

## Model 1: Output of single word search:

### 1. Search word "science"

```
Initializing Search Engine...
Indexing complete. You can now enter a single keyword.
Type 'exit' to quit.

Enter a single keyword: science

The word 'science' appears in 10 page(s):
1. https://www.livescience.com/21478-what-is-culture-definition-of-culture.html (occurrences: 8)
2. https://www.livescience.com/animals/dinosaurs/dispersing-and-exasperating-the-worlds-super-rich-are-buying-up-t-rex-fossils-and-its-hampering-research (occurrences: 7)
3. https://www.livescience.com/space/after-2-years-in-space-the-james-webb-telescope-has-broken-cosmology-can-it-be-fixed (occurrences: 7)
4. https://www.livescience.com/space/astronomy/the-james-webb-telescope-reveals-the-truth-about-a-planet-that-crashed-into-its-own-star (occurrences: 6)
5. https://www.livescience.com/space/cosmology/universes-cosmological-collider-lands-3-scientists-dollar100000-physics-prize (occurrences: 6)
6. https://www.livescience.com/archaeology/who-were-the-first-farmers (occurrences: 5)
7. https://www.livescience.com/stone-age-bog-bones-germany (occurrences: 5)
8. https://www.livescience.com/animals/elephants/elephants-say-hello-to-friends-by-flapping-their-ears-and-making-little-rumbly-noises (occurrences: 4)
9. https://www.livescience.com/animals/elephants/watch-zoo-elephants-form-protective-alert-circle-around-young-during-5-2-san-diego-earthquake (occurrences: 4)
10. https://www.livescience.com/archaeology/inequality-isnt-new-but-its-far-from-inevitable-10-000-year-archeological-study-reveals (occurrences: 3)
```

### 2. Search word "TeLesCope" (the system should lower the case as telescope)

```
Enter a single keyword: TeLesCope

The word 'telescope' appears in 6 page(s):
1. https://www.livescience.com/space/after-2-years-in-space-the-james-webb-telescope-has-broken-cosmology-can-it-be-fixed (occurrences: 11)
2. https://www.livescience.com/space/astronomy/the-james-webb-telescope-reveals-the-truth-about-a-planet-that-crashed-into-its-own-star (occurrences: 4)
3. https://www.livescience.com/animals/dinosaurs/dispersing-and-exasperating-the-worlds-super-rich-are-buying-up-t-rex-fossils-and-its-hampering-research (occurrences: 1)
4. https://www.livescience.com/animals/elephants/elephants-say-hello-to-friends-by-flapping-their-ears-and-making-little-rumbly-noises (occurrences: 1)
5. https://www.livescience.com/archaeology/inequality-isnt-new-but-its-far-from-inevitable-10-000-year-archeological-study-reveals (occurrences: 1)
6. https://www.livescience.com/space/cosmology/universes-cosmological-collider-lands-3-scientists-dollar100000-physics-prize (occurrences: 1)
```

### 3. Stop words are eradicated

```
Initializing Search Engine...
Indexing complete. You can now enter a single keyword.
Type 'exit' to quit.

Enter a single keyword: are
No pages contain the word 'are'.

Enter a single keyword: being
No pages contain the word 'being'.

Enter a single keyword: can't
No pages contain the word 'can't'.

Enter a single keyword: have
No pages contain the word 'have'.

Enter a single keyword: The
No pages contain the word 'the'.

Enter a single keyword: is
No pages contain the word 'is'.

Enter a single keyword: exit
```

#### 4. Boundary conditions

4.1 Empty input (just press Enter). Excepted Output: “Please enter a keyword”

```
Enter a single keyword:  
Please enter a keyword.
```

4.2 Multiple words input in single mode. Excepted Output: “Please enter only one word”

```
Enter a single keyword: apple banana  
Please enter only one word.
```

4.3 Searching non-existent word. Excepted Output: No pages contain the word 'xxxx'

```
Enter a single keyword: asdfghjkl  
No pages contain the word 'asdfghjkl'.
```

