

GTU Department of Computer Engineering
CSE 222/505 - Spring 2021
Homework 4 – Part 2

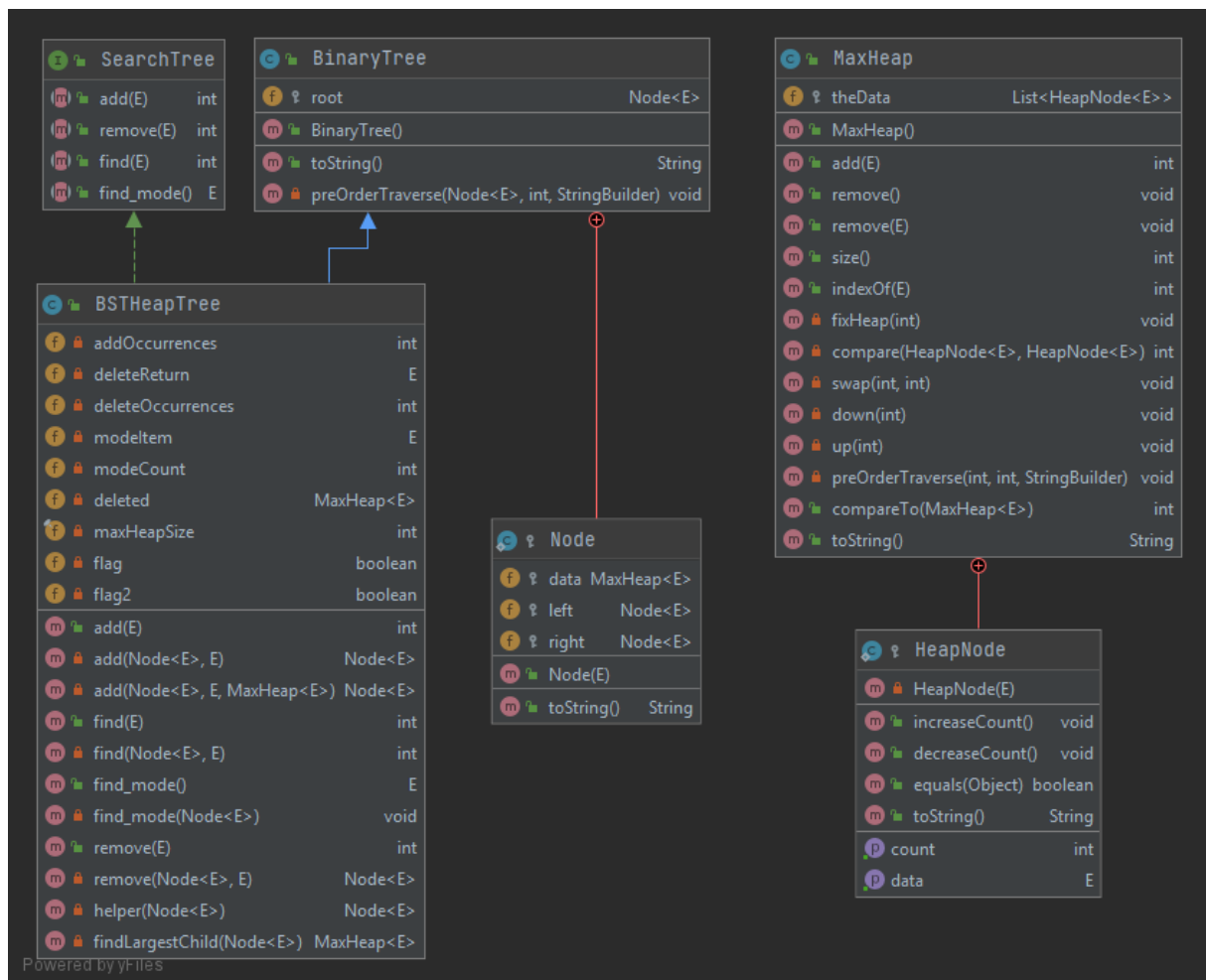
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-Problem Solution Approach

BSTHeapTree class extends the BinaryTree class. BinaryTree class include Node class as a inner class, this inner class holds the MaxHeap class to store data and holds the reference of left and right subtrees. MaxHeap class include HeapNode class as a inner class, this inner class holds two data: a value and the number of occurrences of the value.

