# IMU Experiment in IR4QA at NTCIR-8

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# Outline

- Basic Approaches
- Experiments
- Conclusion

# Basic Approaches

- Query Formulation
- Results Combination

# Basic Approaches

- Query Formulation
  - Question classification
  - Weighting
  - Query expansion
- Results Combination

- **Classes: BIOGRAPHY, PERSON, etc.**
- **Method: KeySring plus a few Rules**

# KeyString

- Source: Sina iAsk and Baidu Zhidao
- Manully classify them
- Statistics

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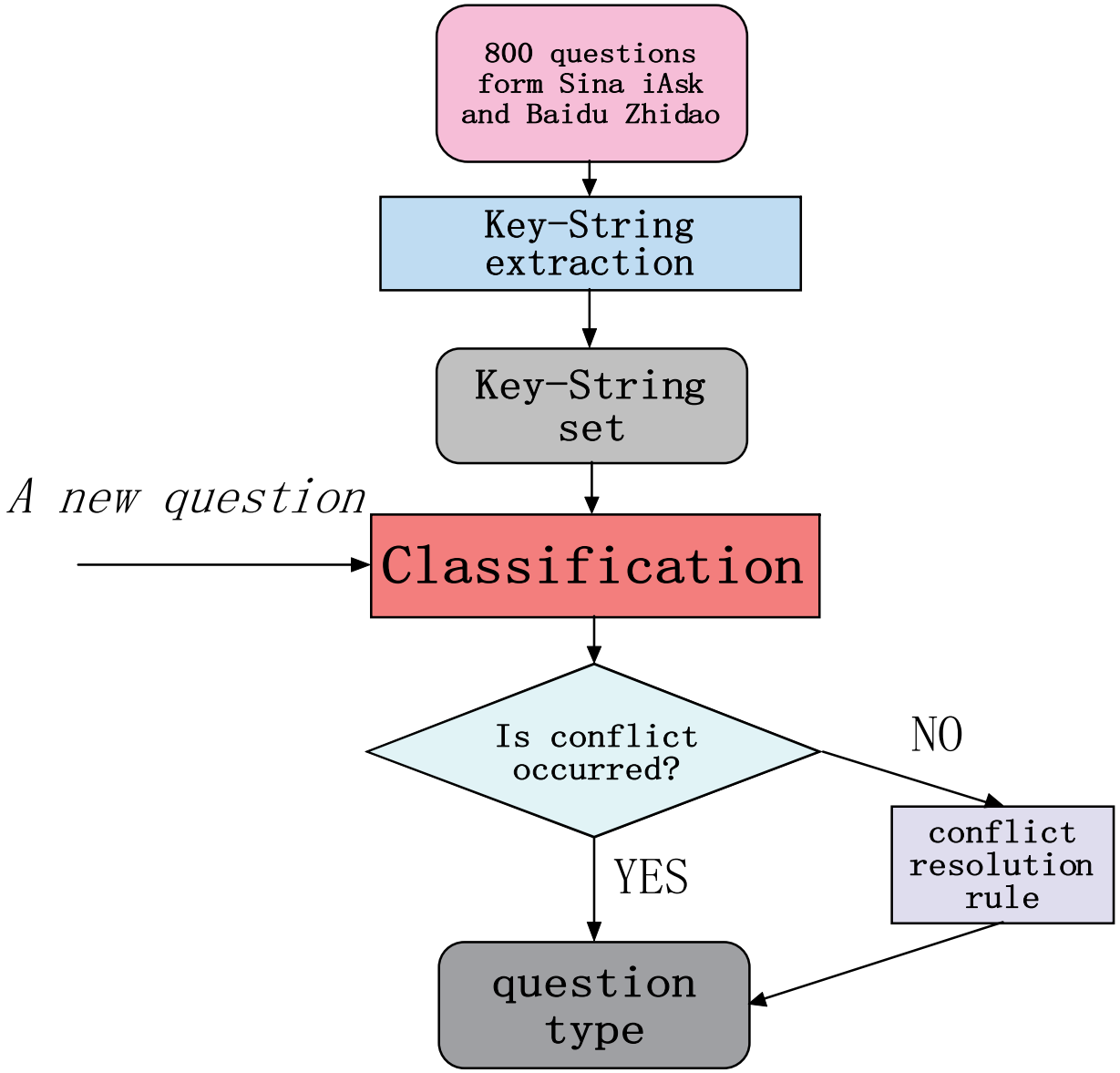
# Key-String of DATE type questions

