# Cross-Dialect Information Retrieval: Information Access in Low-Resource and High-Variance Languages

Robert Litschko, Oliver Kraus, Verena Blaschke, Barbara Plank

COLING 2025 • Abu Dhabi

The 31st International Conference on Computational Linguistics

CIS

nlp

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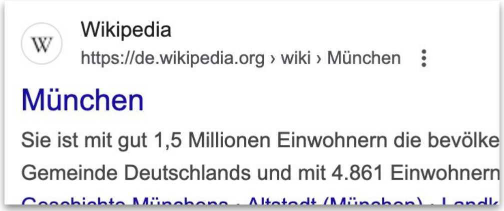
Munich Center for Machine Learning

🔍 München (“Munich”)

# München ("Munich")



Wikipedia
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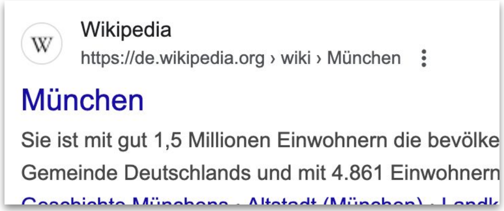
München

Sie ist mit gut 1,5 Millionen Einwohnern die bevölke
Gemeinde Deutschlands und mit 4.861 Einwohnern
Geschichte Münchens · Altstadt (München) · Landk

# München (“Munich”)

What about culture-specific knowledge that can often be found in dialect Wikis?



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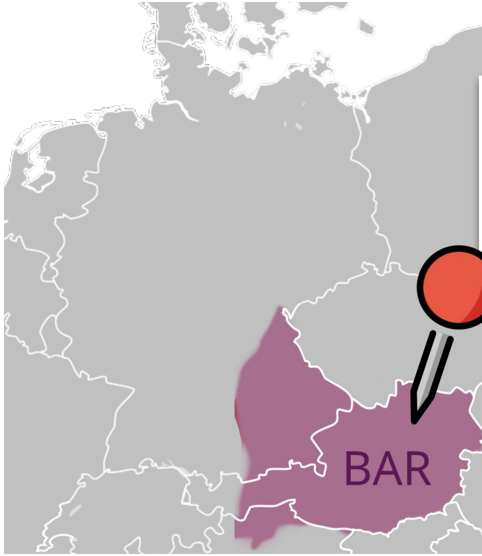

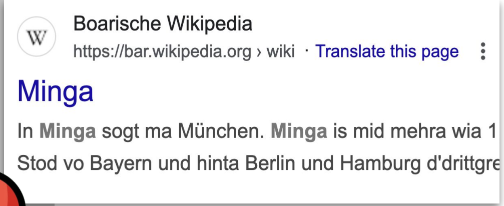
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Minga

In **Minga** sogt ma München. **Minga** is mid mehra wia 1
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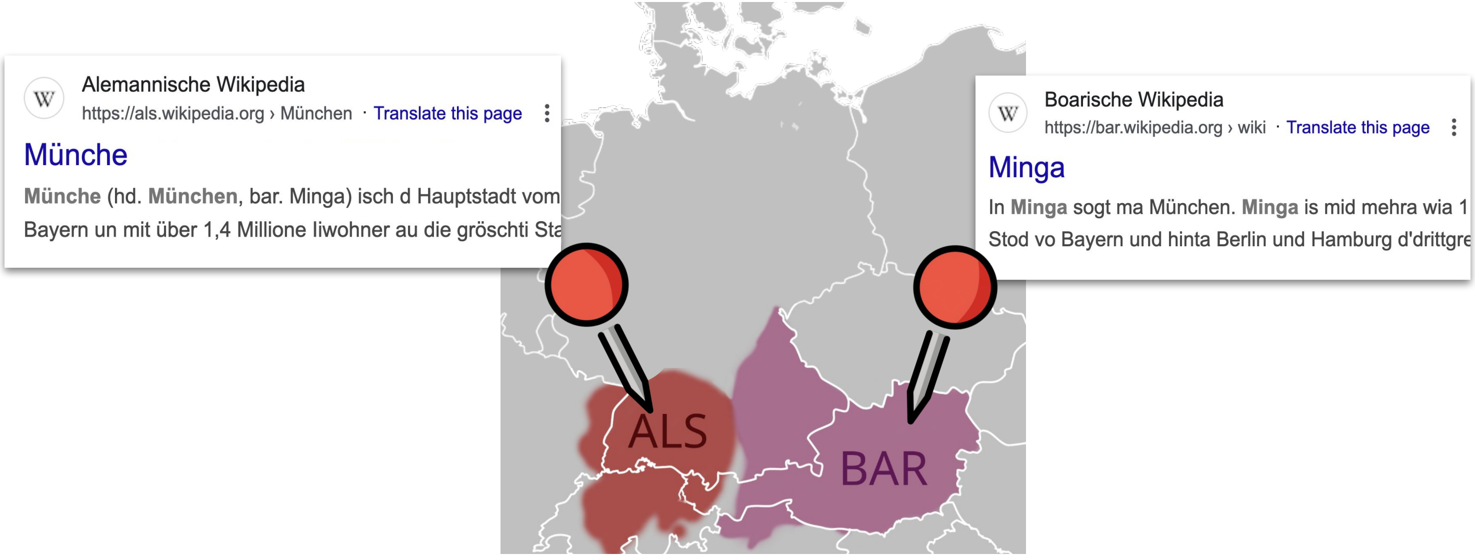

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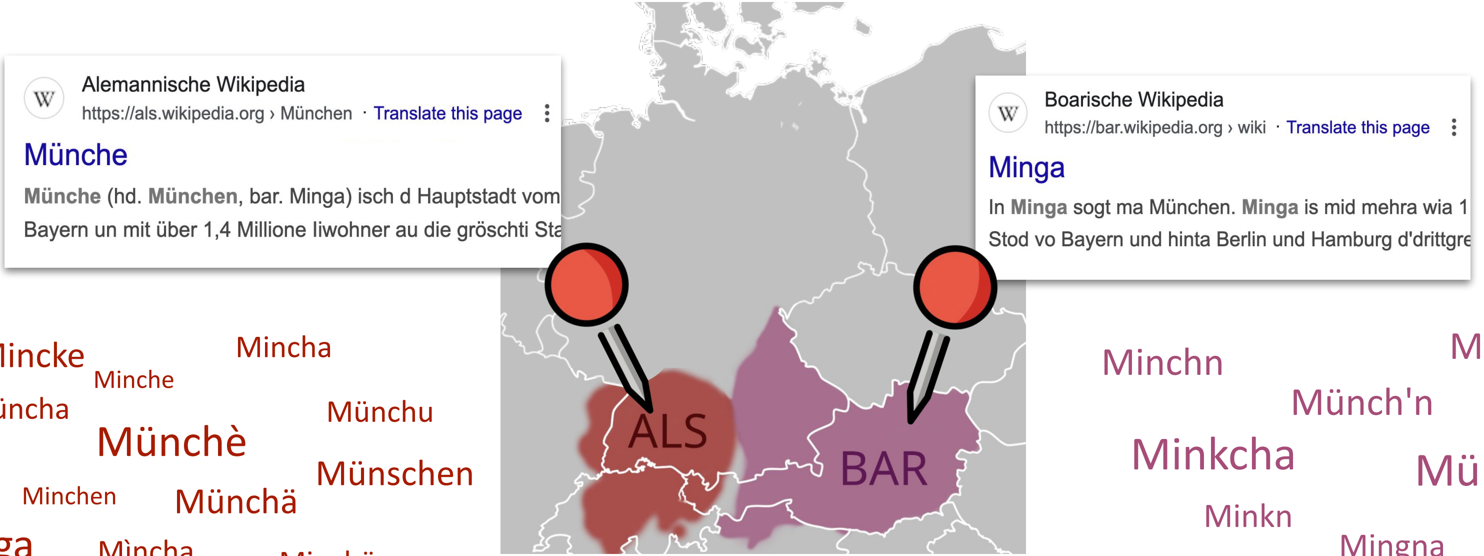

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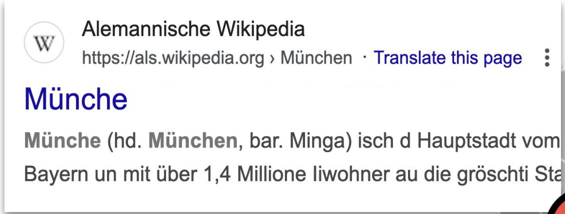
Mincke Mincha Minche Müncha Münchu Minke Münchè Münschen Minchen Münchä Minga Mìncha Minchä

Minchn Minkhn Münch'n Minkcha Münchn Minkn Mingna

High Lexical variation due to regional word choices and different pronunciations.



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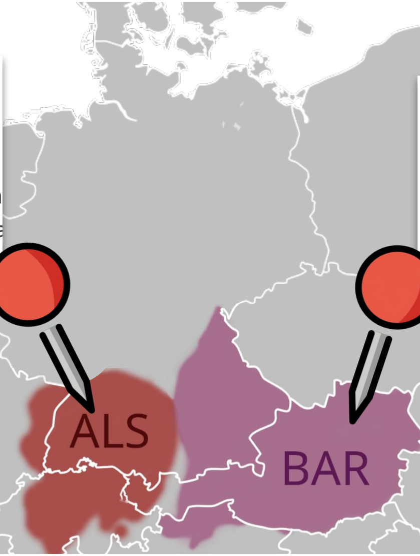

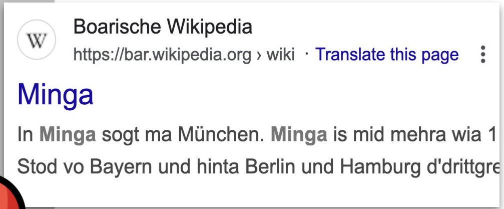

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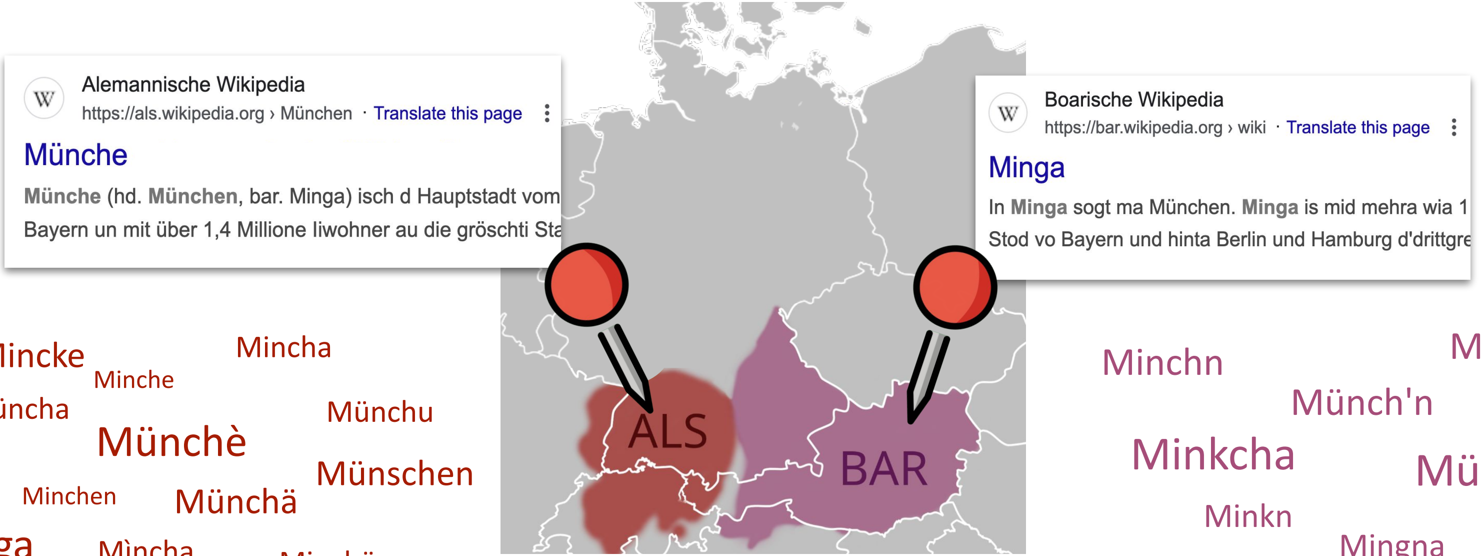

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Minchn
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Minkcha
Münchn
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Lexical retrieval falls short: Normalizers do not exists for most dialects.