-Class Diagram



-Running and Results

```
1 "C:\Program Files\Amazon Corretto\jdk11.0.10_9\bin\java.exe
  "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA 2020.3.2\lib
  \idea_rt.jar=58678:C:\Program Files\JetBrains\IntelliJ IDEA 2020.3.
  2\bin" -Dfile.encoding=UTF-8 -classpath C:\Users\murat\Desktop
  \YL\PDF\spring\cse222\HW4\Part2\out\production\Part2 main
2 ### Insert the 3000 numbers into the tree ###
3 ### Search for 100 numbers in the array ###
4 --- SEARCH 4626 ---
5 1
6 --- SEARCH 391 ---
7 1
8 --- SEARCH 1502 ---
9 2
10 --- SEARCH 3130 ---
11 3
12 --- SEARCH 3926 ---
13 1
14 --- SEARCH 4006 ---
15 2
16 --- SEARCH 308 ---
17 1
18 --- SEARCH 4995 ---
19 1
20 --- SEARCH 4806 ---
21 2
22 --- SEARCH 7 ---
23 3
24 --- SEARCH 2894 ---
25 1
26 --- SEARCH 114 ---
27 3
28 --- SEARCH 4271 ---
29 1
30 --- SEARCH 4161 ---
31 3
32 --- SEARCH 1754 ---
33 3
34 --- SEARCH 2275 ---
35 1
36 --- SEARCH 3642 ---
37 2
38 --- SEARCH 1884 ---
39 3
40 --- SEARCH 4152 ---
```

41 1
42 --- SEARCH 347 ----
43 1
44 --- SEARCH 1385 ----
45 1
46 --- SEARCH 4675 ----
47 1
48 --- SEARCH 356 ----
49 1
50 --- SEARCH 2141 ----
51 2
52 --- SEARCH 3714 ----
53 1
54 --- SEARCH 4996 ----
55 1
56 --- SEARCH 2305 ----
57 2
58 --- SEARCH 4756 ----
59 3
60 --- SEARCH 569 ----
61 1
62 --- SEARCH 2797 ----
63 1
64 --- SEARCH 1442 ----
65 1
66 --- SEARCH 2836 ----
67 1
68 --- SEARCH 3224 ----
69 2
70 --- SEARCH 2144 ----
71 2
72 --- SEARCH 533 ----
73 2
74 --- SEARCH 3164 ----
75 1
76 --- SEARCH 4914 ----
77 2
78 --- SEARCH 438 ----
79 3
80 --- SEARCH 2565 ----
81 1
82 --- SEARCH 3403 ----
83 1
84 --- SEARCH 4053 ----

85 1
86 --- SEARCH 2716 ----
87 1
88 --- SEARCH 4591 ----
89 2
90 --- SEARCH 2941 ----
91 1
92 --- SEARCH 1537 ----
93 3
94 --- SEARCH 4276 ----
95 1
96 --- SEARCH 2520 ----
97 2
98 --- SEARCH 4876 ----
99 1
100 --- SEARCH 1268 ----
101 1
102 --- SEARCH 165 ----
103 1
104 --- SEARCH 424 ----
105 1
106 --- SEARCH 4757 ----
107 1
108 --- SEARCH 1875 ----
109 2
110 --- SEARCH 4053 ----
111 1
112 --- SEARCH 4498 ----
113 2
114 --- SEARCH 929 ----
115 3
116 --- SEARCH 4462 ----
117 1
118 --- SEARCH 4090 ----
119 1
120 --- SEARCH 1116 ----
121 2
122 --- SEARCH 929 ----
123 3
124 --- SEARCH 933 ----
125 1
126 --- SEARCH 785 ----
127 3
128 --- SEARCH 772 ----