**Key-String:** 哪年，哪月，哪天，何时，何年, 何月，何日，什么时候，什么时间，什么时辰，多会儿，具体时间，生日，诞辰，纪念日

# Rule Based collision resolution




800 questions form Sina iAsk and Baidu Zhidao
Key-String extraction
Key-String set
A new question
Classification
Is conflict occurred?
NO
conflict resolution rule
YES
question type

# Basic Approaches

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- #weight( 0 Where 0 will 0 the 1 NTCIR-8 0 conference 0 be 1 hold 0 on?)

# Weighting

- Biography & Definition -> no weighting
- Relationship -> weighting according to the collection frequency of the two objects in the question.
- Other types -> increase the weights of the most important two key words.

# Basic Approaches

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# Query expansion

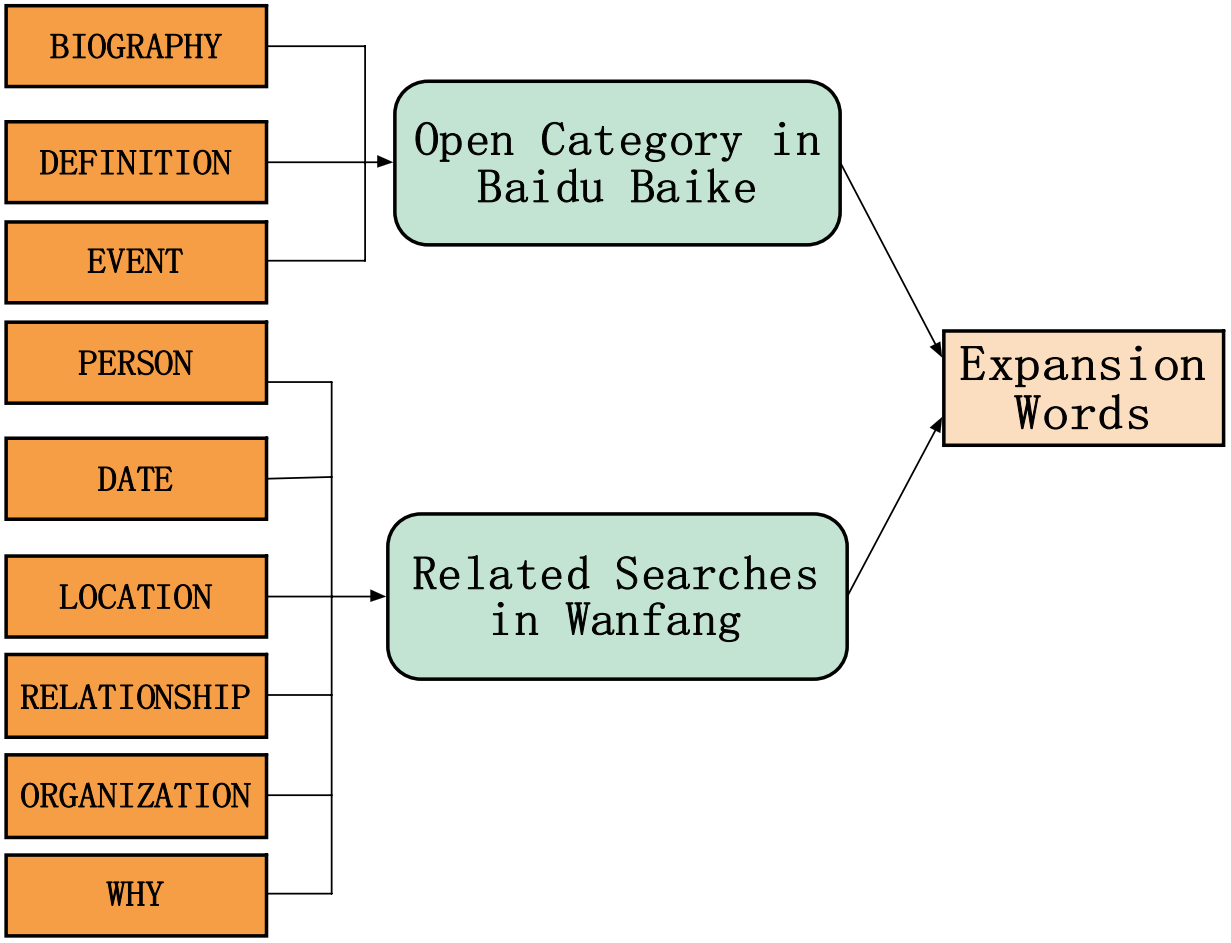
- Vocabulary mismatch between documents and user's query
- Type specific Query expansion
  - BIOGRAPHY, DEFINITION and EVENT -> Baidu Baike
  - Others -> Wan Fang