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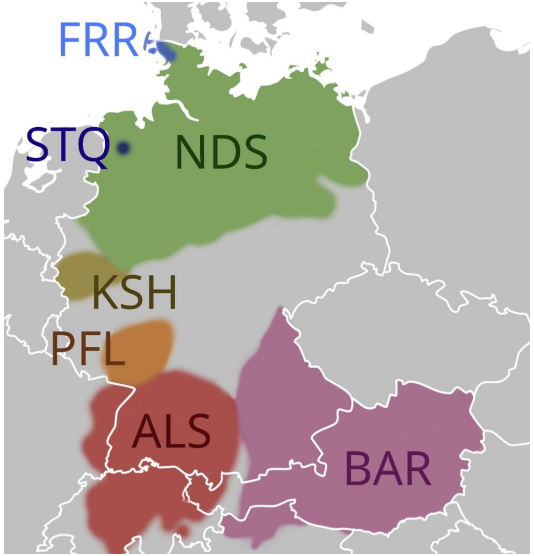
High Lexical variation due to regional word choices and different pronunciations.



Low German (**nds**)

Alemannic (**als**)

Bavarian (**bar**)

North Frisian (**frr**)

Saterfrisian (**stq**)

Ripuarian (**ksh**)

Rhine Franconian (**pfl**)

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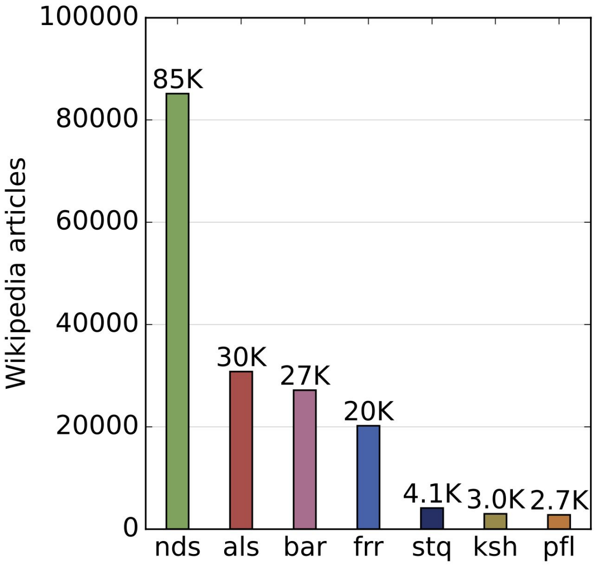

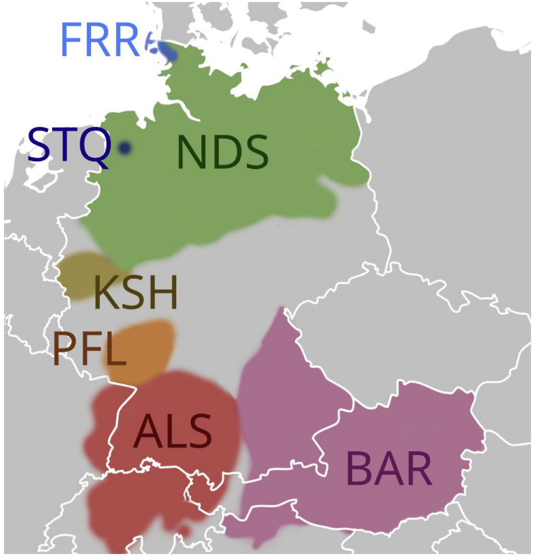

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Standard German: 2.9M Wiki articles

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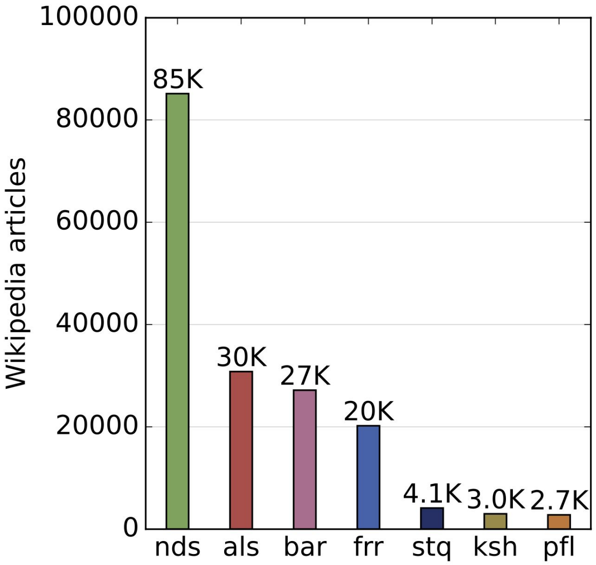

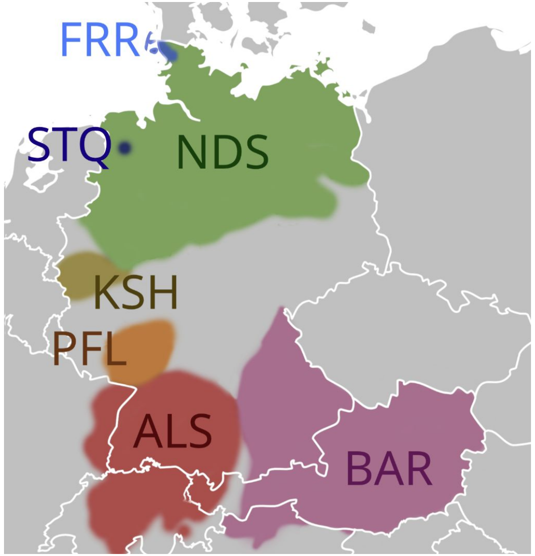

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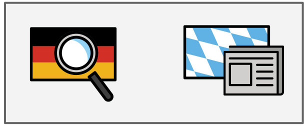
Low-resource: Very Limited resources data to train neural retrieval models.

# Contribution

- New task: Cross-dialect information retrieval
- New dataset: WikiDIR
- Dialect variation dictionaries
- Evaluation of IR models on WikiDIR

**Example**



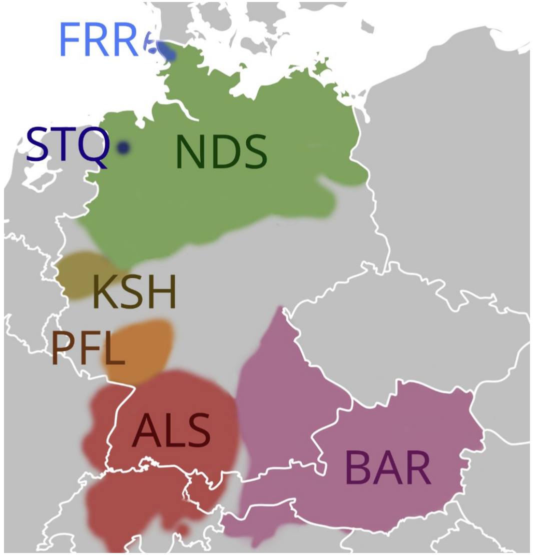


Image based on a map of Europe by Marian Sigler, CC BY-SA 3.0.

# Agenda

1. **Motivation**

2. WikiDIR dataset

3. Dialect dictionaries

4. Models

5. Results

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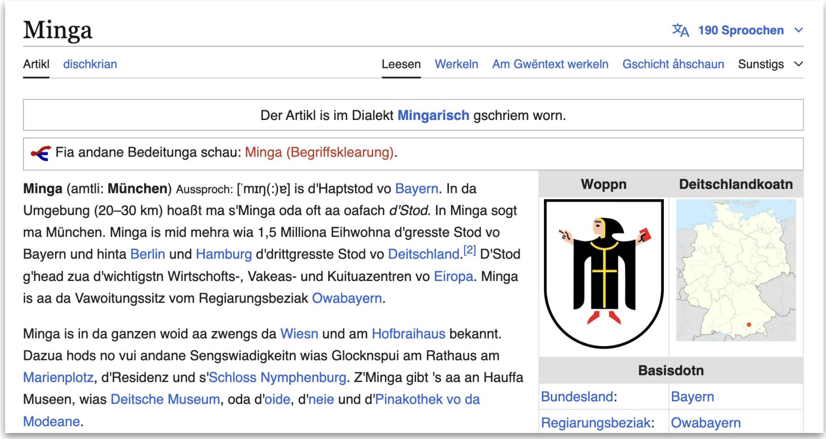
2. **WikiDIR dataset**
3. Dialect dictionaries
4. Models
5. Results

# Dataset Pipeline



Minga

190 Sproochen

Artikl dischkrian

Leesen Werkeln Am Gwëntext werkeln Gschicht åhschaun Sunstigs

Der Artikl is im Dialekt **Mingarisch** gschriem worn.

Fia andane Bedeitunga schau: Minga (Begriffsklearung).

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Minga is in da ganzen woid aa zwengs da Wiesn und am Hofbraihaus bekannt. Dazua hods no vui andane Sengswiadigkeitn wias Glocknspui am Rathaus am Marienplotz, d'Residenz und s'Schloss Nymphenburg. Z'Minga gibt 's aa an Hauffa Museen, wias Deitsche Museum, oda d'oide, d'neie und d'Pinakothek vo da Modeane.

| Woppn | Deitschlandkoatn |
|---|---|
| | |

| Basisdotn | |
|---|---|
| Bundesland: | Bayern |
| Regiarungsbeziak: | Owabayern |

based on CLIRMatrix (Sun and Duh, 2018)

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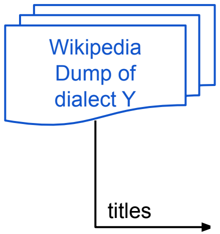
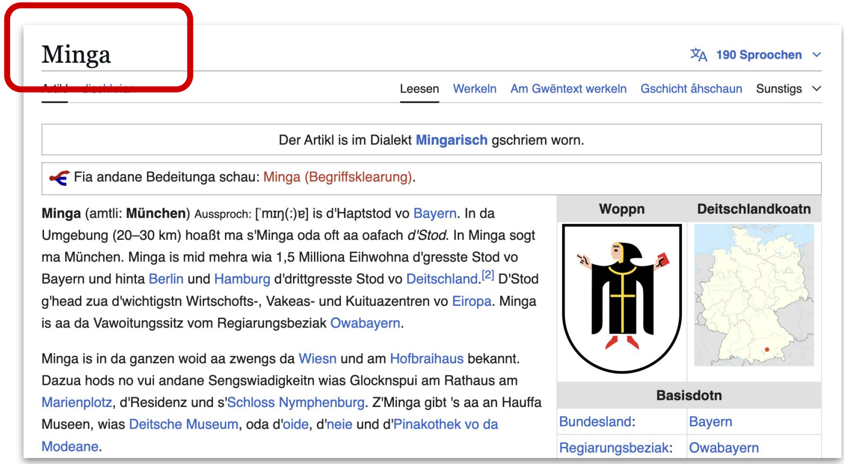


Query $q_i$



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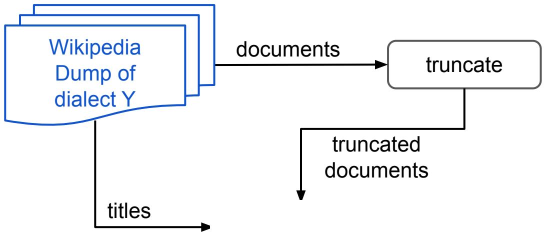

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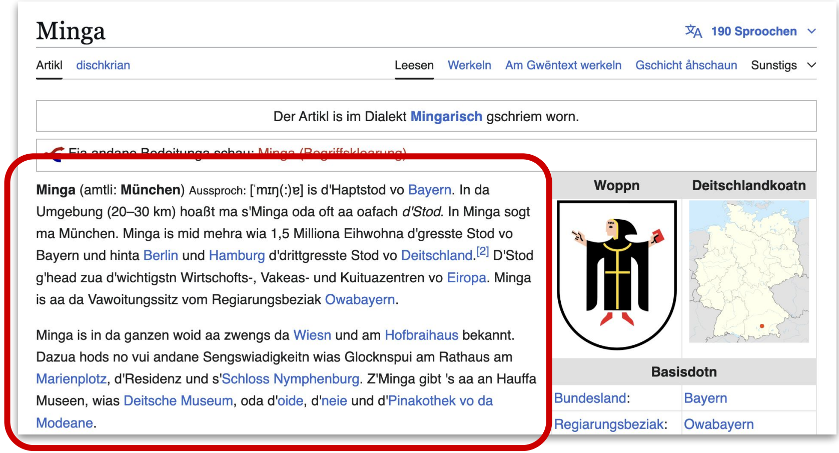
titles

Query $q_i$

Corpus $\mathcal{D}$



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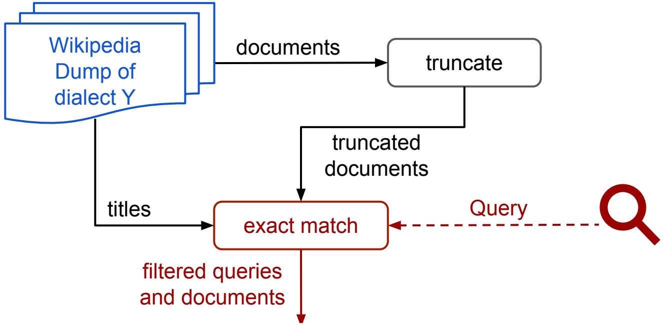