129 1
130 --- SEARCH 1708 ----
131 1
132 --- SEARCH 3983 ----
133 2
134 --- SEARCH 1974 ----
135 1
136 --- SEARCH 3025 ----
137 1
138 --- SEARCH 4404 ----
139 1
140 --- SEARCH 3371 ----
141 1
142 --- SEARCH 1252 ----
143 1
144 --- SEARCH 357 ----
145 1
146 --- SEARCH 2089 ----
147 2
148 --- SEARCH 3510 ----
149 1
150 --- SEARCH 179 ----
151 1
152 --- SEARCH 3713 ----
153 1
154 --- SEARCH 29 ----
155 1
156 --- SEARCH 4789 ----
157 2
158 --- SEARCH 4876 ----
159 1
160 --- SEARCH 4750 ----
161 1
162 --- SEARCH 243 ----
163 1
164 --- SEARCH 4748 ----
165 1
166 --- SEARCH 4391 ----
167 2
168 --- SEARCH 2456 ----
169 3
170 --- SEARCH 2384 ----
171 2
172 --- SEARCH 435 ----

```
173 2
174 --- SEARCH 2431 ----
175 2
176 --- SEARCH 1857 ----
177 1
178 --- SEARCH 114 ----
179 3
180 --- SEARCH 523 ----
181 2
182 --- SEARCH 2883 ----
183 1
184 --- SEARCH 917 ----
185 1
186 --- SEARCH 835 ----
187 1
188 --- SEARCH 4375 ----
189 1
190 --- SEARCH 17 ----
191 2
192 --- SEARCH 1047 ----
193 2
194 --- SEARCH 1694 ----
195 1
196 --- SEARCH 2838 ----
197 2
198 --- SEARCH 3270 ----
199 2
200 --- SEARCH 4079 ----
201 1
202 --- SEARCH 4552 ----
203 1
204 ### Search for 10 numbers not in the array ###
205 --- SEARCH 5962 ----
206 -1
207 --- SEARCH 5745 ----
208 -1
209 --- SEARCH 5676 ----
210 -1
211 --- SEARCH 5539 ----
212 -1
213 --- SEARCH 5801 ----
214 -1
215 --- SEARCH 5933 ----
216 -1
```

```
217 --- SEARCH 5851 ----
218 -1
219 --- SEARCH 5796 ----
220 -1
221 --- SEARCH 5659 ----
222 -1
223 --- SEARCH 5835 ----
224 -1
225 ### Find the mode of the BSTHeapTree ###
226 Mode Count: 5 Mode: 847
227 847
228 ### Remove 100 numbers in the array ###
229 --- REMOVE 4745 ----
230 0
231 --- REMOVE 3836 ----
232 0
233 --- REMOVE 2329 ----
234 0
235 --- REMOVE 3501 ----
236 1
237 --- REMOVE 1519 ----
238 0
239 --- REMOVE 305 ----
240 0
241 --- REMOVE 768 ----
242 1
243 --- REMOVE 3829 ----
244 0
245 --- REMOVE 3114 ----
246 1
247 --- REMOVE 563 ----
248 0
249 --- REMOVE 3359 ----
250 1
251 --- REMOVE 2955 ----
252 0
253 --- REMOVE 2498 ----
254 1
255 --- REMOVE 4747 ----
256 0
257 --- REMOVE 4528 ----
258 0
259 --- REMOVE 4604 ----
260 0
```


261 --- REMOVE 3312 ----
262 1
263 --- REMOVE 2902 ----
264 0
265 --- REMOVE 2180 ----
266 1
267 --- REMOVE 2759 ----
268 2
269 --- REMOVE 2100 ----
270 0
271 --- REMOVE 3776 ----
272 2
273 --- REMOVE 2594 ----
274 1
275 --- REMOVE 1047 ----
276 1
277 --- REMOVE 825 ----
278 0
279 --- REMOVE 2856 ----
280 0
281 --- REMOVE 2311 ----
282 0
283 --- REMOVE 3164 ----
284 0
285 --- REMOVE 2680 ----
286 1
287 --- REMOVE 2799 ----
288 0
289 --- REMOVE 3534 ----
290 1
291 --- REMOVE 3494 ----
292 1
293 --- REMOVE 150 ----
294 1
295 --- REMOVE 898 ----
296 0
297 --- REMOVE 541 ----
298 1
299 --- REMOVE 4545 ----
300 0
301 --- REMOVE 2480 ----
302 0
303 --- REMOVE 335 ----
304 0

