Lab Report

Zhenhao Zhang 32277234 zzh133@u.rochester.edu Lab - 24

```
[dhcp-10-5-181-188:Lab 2 zzh$ javac TwoSum.java
[dhcp-10-5-181-188:Lab 2 zzh$ java TwoSum 1Kints.txt
       1     0.0   20230912_233341  zzh133  1Kints.txt
[dhcp-10-5-181-188:Lab 2 zzh$  java TwoSum 2Kints.txt
       2     0.0   20230912_233358  zzh133  2Kints.txt
[dhcp-10-5-181-188:Lab 2 zzh$  java TwoSum 4Kints.txt
       3     0.0   20230912_233415  zzh133  4Kints.txt
[dhcp-10-5-181-188:Lab 2 zzh$  java TwoSum 8Kints.txt
      19     0.0   20230912_233426  zzh133  8Kints.txt
[dhcp-10-5-181-188:Lab 2 zzh$  java TwoSum 16Kints.txt
      66     0.1   20230912_233433  zzh133  16Kints.txt
[dhcp-10-5-181-188:Lab 2 zzh$  java TwoSum 32Kints.txt
     273     0.5   20230912_233444  zzh133  32Kints.txt
```

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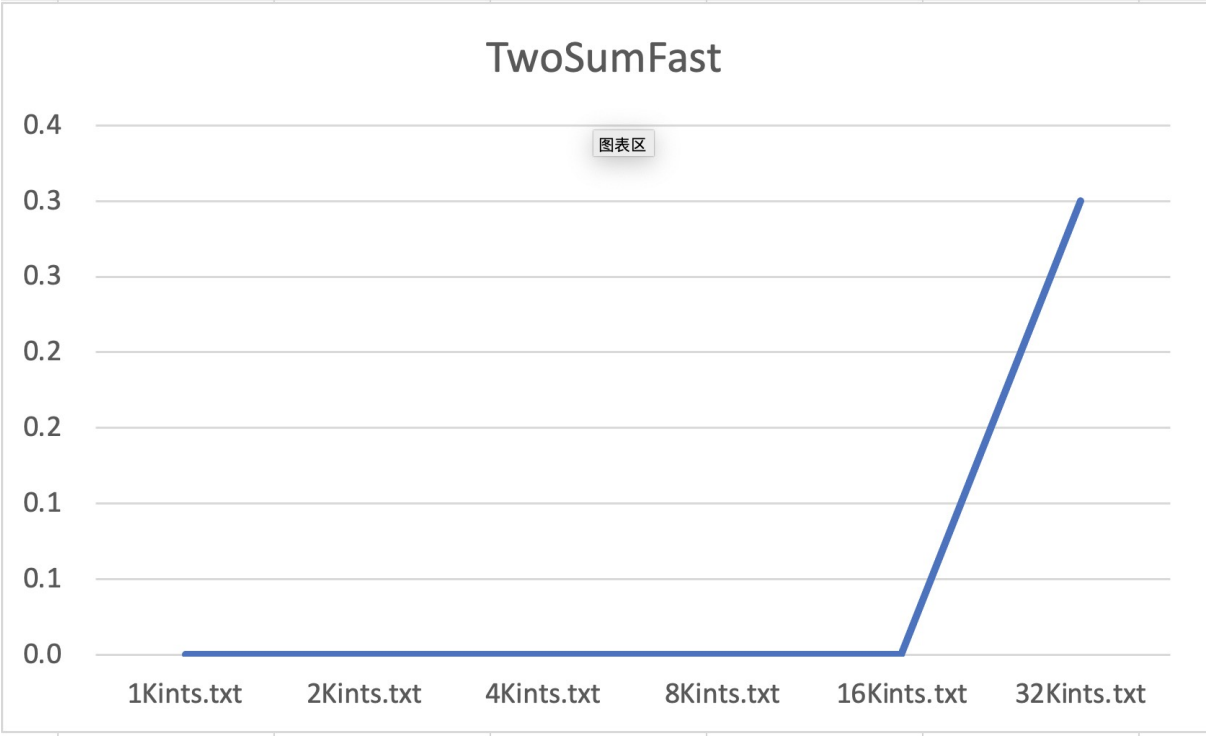
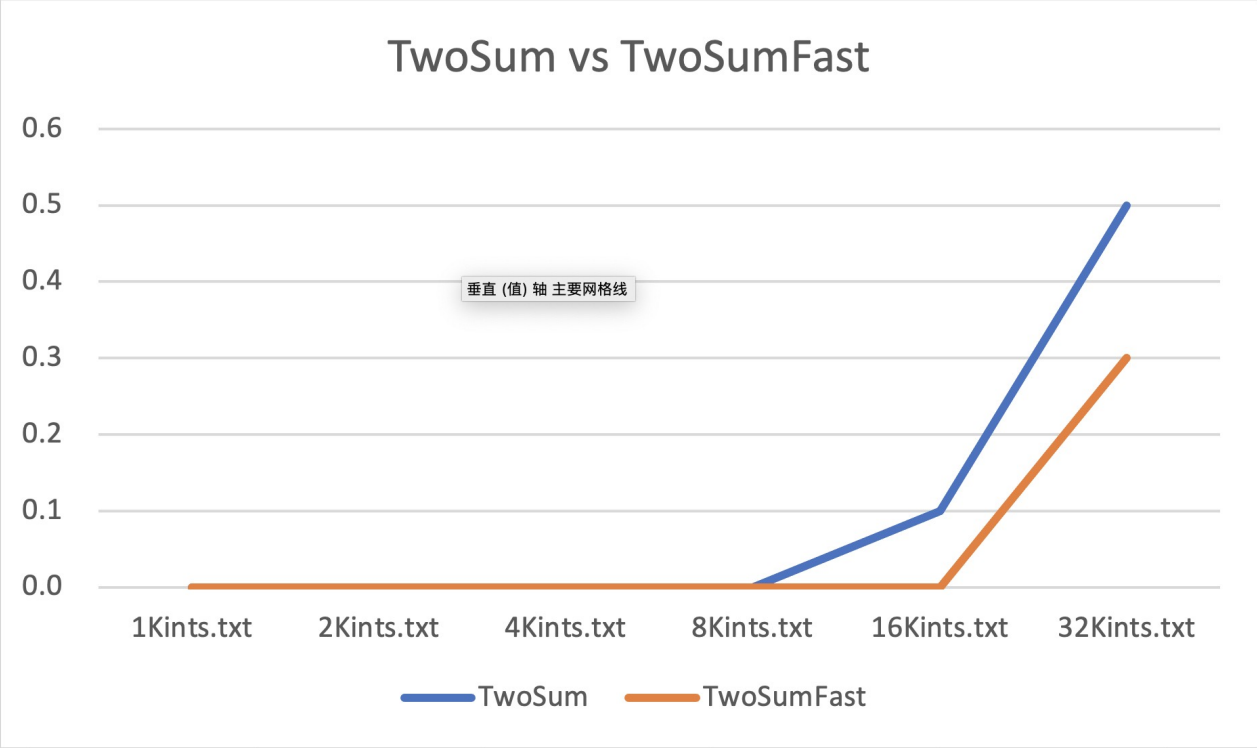
[dhcp-10-5-181-188:Lab 2 zzh$ java TwoSumFast 1Kints.txt
       1     0.0   20230912_234643  zzh133  1Kints.txt
[dhcp-10-5-181-188:Lab 2 zzh$ java TwoSumFast 2Kints.txt
       2     0.0   20230912_234655  zzh133  2Kints.txt
[dhcp-10-5-181-188:Lab 2 zzh$ java TwoSumFast 4Kints.txt
       3     0.0   20230912_234701  zzh133  4Kints.txt
[dhcp-10-5-181-188:Lab 2 zzh$ java TwoSumFast 8Kints.txt
      19     0.0   20230912_234705  zzh133  8Kints.txt
[dhcp-10-5-181-188:Lab 2 zzh$ java TwoSumFast 16Kints.txt
      66     0.0   20230912_234711  zzh133  16Kints.txt
[dhcp-10-5-181-188:Lab 2 zzh$ java TwoSumFast 32Kints.txt
     273     0.0   20230912_234716  zzh133  32Kints.txt