# Open Category in Baidu Baike

| entry | Open Category |
|---|---|
| 何大一 | 台湾，人物，博士，科学院院士 |
| 李宇春 | 明星，华人明星，歌手，超级女声，影响力人物 |
| 老龄化社会 | 社会保障，社会保险，社会问题， 老人，人口研究 |
| **319**枪击案 | 台湾 |

# Related Search in Wanfang

| KeyTerm | 藏历 | 重合 |
| --- | --- | --- |
| ty_max | 历法,时令节气,时轮历,藏历 | 不动点,匹配,相交,重合 |
| ty_mid | | 主位,主语,平移,旋转角度,移动变换,超凸度量空间,非紧性测度 |
| ty_min | | g-凸空间,双务合同,定性对策,履行,截口,抽象经济 |


BIOGRAPHY
DEFINITION
EVENT
PERSON
DATE
LOCATION
RELATIONSHIP
ORGANIZATION
WHY
Open Category in Baidu Baike
Related Searches in Wanfang
Expansion Words

# Basic Approaches

- Query Formulation
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  - Query expansion
- Results Combination

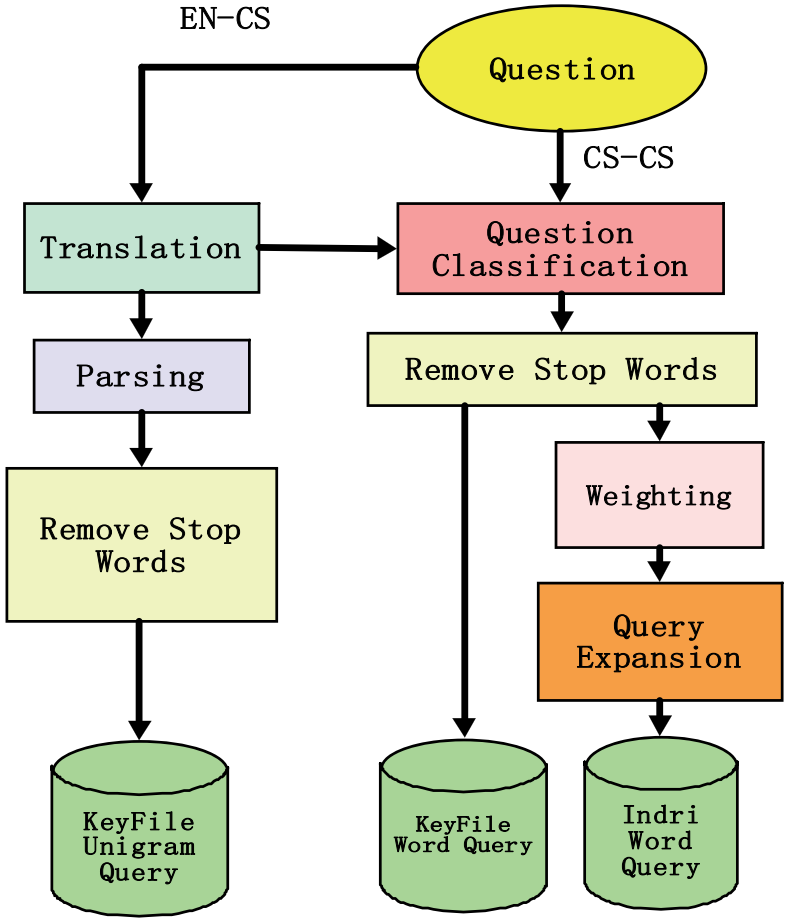
# Results Combination

- Multi-Evidence
  - The more evidence a document get, the higher it ranked.