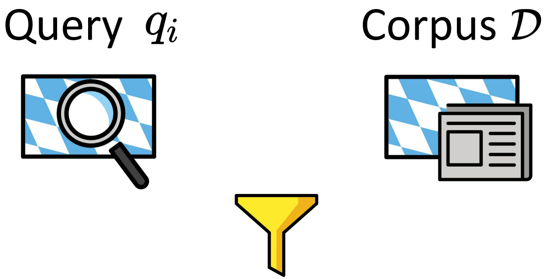

$$\mathcal{D}_{\text{rel}}^{q_i} = \{d_j \in \mathcal{D} \mid d_j \text{ contains } q_i\}$$

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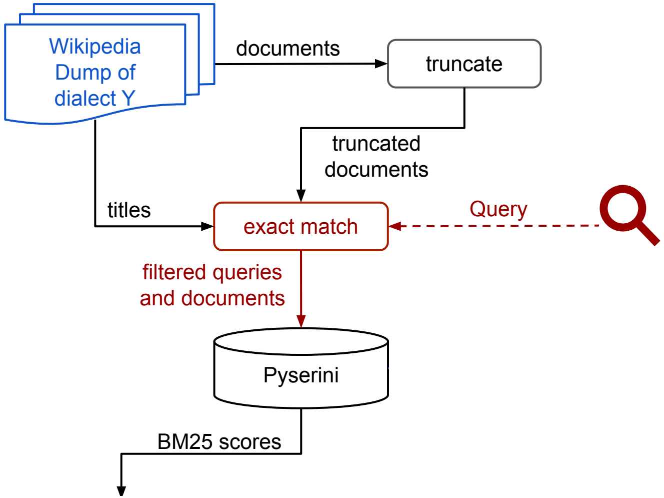

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BM25 scores

Query $q_i$

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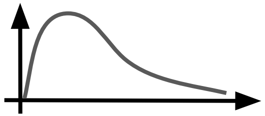
Lexical Similarity Scores



all (q,d)-pairs

based on CLIRMatrix (Sun and Duh, 2018)

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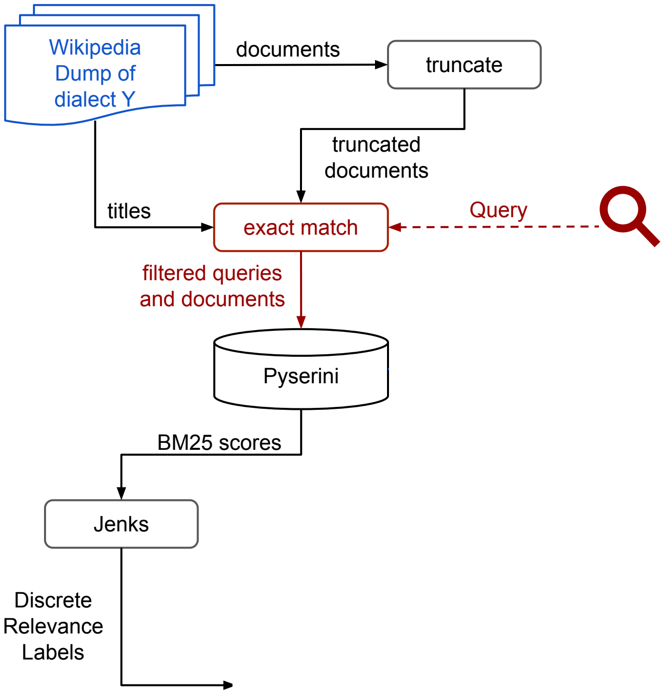

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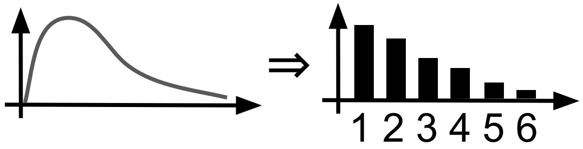
Monolingual Relevance Labels



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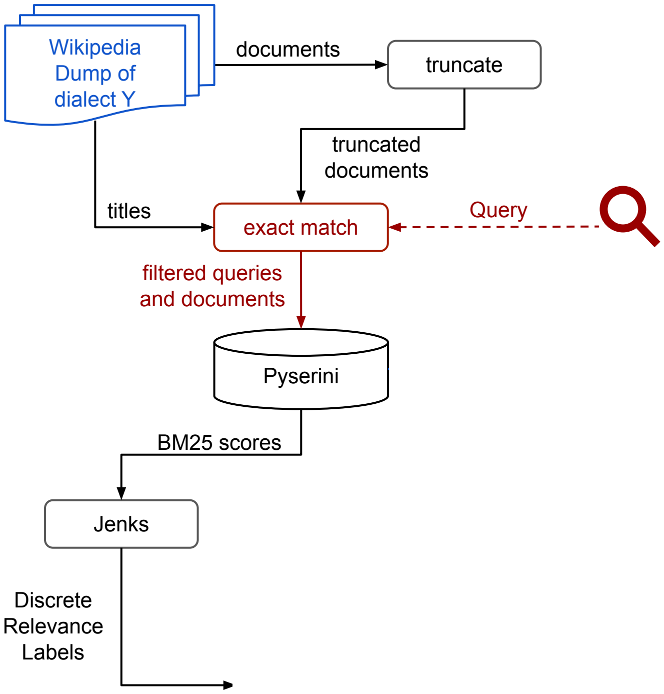
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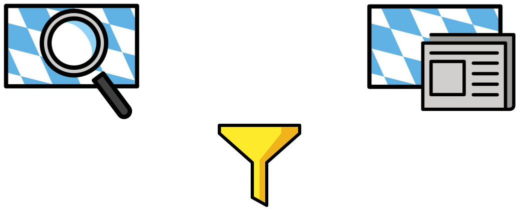

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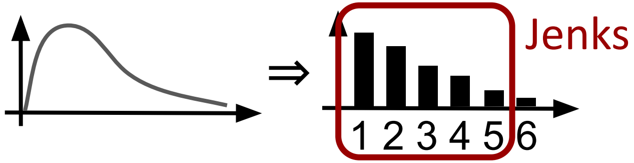

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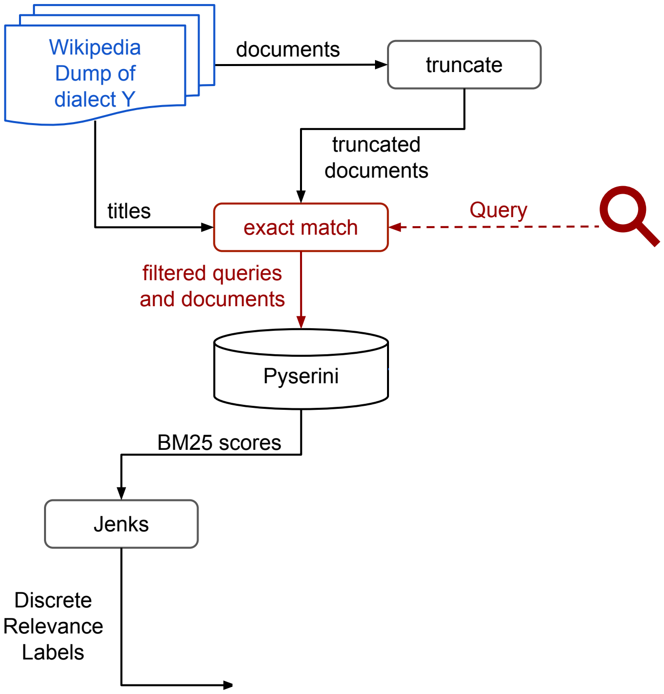

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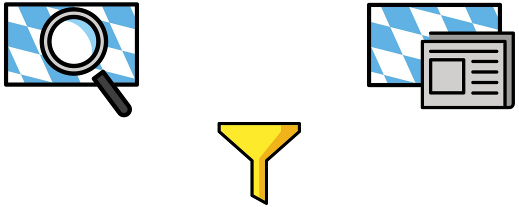

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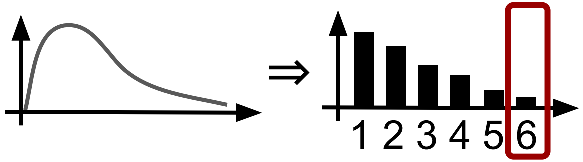

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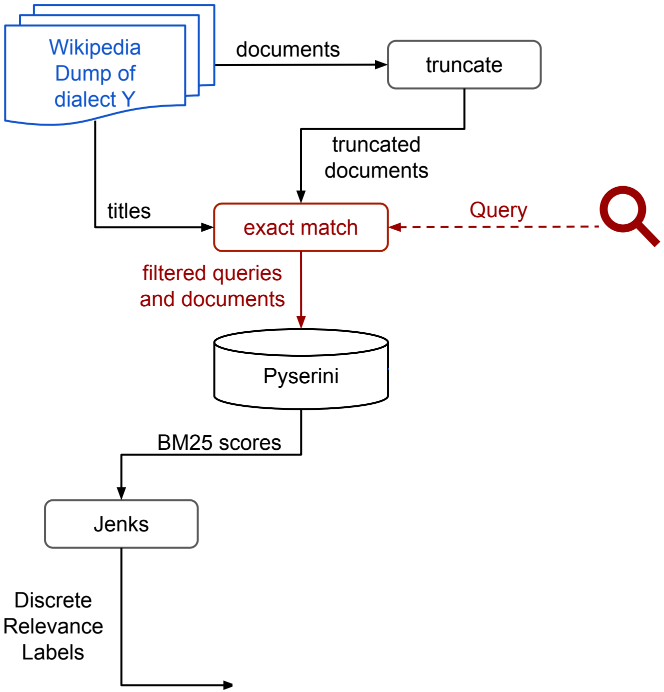

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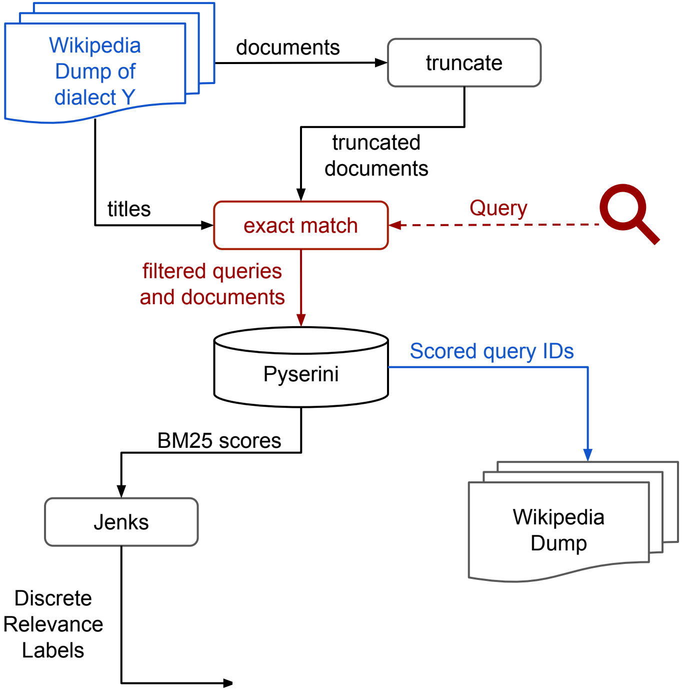

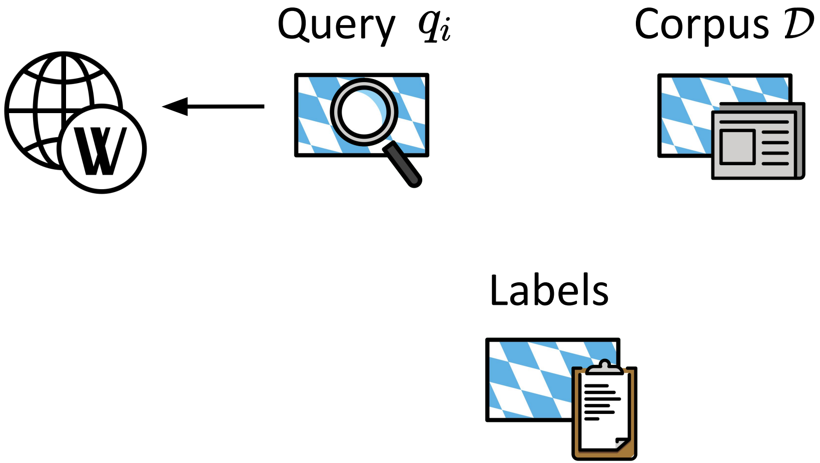

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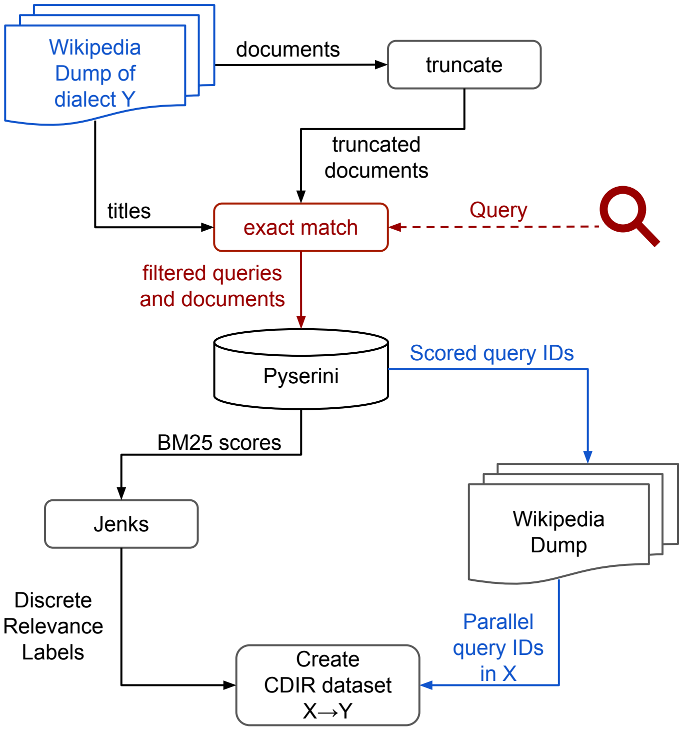