```

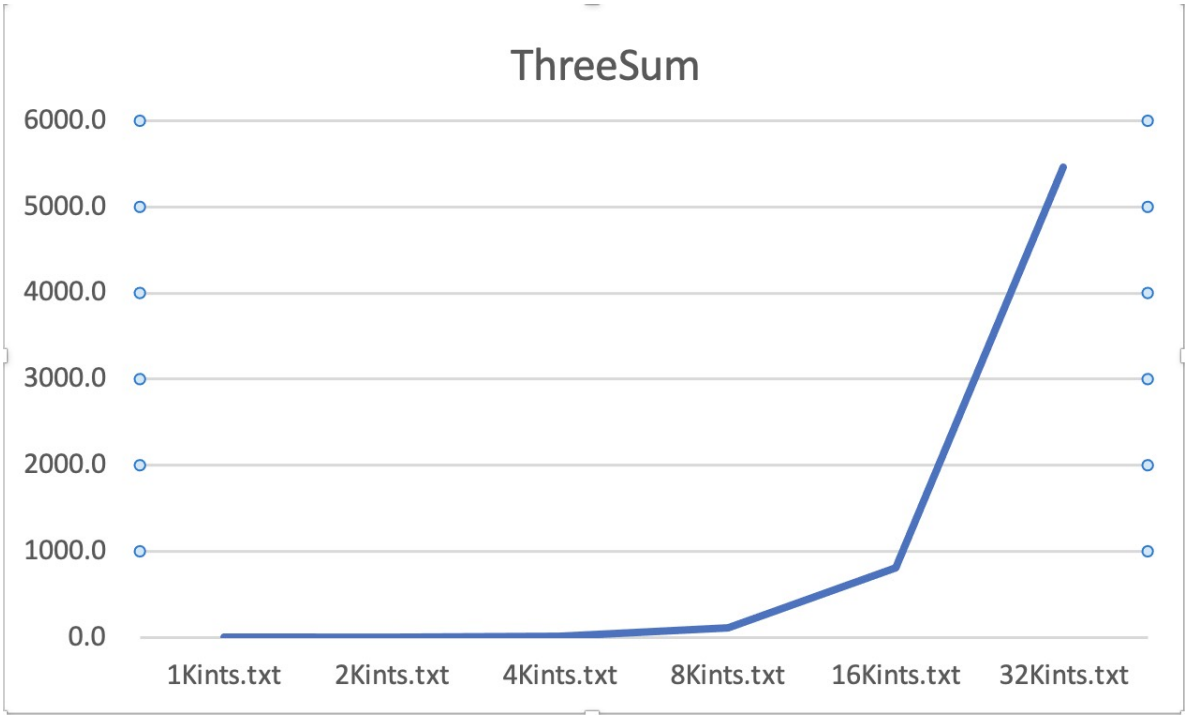
```
[dhcp-10-5-227-248:Lab 2 zzh$ java ThreeSum 1Kints.txt
      70     0.2   20230913_211818  zzh133  1Kints.txt
[dhcp-10-5-227-248:Lab 2 zzh$ java ThreeSum 2Kints.txt
     528     1.5   20230913_211823  zzh133  2Kints.txt
[dhcp-10-5-227-248:Lab 2 zzh$ java ThreeSum 4Kints.txt
    4039    12.2   20230913_211840  zzh133  4Kints.txt
[dhcp-10-5-227-248:Lab 2 zzh$ java ThreeSum 8Kints.txt
   32074   108.0   20230913_212033  zzh133  8Kints.txt
[dhcp-10-5-227-248:Lab 2 zzh$ java ThreeSum 16Kints.txt
  255181   803.3   20230913_213505  zzh133  16Kints.txt
[dhcp-10-5-227-248:Lab 2 zzh$ java ThreeSum 32Kints.txt
 2052358  5460.7   20230913_231003  zzh133  32Kints.txt
```

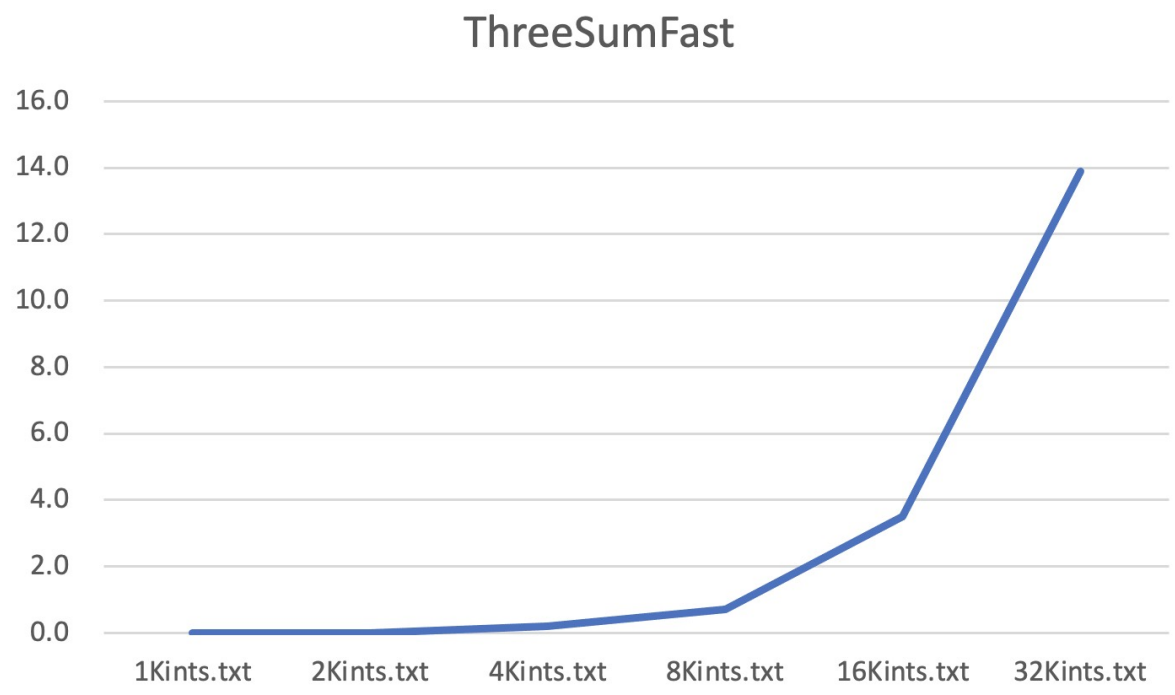
```
