

Final project report

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0.How to run these applications

Step 1: Change external IP: 34.106.64.114 (it will change every time I restart the clusters) in:

sample\src\pages\landing.js

sample\src\component\TopN.js

sample\src\component\MiniSearchClient.js

Example:

← hw3-m EDIT RESET + CREATE MACHINE IMAGE + CREATE SIMILAR ⋮ OPERATIONS ▾

DETAILS OBSERVABILITY OS INFO SCREENSHOT

Network tags

dataproc-notebook-vm

Network interfaces

Name ↑	Network	Subnetwork	Primary internal IP address	Alias IP ranges	Stack Type	External IP address	Netw
nic0	default	default	10.180.0.3		IPv4	34.106.64.114 (Ephemeral)	Prent

```
axios.post("http://34.106.64.114:5000/upload", formData)
```

Step2: Start the first application on your PC:

```
cd sample
```

```
docker run -it --rm -v %cd%:/app -v /app/node_modules -p 3001:3000 -e
```

```
CHOKIDAR_USEPOLLING=true tonyrays/dockerhub:projtimagepush2
```

Step3: Start the second application on GCP:

Connect to compute engine via SSH, move folder flask_second_app to the compute engine.

```
pip install Flask
```

```
pip install flask_cors
```

```
python app.py
```

Note1 If TCP connection is blocked:

Create a firewall rule to allow traffic to port 5000:

Firewall + CREATE FIREWALL POLICY + CREATE FIREWALL RULE

Notifications

✓ Create firewall rule "allow-flask-port-5000" Just now
new pro

✓ Start VM instance "hw3-w-1" 1 hour ago

Note2 Data folder:

Create a 'Data' folder and insert the necessary data into it. Then, compress the folder into a zip file for uploading. Alternatively, you can use the zip file provided in the extra credit quiz.("./test_data/Data.zip")

1. Brief introduction to the first application

The first application contains four frontend pages:

- (1) Landing.js: where you can upload a zip file to construct Inverted Indices
- (2) MiniSearchIndex.js: index page, proceed to (3) or (4), or go back to (1)
- (3) MiniSearchClient.js: Search For Term
- (4) Top_N.js: TOP-N Frequent Terms
- (5) dropdown.js: implement a dropdown for better user experience
- (6) Docker image on dockerhub

```
sample > Dockerfile > ...
You, 2 months ago | 1 author (You)
1 # pull official base image
2 FROM node:13.12.0-alpine
3
4 # set working directory
5 WORKDIR /app
6
7 # add `/app/node_modules/.bin` to $PATH
8 ENV PATH /app/node_modules/.bin:$PATH
9
10 # install app dependencies
11 COPY package.json ./
12 COPY package-lock.json ./
13 RUN npm install --silent
14 RUN npm install react-scripts@3.4.1 -g --silent
15 RUN npm install axios
16 RUN npm install @mui/material @emotion/react @emotion/styled
17 RUN npm install react-router-dom
18 RUN npm install react-bootstrap
19 # add app
20 COPY . ./
21
22 # start app
23 CMD ["npm", "start"]
```

Watch the video for more details.

2. How I create the second application step by step

Since I have completed extra credit quiz, so I just modify the mapper.py and reducer.py I used for extra credits.

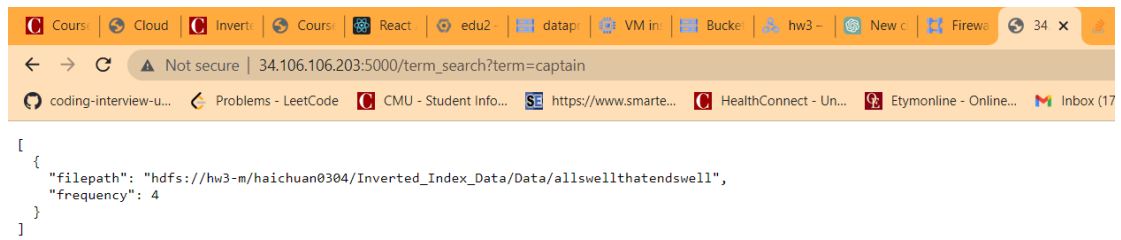
The second application contains:

- (1) App.py
- (2) Mapper_q.py
- (3) Reducer_q.py
- (4) Term_search.py
- (5) Top_n_search.py