Query $q_i$

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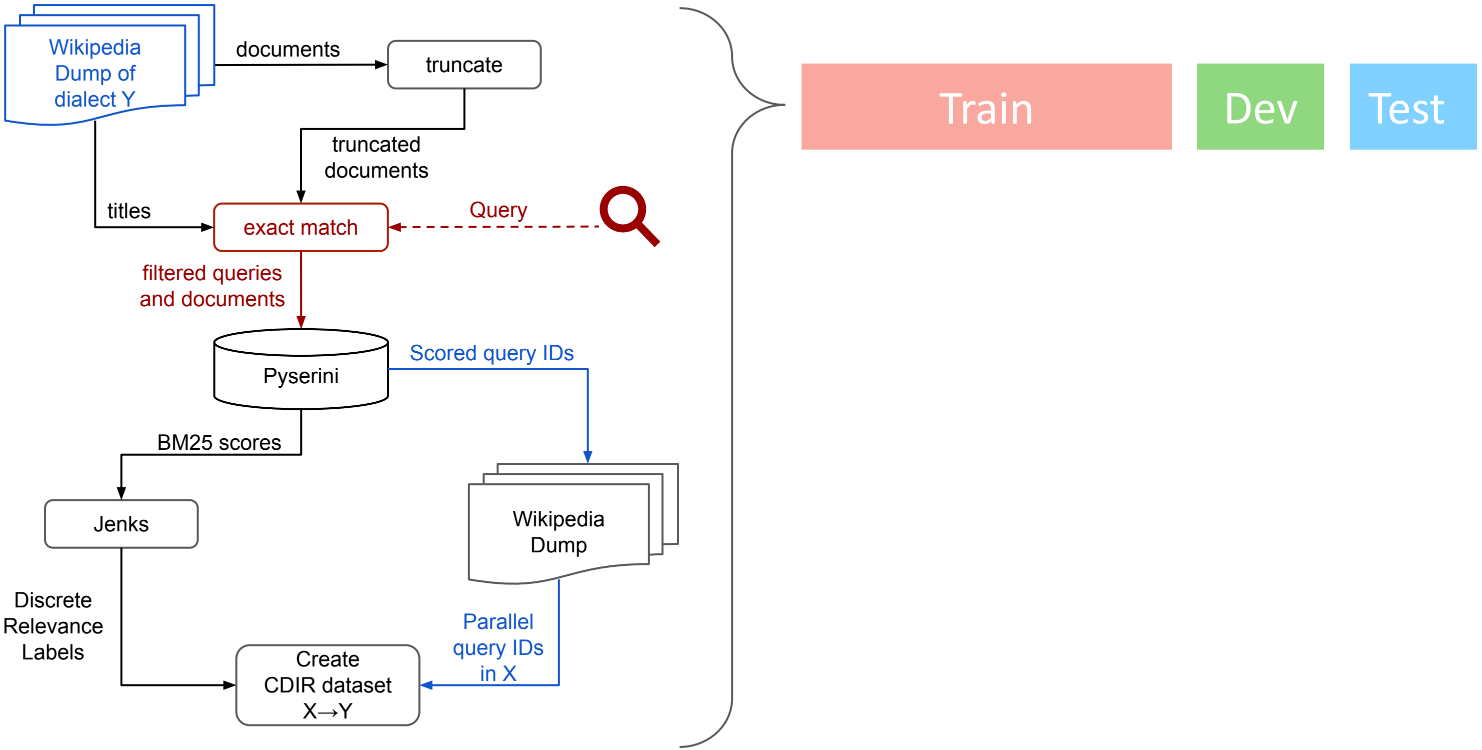
Labels

based on CLIRMatrix (Sun and Duh, 2018), wiki icon by Putu Kharismayad

# Dataset Pipeline



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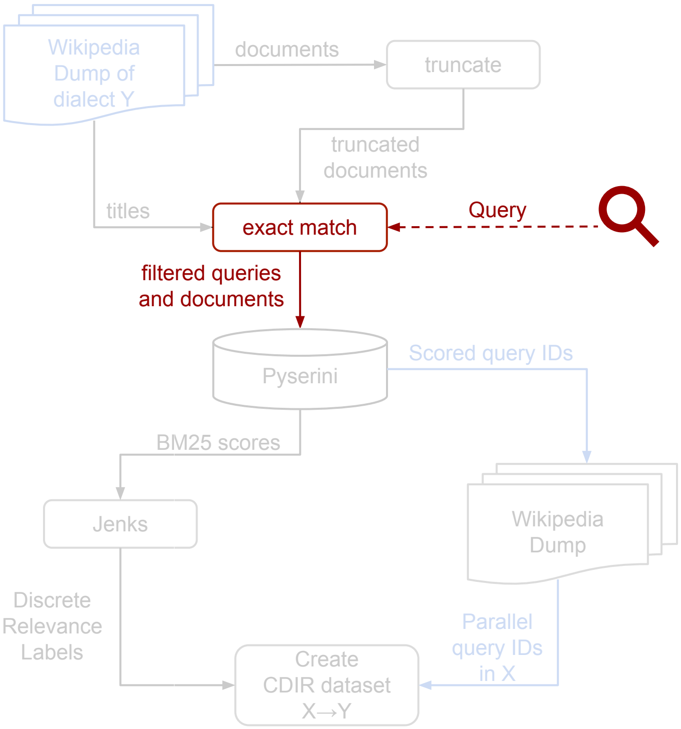


Wikipedia Dump of dialect Y

documents

truncate

truncated documents

titles

exact match

Query

filtered queries and documents

Pyserini

Scored query IDs

BM25 scores

Jenks

Wikipedia Dump

Discrete Relevance Labels

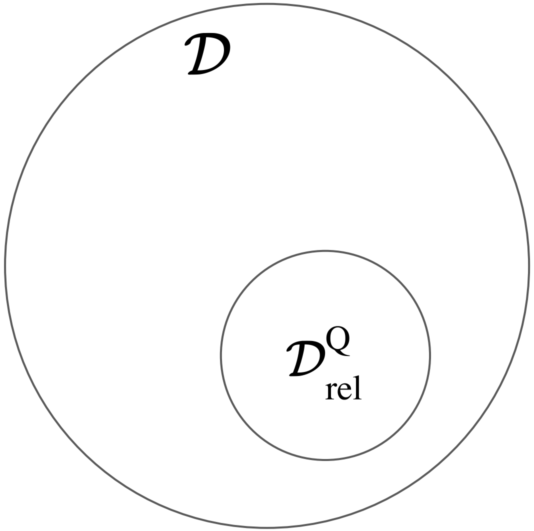
Parallel query IDs in X

Create CDIR dataset X→Y

| Train | Dev | Test |
|---|---|---|

**Set of rel. docs.**

All documents that contain a query.



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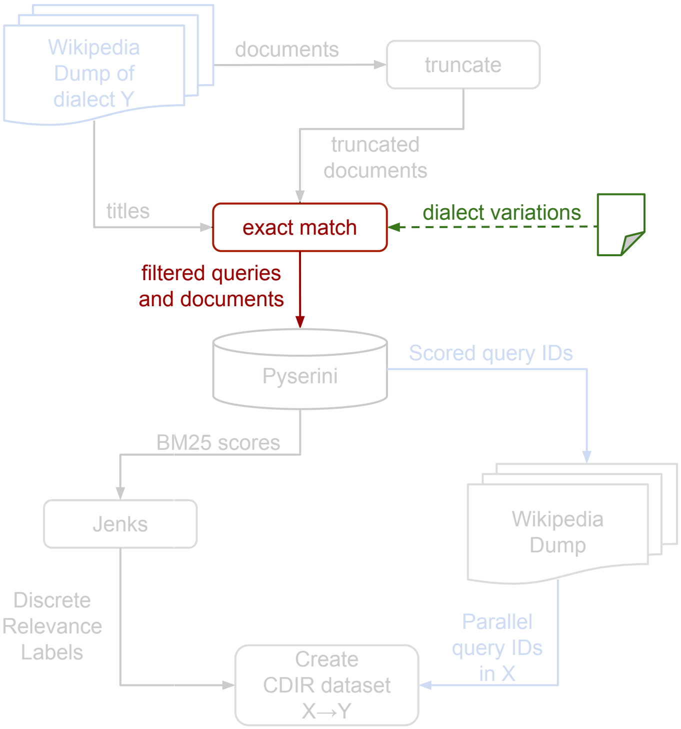
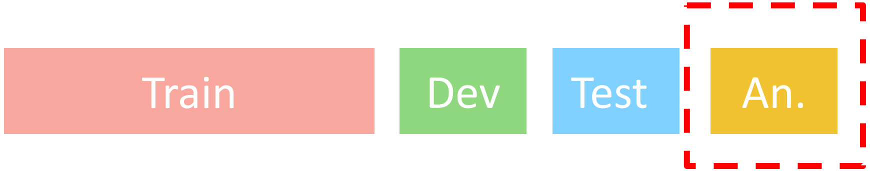
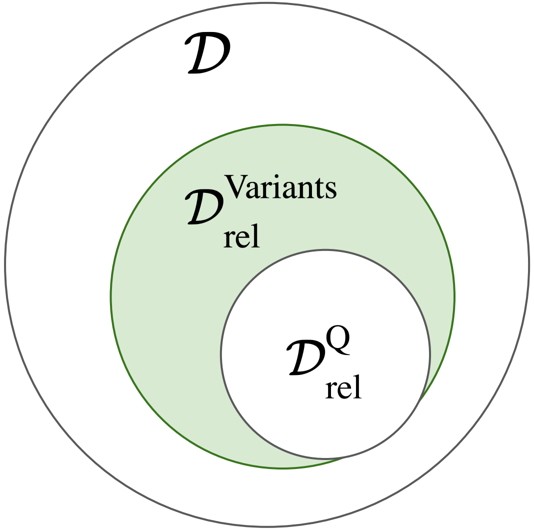




## Analysis Split

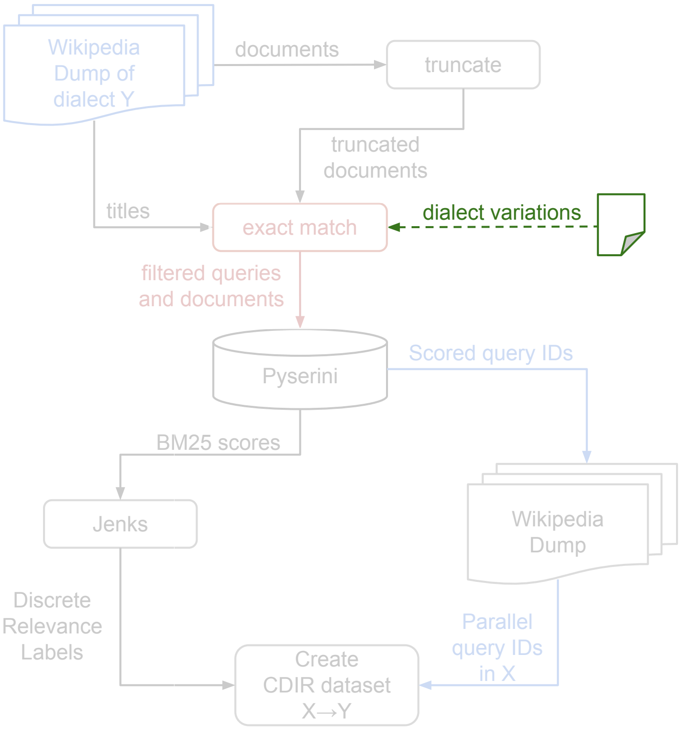
All documents that contain a query or any of its dialect variations.



