

BinarySearchTree						
Insert Runtime	(worst case lopsided right heavy tree)					
	Trials (ms)					
	Trial 1 Average	Trial 2 Average	Trial 3 Average	Average	Number of Elements / Runtime	
	1,000	2.67	2	2	2.22	449.7751124
	2,000	7.67	7.67	8	7.78	257.0694087
	4,000	33.33	33	34	33.44	119.6053025
	8,000	142.67	142.67	142.33	142.56	56.11893493
	16,000	518.33	534.67	516.67	523.22	30.57967598
# of elements	32,000	2084.67	2148	2128	2,120.22	15.89274966

BinarySearchTree						
Insert Runtime	(best case balanced)					
		Trials (ms)				
		Trial 1 Average	Trial 2 Average	Trial 3 Average	Average	Number of Elements / Runtime
		1,000	1	1	1.00	1000
		2,000	4	4	3.67	514.1388175
		4,000	15.67	16	16	251.7386482
		8,000	65	67.67	65.33	121.2121212
		16,000	269.67	268	265.33	59.7789406
# of elements		32,000	1036.33	1097.33	1058.33	30.87528219

BinarySearchTree						
Insert Runtime	(random root in range)					
		Trials (ms)				
		Trial 1 Average	Trial 2 Average	Trial 3 Average	Average	Number of Elements / Runtime
	1,000	1.33	1	1.67	1.33	750
	2,000	3.67	6.33	3.67	4.56	438.9173372
	4,000	31.33	19.67	25.33	25.44	157.2121853
	8,000	84.33	87.67	76	82.67	96.77419355
	16,000	429.67	280	272.67	327.45	48.86291915
# of elements	32,000	1904	1146	1352.67	1,467.56	21.89459818

BinarySearchTree						
Find Runtime	(best case balanced)					
		Trials (ms)				
		Trial 1 Average	Trial 2 Average	Trial 3 Average	Average	Number of Elements / Runtime
		1,000	9	9	9	9.00
		2,000	19	18	19	18.67
		4,000	76	78	75	76.33
		8,000	315	316	316	315.67
		16,000	1363	1397	1359	1,373.00
# of elements	32,000	5388	5526	5475	5,463.00	

BinarySearchTree						
Find Runtime	(worst case)					
		Trials (ms)				
		Trial 1 Average	Trial 2 Average	Trial 3 Average	Average	Number of Elements / Runtime
		1,000	14	14	14	14.00
		2,000	36	38	37	37.00
		4,000	158	160	159	159.00
		8,000	711	720	726	719.00
		16,000	2715	2727	2704	2,715.33
# of elements		32,000	11055	10871	10676	10,867.33

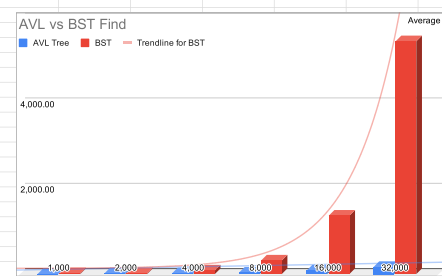
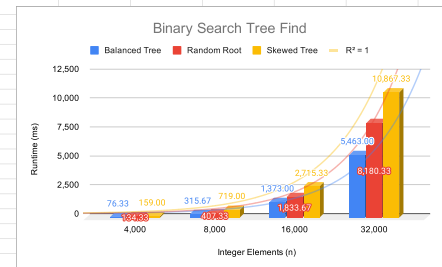
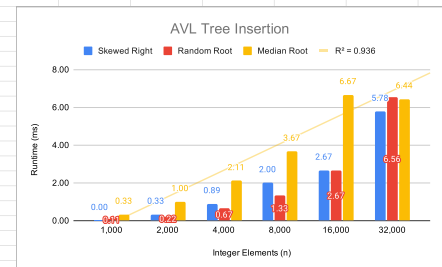
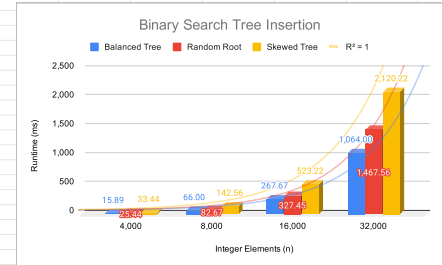
BinarySearchTree						
Find Runtime	(random root)					
		Trials (ms)				
		Trial 1 Average	Trial 2 Average	Trial 3 Average	Average	Number of Elements / Runtime
		1,000	10	10	10	10.00
		2,000	23	34	25	27.33
		4,000	88	158	157	134.33
		8,000	523	350	349	407.33
		16,000	1457	1444	2600	1,833.67
# of elements		32,000	10955	7482	6104	8,180.33