2.1 Test manually generate json file:

```
hadoop jar /usr/lib/hadoop/hadoop-streaming.jar -file mapper_q.py -mapper 'python mapper_q.py' -
file reducer_q.py -reducer 'python reducer_q.py' -input /haichuan0304/Inverted_Index_Data/Data/ -
output /haichuan0304/output_inverted_final6
```

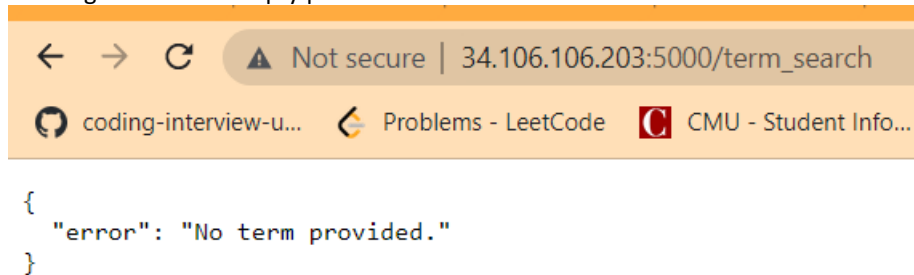
```
hadoop fs -getmerge /haichuan0304/output_inverted_final6 ./flask/inverted_index.json
```



A screenshot of a web browser window. The address bar shows the URL `34.106.106.203:5000/term_search?term=captain`. The browser tabs include 'Cours', 'Cloud', 'Invert', 'Cours', 'React', 'edu2', 'datap', 'VM in', 'Bucke', 'hw3', 'New c', and 'Firew'. The page content displays a JSON object:

```
[
  {
    "filepath": "hdfs://hw3-m/haichuan0304/Inverted_Index_Data/Data/allswellthatendswell",
    "frequency": 4
  }
]
```

I also handle edge cases like 'empty params':



A screenshot of a web browser window. The address bar shows the URL `34.106.106.203:5000/term_search`. The browser tabs include 'coding-interview-u...', 'Problems - LeetCode', and 'CMU - Student Info...'. The page content displays a JSON object:

```
{
  "error": "No term provided."
}
```


2.2 Test react app:

`docker run -it --rm -v %cd%:/app -v /app/node_modules -p 3001:3000 -e CHOKIDAR_USEPOLLING=true tonyrays/dockerhub:projimagepush2`

CoursCloudInvertCoursReXedu2-datapVM inBuckethw3

localhost:3001/miniSearchIndex/miniSearchClient

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Mini Search Engine: Search For Term

[Back to miniSearchIndex](#) show per page

Id	filepath	frequency
1	hdfs://hw3-m/haichuan0304/Inverted_Index_Data/Data/cymbeline	15
2	hdfs://hw3-m/haichuan0304/Inverted_Index_Data/Data/3kinghenryvi	3
3	hdfs://hw3-m/haichuan0304/Inverted_Index_Data/Data/1kinghenryiv	11
4	hdfs://hw3-m/haichuan0304/Inverted_Index_Data/Data/2kinghenryiv	18
5	hdfs://hw3-m/haichuan0304/Inverted_Index_Data/Data/asyoulikeit	16
6	hdfs://hw3-m/haichuan0304/Inverted_Index_Data/Data/allswellthatendswell	13
7	hdfs://hw3-m/haichuan0304/Inverted_Index_Data/Data/comedyoferrors	11


<!DOCTYPE
<html
<body
<div
<div
</div>
</body>
</html>

Also test out top_n_search:

CoursCloudInvertCoursRe: xedu2-datapVM inBuckethw3

localhost:3001/miniSearchIndex/topN

coding-interview-u...Problems - LeetCodeCMU - Student Info...https://www.smarte...HealthConnect -



