WoLF

Word-List-Filter

Filter

Simple-Vector-Filter: Filter

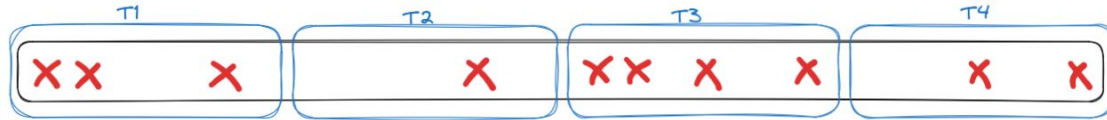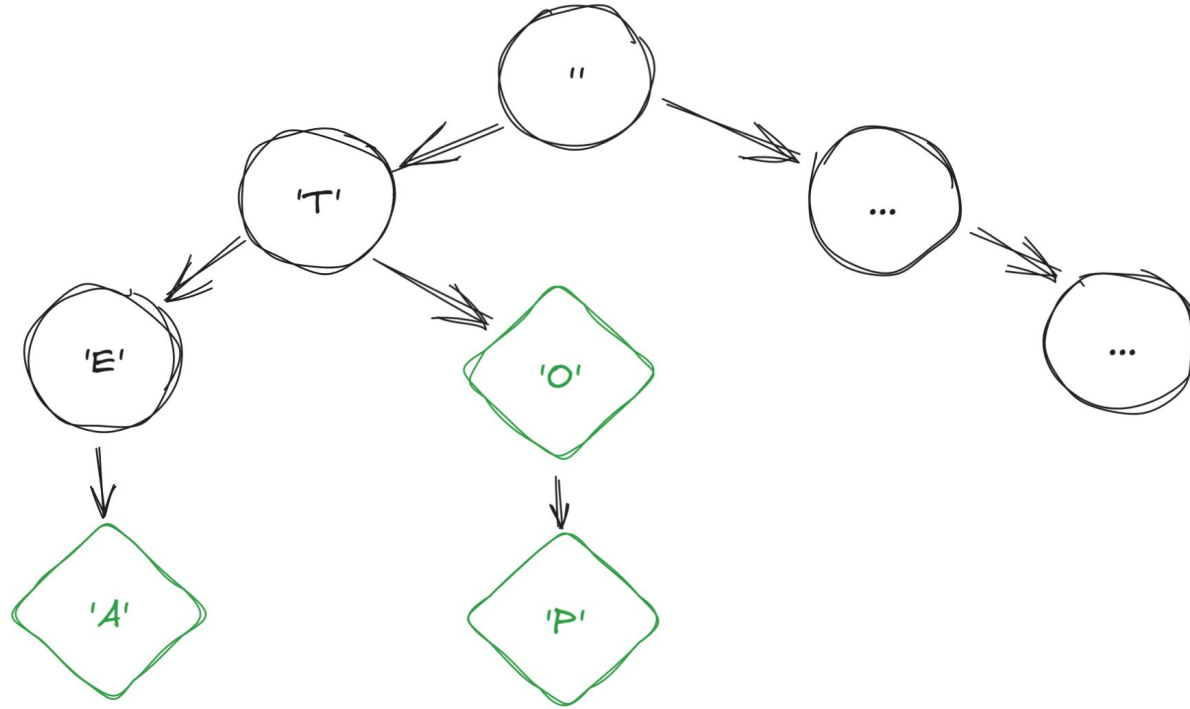# Simple-Vector-Filter: Benchmark (width 4)

```
File: bench/01_svf_mtf_w4.txt

1   Benchmark (2023-11-20 22:01:24)
2   Input:     456976 words
3   Iterations: 100
4   Threads:    1 2 4 8 12 16 32 48 64
5
6   Simple-Vector-Filter:
7       Pre:     A   Thr:       1  All:    1762  Con:      10  Ses:     530  Ins:      0  Fil:   1051  Col:    161  Des:     10
8       Pre:     A   Thr:       2  All:    1256  Con:      18  Ses:     520  Ins:      0  Fil:    539  Col:    169  Des:     10
9       Pre:     A   Thr:       4  All:     832  Con:      33  Ses:     337  Ins:      0  Fil:    272  Col:    173  Des:     17
10      Pre:     A   Thr:       8  All:     560  Con:      73  Ses:     170  Ins:      0  Fil:    133  Col:    155  Des:     29
11      Pre:     A   Thr:      12  All:     676  Con:     137  Ses:     208  Ins:      0  Fil:    122  Col:    148  Des:     61
12      Pre:     A   Thr:      16  All:     753  Con:     216  Ses:     171  Ins:      0  Fil:    100  Col:    149  Des:    117
13      Pre:     A   Thr:      32  All:    1243  Con:     551  Ses:     198  Ins:      0  Fil:    131  Col:    153  Des:    210
14      Pre:     A   Thr:      48  All:    1573  Con:     808  Ses:     174  Ins:      0  Fil:    154  Col:    155  Des:    282
15      Pre:     A   Thr:      64  All:    2066  Con:    1091  Ses:     235  Ins:      0  Fil:    181  Col:    156  Des:    403
16      Pre:    BC   Thr:       1  All:    1154  Con:       9  Ses:     169  Ins:      0  Fil:    877  Col:     89  Des:     10
17      Pre:    BC   Thr:       2  All:    1209  Con:      19  Ses:     545  Ins:      0  Fil:    535  Col:     99  Des:     11
18      Pre:    BC   Thr:       4  All:     583  Con:      34  Ses:     170  Ins:      0  Fil:    278  Col:     87  Des:     14
