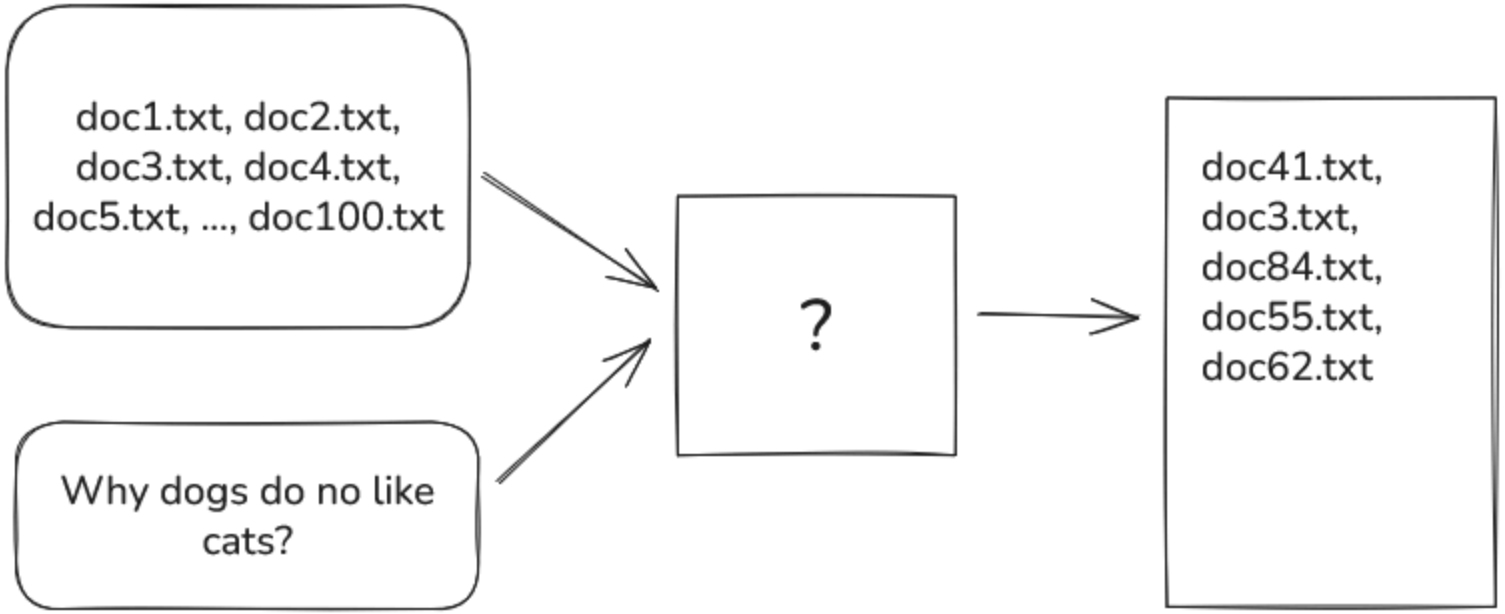
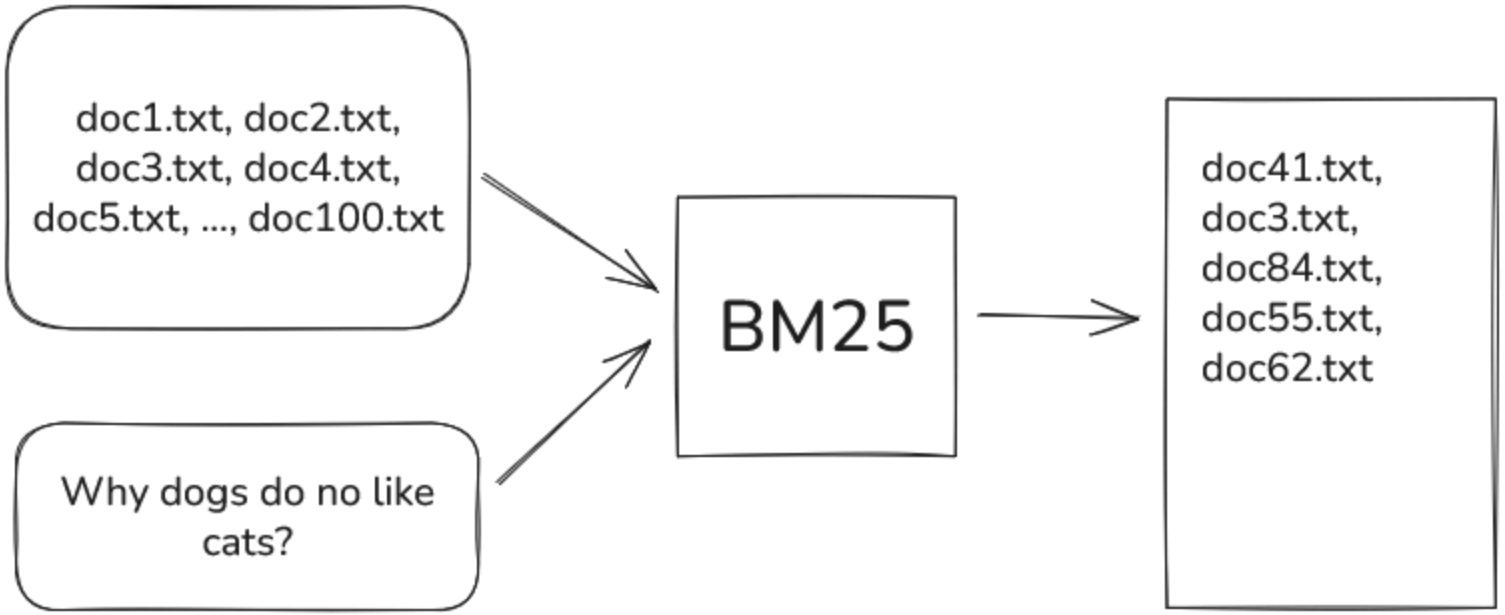
Some entry title here with logo