AVLTree						
Insert Runtime	(worst case)					
		Trials (ms)				
		Trial 1	Trial 2	Trial 3	Average	Number of Elements/ Runtime
		1,000	0.33	0.33	0.33	
		2,000	1	1	1	1.00
		4,000	2	2.33	2	2.11
		8,000	3.67	3.67	3.67	3.67
		16,000	6.67	7.33	6	6.67
# of elements		32,000	6.33	6.33	6.67	6.44

AVLTree									
Insert Runtime	(best case)								
		Trials (ms)							
		Trial 1	Trial 2	Trial 3	Average	Number of Elements/ Runtime			
		1,000	0	0	0	0.00			
		2,000	0.33	0.33	0.33	0.33			
		4,000	0.67	1	1	0.89			
		8,000	1.67	2.33	2	2.00			
		16,000	2.33	2.67	3	2.67			
# of elements		32,000	5.67	6	5.67	5.78			

AVLTree							
Insert Runtime	(random root in range)						
		Trials (ms)					
		Trial 1	Trial 2	Trial 3	Average	Number of Elements/ Runtime	
		1,000	0	0.33	0	0.11	
		2,000	0.33	0	0.33	0.22	
		4,000	0.67	0.67	0.67	0.67	
		8,000	1.33	1.33	1.33	1.33	
		16,000	2.67	2.67	2.67	2.67	
		32,000	6.67	6.33	6.67	6.56	
# of elements							

AVLTree							
Find Runtime							
		Trials (ms)					
		Trial 1	Trial 2	Trial 3	Average	Number of Elements/ Runtime	
		1,000	8	3	9	6.67	
		2,000	8	10	8	8.67	
		4,000	14	16	14	14.67	
		8,000	39	36	41	38.67	
		16,000	82	80	80	80.67	
# of elements		32,000	161	162	163	162.00	



3 warmups always!

MoveToFrontList

Insert Runtime

Runtime (ms)						
	Trial 1	Average	Trial 2	Average	Trial 3	Average
10,000	15	2	2.666	6.553333333	1525.47544	
50,000	9.666	9	15.333	11.333	4411.894467	
100,000	71.333	88.333	71.333	76.99966667	1298.786921	
250,000	88.333	66.666	77.333	77.444	3228.139842	
500,000	359.667	305.667	150.334	271.8893333	1838.983508	
1,000,000	474.667	584.666	580	546.4443333	1838.012572	

Find Runtime

Runtime (ms)						
	Trial 1	Average	Trial 2	Average	Trial 3	Average
10,000	0.333	0.333	0.666	0.444	22522.52252	
50,000	2.666	1.666	1.666	1.999333333	25888.33611	
100,000	13	4.666	3.666	7.110666667	14863.37896	
250,000	14.666	7	4	8.555333333	29221.53822	
500,000	19.666	10.333	9	12.99966667	38462.52468	
1,000,000	33.333	15	16.333	21.55533333	46392.23885	

FindTwice Runtime

10,000,000 elements

Runtime			
trial 1	trial 2	trial 3	average
6.15E-05	5.66E-05	7.23E-05	6.35E-05

BST

Insert Runtime

Runtime (ms)						
	Trial 1	Average	Trial 2	Average	Trial 3	Average
10,000	8.666	9.333	5.333	7.777333333	1285.787759	
50,000	46.664	26	7.333	26.66566667	1875.070315	
100,000	168	77	96.667	113.889	878.0479239	
250,000	143	113	213	156.3333333	1599.147122	
500,000	420.667	263.333	507.667	397.2223333	1258.748907	
1,000,000	6426.667	7620	6088.33	6711.665667	148.9943108	

Find Runtime

Runtime (ms)						
	Trial 1	Average	Trial 2	Average	Trial 3	Average
10,000	0.666	0.666	1	0.7773333333	12864.494	
50,000	3.335	1.333	5.667	3.445	14513.7881	
100,000	4	1.667	2.335	2.667333333	37490.62734	
250,000	8.666	6.333	33	15.99966667	15625.32553	
500,000	14.334	9.333	10	11.22233333	44554.01432	
1,000,000	59	33	24.666	38.88866667	25714.43265	