$\mathcal{D}$
$\mathcal{D}^{\text{Variants}}_{\text{rel}}$
$\mathcal{D}^{\text{Q}}_{\text{rel}}$

based on CLIRMatrix (Sun and Duh, 2018)

# Dataset Pipeline



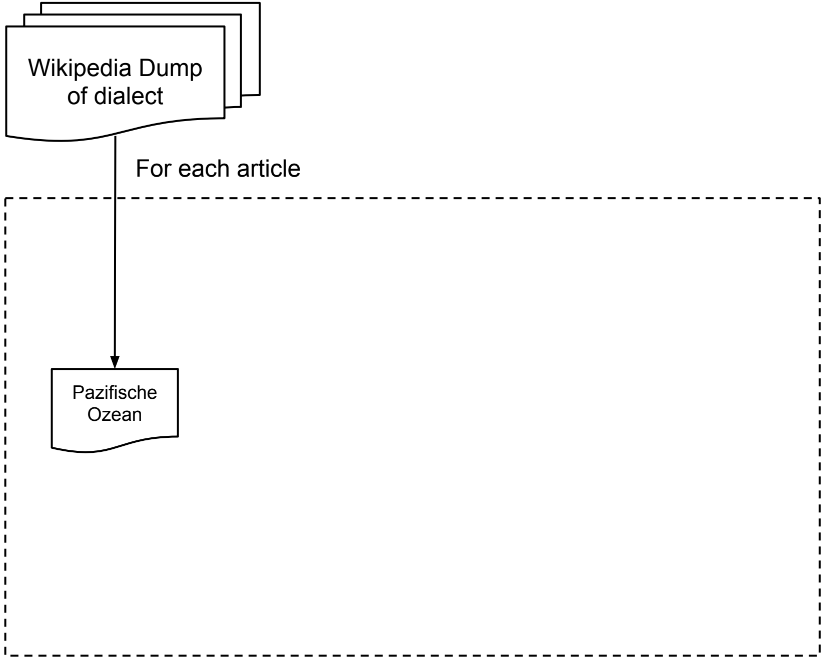
Where do **dialect variations** come from?

based on CLIRMatrix (Sun and Duh, 2018)

# Agenda

1. Motivation
2. WikiDIR Dataset
3. **Dialect dictionaries**
4. Models
5. Results

# Dialect variation dictionaries



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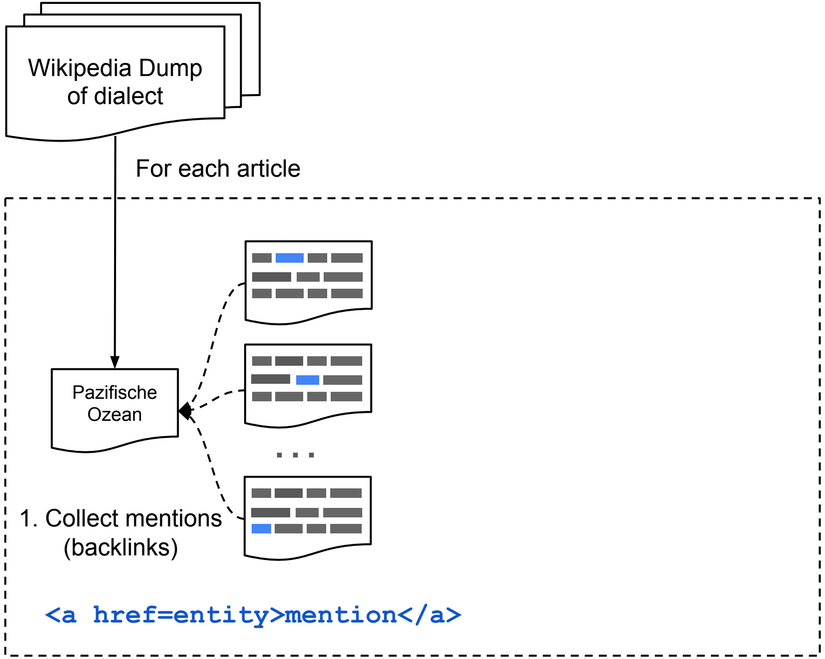
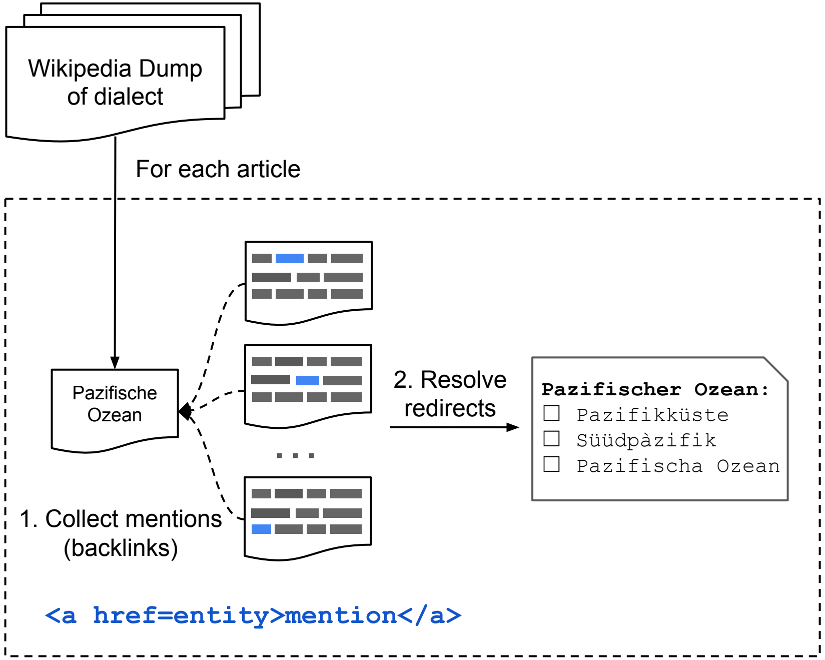


```
<a href=entity>mention</a>
```

# Dialect variation dictionaries



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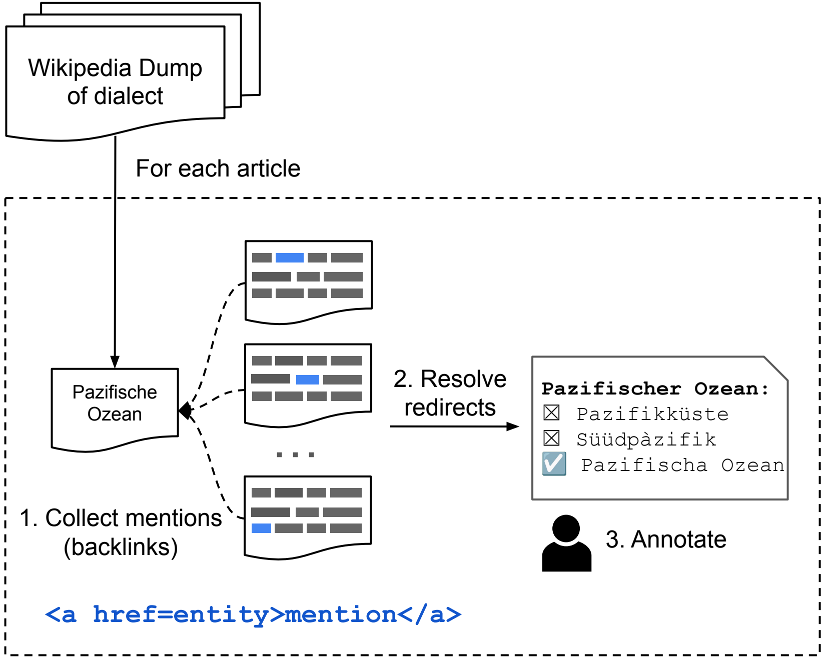


Wikipedia Dump of dialect

For each article

Pazifische Ozean

1. Collect mentions (backlinks)

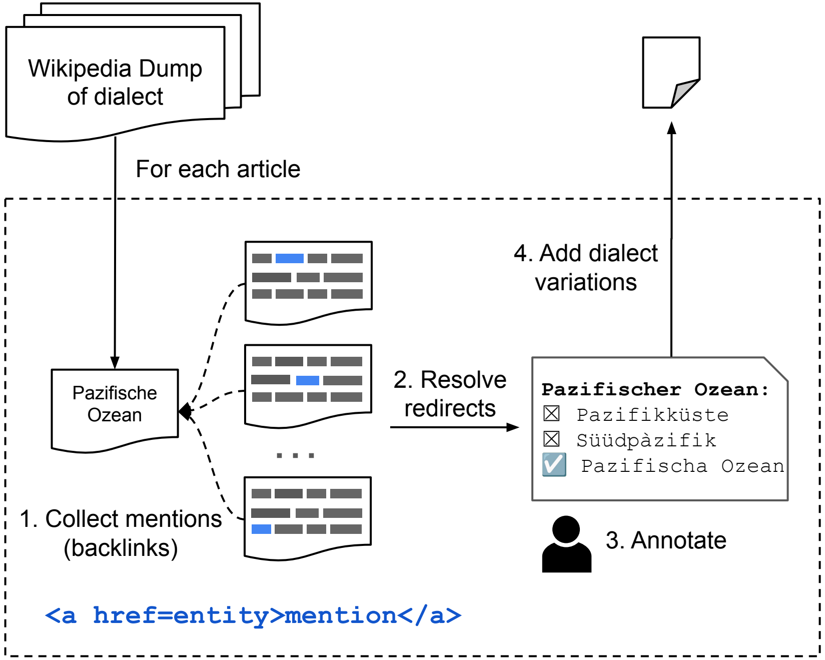
2. Resolve redirects

**Pazifischer Ozean:**
☒ Pazifikküste
☒ Süüdpàzifik
☑ Pazifischa Ozean

3. Annotate

`<a href=entity>mention</a>`

# Dialect variation dictionaries



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☒ Pazifikküste

☒ Süüdpàzifik

☑ Pazifischa Ozean

3. Annotate

4. Add dialect variations

```
<a href=entity>mention</a>
```

# Example Record (Bavarian dictionary)

```
{
  "de_id": "3215",
  "de_title": "München",
  "dial_id": "12259",
  "dial_title": "Minga",
  "variants": ["Münch'n", "Minkcha", "Minkn", "Minchn", "Mingna", "Minkhn", "Münchn"]
}
```

# Agenda

1. Motivation
2. WikiDIR dataset
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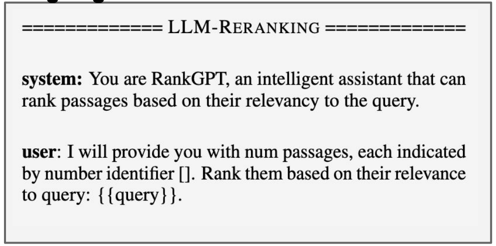
# Models

**Baseline:** BM25 (Robertson, 1995)

# Models

RankGPT (Llama 3.1)



============= LLM-RERANKING =============

**system:** You are RankGPT, an intelligent assistant that can rank passages based on their relevancy to the query.

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Llama icon created by Freepik - Flaticon

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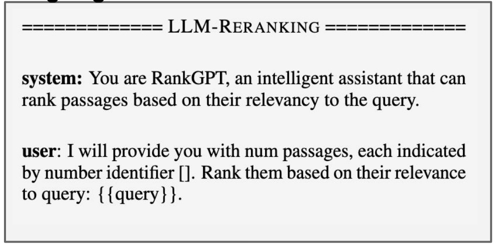
RankGPT (Llama 3.1)



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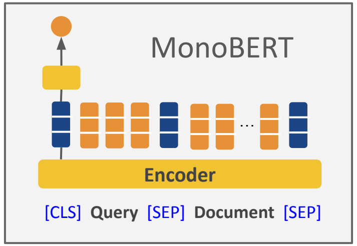

(Nogueira et al., 2019)

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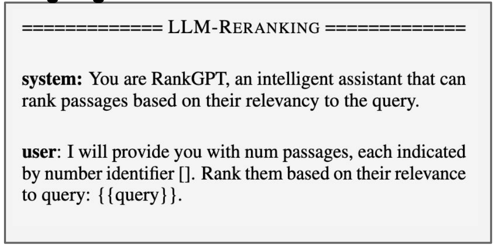
Model diagrams taken from (Litschko, 2024)

# Models

RankGPT (Llama 3.1)



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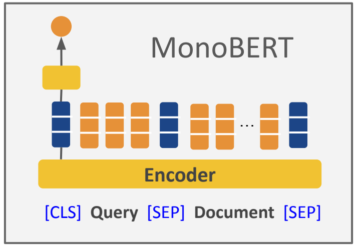
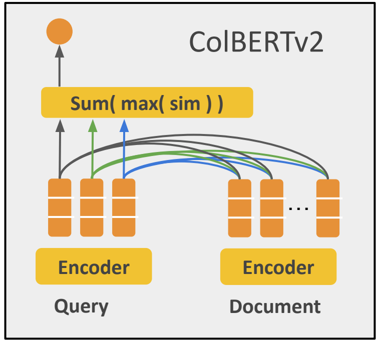