What problem we are trying to solve ?



Our solution to the problem



What is BM25 ?

From wikipedia:

> BM25 is a bag-of-words retrieval function that ranks a set of documents based on the query terms appearing in each document, regardless of their proximity within the document.

How to use ?

Step1 : Build index

```
$ java -jar target/bm25.jar build \
    -I=index.txt src/main/resources/documents
```

Step2 : Search using it

```
$ java -jar target/bm25.jar search \
    index.txt Which animal is the human best friend?
```

How it works ? (build 1)

1. Read the content of files

```
"a cat is a feline and likes to eat bird",            // file1.txt
"a dog is the human's best friend and likes to play", // file2.txt
"a bird is a beautiful animal that can fly",          // file3.txt
```

How it works ? (build 2)

2. split them
3. avoid meaningless words (is/a/to/etc)
4. stem them (connections, connected, connecting -> connect)

```
[
    ["cat", "felin", "like", "eat", "bird"],            // file1.txt
    ["dog", "human", "best", "friend", "like", "plai"], // file2.txt
    ["bird", "beauti", anim", "can", "fly"]             // file3.txt
]
```

How it works ? (build 3)

5. build vocabulary

```
corpus = [
    ["cat", "felin", "like", "eat", "bird"],
    ["dog", "human", "best", "friend", "like", "plai"],
    ["bird", "beauti", anim", "can", "fly"]
]

vocabulary = [
    "like", "best", "plai", "can", "fly", "beauti",
    "cat", "bird", "friend", "eat", "anim", "dog", "human", "felin"
]
```

How it works ? (build 4)

6. For every token in every document compute BM25 scores

$$log(\frac{N - df_t + 0.5}{df_t + 0.5} + 1) \cdot \frac{tf_{td}}{k_1 \cdot (1 - b + b \cdot (\frac{L_d}{L_{avg}})) + tf_{td}}$$

How it works ? (build 5)

6. Build document-term matrix with resulting BM25 scores

docIdx	like	best	plai	can	fly	beauti	cat	bird
0	0.22	0.00	0.00	0.00	0.00	0.00	0.46	0.22
1	0.20	0.42	0.42	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.46	0.46	0.46	0.00	0.22

docIdx	friend	eat	anim	dog	human	felin
0	0.00	0.46	0.00	0.00	0.00	0.46
1	0.42	0.00	0.00	0.42	0.42	0.00
2	0.00	0.00	0.46	0.00	0.00	0.00

How it works ? (search 1)

1. Tokenize query

```
// From :
"Which animal is the human best friend?"

// To
[ "anim", "human", "best", "friend" ]
```

How it works ? (search 2)

2. Iterater over document-term matrix and accumulate corresponding tokens.

docIdx	best	friend	anim	human	Result
0	0.00	0.00	0.00	0.00	0.00
1	0.42	0.42	0.00	0.42	1.26
2	0.00	0.00	0.46	0.00	0.46

Is there room for improvements ?

[profiler image with problem places]

- token ids + sparse matrix with compressed sparse column (CSC) storage
- unit testing

Thank you for your attention !