19      Pre:    BC   Thr:       8  All:     627  Con:      90  Ses:     268  Ins:      0  Fil:    144  Col:     90  Des:     35
20      Pre:    BC   Thr:      12  All:     616  Con:     142  Ses:     204  Ins:      0  Fil:    123  Col:     89  Des:     58
21      Pre:    BC   Thr:      16  All:     763  Con:     233  Ses:     222  Ins:      0  Fil:    101  Col:     89  Des:    118
22      Pre:    BC   Thr:      32  All:    1197  Con:     536  Ses:     225  Ins:      0  Fil:    135  Col:     89  Des:    212
23      Pre:    BC   Thr:      48  All:    1599  Con:     838  Ses:     222  Ins:      0  Fil:    161  Col:     89  Des:    289
24      Pre:    BC   Thr:      64  All:    2044  Con:    1114  Ses:     237  Ins:      0  Fil:    194  Col:     90  Des:    409
25      Pre:   CAB   Thr:       1  All:    1152  Con:       8  Ses:     171  Ins:      0  Fil:    881  Col:     84  Des:      8
26      Pre:   CAB   Thr:       2  All:    1224  Con:      20  Ses:     555  Ins:      0  Fil:    538  Col:     99  Des:     12
27      Pre:   CAB   Thr:       4  All:     782  Con:      36  Ses:     365  Ins:      0  Fil:    275  Col:     91  Des:     15
28      Pre:   CAB   Thr:       8  All:     630  Con:      91  Ses:     270  Ins:      0  Fil:    145  Col:     87  Des:     37
29      Pre:   CAB   Thr:      12  All:     658  Con:     146  Ses:     241  Ins:      0  Fil:    126  Col:     86  Des:     59
30      Pre:   CAB   Thr:      16  All:     723  Con:     238  Ses:     175  Ins:      0  Fil:    105  Col:     85  Des:    120
31      Pre:   CAB   Thr:      32  All:    1221  Con:     562  Ses:     226  Ins:      0  Fil:    133  Col:     85  Des:    215
32      Pre:   CAB   Thr:      48  All:    1475  Con:     786  Ses:     172  Ins:      0  Fil:    150  Col:     83  Des:    284
33      Pre:   CAB   Thr:      64  All:    1886  Con:    1074  Ses:     175  Ins:      0  Fil:    177  Col:     83  Des:    377
