

# A search engine for classical Chinese poems

Xiwei Wu & Ning Yang & Hui Ma

**Abstract:** This is a group-based project for Web Search & Mining. In this project, we implemented a poetry crawler that crawled more than 10,000 poems from 中华诗词网 from pre-Qin to modern times, then implemented a search engine that can support a variety of different search requirements, and finally provided a web front-end that can be easily used.

**Keywords:** Scrapy, Chinese poems, search engine

## 1 Project Requirements

In this project, we are required to crawl classical Chinese poems online and building a simple search engine. Detailed requirements are as follows:

### 1. Data Crawling and Preprocessing.

You need to crawl classical Chinese poems from websites. After that, you have to do some necessary data preprocessing steps to transform the raw data into structure records, with each having the following attributes: title, author, dynasty, content, and optionally other information if available: translation, annotation, appreciation, background, etc.

### 2. Search Engine.

Based in the poems, you need to implement a simple search engine supporting the following functionalities.

a) **Boolean Search:** Users provide search keys and operations between keys. The system needs to return all the relevant poems (Either title or content meets the requirement of the query). The query language must include operations such as AND, OR, NOT.

b) **Zone-specific Search:** Allow users to specify the attribute to filter/search.

For enumerable attributes like author and dynasty, the results should only contain those exactly match the query.

For other attributes like title and content, a Boolean or ranked search can be performed. You can use either designs of UI or query (e.g. author(李白), title(酒)) to support such specification.

- c) **Pinyin-based Tolerant(Fuzzy) Search:** Just like SOUNDEX introduced in class, we can use pinyin for Chinese phonetic tolerant search. This can be especially useful when the user enters a wrong word with the same sound, or the poem itself contains 通假字. Therefore, your search engine should support a special query language SOUND(x) which can retrieve poems with any word having the same pinyin as x. For example, we should be able to get "最爱湖东行不足，绿杨阴里白沙堤。" with SOUND(荫).
- d) **Ranked Search:** Return the search results with certain order that may be favorable by the users. The factors to consider may include: semantic relevance, fame of the author and the poem itself, etc. You can use any ranking method and any available information only to achieve this. We will prepare several test cases and score the system according to our search experience.

### 3. Nice Web Interface for demo and Project Report.

**Outline.** In Section 2, we will introduce our crawler based on Scrapy and SQL. In Section 3, we will introduce our design for search engine. In Section 4, we will introduce our design for web front-end. In Section 5, we will give some of our thoughts on the project implementation process.

The projected is finished as follows: Xiwei Wu finished the Data Crawling part, Ning Yang finished the Search engine part, Hui Ma finished the Web Interface part, and we worked together, coordinated these part and completed this project document.

## 2 Data Crawling

We use Scrapy for crawling data and SQL for storing data. Here we use 中华诗词网 as our poem source. Our crawler starts with the pages belonging to different dynasties. By analyzing the web code we get the relevant information.

---

```

1  def start_requests(self):
2      dynastys = {
3          "先秦": "https://www.shi-ci.com/dynasty/72057594037927936",
4          "汉代": "https://www.shi-ci.com/dynasty/144115188075855872",
5          "三国两晋": "https://www.shi-ci.com/dynasty/216172782113783808",
6          "南北朝": "https://www.shi-ci.com/dynasty/288230376151711744",
7          "隋代": "https://www.shi-ci.com/dynasty/360287970189639680",
8          "唐代": "https://www.shi-ci.com/dynasty/432345564227567616",
9          "宋代": "https://www.shi-ci.com/dynasty/504403158265495552",
10         "元代": "https://www.shi-ci.com/dynasty/576460752303423488",
11         "明代": "https://www.shi-ci.com/dynasty/648518346341351424",
12         "清代": "https://www.shi-ci.com/dynasty/720575940379279360",
13         "近现代": "https://www.shi-ci.com/dynasty/792633534417207296",
14     }
15     for k,url in dynastys.items():
16         yield Request(url,meta={"item":k},callback=self.parse_dynasty)

```

---

For each poem, we collect dynasty, poet name, poem name, contents, poet description and the associated page url.