(Nogueira et al., 2019)



(Santhanam et al., 2022)

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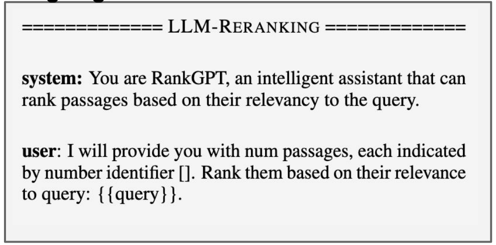
Model diagrams taken from (Litschko, 2024)

# Models

## Rerank top 100

RankGPT (Llama 3.1)



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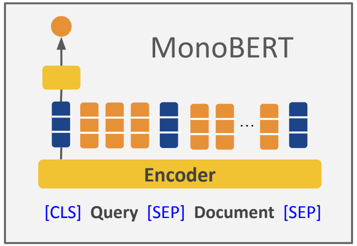

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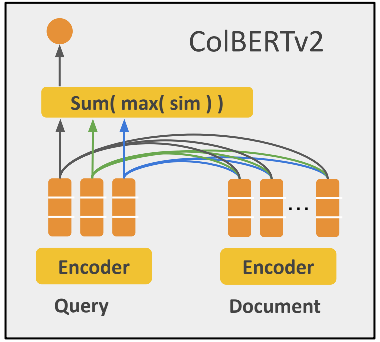

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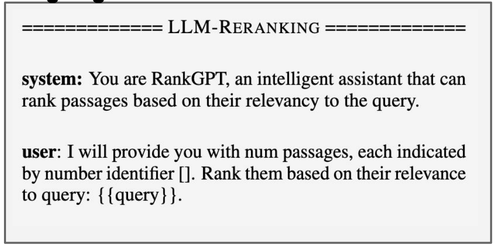

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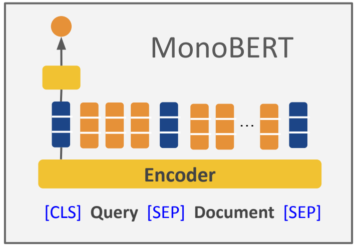
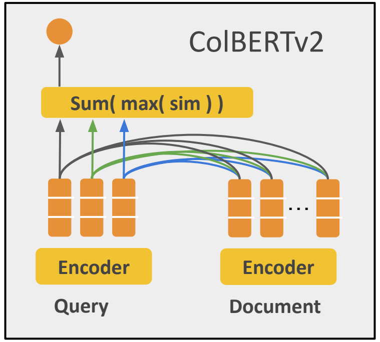


(Nogueira et al., 2019)

Retrieval



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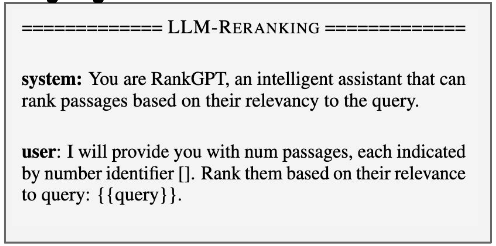

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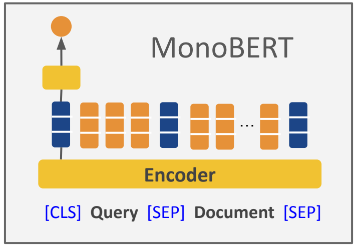

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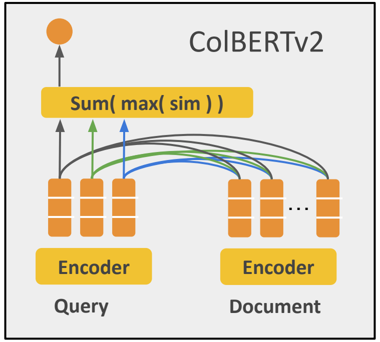
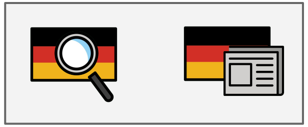
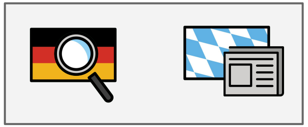


(Santhanam et al., 2022)

Zero-shot Transfer



Fine-tuning



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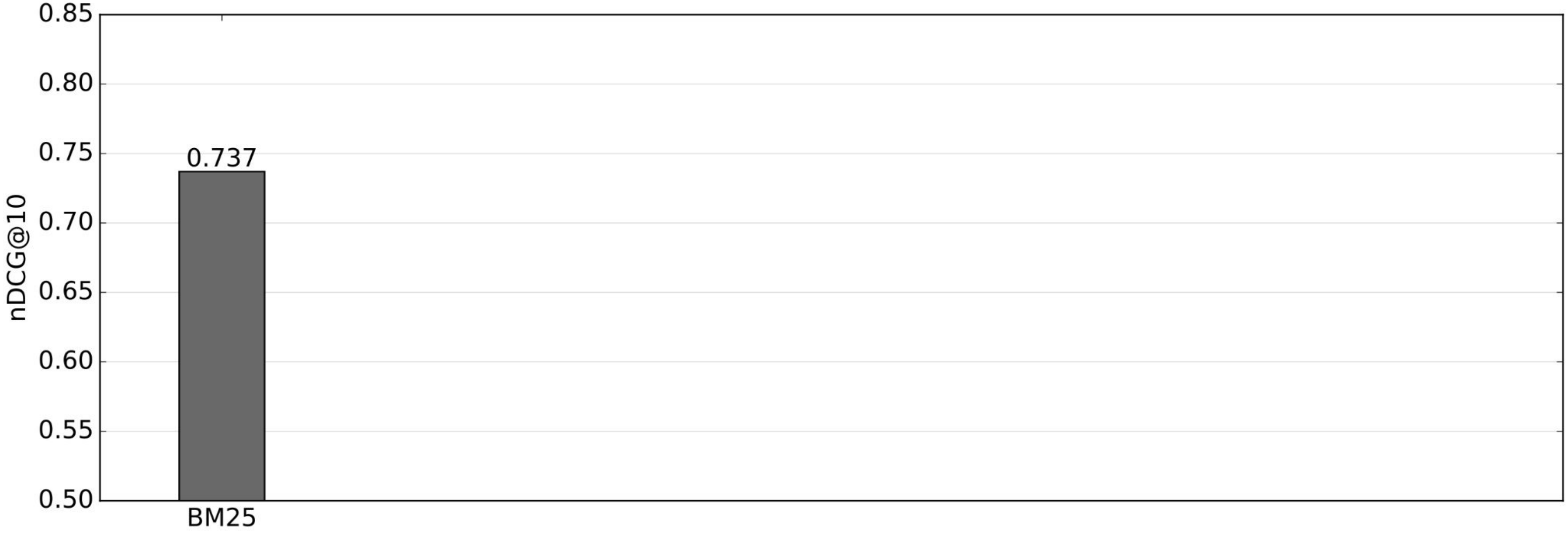
# Agenda

1. Motivation
2. WikiDIR dataset
3. Dialect dictionaries
4. Models
5. **Results**

Test

# Main results



*average over 7 dialects

Test

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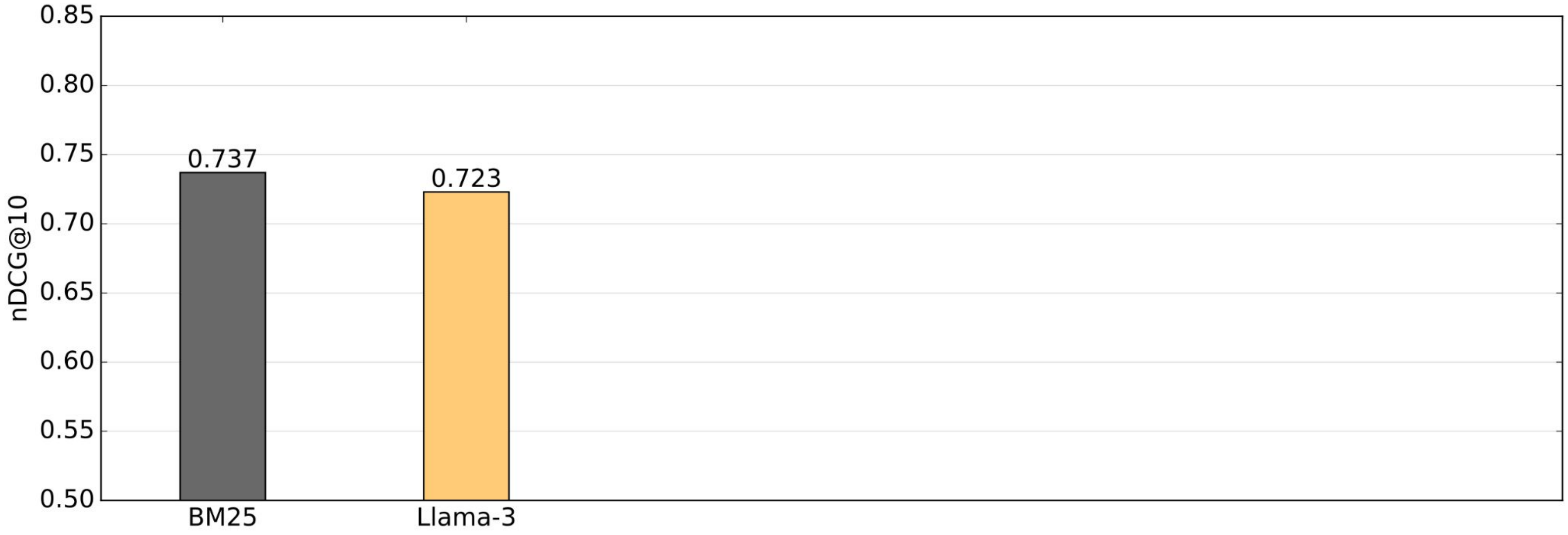

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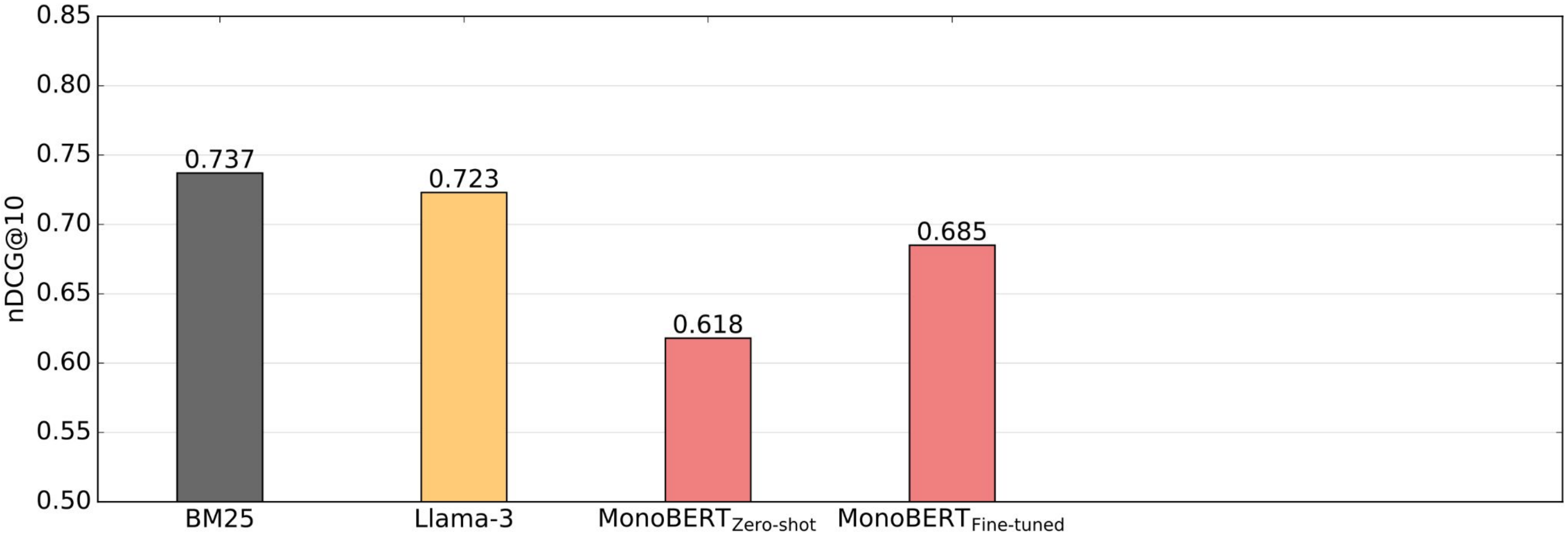

