding subtask

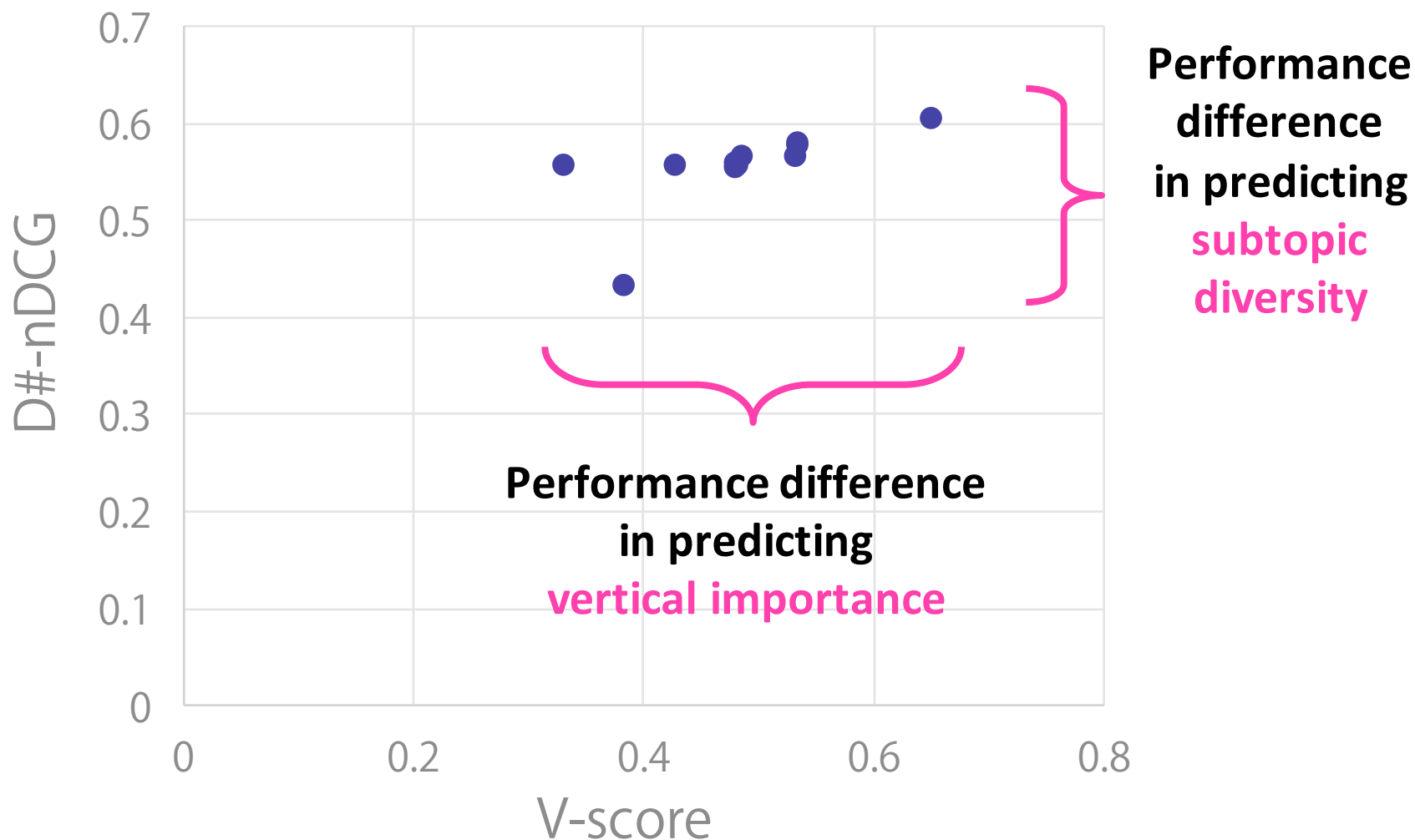
33



**NEXTI** achieved the best performance  
– significantly different from the others

# Japanese Query Understanding subtask

34

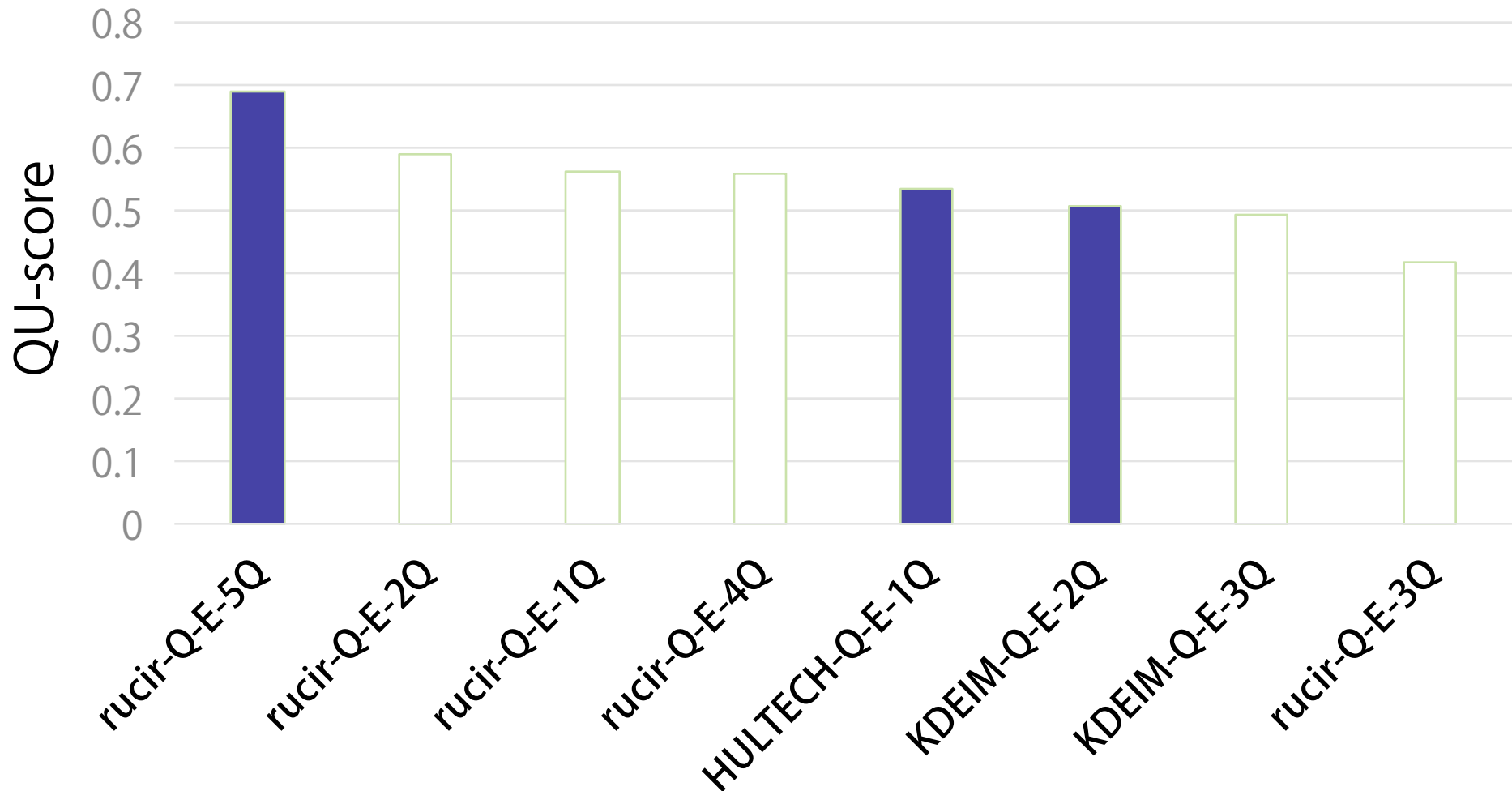


**V-score diff. > D#-nDCG diff.**

Participant runs have similar performances in subtopic diversity

# English Query Understanding Subtask

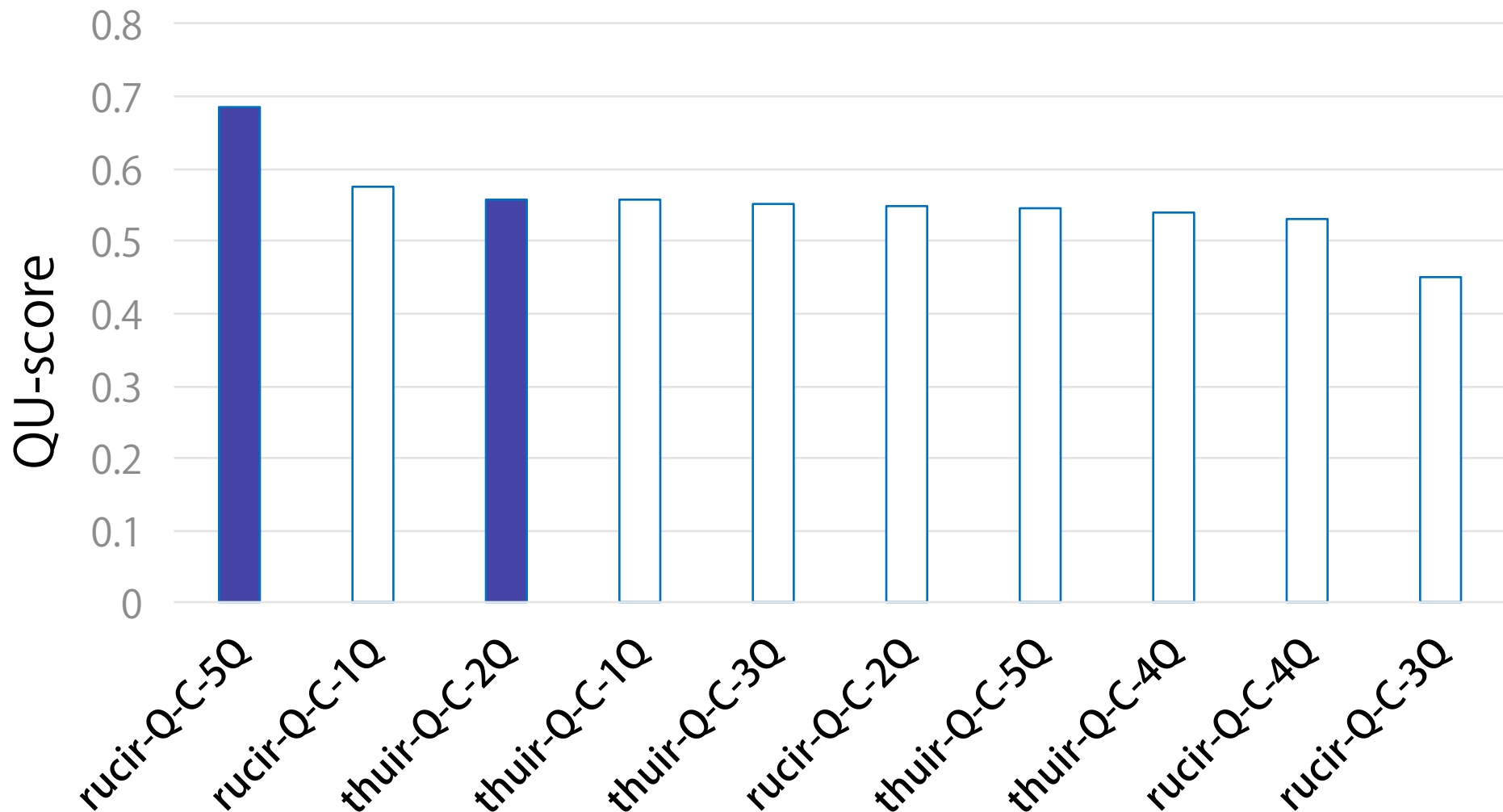
35