---

```
1 class PoemItem(scrapy.Item):  
2     dynasty = scrapy.Field()  
3     poet_name = scrapy.Field()  
4     poet_url = scrapy.Field()  
5     poem_name = scrapy.Field()  
6     poem_url = scrapy.Field()  
7     contents = scrapy.Field()  
8     poet_desc = scrapy.Field()  
9     crawl_url = scrapy.Field()
```

---

Based on these data, we created the table via mysql, and the relevant steps can be referred to the poem/README.md file. Finally, we output the data in SQL format for later use. You can see our dataset as poem/data/poem.sql.

Due to the problem of website data, we need to process the poems obtained by the crawlers, such as the unification of Chinese and English commas, the addition of missing content in the body, and the appearance of ellipses due to the excessive length of titles. Here we would like to mention the ellipsis in the title, we found that among the more than 50,000 ancient poems we collected, there are more than 1,200 poems with ellipsis in the title, most of them are Tang poems. And we found that the titles of these poems existed in most of the websites in the form of containing ellipses, so we also dealt with only some of the poems for which the full names could be found.

## 3 Search Engine

We use Python to build the entire search engine, and a series of data structures, such as DataFrame are used to build our entire search engine.

### 3.1 Overall Design

The entire search process is as follows: first, based on the SQL database, we built several dictionaries and stored the entire SQL database into a DATAframe `df_all`, along with the rank information we decided. After a series of processes, our engine initialization is complete and enter the query phase.

After asking user to get the query type and query content, we process the content according to the query type, and then make the corresponding query within `df_all`, return the results for output, and ask the user whether to continue the query. We will describe how to implement these steps in the following sections.

All the codes are in '`process.py`' and '`run.py`'. You can use Python run `run.py` to start this system.

## 3.2 Data Process

First, after reading into the database, we stored it in the DataFrame `df_all` for easy processing, and the attributes are as previously mentioned : dynasty, poet name, poem name, contents, poet description. Also, for subsequent zone-specific queries, we store two dictionaries of poem name and contents.

Then, for Boolean search, we construct a term dictionary. And consider the complexity of the grammar of Chinese ancient poetry, we decide to think a single word as a term. According to this idea, we construct the term dictionary `dict_word`. Based on the dictionary, we process and obtain a 0-1 vector for each ancient poem and construct the term-poem incidence matrix, and the matrix is `matrix_binary_all`. In each vector, 1 means the word appears in the poem corresponding to this position and 0 means not.

Finally, we appended two sets of ranking values to each ancient poem according to the ranking we thought about and added them to `df_all`. The entire data processing process is completed.

## 3.3 Boolean Search

The user input a string include search keys and operations, for each search key, we convert it to a 0-1 vector based on the dict we got before. For multiple single words inside the search key, we get all the corresponding vectors and then do `AND` on them. Then we check each result we get to make sure that the search key is actually present in the result, not scattered throughout the poem.

Then for each search key, we perform the corresponding `AND`, `OR`, `NOT` operation, and get the final result vector. And, unlike the documentation requirements, we have included dynasties and authors in the search

And finally, all search methods, including this one, will end up with a vector, and then the `vec_to_outlist` and `outlist_to_out` functions will be called to output the corresponding poems. This step is not repeated in the following search.

Here are three examples of searches.

```
输入查询类型, 0: binary; 1: zone; 2 : fuzzy; 3: ranked; 4: zone+ranked
0
请输入查询
白居易 AND 琵琶行
      Unnamed: 0   id  dynasty_name  poet_name  poem_name
12853          0  12853        唐代      白居易    琵琶行
                           2559        878
共搜到诗的数目:
1
```

图 1: Boolean Search example 1: search with AND. We search '白居易 AND 琵琶行', and return 1 result, which is correct.