FindTwice Runtime

10,000,000 elements

Runtime			
trial 1	trial 2	trial 3	average
6.33E-05	6.42E-05	6.88E-05	6.54E-05

AVLTree

Insert Runtime

Runtime (ms)						
	Trial 1	Average	Trial 2	Average	Trial 3	Average
10,000	14	7	6.667	9.222333333	1084.324285	
50,000	71.667	41.333	10.334	41.11133333	1216.289642	
100,000	208.334	164	91	154.4466667	647.4818828	
250,000	221	128.666	175.334	174.9998	1428.573861	
500,000	644.334	413.333	388.333	482	1837.344398	
1,000,000	643.333	658.666	532.333	611.444	1635.47275	

Find Runtime

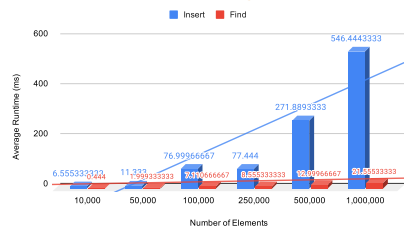
Runtime (ms)						
	Trial 1	Average	Trial 2	Average	Trial 3	Average
10,000	1.667	1	1	1.222333333	8181.074448	
50,000	7.667	5.667	1.667	5.000333333	9999.333378	
100,000	3	2.335	3.335	2.89	34602.07612	
250,000	5.333	6.667	6.667	6.222333333	40177.85397	
500,000	88.333	45.336	33.664	55.77766667	8964.161283	
1,000,000	27.332	19.668	18.668	21.88933333	45684.35159	

FindTwice Runtime

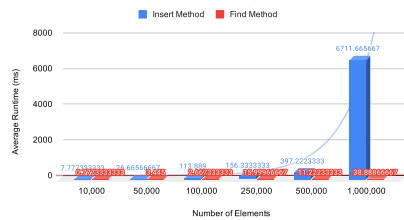
10,000,000 elements

Runtime			
trial 1	trial 2	trial 3	average
7.54E-05	7.71E-05	7.31E-05	7.52E-05

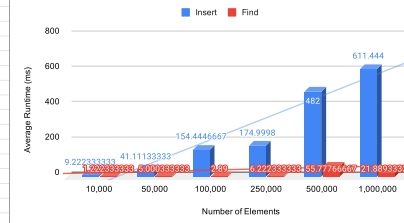
MoveToFrontList: Insert & Find Average Runtime



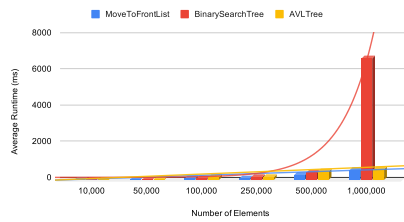
BinarySearchTree: Insert & Find Average Runtime



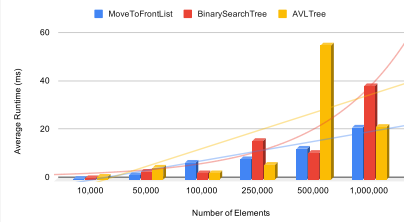
AVLTree: Insert & Find Average Runtime



Chain Types vs Average Insert Runtime



Chain Types vs Average Find Runtime



Chaining Hash Table

constant hash code

		Trials (ms)			
		Trial 1 Average	Trial 2 Average	Trial 3 Average	Average
# of elements	500,000	343	275	307.33	308.4433333
	1,000,000	582	516	566.67	554.89
	1,500,000	1019.33	920	960.33	966.5533333
	2,000,000	1406.67	1416	1333	1385.223333
	2,500,000	1771.67	1632	1630	1677.89
	3,000,000	1901.33	1915	1963	1926.443333