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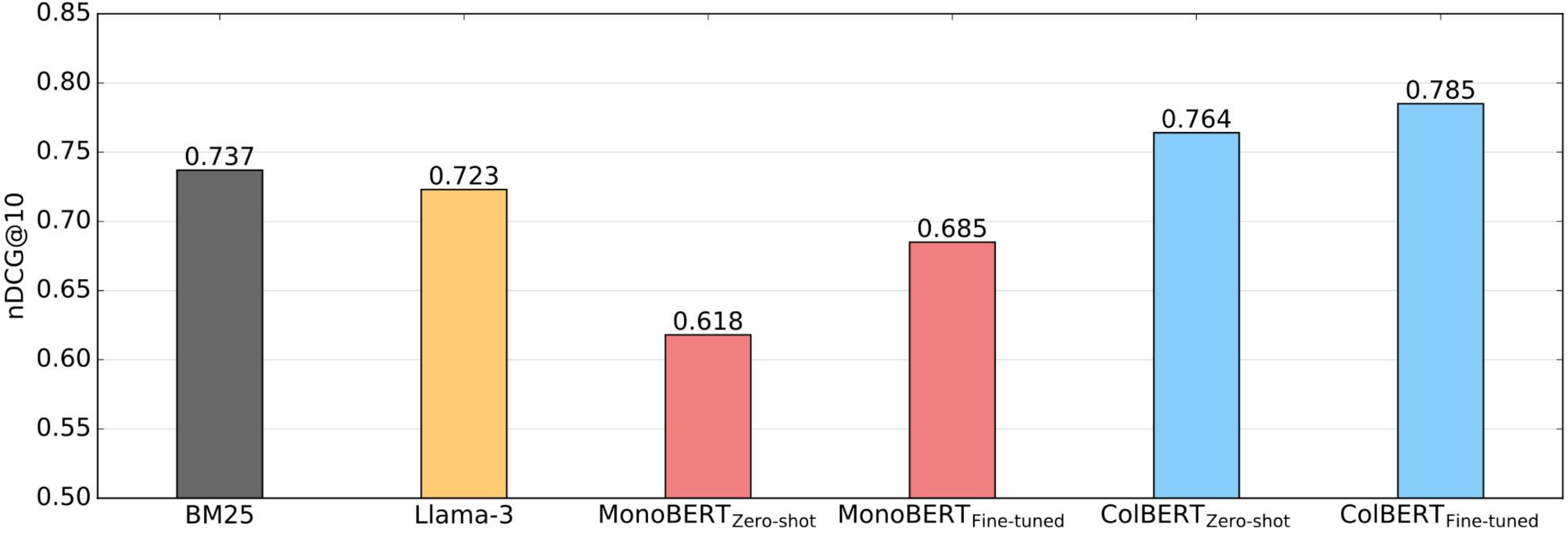

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Test

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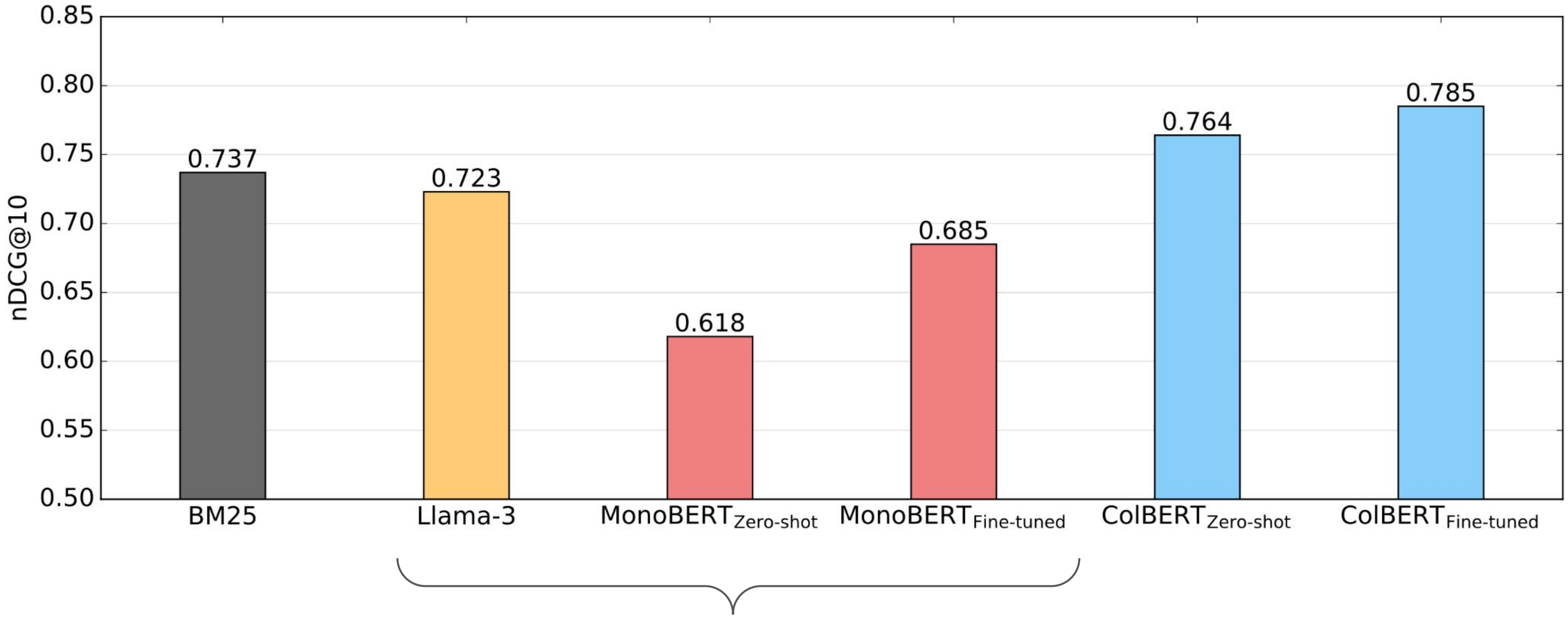
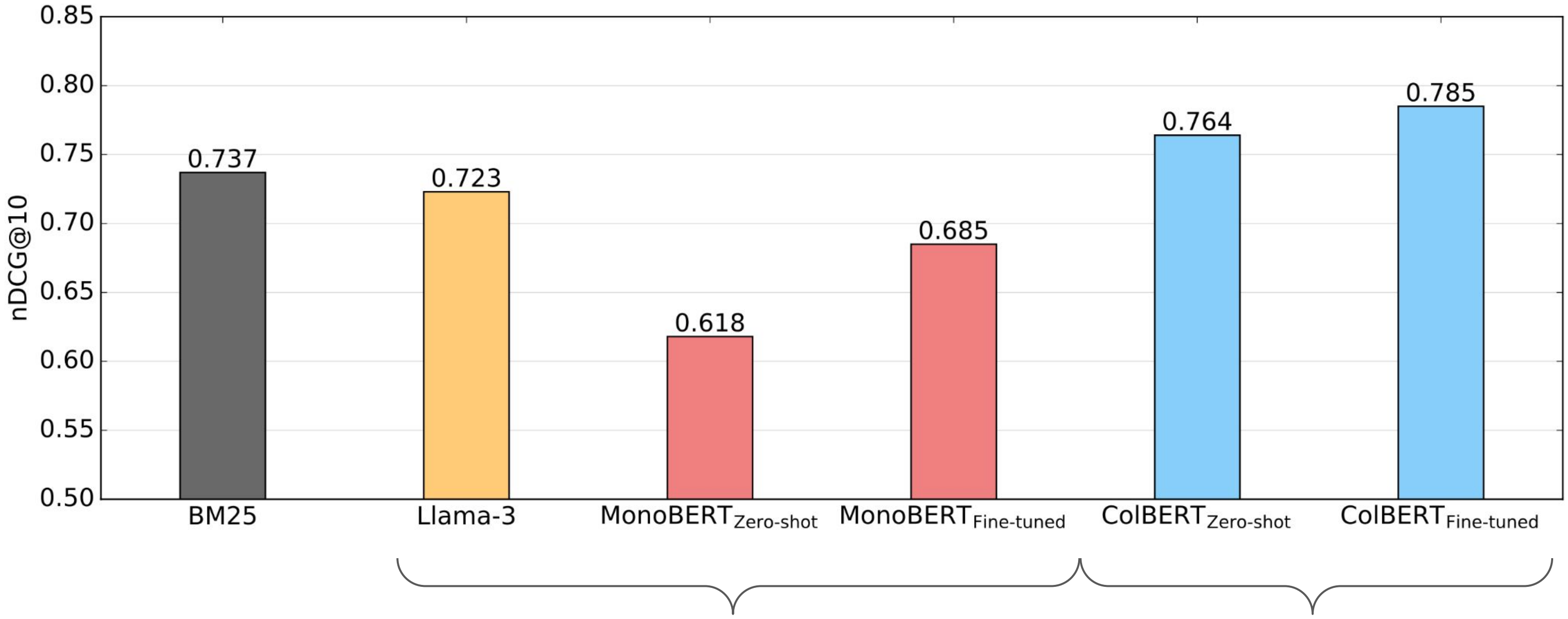


Reranking

*average over 7 dialects

Test

# Main results



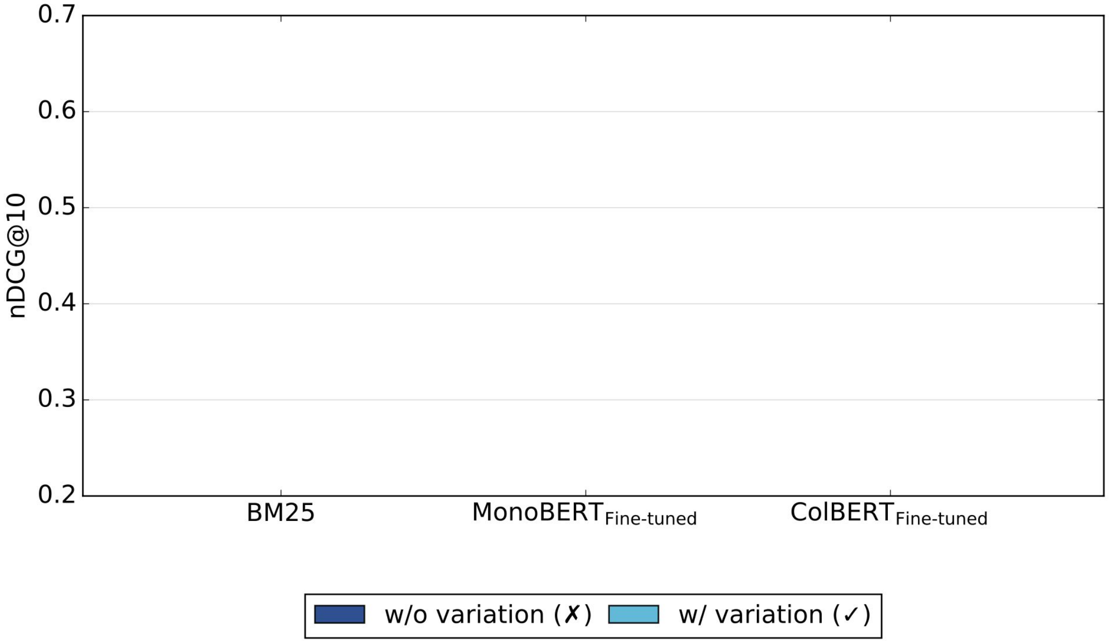
Reranking

Retrieval

*average over 7 dialects

An.

# Dialect variation results



*average over 5 dialects

An.

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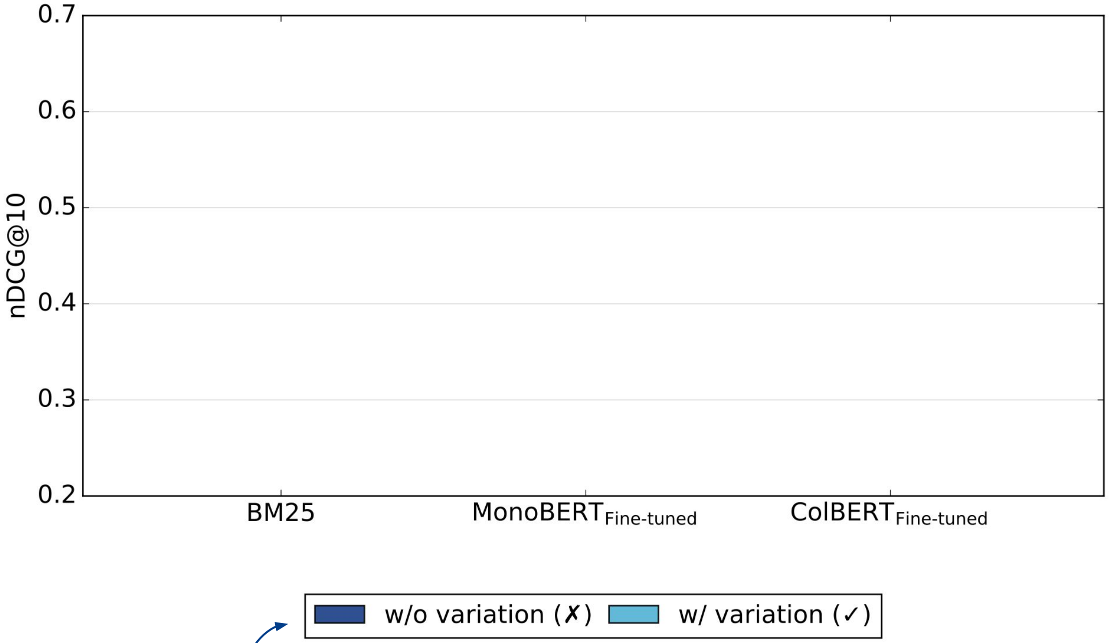

Exclude documents containing variations

*average over 5 dialects

An.