```
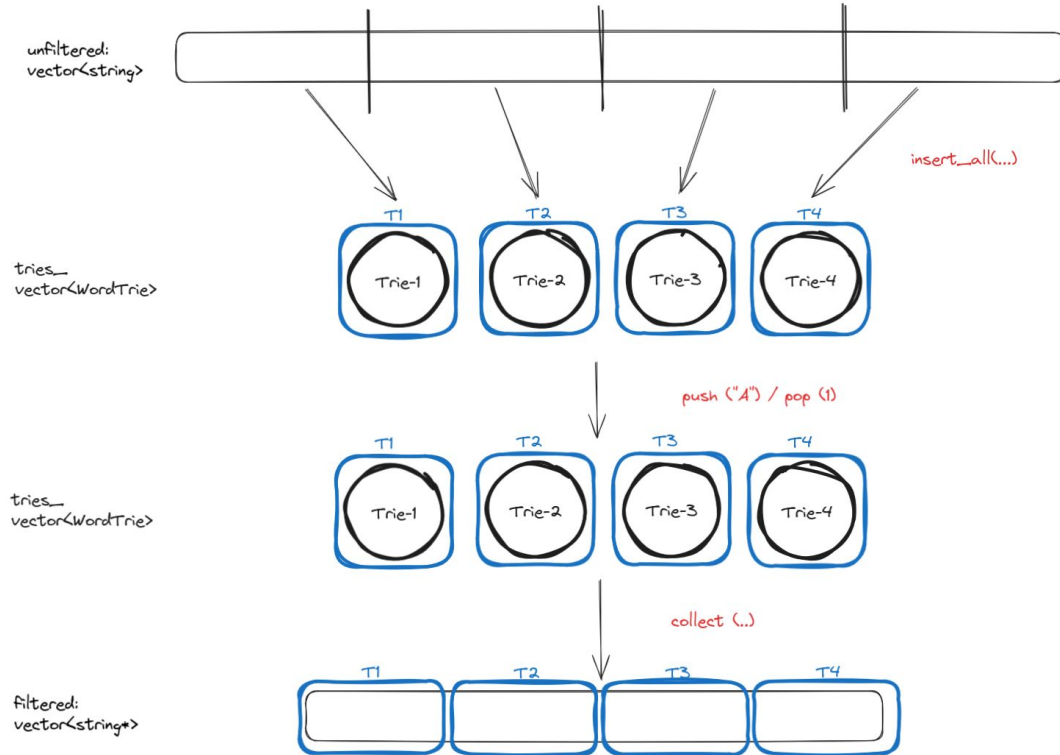
Simple-Vector-Filter: Benchmark (width 5)

```
File: bench/02_svf_mtf_w5.txt

Benchmark (2023-11-20 22:17:52)
Input:     11881376 words
Iterations: 3
Threads:   1 2 4 8 12 16 32 48 64

Simple-Vector-Filter:
    Pre:      A   Thr:       1   All:   39025   Con:     26   Ses:   9211   Ins:      0   Fil:   24850   Col:   4515   Des:    423
    Pre:      A   Thr:       2   All:   28021   Con:     47   Ses:   9717   Ins:      0   Fil:   13428   Col:   4391   Des:    438
    Pre:      A   Thr:       4   All:   25863   Con:     69   Ses:   9719   Ins:      0   Fil:   11218   Col:   4363   Des:    494
    Pre:      A   Thr:       8   All:   25778   Con:    144   Ses:   9185   Ins:      0   Fil:   11516   Col:   4594   Des:    339
    Pre:      A   Thr:      12   All:   26123   Con:    207   Ses:   9319   Ins:      0   Fil:   11642   Col:   4399   Des:    556
    Pre:      A   Thr:      16   All:   25865   Con:    254   Ses:   9321   Ins:      0   Fil:   11503   Col:   4404   Des:    383
    Pre:      A   Thr:      32   All:   26736   Con:    593   Ses:   9190   Ins:      0   Fil:   11860   Col:   4402   Des:    691
    Pre:      A   Thr:      48   All:   26913   Con:    912   Ses:   9193   Ins:      0   Fil:   11814   Col:   4349   Des:    645
    Pre:      A   Thr:      64   All:   27514   Con:   1221   Ses:   9218   Ins:      0   Fil:   11912   Col:   4372   Des:    791
    Pre:     BC   Thr:       1   All:   38982   Con:     22   Ses:   9442   Ins:      0   Fil:   26428   Col:   2700   Des:    390
    Pre:     BC   Thr:       2   All:   25892   Con:     50   Ses:   9348   Ins:      0   Fil:   13607   Col:   2497   Des:    390
    Pre:     BC   Thr:       4   All:   23768   Con:     70   Ses:   9442   Ins:      0   Fil:   11185   Col:   2640   Des:    431