# Basic Approaches

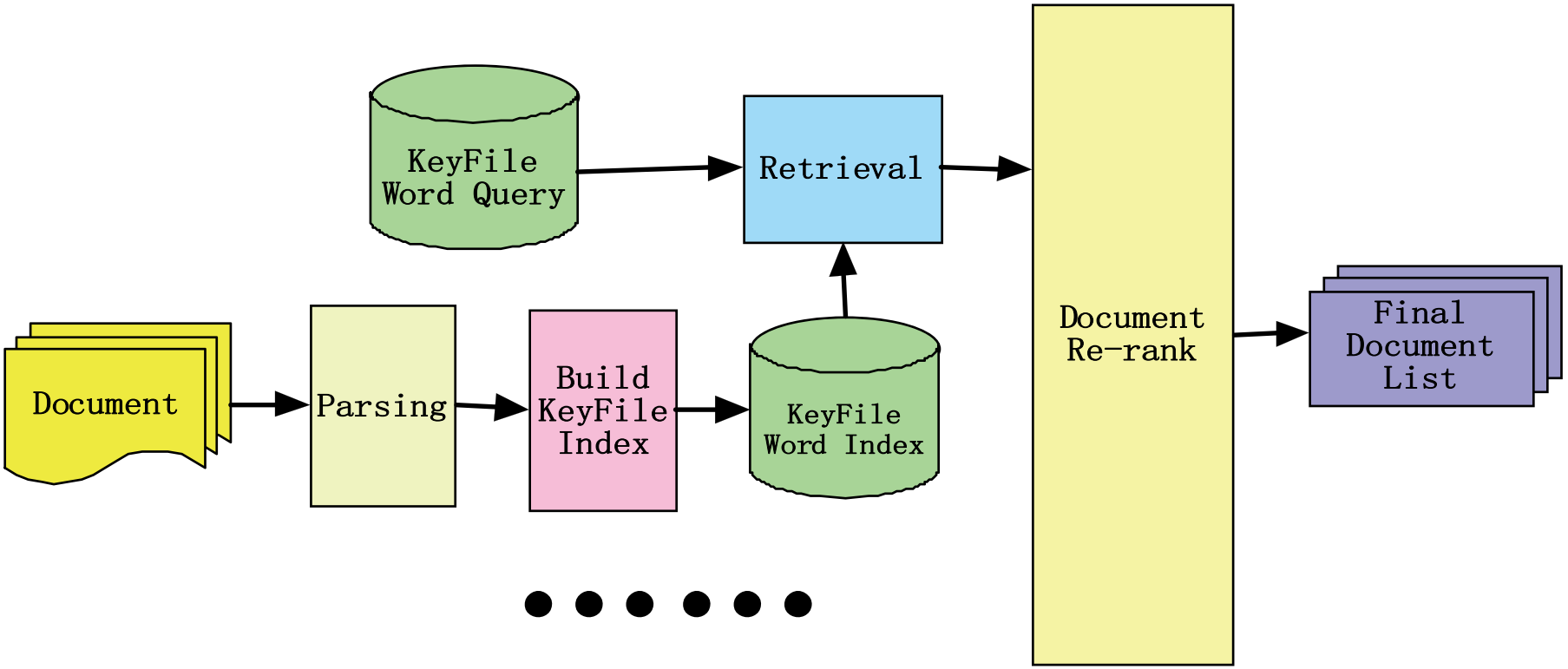
- Query Formulation
- Results Combination
  - **Three Indexes**
  - **Re-rank**

- KeyFile-Unigram-Index
- KeyFile-Word-Index
- Indri-Word-Index


EN-CS
Question
CS-CS
Translation
Question Classification
Parsing
Remove Stop Words
Remove Stop Words
Weighting
Query Expansion
KeyFile Unigram Query
KeyFile Word Query
Indri Word Query