## Model 2: Output of Multi Words Search

1. Exact match multi-word search, for example, “telescope science”

```
Enter keywords (space-separated): telescope science  
Top 6 matching pages (ranked):  
  
Rank #1  
https://www.livescience.com/space/after-2-years-in-space-the-james-webb-telescope-has-broken-cosmology-can-it-be-fixed  
  Matched Words: ['telescope', 'science']  
  Total Occurrences: 18  
  Score: (2, 18)  
  
Rank #2  
https://www.livescience.com/space/astronomy/the-james-webb-telescope-reveals-the-truth-about-a-planet-that-crashed-into-its-own-star  
  Matched Words: ['telescope', 'science']  
  Total Occurrences: 10  
  Score: (2, 10)  
  
Rank #3  
https://www.livescience.com/animals/dinosaurs/dispiriting-and-exasperating-the-worlds-super-rich-are-buying-up-t-rex-fossils-and-its-hampering-research  
  Matched Words: ['telescope', 'science']  
  Total Occurrences: 8  
  Score: (2, 8)  
  
Rank #4  
https://www.livescience.com/space/cosmology/universes-cosmological-collider-lands-3-scientists-dollar100000-physics-prize  
  Matched Words: ['telescope', 'science']  
  Total Occurrences: 7  
  Score: (2, 7)  
  
Rank #5  
https://www.livescience.com/animals/elephants/elephants-say-hello-to-friends-by-flapping-their-ears-and-making-little-rumbly-noises  
  Matched Words: ['telescope', 'science']  
  Total Occurrences: 5  
  Score: (2, 5)  
  
Rank #6  
https://www.livescience.com/archaeology/inequality-isnt-new-but-its-far-from-inevitable-10-000-year-archeological-study-reveals  
  Matched Words: ['telescope', 'science']  
  Total Occurrences: 4  
  Score: (2, 4)
```

2. Case-insensitive input, for example "TELEscope science", Output: Correctly matched (case normalized to lowercase)

```
Enter keywords (space-separated): TELEscope science

Top 6 matching pages (ranked):

Rank #1
https://www.livescience.com/space/after-2-years-in-space-the-james-webb-telescope-has-broken-cosmology-can-it-be-fixed
Matched Words: ['telescope', 'science']
Total Occurrences: 18
Score: (2, 18)

Rank #2
https://www.livescience.com/space/astronomy/the-james-webb-telescope-reveals-the-truth-about-a-planet-that-crashed-into-its-own-star
Matched Words: ['telescope', 'science']
Total Occurrences: 10
Score: (2, 10)

Rank #3
https://www.livescience.com/animals/dinosaurs/dispiriting-and-exasperating-the-worlds-super-rich-are-buying-up-t-rex-fossils-and-its-hampering-research
Matched Words: ['telescope', 'science']
Total Occurrences: 8
Score: (2, 8)

Rank #4
https://www.livescience.com/space/cosmology/universes-cosmological-collider-lands-3-scientists-dollar100000-physics-prize
Matched Words: ['telescope', 'science']
Total Occurrences: 7
Score: (2, 7)

Rank #5
https://www.livescience.com/animals/elephants/elephants-say-hello-to-friends-by-flapping-their-ears-and-making-little-rumbly-noises
Matched Words: ['telescope', 'science']
Total Occurrences: 5
Score: (2, 5)

Rank #6
https://www.livescience.com/archaeology/inequality-isnt-new-but-its-far-from-inevitable-10-000-year-archeological-study-reveals
Matched Words: ['telescope', 'science']
Total Occurrences: 4
Score: (2, 4)
```

3. All keywords do not exist (multi). Output: No pages contain all of the given keywords

```
Enter keywords (space-separated): unicorn pineapple quantumflop
No pages contain all of the given keywords.
```

4. Some keywords exist (multi). Output: No pages contain all of the given keywords

```
Enter keywords (space-separated): science pineapple
No pages contain all of the given keywords.
```