Mini Search Engine: TOP-N Frequent Terms

Back to miniSearchIndex

Choose your N value: 10

Search

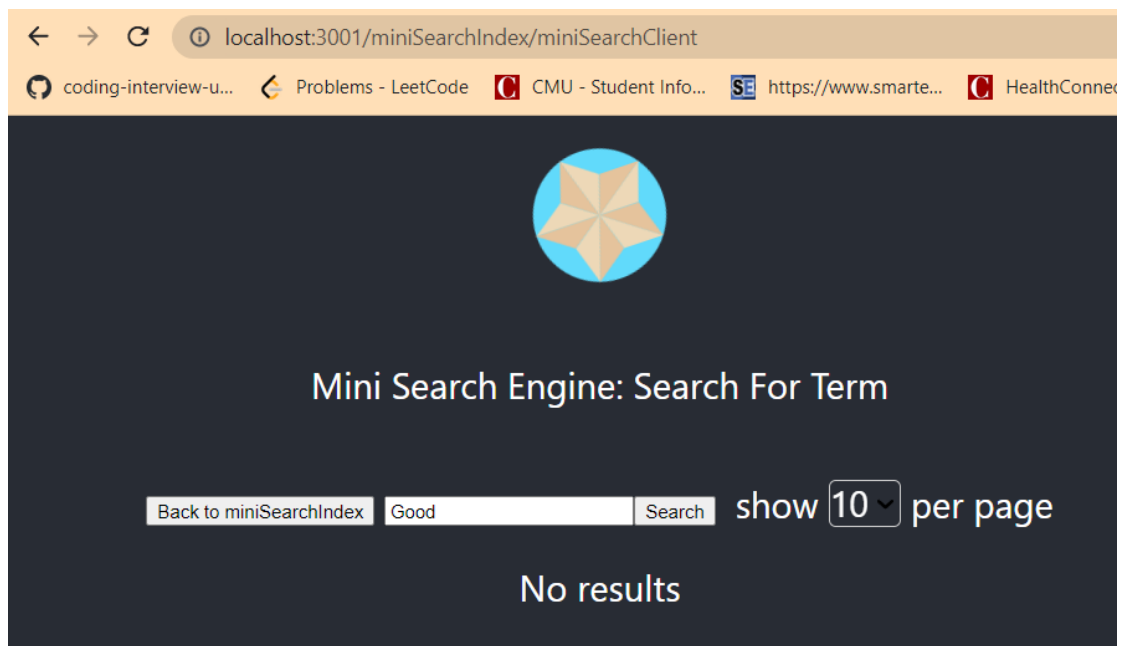
Id	Term	Frequency
1	the	4818
2	I	4131
3	and	3717
4	of	3114
5	to	3039
6	a	2642
7	my	2145
8	in	1893

2.3 Add stop word list

```
JS TopN.js M JS MiniSearchClient.js M mapper_q.py X reducer_q.py
C: > Users > haich > Downloads > quiz_inverted > mapper_q.py > ...
1  #!/usr/bin/env python
2
3  import sys
4  import os
5  import re
6
7  # stop words list
8  stop_words = set(["a", "an", "and", "are", "as", "at", "be", "by", "
9
10 # input comes from standard input (stdin)
11 for line in sys.stdin:
12     # remove leading and trailing whitespace
13     line = line.strip()
```

2.4 Regenerate json file with stop words:

```
hadoop jar /usr/lib/hadoop/hadoop-streaming.jar -file mapper_q.py -mapper 'python mapper_q.py' -
file reducer_q.py -reducer 'python reducer_q.py' -input /haichuan0304/Inverted_Index_Data/Data/ -
output /haichuan0304/output_inverted_final7
hadoop fs -getmerge /haichuan0304/output_inverted_final7 ./inverted_index.json
```



localhost:3001/miniSearchIndex/miniSearchClient

coding-interview-u...


Problems - LeetCode

CMU - Student Info...

SE

https://www.smarte...

HealthCon



Mini Search Engine: Search For Term

Back to miniSearchIndex

monkey

Search

show 10 per page

Id	filepath	frequency
1	hdfs://hw3-m/haichuan0304/Inverted_Index_Data/Data/2kinghenryiv	1
2	hdfs://hw3-m/haichuan0304/Inverted_Index_Data/Data/asyoulikeit	1

← → ↻ ⓘ localhost:3001/miniSearchIndex/topN

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Mini Search Engine: TOP-N Frequent Terms

[Back to miniSearchIndex](#) Choose your N value:

Id	Term	Frequency
1	i	4738
2	you	2789
3	my	2442
4	not	1649
5	me	1601
6	s	1474
7	his	1384
8	your	1278
9	but	1277
10	this	1222

The top-N results are not satisfactory; therefore, it is necessary to include additional stop-words.