# Basic Approaches

- Query Formulation
- Results Combination
  - **Three Indexes**
  - **Re-rank**


KeyFile
Word Query
Retrieval
Document
Re-rank
Final
Document
List
Document
Parsing
Build
KeyFile
Index
KeyFile
Word Index

# Re-rank algorithm

**Description: This algorithm is designed to implement the document re-rank task according to the returned document lists from three indexes mentioned above.**

**(1)score normalize:**

**For each returned document list from above three indexes**

**For each Di in the returned document list**

**Score normalize(Di);**

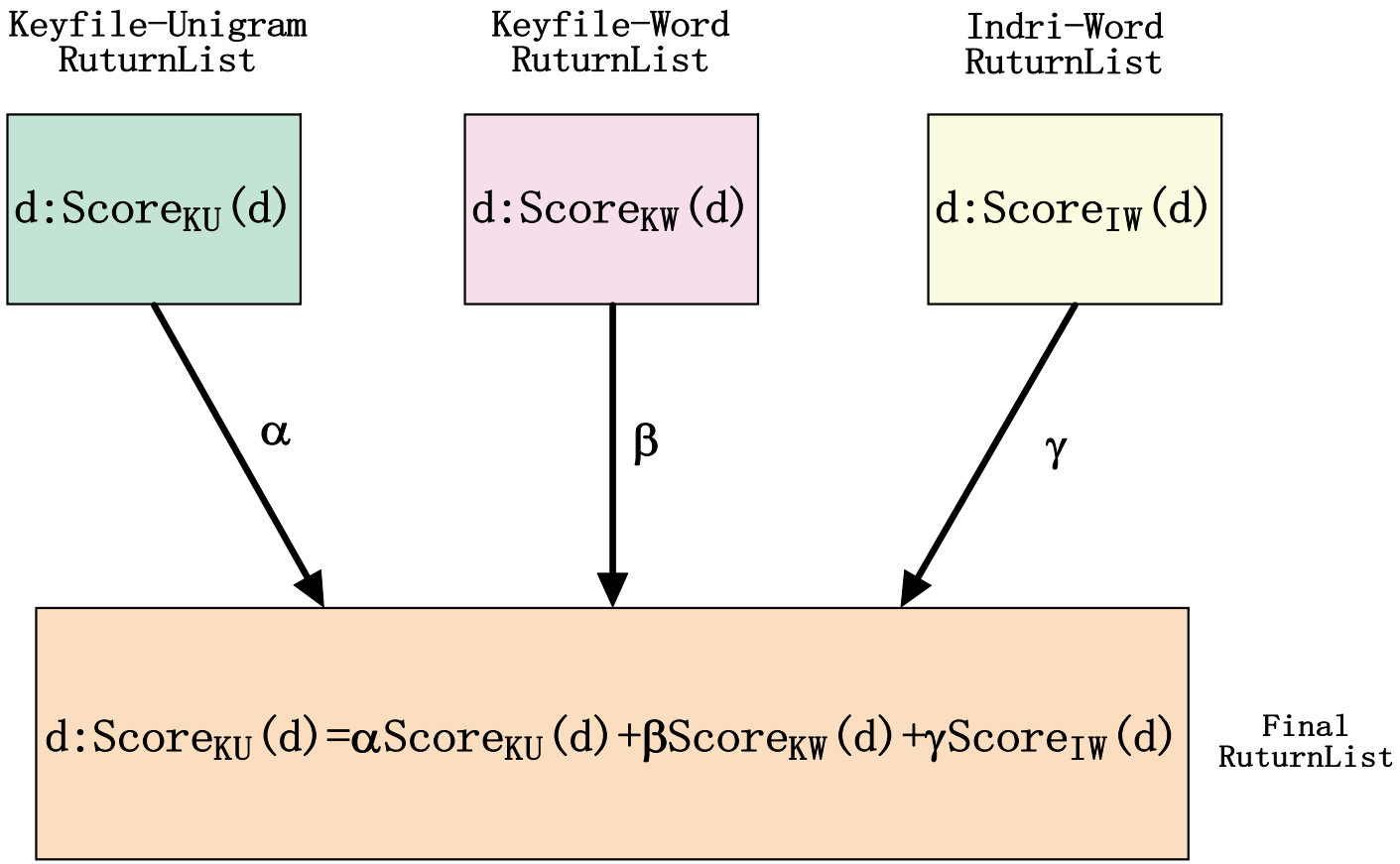
**(2)compute score:**

**For each Di appeared in one of the returned document list**

**Score interpolating(Di);**

**(3)sort documents:**

**Sort(score list);**


Keyfile-Unigram
RuturnList
Keyfile-Word
RuturnList
Indri-Word
RuturnList
d:Score_KU(d)
d:Score_KW(d)
d:Score_IW(d)
α
β
γ
d:Score_KU(d)=αScore_KU(d)+βScore_KW(d)+γScore_IW(d)
Final
RuturnList

# Outline

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# Experimental Setting

- Lemur Toolkit
  - Tf-Idf
  - Pseudo Relevance Feedback
- Indri Search Engine
  - Language model and Inference Network
  - Pseudo Relevance Feedback
- ICTCLAS
- Hailiang API (http://www.*hylanda.com)*

# Experiment Results



# Expansion

**Performance comparison between results with and without Open Category expansion in the training experiments with the NTCIR-7 IR4QA CS test collection**

| Expansion | Indri Word Query | | |
|---|---|---|---|
| | MAP | Q-measure | nDCG |
| No | 0.5837 | 0.5579 | 0.6820 |
| Yes | 0.6060 | 0.5800 | 0.7180 |

Legend: No represents result without expansion, Yes represents result with expansion