    Pre:     BC   Thr:       8   All:   23823   Con:    150   Ses:   9007   Ins:      0   Fil:   11599   Col:   2722   Des:    345
    Pre:     BC   Thr:      12   All:   23806   Con:    192   Ses:   9119   Ins:      0   Fil:   11511   Col:   2644   Des:    340
    Pre:     BC   Thr:      16   All:   23819   Con:    245   Ses:   9088   Ins:      0   Fil:   11463   Col:   2656   Des:    367
    Pre:     BC   Thr:      32   All:   24325   Con:    595   Ses:   9015   Ins:      0   Fil:   11540   Col:   2610   Des:    565
    Pre:     BC   Thr:      48   All:   25156   Con:    891   Ses:   9189   Ins:      0   Fil:   11780   Col:   2642   Des:    654
    Pre:     BC   Thr:      64   All:   25861   Con:   1180   Ses:   9283   Ins:      0   Fil:   11739   Col:   2617   Des:   1042
    Pre:    CAB   Thr:       1   All:   37348   Con:     22   Ses:   9190   Ins:      0   Fil:   25164   Col:   2565   Des:    407
    Pre:    CAB   Thr:       2   All:   26261   Con:     50   Ses:   9750   Ins:      0   Fil:   13402   Col:   2618   Des:    441
    Pre:    CAB   Thr:       4   All:   24051   Con:     71   Ses:   9715   Ins:      0   Fil:   11252   Col:   2573   Des:    440
    Pre:    CAB   Thr:       8   All:   23901   Con:    147   Ses:   9296   Ins:      0   Fil:   11519   Col:   2590   Des:    349
    Pre:    CAB   Thr:      12   All:   23920   Con:    198   Ses:   9160   Ins:      0   Fil:   11568   Col:   2621   Des:    373
    Pre:    CAB   Thr:      16   All:   24000   Con:    257   Ses:   9282   Ins:      0   Fil:   11507   Col:   2586   Des:    368
    Pre:    CAB   Thr:      32   All:   24765   Con:    560   Ses:   9145   Ins:      0   Fil:   11855   Col:   2610   Des:    595
    Pre:    CAB   Thr:      48   All:   25004   Con:    877   Ses:   9203   Ins:      0   Fil:   11639   Col:   2629   Des:    656
    Pre:    CAB   Thr:      64   All:   25841   Con:   1221   Ses:   9524   Ins:      0   Fil:   11717   Col:   2594   Des:    785
```