## 3.4 Zone-specific Search

The dynasty, author, title and content are entered in order, or keep empty. For enumerable attributes like author and dynasty, the returned vector only contain those exactly match the query, where we use the query function of DataFrame,

输入查询类型, 0: binary; 1: zone; 2 : fuzzy; 3: ranked; 4: zone+ranked						
0 请输入查询						
床前明月光 OR 汉皇重色						
12104 Unnamed: 0 12104 12104 唐代 白居易 长恨歌 汉皇重色思倾国, \n御宇多年求不得。 \n杨家有女初长成, \n齐在深闺人未识。 \n天生丽质难自...						
2559 Unnamed: 0 1198						
22038 Unnamed: 0 22038 22038 唐代 李白 静夜思 床前明月光, \n疑是地上霜。 \n举头望明月, \n低头思故乡。						
共找到诗的数目:						
2						

图 2: Boolean Search example 2: search with OR. We search '床前明月光 OR 汉皇重色', and return 1 result, which is correct.

输入查询类型, 0: binary; 1: zone; 2 : fuzzy; 3: ranked; 4: zone+ranked						
0 请输入查询						
张若虚						
29325 Unnamed: 0 29325 29325 唐代 张若虚 春江花月夜 春江潮水连海平, \n海上明月共潮生。 \n滟滟随波千万里, \n何处春江无月明。 \n江流宛转绕芳...						
2 358						
29328 Unnamed: 0 29328 29328 唐代 张若虚 代答闺梦还 关塞年华早, \n楼台别望违。 \n试衫著暖气, \n开镜觅春晖。 \n燕入寂寥幕, \n蜂来上画衣。 ...						
2 94						
共找到诗的数目:						
2						

---

```
1 list = df_all.loc[df_all.dynasty_name == dynasty]
2 list = df_all.id[df_all.poet_name == author]
```

---

And we use Boolean search on title and content. At last, we do AND on the four returned vectors to get the final out, empty set as all-1 vector.

The example is shown in fig4 and fig5.

### 3.5 Pinyin-based Tolerant Search

To handle the fuzzy search based on pinyin, we created a table of Chinese characters to pinyin correspondence, which can be found in poem/data/pinyin.txt. For every word of the target to be searched, we will do single word substitution according to the pinyin, and do a Boolean search, then connect each different returned vector with OR.

Finally, we use AND to link all the single word vectors and output.

Such a search has several advantages and several disadvantages, the advantages of such search method is very powerful, as long as the pin-yin is right, it will definitely return the correct result, but there are corresponding cost. The number of results returned may be large, and the search time may be longer, there is no guarantee that the results the user wants will be at the top of the list. It may be possible to optimize further with a fuzzy search rank, but the search will take longer. Taking all things into account, we decided to keep this search the way it is now.

The example is shown in fig6.

### 3.6 Ranked Search

First, the search result is based on Boolean search, but here we no longer support logical operations. We have thought and discussed, and have come up with some ranking bases. One caveat is that poetry ordering is very subjective and varies from person, so we do not guarantee that our ordering will be the best in all cases. Here are some thoughts:

```

输入查询类型, 0: binary; 1: zone; 2 : fuzzy; 3: ranked; 4: zone+ranked
0
请输入查询
张若虚 AND NOT 春江花月夜
29328 Unnamed: 0 id dynasty_name poet_name poem_name contents desc weight_poet weight_poem
29328 29328 29328 唐代 张若虚 代答闺梦还 关塞年华早, \n楼台别望违。 \n试衫著暖气, \n开镜觅春晖。 \n燕入霓裳幕, \n峰来上画衣。 ...
2 94
共搜到诗的数目:
1