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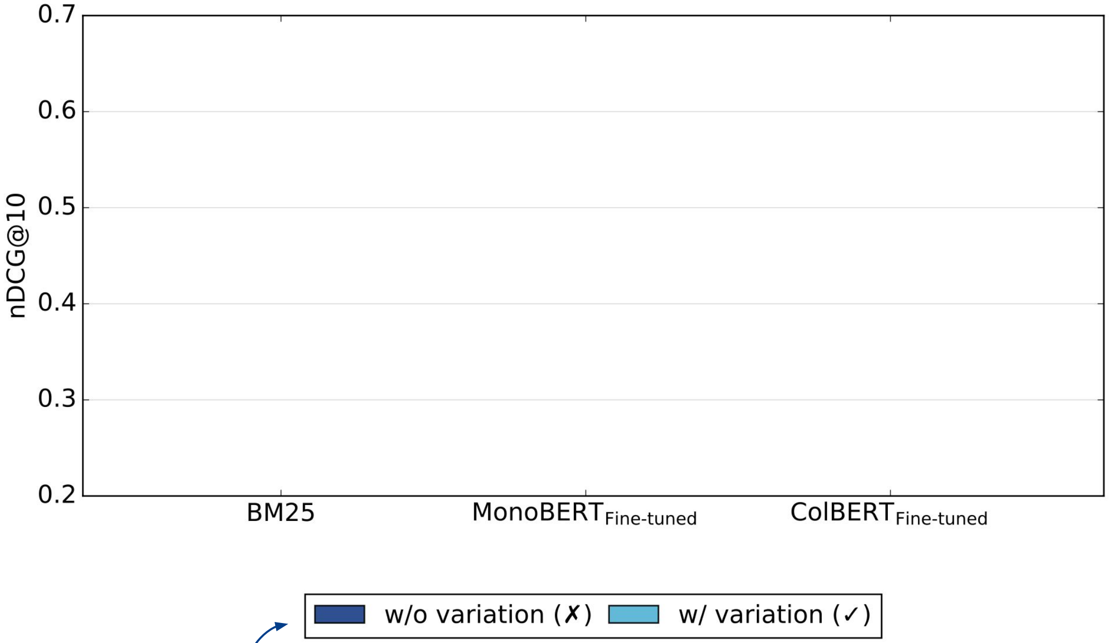

Exclude documents containing variations

full analysis split

*average over 5 dialects

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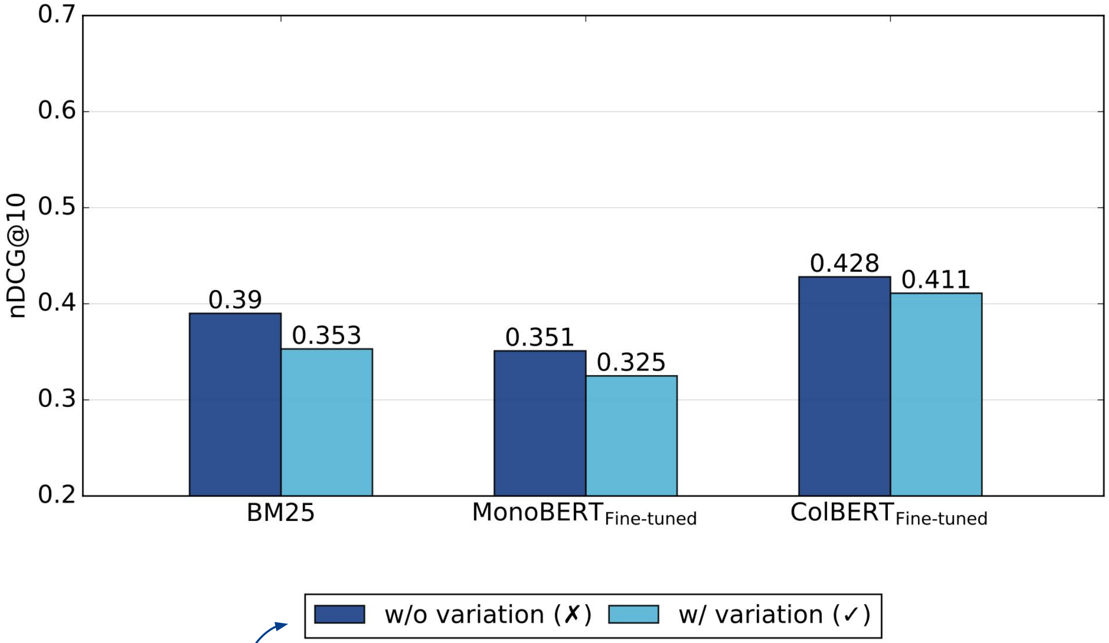

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Exclude documents containing variations

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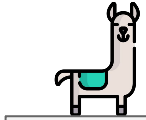
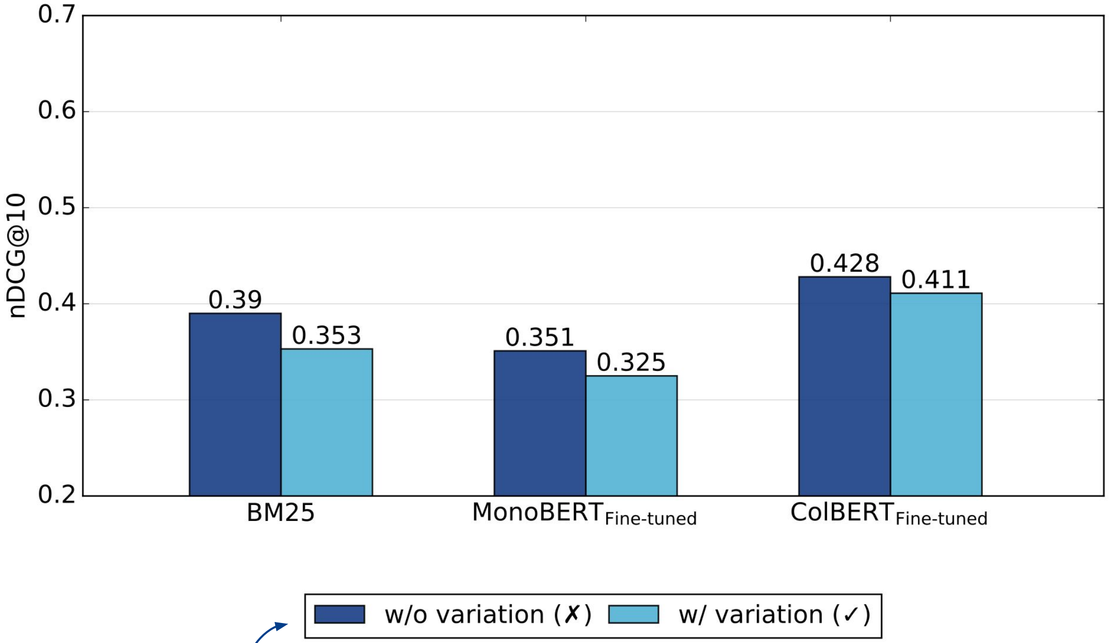
# Document translation results

Can we use LLMs to close the dialect gap?



Document transl.
Dialect → DE



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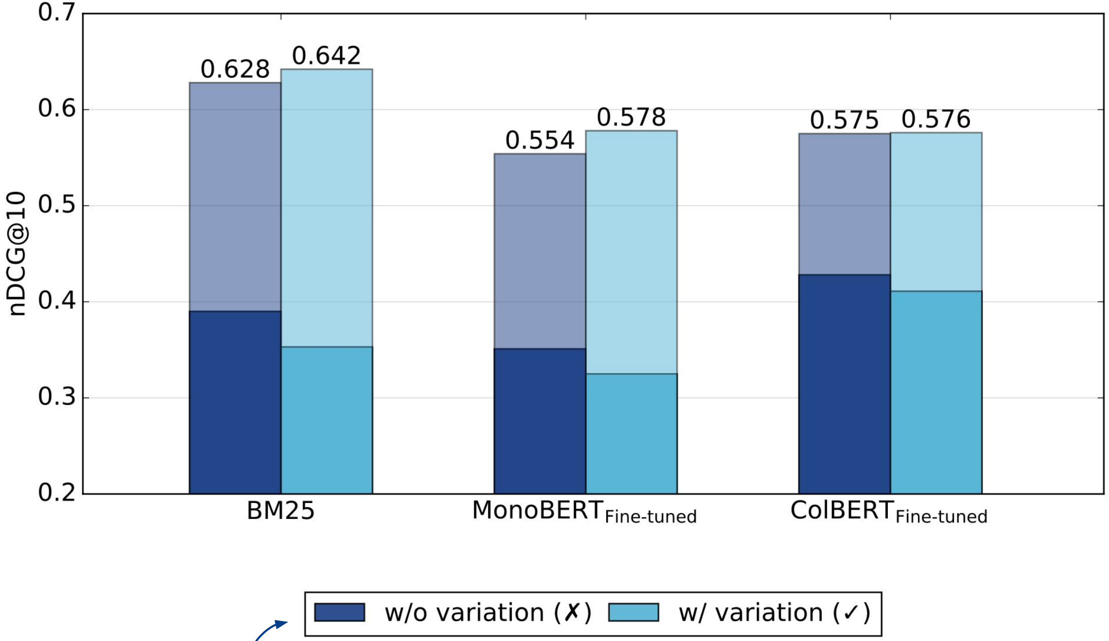


*average over 5 dialects

Exclude documents containing variations

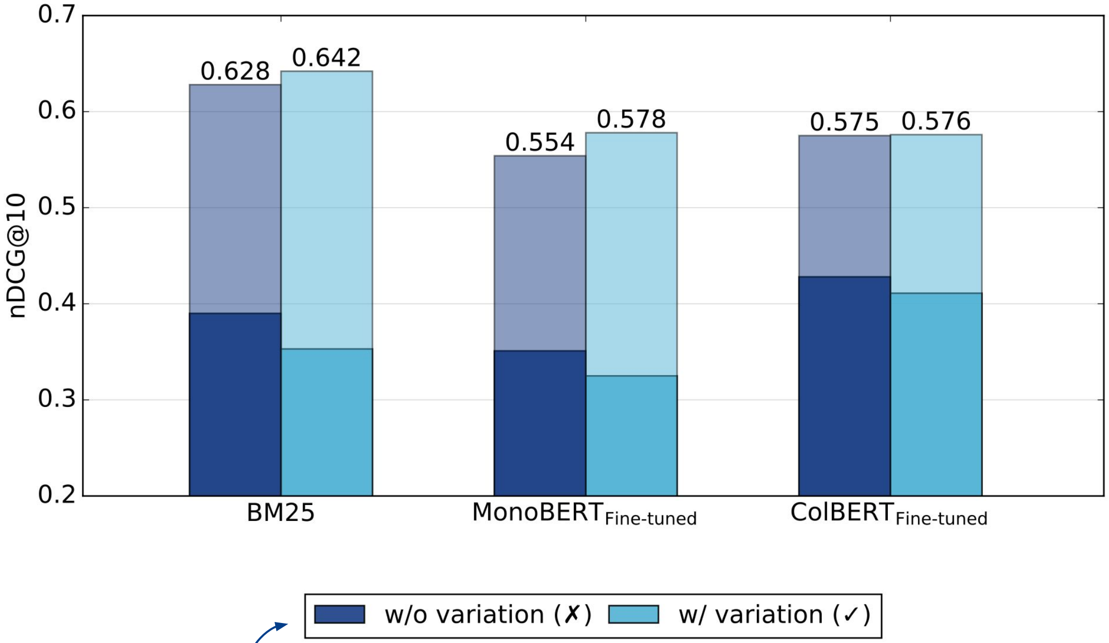
full analysis split

An.

# Document translation results

Can we use LLMs to close the dialect gap?

Document transl.
Dialect → DE



Exclude documents containing variations

full analysis split

There are still large gaps!

*average over 5 dialects

# Conclusion

- We introduce WikiDIR, a cross-dialect information retrieval dataset.
- We release dialect variation dictionaries for German dialects.
- More results and analyses in the paper.

GitHub

# Conclusion

- We introduce WikiDIR, a cross-dialect information retrieval dataset.
- We release dialect variation dictionaries for German dialects.
- More results and analyses in the paper.

CDIR is novel and challenging task!

→ Low-resource

→ High-Variance

The gaps are still large.

GitHub