Multi-Trie-Filter: Trie

Multi-Trie-Filter: Filter

Multi-Trie-Filter: Benchmark (width 4)

```
File: bench/01_svf_mtf_w4.txt

Benchmark (2023-11-20 22:01:24)
Input:     456976 words
Iterations: 100
Threads:    1 2 4 8 12 16 32 48 64

Multi-Trie-Filter:
    Pre:      A  Thr:      1  All:  155437  Con:      12  Ses:      0  Ins:  102566  Fil:   13  Col:  857  Des:  51989
    Pre:      A  Thr:      2  All:  112079  Con:      40  Ses:      0  Ins:   55338  Fil:   14  Col:  314  Des:  56373
    Pre:      A  Thr:      4  All:   89980  Con:      71  Ses:      0  Ins:   35493  Fil:   16  Col:  292  Des:  54108
    Pre:      A  Thr:      8  All:   87799  Con:     142  Ses:      0  Ins:   23951  Fil:   18  Col:  201  Des:  63487
    Pre:      A  Thr:     12  All:   93771  Con:     202  Ses:      0  Ins:   19525  Fil:   23  Col:  174  Des:  73847
    Pre:      A  Thr:     16  All:  101300  Con:     356  Ses:      0  Ins:   17471  Fil:   26  Col:  185  Des:  83262
    Pre:      A  Thr:     32  All:  106220  Con:     661  Ses:      0  Ins:   13975  Fil:   44  Col:  165  Des:  91375
    Pre:      A  Thr:     48  All:  122948  Con:     970  Ses:      0  Ins:   13818  Fil:   71  Col:  187  Des: 107902
    Pre:      A  Thr:     64  All:  133059  Con:    1250  Ses:      0  Ins:   13969  Fil:   92  Col:  206  Des: 117542
    Pre:     BC  Thr:      1  All:  158101  Con:      18  Ses:      0  Ins:  105832  Fil:   13  Col:   42  Des:  52196
    Pre:     BC  Thr:      2  All:  105323  Con:      47  Ses:      0  Ins:   55544  Fil:   15  Col:   23  Des:  49694
    Pre:     BC  Thr:      4  All:   88353  Con:      68  Ses:      0  Ins:   33604  Fil:   15  Col:   25  Des:  54641
    Pre:     BC  Thr:      8  All:   91553  Con:     139  Ses:      0  Ins:   23710  Fil:   18  Col:   23  Des:  67663
    Pre:     BC  Thr:     12  All:   96048  Con:     194  Ses:      0  Ins:   19838  Fil:   23  Col:   27  Des:  75966
    Pre:     BC  Thr:     16  All:  103990  Con:     352  Ses:      0  Ins:   17466  Fil:   27  Col:   30  Des:  86115
    Pre:     BC  Thr:     32  All:  122791  Con:     743  Ses:      0  Ins:   14408  Fil:   53  Col:   42  Des: 107545
    Pre:     BC  Thr:     48  All:  145477  Con:    1027  Ses:      3  Ins:   15150  Fil:   87  Col:   56  Des: 129154
    Pre:     BC  Thr:     64  All:  160028  Con:    1264  Ses:      0  Ins:   15069  Fil:  104  Col:   72  Des: 143519
    Pre:    CAB  Thr:      1  All:  160666  Con:      24  Ses:      0  Ins:  101791  Fil:   13  Col:   12  Des:  58826
    Pre:    CAB  Thr:      2  All:  105996  Con:      49  Ses:      0  Ins:   54764  Fil:   14  Col:    9  Des:  51160
    Pre:    CAB  Thr:      4  All:   94182  Con:      65  Ses:      0  Ins:   35338  Fil:   16  Col:   11  Des:  58752
    Pre:    CAB  Thr:      8  All:   96654  Con:     140  Ses:      0  Ins:   25059  Fil:   20  Col:   11  Des:  71424
    Pre:    CAB  Thr:     12  All:  104136  Con:     197  Ses:      0  Ins:   19916  Fil:   24  Col:   15  Des:  83984
    Pre:    CAB  Thr:     16  All:  113570  Con:     357  Ses:      0  Ins:   18752  Fil:   28  Col:   21  Des:  94412
    Pre:    CAB  Thr:     32  All:  129564  Con:     743  Ses:      3  Ins:   14925  Fil:   42  Col:   19  Des: 113832
    Pre:    CAB  Thr:     48  All:  152436  Con:    1045  Ses:      3  Ins:   16272  Fil:   84  Col:   14  Des: 135018
    Pre:    CAB  Thr:     64  All:  166842  Con:    1271  Ses:      5  Ins:   15399  Fil:   94  Col:   17  Des: 150056
```