2.5 Regenerate json file with even more stop words:

Here I used stop words from library nltk.

```
import nltk
from nltk.corpus import stopwords
print(stopwords.words('english'))
```

```
{'ourselves', 'hers', 'between', 'yourself', 'but', 'again', 'there', 'about', 'once', 'during', 'out', 'very',
'having', 'with', 'they', 'own', 'an', 'be', 'some', 'for', 'do', 'its', 'yours', 'such', 'into', 'of', 'most', 'itself',
'other', 'off', 'is', 's', 'am', 'or', 'who', 'as', 'from', 'him', 'each', 'the', 'themselves', 'until', 'below', 'are',
'we', 'these', 'your', 'his', 'through', 'don', 'nor', 'me', 'were', 'her', 'more', 'himself', 'this', 'down',
'should', 'our', 'their', 'while', 'above', 'both', 'up', 'to', 'ours', 'had', 'she', 'all', 'no', 'when', 'at', 'any',
'before', 'them', 'same', 'and', 'been', 'have', 'in', 'will', 'on', 'does', 'yourselves', 'then', 'that',
'because', 'what', 'over', 'why', 'so', 'can', 'did', 'not', 'now', 'under', 'he', 'you', 'herself', 'has', 'just',
'where', 'too', 'only', 'myself', 'which', 'those', 'i', 'after', 'few', 'whom', 't', 'being', 'if', 'theirs', 'my',
'against', 'a', 'by', 'doing', 'it', 'how', 'further', 'was', 'here', 'than'}
```


localhost:3001/miniSearchIndex/topN

Mini Search Engine: TOP-N Frequent Terms

[Back to miniSearchIndex](#) Choose your N value:

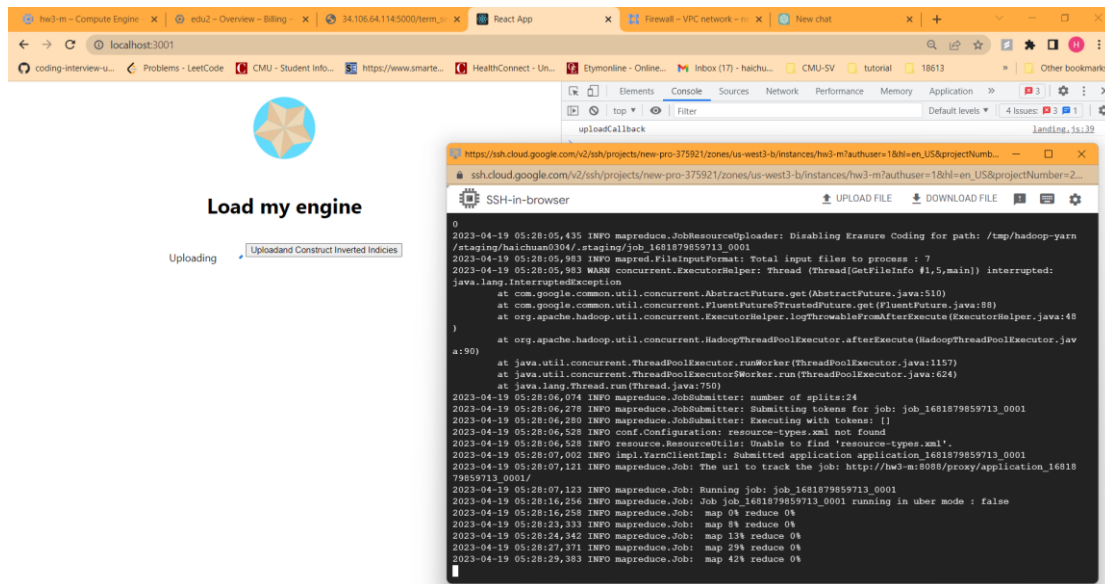
Id	Term	Frequency
1	thou	1190
2	d	976
3	king	858
4	lord	788
5	thy	740
6	shall	664
7	sir	629
8	thee	627
9	good	591
10	henry	587

Looks much better now!

2.6 Allow user to upload a zip file and automatically generate json file.

To prevent auto reload, disable use_reloader.