**ruicir** achieved the best performance  
– significantly different from the others

# Chinese Query Understanding Subtask

36

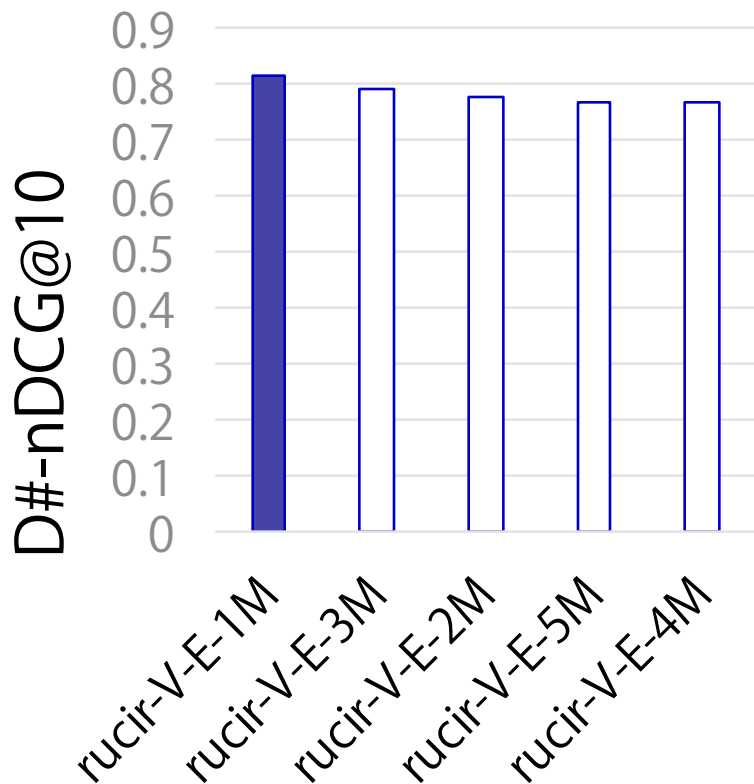


**ruicir** again achieved the best performance  
– significantly different from the others

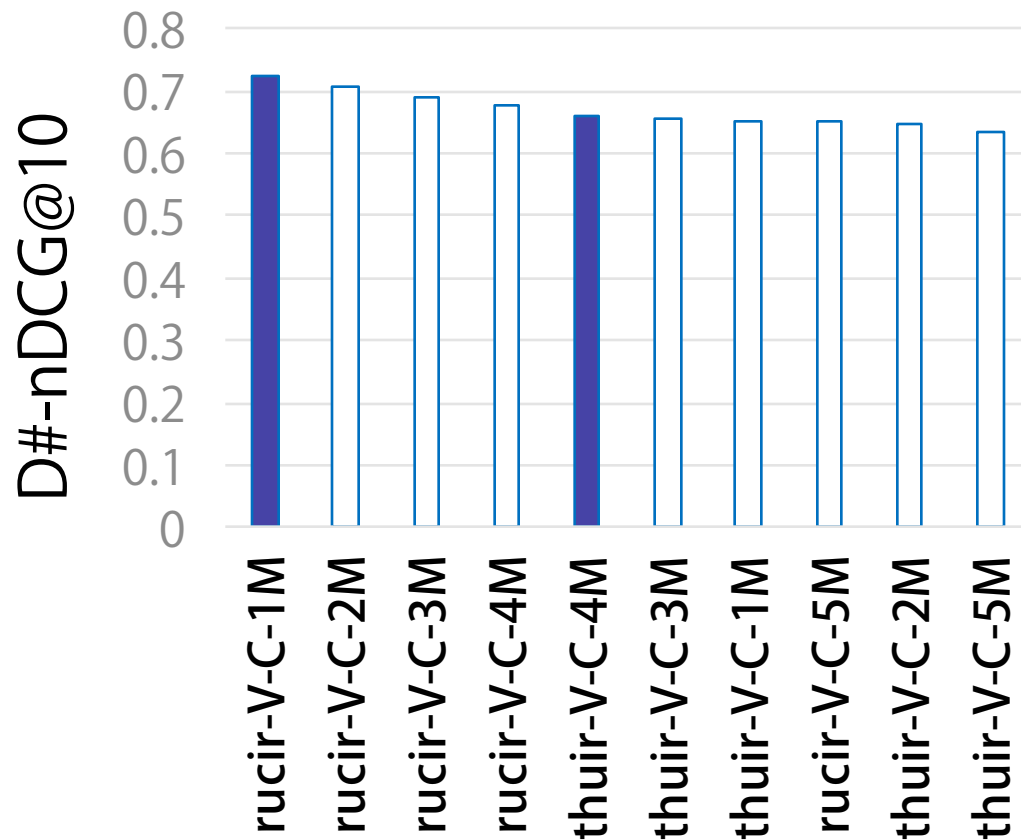
# Vertical Incorporating Subtask

37

## ENGLISH



## CHINESE



**ruicir** achieves the best performance

- Researches related to INTENT/IMINE
  - Many Diversification algorithms...
    - Selective Diversification [Sakai+WWW2012] [Tsukuda+AIRS2013]...
    - Hierarchical Intents [Hu+CIKM2015][Wang+SIGIR2016]...
  - Evaluation Metrics [Sakai+SIGIR2011] ...
  - Task-oriented Search [Yan+SIGIR2015]...
  - Intrinsically Diverse Search [Raman+SIGIR2013][Umemoto+SIGIR2016]...

# What would be the remaining research topics?

- Techniques

- How can we generate vertical results which can satisfy different user intents?

- Evaluation

- How can we evaluate the utility of a ranked list as a whole?
  - Appearance of a vertical result affects the utility of other Web documents

- IMine-2
  - Understand and satisfies diverse users' search intents
- Subtasks
  - Query Understanding
  - Vertical Incorporating
- Results
  - 42 runs from 9 teams
  - Some teams achieved significantly different performance than other teams