Multi-Trie-Filter: Benchmark (width 5)

```
File: bench/02_svf_mtf_w5.txt

Benchmark (2023-11-20 22:17:52)
Input:      11881376 words
Iterations: 3
Threads:    1 2 4 8 12 16 32 48 64

Multi-Trie-Filter:
   Pre:      A  Thr:       1  All:  9000608  Con:       21  Ses:       0  Ins: 7354559  Fil:     11  Col:   38204  Des: 1607813
   Pre:      A  Thr:       2  All:  6401137  Con:       46  Ses:       0  Ins: 4719678  Fil:     17  Col:   20708  Des: 1660688
   Pre:      A  Thr:       4  All:  4223853  Con:       70  Ses:       0  Ins: 2325657  Fil:     18  Col:   10244  Des: 1887864
   Pre:      A  Thr:       8  All:  3918681  Con:      235  Ses:       0  Ins: 1348815  Fil:     36  Col:    6157  Des: 2563438
   Pre:      A  Thr:      12  All:  3898549  Con:      292  Ses:       0  Ins: 1079125  Fil:     33  Col:    5023  Des: 2814076
   Pre:      A  Thr:      16  All:  4100348  Con:      409  Ses:       0  Ins: 1010676  Fil:     36  Col:    4462  Des: 3084765
   Pre:      A  Thr:      32  All:  3999800  Con:      740  Ses:       1  Ins:  691094  Fil:     61  Col:    4263  Des: 3303641
   Pre:      A  Thr:      48  All:  4733426  Con:     1218  Ses:       1  Ins:  760096  Fil:    102  Col:    4854  Des: 3967155
   Pre:      A  Thr:      64  All:  4647463  Con:     1608  Ses:       0  Ins:  679001  Fil:    157  Col:    5336  Des: 3961361
   Pre:     BC  Thr:       1  All: 10067144  Con:       25  Ses:       0  Ins: 8401857  Fil:     17  Col:    1652  Des: 1663593
   Pre:     BC  Thr:       2  All:  6547366  Con:       55  Ses:       0  Ins: 4760951  Fil:     16  Col:     838  Des: 1785506
   Pre:     BC  Thr:       4  All:  4430072  Con:       72  Ses:       0  Ins: 2372405  Fil:     19  Col:     756  Des: 2056820
   Pre:     BC  Thr:       8  All:  4048376  Con:      263  Ses:       0  Ins: 1404122  Fil:     30  Col:     539  Des: 2643422
   Pre:     BC  Thr:      12  All:  4412397  Con:      302  Ses:       0  Ins: 1152350  Fil:     38  Col:     510  Des: 3259197
   Pre:     BC  Thr:      16  All:  4584262  Con:      431  Ses:       0  Ins: 1046160  Fil:     38  Col:     516  Des: 3537117
   Pre:     BC  Thr:      32  All:  4788474  Con:      760  Ses:       1  Ins:  725991  Fil:     58  Col:     439  Des: 4061225
   Pre:     BC  Thr:      48  All:  5183922  Con:     1177  Ses:       3  Ins:  793738  Fil:     98  Col:     557  Des: 4388349
   Pre:     BC  Thr:      64  All:  5354458  Con:     1586  Ses:       0  Ins:  753607  Fil:    107  Col:     454  Des: 4598704
   Pre:    CAB  Thr:       1  All: 10372451  Con:       27  Ses:       0  Ins: 8713604  Fil:     17  Col:      92  Des: 1658711
   Pre:    CAB  Thr:       2  All:  6572883  Con:       49  Ses:       0  Ins: 4688564  Fil:     18  Col:      55  Des: 1884197
   Pre:    CAB  Thr:       4  All:  4312908  Con:       65  Ses:       0  Ins: 2360150  Fil:     25  Col:     137  Des: 1952531
   Pre:    CAB  Thr:       8  All:  4196793  Con:      245  Ses:       0  Ins: 1466600  Fil:     32  Col:     214  Des: 2729702
   Pre:    CAB  Thr:      12  All:  4220756  Con:      322  Ses:       0  Ins: 1185709  Fil:     38  Col:     256  Des: 3034431
   Pre:    CAB  Thr:      16  All:  4475163  Con:      424  Ses:       0  Ins:  977471  Fil:     48  Col:     245  Des: 3496975
   Pre:    CAB  Thr:      32  All:  4701510  Con:      848  Ses:       2  Ins:  740593  Fil:     66  Col:     258  Des: 3959743
   Pre:    CAB  Thr:      48  All:  5208228  Con:     1160  Ses:       3  Ins:  789574  Fil:    100  Col:     276  Des: 4417115
   Pre:    CAB  Thr:      64  All:  5443743  Con:     1595  Ses:       6  Ins:  770577  Fil:    156  Col:     262  Des: 4671147
```

Sorted-Vector-Filter: Todo

- Initialization:
    - Create a reference vector
    - Sort the vector, using quicksort or mergesort
        - Can be performed on multiple threads
- Search:
    - Find the first, and last
        - Can be performed on up to 2 threads
    - Copy the found range in to the result vector

Misc.