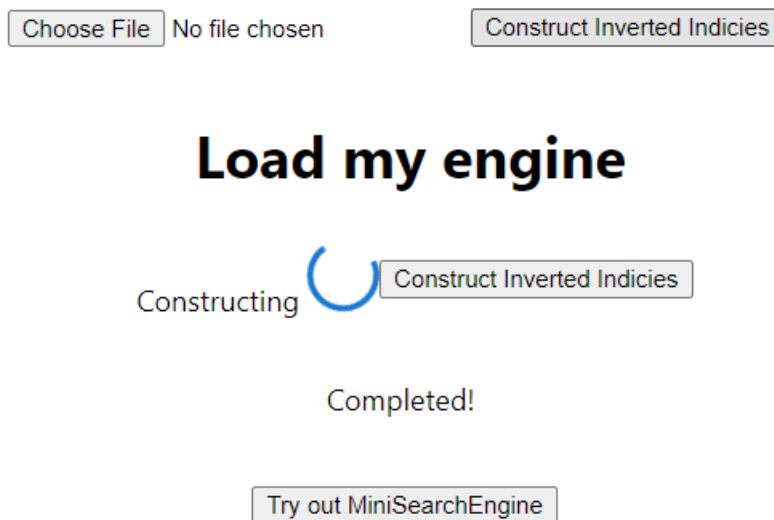
```
app.run(use_reloader=False, debug=True, host='0.0.0.0')
```



Delete 'input' and 'output' folder on HDFS to maintain a tidy environment.

```
2023-04-19 05:28:54,664 INFO streaming.StreamJob: Output directory: /haichuan0304/output
Deleted /haichuan0304/input
Deleted /haichuan0304/output
```

Rename the button:



2.7 Double check:

Delete inverted_index.json

```
haichuan0304@hw3-m:~/flask$ rm inverted_index.json
haichuan0304@hw3-m:~/flask$ ls
__pycache__  mapper_q.py  reducer_q.py  top_n_search.py
app.py       reducer.py.save  term_search.py  uploaded_files
```

The screenshot shows a web browser at localhost:3001 with a page titled "Load my engine". The page has a blue star logo and a "Completed!" message. Below it is a button that says "Try out MiniSearchEngine". To the right, an SSH-in-browser window is open, displaying a terminal output of a MapReduce job. The output includes statistics like "Reduce input records=93637", "Spilled Records=187274", and "Shuffled Maps =168". It also shows error counts for "Shuffle Errors" and "File Input/Output Format Counters". The terminal output ends with a successful HTTP status "200".

Works well:

The screenshot shows a web browser at localhost:3001 with a page titled "Mini Search Engine: TOP-N Frequent Terms". The page has a blue star logo and a "Choose your N value: 10" dropdown menu. Below the dropdown is a "Search" button. To the right, an SSH-in-browser window is open, displaying a terminal output of a MapReduce job. The output includes statistics like "Reduce output records=7", "Spilled Records=187274", and "Shuffled Maps =168". It also shows error counts for "Shuffle Errors" and "File Input/Output Format Counters". The terminal output ends with a successful HTTP status "200".

Update:

I recently noticed that I forgot to include the execution time in the output, so I have updated my functions to return this information. Additionally, I have created a second video demonstration to showcase the newly execution time feature. Sorry for the inconvenience.

e.g.

```

100, 6 minutes ago | 1 author (100)
import time

def term_search(term, word_postings):
    start_time = time.time()

    # Search for the term in the inverted index
    postings = word_postings.get(term, {})
    # results = [{"filepath": filepath, "frequency": frequency}]
    results = [{"id": idx, "filepath": filepath, "frequency": frequency}]


    execution_time = time.time() - start_time
    return results, execution_time

```

```
const Result = ({searchResults, execution_time}) => {
  return (<div>
    {/* <TextField/> */}
    <h3>Your search was executed in {execution_time} seconds</h3>
    <Table style={{backgroundColor:'white'}}>
      <TableHead>
```

localhost:3001/miniSearchIndex/miniSearchClient

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Mini Search Engine: Search For Term


Back to miniSearchIndex monkey Search show 10 per page

Your search was executed in 0.000011682510375976562 seconds

Id	filepath	frequency
1	hdfs://hw3-m/haichuan0304/input/Data/asyoulikeit	1
2	hdfs://hw3-m/haichuan0304/input/Data/2kinghenryiv	1

localhost:3001/miniSearchIndex/miniSearchClient

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Mini Search Engine: Search For Term

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Your search was executed in 0.000012636184692382812 seconds

Id	filepath	frequency
1	hdfs://hw3-m/haichuan0304/input/Data/asyoulikeit	1
2	hdfs://hw3-m/haichuan0304/input/Data/2kinghenryiv	140
3	hdfs://hw3-m/haichuan0304/input/Data/cymbeline	41
4	hdfs://hw3-m/haichuan0304/input/Data/allswellthatendswell	136
5	hdfs://hw3-m/haichuan0304/input/Data/3kinghenryvi	403
6	hdfs://hw3-m/haichuan0304/input/Data/1kinghenryiv	137