```

图 3: Boolean Search example 3: search with NOT. We search '张若虚', and return 2 result; if we search '张若虚 NOT 春江花月夜', and we will get 1 result, the specified item is excluded from the search results.

```

输入查询类型, 0: binary; 1: zone; 2 : fuzzy; 3: ranked; 4: zone+ranked
1
请输入朝代, 或者输入@保持空
唐代
请输入诗人名字, 或者输入@保持空
江城子
请输入诗歌标题, 或者输入@保持空
江城子
请输入诗词内容, 或者输入@保持空

Unnamed: 0 id dynasty_name poet_name poem_name contents desc weight_poet weight_poem
4266 4266 4266 唐代 韦庄 江城子 餐鬟狼籍黛眉长, \n倚兰房, \n别郎。 \n角声咽, \n星斗渐微茫。 \n露冷月残人未起, \...
337 51
Unnamed: 0 id dynasty_name poet_name poem_name contents desc weight_poet weight_poem
17765 17765 17765 唐代 千秋 江城子 鳞飞起都城东, \n碧江空, \n半滩风。 \n碧玉簪花中, \n垂垂卷水漫愁起, \...
12 118
Unnamed: 0 id dynasty_name poet_name poem_name contents desc weight_poet weight_poem
18822 18822 18822 唐代 欧阳炯 江城子 晚日金陵岸草平, \n落霞明, \n无情。 \n六代繁华, \n曲逐逝波声。 \n只有姑苏台上月, \...
23 58
Unnamed: 0 id dynasty_name poet_name poem_name contents desc weight_poet weight_poem
30749 30749 30749 唐代 张泌 江城子 犹衡外小中庭, \n雨初晴, \n晓莺声。 \n飞落花, \n时节已清明。 \n起来帘幕无一事, \...
29 177
Unnamed: 0 id dynasty_name poet_name poem_name contents desc weight_poet weight_poem
33080 33080 33080 唐代 尹鹗 江城子 裙拖碧, \n步飘香, \n腰束素长。 \n鬓云光, \n拂面挑蝶。 \n玉碎鬟, \n杜秦等弹...
12 61
Unnamed: 0 id dynasty_name poet_name poem_name contents desc weight_poet weight_poem
34272 34272 34272 唐代 和凝 江城子 斗转星移玉漏频, \n已三更, \n对梧桐。 \n历花间, \n有马蹄声。 \n含笑整衣并绣户, \...
23 57
共搜到诗的数目:
6

```

图 4: Zone-specific Search example 1: We search '江城子' as title and '唐代' as dynasty, and return 6 results, all meet the requirements.

Intuitively, for the same content, it appears at the beginning or at the end, we usually prefer the former;

For the same content, if it appears in the poet, the title, the dynasty and the content of the poem, we want the poet is the first appears in the results, the title second, and the dynasty and the content.

For the fame of the poet, since there is no necessarily correct measure method, we used a more intuitive measure: the more poems this poet had, the more likely he was famous. For those poets who are very famous but have few works now, this may not be the right standard, but for most poets, this is the right standard.

And, for users, they always prefer short content to lengthy content, so we will put shorter poems in front.

Based on these idea, we measured each poem the number of poems retained by the author and the length of the poem, and add them to `df_all`. This process is very time-consuming(about 2-3 minutes), so we store the `df_all` as a csv so that we don't have to wait too long after one initialization.

Before the final output, we use `query_seq` to do these rank, first we sort the poems according to content's length, then we sort the poems in reverse order according to the the number of poems retained by the author, at last we sort the poems according to location where the query appears.

The more the author's work and the shorter the poem, the earlier the query is matched, the more this result will be in front.