Misc.: Benchmarks

- AMD Ryzen 9 7950X (32) @ 5.88 GHz
- 2x16GB DDR5-6000 DIMM CL30-38-38-96

```
 2        for (const auto &p : prefixes_) {
 3            for (auto tc : thread_count_) {
 4
 5                i64 best_construct_time = std::numeric_limits<i64>::max();
 6                // ...
 7
 8                for (usize i = 0; i < iterations_; ++i) {
 9                    const auto result = fn(input_, p, tc);
10                    best_construct_time = std::min(best_construct_time,
11                                                   result.construct_time);
12                    // ...
13                }
14            }
15    }
```
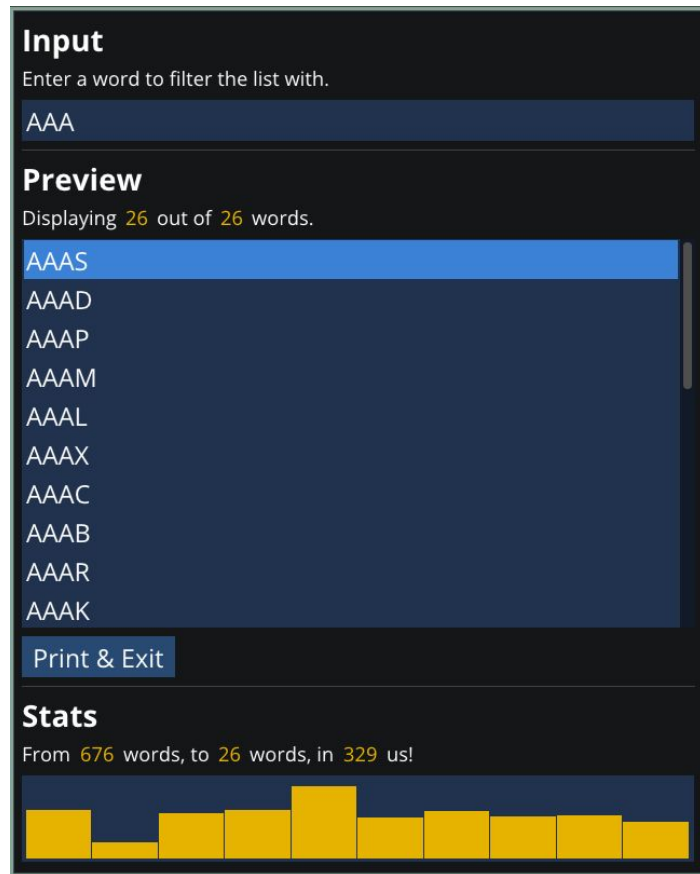
Misc.: Runner

- Test-Generator (-m gen)
    - Generates all combinations of letters A-Z, for a given width
    - E.g.: width = 4 -> Generates all combinations from AAAA to ZZZZ
- One-Shot-Filter (-m fos)
    - Uses the: **Simple-Vector-Filter**
    - Creates a filter -> filters based on a given prefix -> exists
- Interactive-Fiter (-m fin)
    - Uses the: **Multi-Trie-Filter**
    - Lets the user interactively filter and print the list using a gui interface
- Benchmark (-m bench)
    - Benchmarks both filters with different combinations of prefixes and threads

Misc.: IO

- Reader
    - **ConsoleWriter** - Read from stdout
    - **FileWriter** - Read to file

- Writer
    - **ConsoleWriter** - Write to stdout
    - **FileWriter** - Write to file

Misc.: GUI

- Used for interactive-mode
- Based on the **Dear ImGui** project (https://github.com/ocornut/imgui)
- Backend: **OpenGL** + **GLFW**

Misc.

- Config
  - Default Configuration
  - Can be changed via command line arguments
- ThreadPool
  - Create a pool of threads, which can be reused for multiple task
- Timer
  - Simple time measuring