# Results Combination

**Performance of single index and their combination in the CS-CS training experiments with the NTCIR-7 IR4QA CS test collection**

| Result | CS-CS | | | | | | |
|---|---|---|---|---|---|---|---|
| Measure | ① | ② | ③ | ①+② | ①+③ | ②+③ | ①+②+③ |
| AP | 0.4354 | 0.5424 | 0.5435 | 0.5685 | 0.5600 | 0.5483 | 0.5735 |
| Q-measure | 0.4445 | 0.5389 | 0.5396 | 0.5693 | 0.5564 | 0.5441 | 0.5738 |
| nDCG | 0.6736 | 0.7378 | 0.7438 | 0.7710 | 0.7579 | 0.7458 | 0.7733 |

① KeyFile-Unigram-Index

② KeyFile-Word-Index
③ Indri-Word-Inde
+ means the combination of them

# Classification Result

| Type | BIOGRAPHY | PERSON | EVENT |
|---|---|---|---|
| Number | 10 | 5 | 18 |
| Type | ORGANIZATION | LOCATION | DATE |
| Number | 4 | 7 | 5 |
| Type | RELATIONSHIP | DEFINITION | WHY |
| Number | 19 | 10 | 22 |

Accuracy of question classification is 0.87.

# Mean AP of Each Class

| Type | BIOGRAPHY | PERSON | EVENT |
|---|---|---|---|
| Number | 0.535733 | 0.427233 | 0.557311 |
| Type | ORGANIZATION | LOCATION | DATE |
| Number | 0.63205 | 0.42242 | 0.3473 |
| Type | RELATIONSHIP | DEFINITION | WHY |
| Number | 0.538154 | 0.305363 | 0.2096 |

# Mean AP comparison of each question types

ORGANIZATION>EVENT>RELATIONSHIP>
BIOGRAPHY>PERSON>LOCATION>DATE>
DEFINITION>WHY

# Our formal runs

## Official Runs with Combination Parameters

| Measure | IMU-CS-CS-01-T | IMU-CS-CS-02-T | IMU-CS-CS-03-T | IMU-EN-CS-01-T |
|---|---|---|---|---|
| α | 0.04 | 0.16 | 0.25 | 0.04 |
| β | 0.16 | 0.24 | 0.25 | 0.16 |
| γ | 0.80 | 0.60 | 0.50 | 0.80 |
| mean AP | 0.4266 | 0.4114 | 0.4032 | 0.3184 |
| mean Q | 0.4628 | 0.448 | 0.4394 | 0.354 |
| mean nDCG | 0.6761 | 0.658 | 0.6575 | 0.5720 |

# Conclusion

- Query Formulation
- Results Combination

# Thanks!

## Comments & Questions?

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