5. Valid single-word search. For example, "telescope". Output: List of pages with the word, sorted by frequency

```
Enter keywords (space-separated): telescope

Top 6 matching pages (ranked):

Rank #1
https://www.livescience.com/space/after-2-years-in-space-the-james-webb-telescope-has-broken-cosmology-can-it-be-fixed
  Matched Words: ['telescope']
  Total Occurrences: 11
  Score: (1, 11)

Rank #2
https://www.livescience.com/space/astronomy/the-james-webb-telescope-reveals-the-truth-about-a-planet-that-crashed-into-its-own-star
  Matched Words: ['telescope']
  Total Occurrences: 4
  Score: (1, 4)

Rank #3
https://www.livescience.com/space/cosmology/universes-cosmological-collider-lands-3-scientists-dollar100000-physics-prize
  Matched Words: ['telescope']
  Total Occurrences: 1
  Score: (1, 1)

Rank #4
https://www.livescience.com/archaeology/inequality-isnt-new-but-its-far-from-inevitable-10-000-year-archeological-study-reveals
  Matched Words: ['telescope']
  Total Occurrences: 1
  Score: (1, 1)

Rank #5
https://www.livescience.com/animals/elephants/elephants-say-hello-to-friends-by-flapping-their-ears-and-making-little-rumbly-noises
  Matched Words: ['telescope']
  Total Occurrences: 1
  Score: (1, 1)

Rank #6
https://www.livescience.com/animals/dinosaurs/dispiriting-and-exasperating-the-worlds-super-rich-are-buying-up-t-rex-fossils-and-its-hampering-research
  Matched Words: ['telescope']
  Total Occurrences: 1
  Score: (1, 1)
```

6. Stop words are eradicated

```
Enter keywords (space-separated):
Please enter at least one keyword.

Enter keywords (space-separated): can't
No pages contain all of the given keywords.

Enter keywords (space-separated): any
No pages contain all of the given keywords.

Enter keywords (space-separated): been
No pages contain all of the given keywords.

Enter keywords (space-separated): did
No pages contain all of the given keywords.

Enter keywords (space-separated): didn't
No pages contain all of the given keywords.

Enter keywords (space-separated): for
No pages contain all of the given keywords.
```

## 7. Boundary conditions

7.1 Repeating same word (multi), for example, "science science". Output: Should be same

as  
single  
input  
result  
(not  
broken)

```
Enter keywords (space-separated): science science
Top 10 matching pages (ranked):

Rank #1
https://www.livescience.com/21478-what-is-culture-definition-of-culture.html
Matched Words: ['science']
Total Occurrences: 8
Score: (1, 8)

Rank #2
https://www.livescience.com/space/after-2-years-in-space-the-james-webb-telescope-has-broken-cosmology-can-it-be-fixed
Matched Words: ['science']
Total Occurrences: 7
Score: (1, 7)

Rank #3
https://www.livescience.com/animals/dinosaurs/dispiriting-and-exasperating-the-worlds-super-rich-are-buying-up-t-rex-fossils-and-its-hampering-research
Matched Words: ['science']
Total Occurrences: 7
Score: (1, 7)

Rank #4
https://www.livescience.com/space/cosmology/universes-cosmological-collider-lands-3-scientists-dollar100000-physics-prize
Matched Words: ['science']
Total Occurrences: 6
Score: (1, 6)

Rank #5
https://www.livescience.com/space/astronomy/the-james-webb-telescope-reveals-the-truth-about-a-planet-that-crashed-into-its-own-star
Matched Words: ['science']
Total Occurrences: 6
Score: (1, 6)

Rank #6
https://www.livescience.com/stone-age-bog-bones-germany
Matched Words: ['science']
Total Occurrences: 5
Score: (1, 5)

Rank #7
https://www.livescience.com/archaeology/who-were-the-first-farmers
Matched Words: ['science']
Total Occurrences: 5
Score: (1, 5)

Rank #8
https://www.livescience.com/animals/elephants/watch-zoo-elephants-form-protective-alert-circle-around-young-during-5-2-san-diego-earthquake
Matched Words: ['science']
Total Occurrences: 4
Score: (1, 4)

Rank #9
https://www.livescience.com/animals/elephants/elephants-say-hello-to-friends-by-flapping-their-ears-and-making-little-rumbly-noises
Matched Words: ['science']
Total Occurrences: 4
Score: (1, 4)

Rank #10
https://www.livescience.com/archaeology/inequality-isnt-new-but-its-far-from-inevitable-10-000-year-archeological-study-reveals
Matched Words: ['science']
Total Occurrences: 3
Score: (1, 3)
```

7.2 Empty input (just press Enter). Excepted Output: "Please enter at least one keyword"

```
Enter keywords (space-separated):
Please enter at least one keyword.
```

7.3 Searching non-existent word. For example, "asdfghjkl "asdr". Output: No pages contain all of the given keywords.

```
Enter keywords (space-separated): asdfghjkl "asdr
No pages contain all of the given keywords.
```