输入查询类型, 0: binary; 1: zone; 2 : fuzzy; 3: ranked; 4: zone+ranked									
请输入朝代, 或者输入0保持空									
请输入诗人名字, 或者输入0保持空									
请输入诗歌标题, 或者输入0保持空									
江城子									
请输入诗句内容, 或者输入0保持空									
100	100	100	宋代	苏轼	江城子	长恨入梦夜何其, \n月波迟。\\露华滋, \\珠被星垂, \\生此宁馨儿。\\天上麒麟人不识, \\... NULL	contents	desc	weight_poet weight_poem
3		116							
533	533	533	宋代	刘辰翁	江城子	华堂深处出娉婷。\\语声轻。\\美声清。\\秀语莺啼, \\一付春情。\\皓月洛阳花发, \\... NULL	contents	desc	weight_poet weight_poem
17		116							
40047	40047	40047	宋代	黄庭坚	江城子	秋风袅袅夕阳红。\\晚烟浓。\\暮云重。\\叠青山, \\山外可孤鸿。\\楼上高楼三百尺, \\... NULL	contents	desc	weight_poet weight_poem
3		116							
40178	40178	40178	宋代	苏轼	江城子	雪消霜入小溪舟。\\试浮游。\\上山头。\\薄寒烟, \\依旧未全收。\\向道梅花开也未, \\... NULL	contents	desc	weight_poet weight_poem
54		116							
40208	40208	40208	宋代	韩元吉	江城子	金门楼阁认蓬莱。\\晓烟开, \\上崔嵬。\\风引凯歌, \\道却招回。\\更莫真箇天眷育秧, \\... NULL	contents	desc	weight_poet weight_poem
34		116							
40321	40321	40321	宋代	晁了翁	江城子	如公何地不阳春。\\往来频。\\醉倾银, \\闻道河阳, \\重推正欢迎。\\移向德威堂上著, \\... NULL	contents	desc	weight_poet weight_poem
43		116							
40380	40380	40380	宋代	高观国	江城子	绿丛篱菊点娇黄。\\过重阳。\\转愁伤。\\风急天高, \\归雁不能行, \\去却去却边知近远, \\... NULL	contents	desc	weight_poet weight_poem
58		116							
40411	40411	40411	宋代	魏夫人	江城子	别郎容易见郎难。\\几何般。\\临窗, \\憔悴容仪, \\睡觉衣裳, \\门外红梅约瘦也, \\... NULL	contents	desc	weight_poet weight_poem
40		116							

图 5: Zone-specific Search example 2: We search '江城子' as title and '宋代' as dynasty, and we can see that there are 103 results, and all meet the requirements.

输入查询类型, 0: binary; 1: zone; 2 : fuzzy; 3: ranked; 4: zone+ranked									
请输入模糊搜索									
绿杨阴里白沙低									
12112	12112	12112	唐代	白居易	绿杨阴里白沙低	水面初平云脚低, \\几处早莺争暖树, \\谁家新燕啄春泥。\\乱花渐欲迷人眼, \\浅草才能没马蹄。	contents	desc	weight_poet weight_poem
2559		78							
14172	14172	14172	唐代	白居易	隋堤柳	隋堤柳, \\出门苦栖栖。\\星云志气高, \\宫阙颜色低。\\生同门友, \\世籍在金闕。	contents	desc	weight_poet weight_poem
2559		203							
12034	12034	12034	唐代	白居易	隋堤柳	隋堤柳, \\岁久年深尽衰朽。\\风飘飘兮雨萧萧, \\三株汴河口。\\老枝病叶愁杀人, \\... NaN	contents	desc	weight_poet weight_poem
2559		217							
13225	13225	13225	唐代	白居易	白居易	白居易, \\思王泽之广被也, \\昆明春, \\昆明春, \\春池岸古春流新, \\浸南山青漫漾, \\波沉西日红霞沉。\\往年因旱,	contents	desc	weight_poet weight_poem
	2559	292							
13465	13465	13465	唐代	白居易	开龙门八节石滩诗二首并序	东都龙门潭之南有八节滩、九漱石, \\船筏过此, \\例反破伤, \\舟人惮怖推挽束缚, \\大寒	contents	desc	weight_poet weight_poem

图 6: Fuzzy Search example: We search '绿杨阴里白沙低', with correct '堤' is changed to the homophonic '低', and we can see that expected correct result is returned.