305 --- REMOVE 766 ----
306 0
307 --- REMOVE 2480 ----
308 -1
309 --- REMOVE 3525 ----
310 1
311 --- REMOVE 2664 ----
312 0
313 --- REMOVE 1706 ----
314 1
315 --- REMOVE 1212 ----
316 1
317 --- REMOVE 3577 ----
318 0
319 --- REMOVE 4928 ----
320 2
321 --- REMOVE 4593 ----
322 0
323 --- REMOVE 2280 ----
324 0
325 --- REMOVE 4985 ----
326 0
327 --- REMOVE 2378 ----
328 0
329 --- REMOVE 875 ----
330 0
331 --- REMOVE 3184 ----
332 0
333 --- REMOVE 3643 ----
334 1
335 --- REMOVE 2345 ----
336 0
337 --- REMOVE 1230 ----
338 2
339 --- REMOVE 3323 ----
340 0
341 --- REMOVE 2217 ----
342 1
343 --- REMOVE 4598 ----
344 3
345 --- REMOVE 955 ----
346 0
347 --- REMOVE 290 ----
348 0

```
349 --- REMOVE 2913 ----
350 0
351 --- REMOVE 2815 ----
352 0
353 --- REMOVE 3523 ----
354 0
355 --- REMOVE 312 ----
356 0
357 --- REMOVE 1042 ----
358 0
359 --- REMOVE 1744 ----
360 2
361 --- REMOVE 49 ----
362 1
363 --- REMOVE 4605 ----
364 1
365 --- REMOVE 4471 ----
366 0
367 --- REMOVE 4621 ----
368 0
369 --- REMOVE 1483 ----
370 0
371 --- REMOVE 313 ----
372 1
373 --- REMOVE 50 ----
374 0
375 --- REMOVE 4765 ----
376 1
377 --- REMOVE 4354 ----
378 0
379 --- REMOVE 4381 ----
380 1
381 --- REMOVE 4811 ----
382 2
383 --- REMOVE 487 ----
384 0
385 --- REMOVE 4784 ----
386 0
387 --- REMOVE 4754 ----
388 0
389 --- REMOVE 4137 ----
390 0
391 --- REMOVE 4450 ----
392 0
```

```
393 --- REMOVE 1143 ----
394 0
395 --- REMOVE 1702 ----
396 1
397 --- REMOVE 2896 ----
398 0
399 --- REMOVE 939 ----
400 1
401 --- REMOVE 3698 ----
402 0
403 --- REMOVE 990 ----
404 2
405 --- REMOVE 1468 ----
406 0
407 --- REMOVE 744 ----
408 1
409 --- REMOVE 4902 ----
410 0
411 --- REMOVE 2192 ----
412 2
413 --- REMOVE 45 ----
414 1
415 --- REMOVE 1975 ----
416 1
417 --- REMOVE 60 ----
418 0
419 --- REMOVE 4580 ----
420 0
421 --- REMOVE 3166 ----
422 0
423 --- REMOVE 4237 ----
424 2
425 --- REMOVE 2283 ----
426 1
427 --- REMOVE 374 ----
428 0
429 ### Remove 10 numbers in not the array ###
430 --- REMOVE 5867 ----
431 -1
432 --- REMOVE 5626 ----
433 -1
434 --- REMOVE 5839 ----
435 -1
436 --- REMOVE 5807 ----
```

```
437 -1
438 --- REMOVE 5846 ----
439 -1
440 --- REMOVE 5587 ----
441 -1
442 --- REMOVE 5549 ----
443 -1
444 --- REMOVE 5917 ----
445 -1
446 --- REMOVE 5751 ----
447 -1
448 --- REMOVE 5750 ----
449 -1
450
451 Process finished with exit code 0
452
```