Chaining Hash Table

good hash code

		Trials (ms)			
		Trial 1 Average	Trial 2 Average	Trial 3 Average	Average
# of elements	500,000	270.67	281	290.33	280.6666667
	1,000,000	525.67	553.33	513.67	530.89
	1,500,000	967.33	978	864	936.4433333
	2,000,000	1380	1316	1416	1370.666667
	2,500,000	1671.33	1693.67	1639.33	1668.11
	3,000,000	1878.33	1880.33	1997	1918.553333

kjv.txt

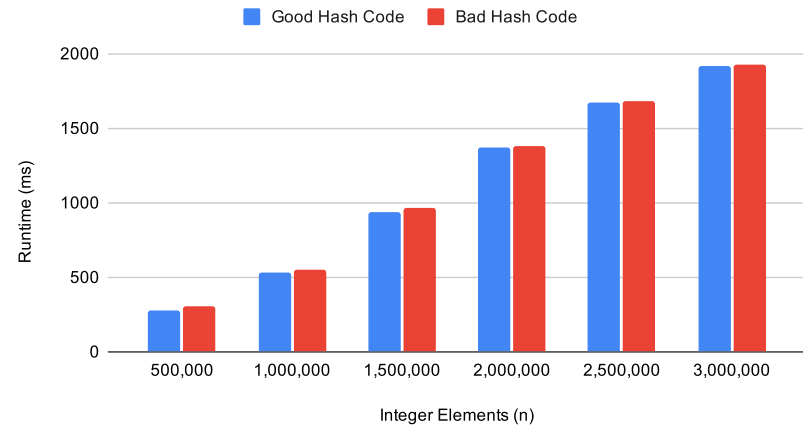
10	14.67	15	13.22333333
17	16.33	16.33	16.55333333

alice.txt

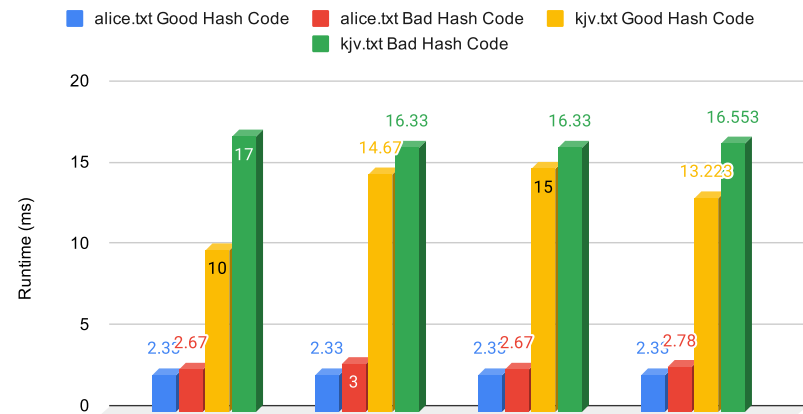
2.33	2.33	2.33	2.33
2.67	3	2.67	2.78

2.33	2.67	10	17
2.33	3	14.67	16.33
2.33	2.67	15	16.33
2.33	2.78	13.223	16.553

Chaining Hash Table Integer Find



Chaining Hash Table String Find



INSERT METHOD													
BST				AVL				CHT				HTM	
	Runtime (ms)				Runtime(ms)				Runtime (ms)				Runtime (ms)
Trial 1	212.666			Trial 1	145.666			Trial 1	108			Trial 1	236
Trial 2	237.334			Trial 2	67.333			Trial 2	61.664			Trial 2	135
Trial 3	124			Trial 3	73			Trial 3	48.336			Trial 3	209.334
Trial 4	73			Trial 4	152			Trial 4	44.336			Trial 4	66
Trial 5	68.667			Trial 5	92.333			Trial 5	42.336			Trial 5	29.668
Avg Runtime	143.1334			Avg Runtime	106.0664			Avg Runtime	60.9344			Avg Runtime	135.2004
FIND METHOD													
BST				AVL				CHT				HTM	
	Runtime (ms)				Runtime(ms)				Runtime (ms)				Runtime (ms)
Trial 1	4.667			Trial 1	8.334			Trial 1	5			Trial 1	7
Trial 2	4.667			Trial 2	3			Trial 2	1.667			Trial 2	4.667
Trial 3	3			Trial 3	2.335			Trial 3	1.667			Trial 3	8.666
Trial 4	9.334			Trial 4	1.667			Trial 4	0.333			Trial 4	6.667
Trial 5	8.334			Trial 5	1.667			Trial 5	2			Trial 5	9
Avg Runtime	6.0004			Avg Runtime	3.4006			Avg Runtime	2.1334			Avg Runtime	7.2