For the other queries, since the query is composite, we only sorted the poem length and the number of poems, and the function is `query_seq_noquery`.

By the way, because of the presence of a large number of anonymous poets(“无名氏”), in order to ensure that they do not unduly affect the ranking of normal poets we manually weighted their number of poems to 1.

The example is shown in 7, we use same key to get different result return order.

## 4 Web Interface

We use the Flask framework to build the web front end. We use the Flask framework to build the web front end. The user first goes to `index.html`, then enters query and selects the search method. If the user want to use zone search, go to `zone_search.html`, enter query and select the zone to search, as shown in Figure 8. The user's query and selected search method are passed to `results.html` through a post request, the search is executed and the output is printed. For binary search, fuzzy search and ranked search, `results.html` unpacks the form sent by the user through the request, and selects the corresponding search model to process the query according to the search method. Examples are shown in Figure 9.

Similarly, for zone search, `results.html` unpacks the form sent by the user through the request,

输入查询类型: 0 : binary; 1 : zone; 2 : fuzzy; 3: ranked; 4: zonerranked								
请输入查询								
李白								
Unamed: 0 id dynasty_name poet_name poem_name								
1232	1232	1232	唐代	项斯	经李白墓 夜郎归未老, \n醉死此江边。 \n弃掷吾家礼, \n印诗快乐有真。 \n诗领应酬局, \n小喝唱当班。 \n...	contents desc weight poet weight poem		
95	62							
Unamed: 0 id dynasty_name poet_name poem_name								
2163	2163	2163	唐代	齐己	还人卷 李白贺进机杼, \n般在人间不知处。 \n闻君有在芙蓉江。 \n日斗歌人织秋浦。 \n念亿礼文离...	contents desc weight poet weight poem		
740	138							
Unamed: 0 id dynasty_name poet_name poem_name								
2251	2251	2251	唐代	齐己	读李白集 峰云诗, \n削巨鳌, \n搜括造化空牢车。 \n真心入海毒神桥, \n藏龙不敢为珠王。 \n人同物...	contents desc weight poet weight poem		
740	100							
Unamed: 0 id dynasty_name poet_name poem_name								
4177	4177	4177	唐代	韦庄	过当涂县 客过当涂县, \n停车访古游。 \n游山有至意, \n许白首大渡。 \n石花发, \n乌江水自流。 \n...	contents desc weight poet weight poem		
337	62							
Unamed: 0 id dynasty_name poet_name poem_name								
4241	4241	4241	唐代	韦庄	萍亭驿小樱桃 当年此树正开花, \n马仙卿酒泉。 \n季白已亡那死, \n两人堪伴玉屏。 \n...	contents desc weight poet weight poem	337	
38								
Unamed: 0 id dynasty_name poet_name poem_name								
4245	4245	4245	唐代	韦庄	焦崖阁 李白曾歌蜀道难, \n长阁白日上青天。 \n今翻覆过焦崖阁, \n信是河在目前。 \n...	contents desc weight poet weight poem		
38								
Unamed: 0 id dynasty_name poet_name poem_name								
4665	4665	4665	唐代	韩愈	醉留东野 韦白因读李杜甫诗, \n恨二人不相从。 \n吾与东野升丹陛, \n如何复嫌二子绿。 \n东野不得...	contents desc weight poet weight poem		
322	146							
Unamed: 0 id dynasty_name poet_name poem_name								
6028	6028	6028	唐代	陆龟蒙	怀魏陵旧游 段阳佳地昔年游, \n幽胜青山李白楼。 \n唯白日深溪上思, \n酒旗风影落春深。 \n...	contents desc weight poet weight poem		
6028								

(a) 1

输入查询类型: 0 : binary; 1 : zone; 2 : fuzzy; 3: ranked; 4: zonerranked								
请输入搜索, 我们会对结果进行排序								
李白								
Unamed: 0 id dynasty_name poet_name poem_name								
21933	21933	21933	唐代	李白	别苏侍僧 东林达客处, \n月白身如雪。 \n孤舟泛江表, \n云深路未歇。 \n...	contents desc weight poet weight poem	855	30
Unamed: 0 id dynasty_name poet_name poem_name								
21935	21935	21937	唐代	李白	初出金门, 将帝勿承遇, 吹笙上碧霄。 \n落羽辞金殿, \n能言终见弃, \n还向陇西飞, ...	contents desc weight poet weight poem		
30								
Unamed: 0 id dynasty_name poet_name poem_name								
21966	21968	21968	唐代	李白	集松寄岑山 众鸟高飞尽, \n孤云独去闲。 \n相看两不厌, \n只有敬亭山。 \n...	contents desc weight poet weight poem	855	30
Unamed: 0 id dynasty_name poet_name poem_name								
21973	21973	21975	唐代	李白	玉阶怨 玉阶生白露, \n夜久侵罗袜。 \n却下水晶帘, \n玲珑望秋月。 \n...	contents desc weight poet weight poem	855	30
Unamed: 0 id dynasty_name poet_name poem_name								
21978	21978	21980	唐代	李白	其十四 火照天河水, \n水寒月明流。 \n渐行波浪中, \n渐照冰川流。 \n...	contents desc weight poet weight poem	855	30
Unamed: 0 id dynasty_name poet_name poem_name								
21981	21981	21983	唐代	李白	秋浦歌 其十六 秋浦田舍翁, \n岁暮耕未休。 \n桑柘废本宿, \n田家此乐秋。 \n...	contents desc weight poet weight poem	855	30
Unamed: 0 id dynasty_name poet_name poem_name								
21982	21982	21984	唐代	李白	秋浦歌 其十五 白发三千丈, \n缘愁似个长。 \n不知明镜里, \n何处得秋霜。 \n...	contents desc weight poet weight poem	855	30
Unamed: 0 id dynasty_name poet_name poem_name								
21983	21983	21985	唐代	李白	秋浦歌 其十三 深水净素月, \n月明飞壁霜。 \n赧郎明月歌, \n苦心捣药歌。 \n...	contents desc weight poet weight poem	855	30
Unamed: 0 id dynasty_name poet_name poem_name								
21985	21985	21987	唐代	李白	秋浦歌 其十二 水如一匹练, \n皎洁如素月。 \n人生若只如初见, \n何事悲秋声。 \n...	contents desc weight poet weight poem	855	30
Unamed: 0 id dynasty_name poet_name poem_name								
21986	21986	21988	唐代	李白	秋浦歌 其十七 挑波一步地, \n了却生声。 \n醉与与孤月, \n挑头明月云。 \n...	contents desc weight poet weight poem	855	30
Unamed: 0 id dynasty_name poet_name poem_name								

(b) 2

图 7: Rank Search example: we search '李白' in Boolean Search and in Rank Search, and we can find that, in Boolean Search, The first result is not a poem written by 李白, while for Rank Search, we can get it in the first result.

selects the zone search search model according to the search method, and processes the query by dynasty, poet, poem name and content according to the corresponding zone, as shown in Figure 10. Show.

## 5 Thoughts

During the implementation of this project, we tried many different websites, but due to the continuous development of crawlers and anti-crawlers, many websites have adopted the sweep copy or login to block crawlers. For general considerations, we have chosen this site to crawl. And Scrapy's sophisticated crawler template saves us a lot of time, we only need to do simple processing through the web code to get the data we need.

While doing pre-processing of the poem names and body, we found some poems with names containing Chinese characters not supported by utf8, so we decisively discarded them. Therefore, we can see that many poems contain vacant parts like \* or "□", but of course, this is also partly due to the missing words in the process of circulation. Also, we found that the body of the poems on this site contained an error message like "以上作品共五首", which creates a tremendous amount of work for us.

As for search engine, we can have more improvements for fuzzy search, such as improving the pinyin database to match only the common passwords or misspellings in ancient poems to reduce

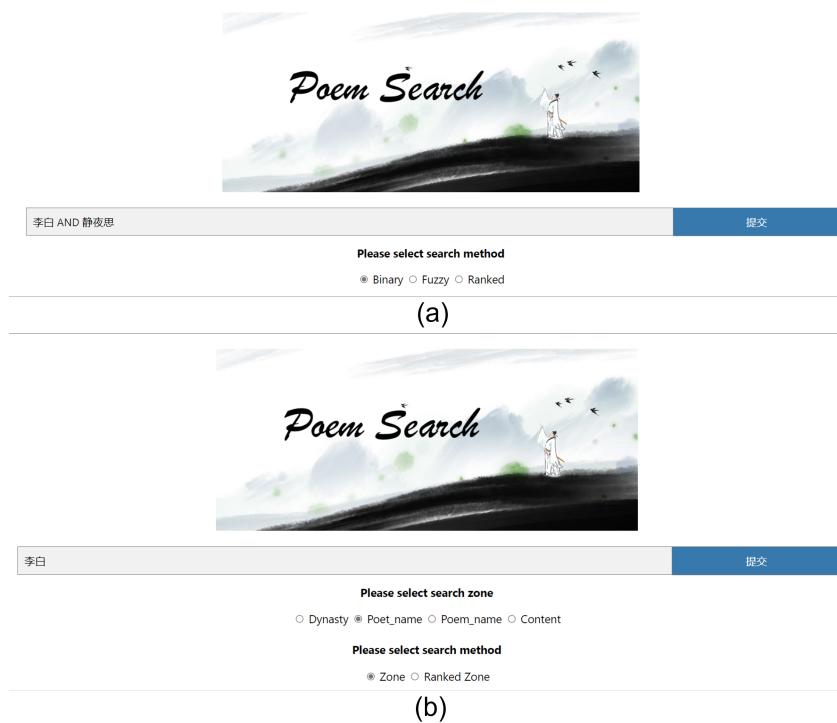


图 8: (a)index.html (b)zone\_search.html

the search space; on the other hand, we can also convert the final result into pinyin and combine it with the searched pinyin to sort the results. And for rank search, we can manually add a weight to those authors with few works but a strong reputation to get their results further up the list, for example, 张若虚 and 《春江花月夜》。

You can see our codes and dataset on the Github Crawl-for-poems.

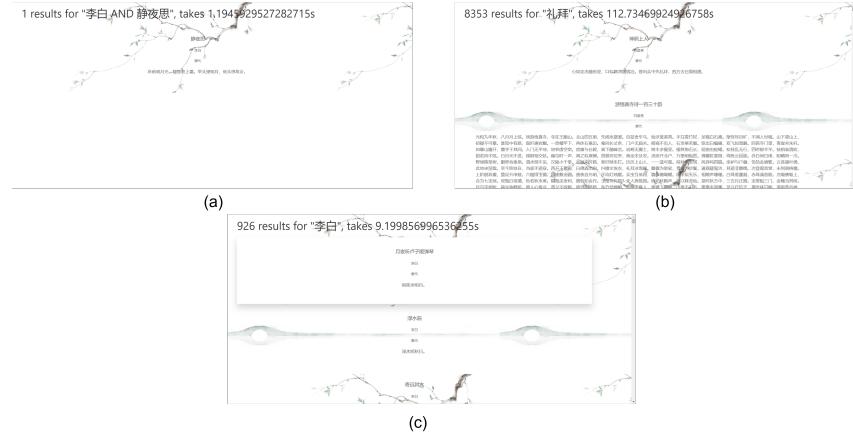


图 9: (a)Binary search (b)Fuzzy search(c)Ranked search



图 10: (a)zone search for dynasty (b)zone search for poet(c)zone search for poem(d)zone search for content