[dhcp-10-5-227-248:Lab 2 zzh$ java ThreeSumFast 1Kints.txt
      70      0.0   20230913_205436  zzh133  1Kints.txt
[dhcp-10-5-227-248:Lab 2 zzh$ java ThreeSumFast 2Kints.txt
     528      0.0   20230913_205445  zzh133  2Kints.txt
[dhcp-10-5-227-248:Lab 2 zzh$ java ThreeSumFast 4Kints.txt
    4039      0.2   20230913_205449  zzh133  4Kints.txt
[dhcp-10-5-227-248:Lab 2 zzh$ java ThreeSumFast 8Kints.txt
   32074      0.7   20230913_205454  zzh133  8Kints.txt
[dhcp-10-5-227-248:Lab 2 zzh$ java ThreeSumFast 16Kints.txt
  255181      3.5   20230913_205503  zzh133  16Kints.txt
[dhcp-10-5-227-248:Lab 2 zzh$ java ThreeSumFast 32Kints.txt
 2052358     13.9   20230913_205915  zzh133  32Kints.txt
```

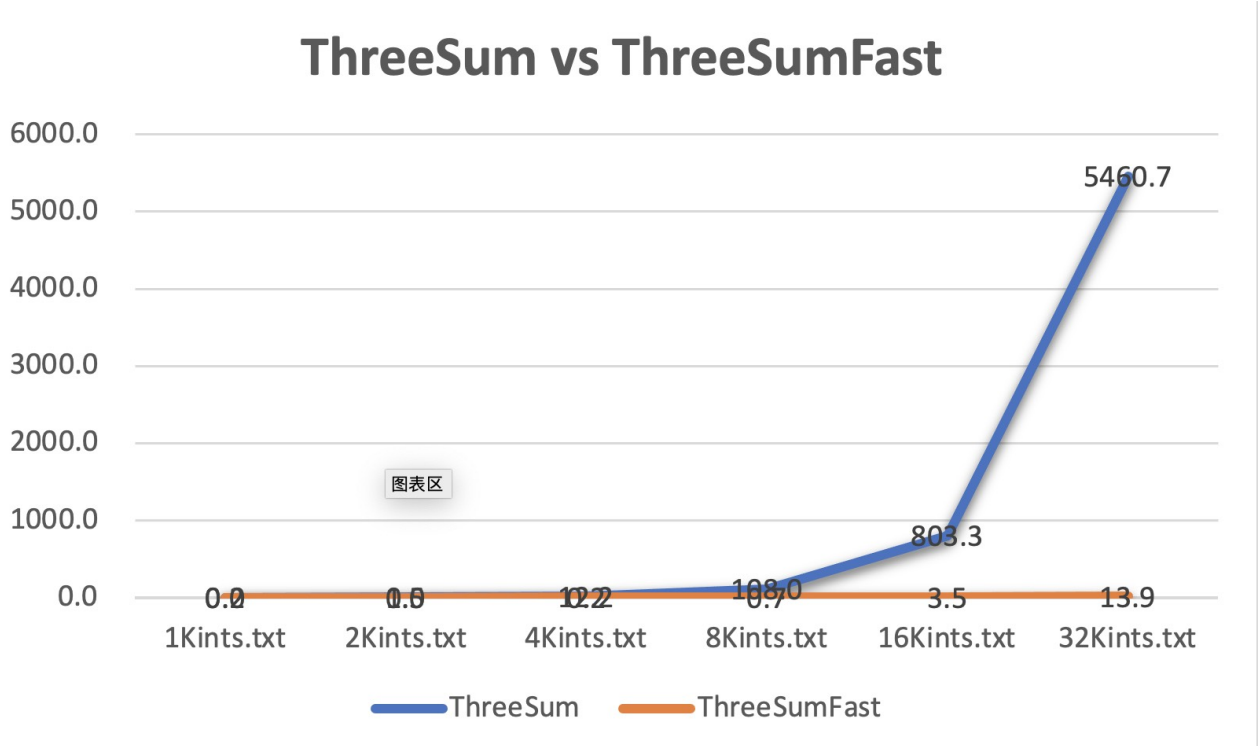

TwoSum
0.6
0.5
0.4
0.3
0.2
0.1
0.0
绘图区
1Kints.txt
2Kints.txt
4Kints.txt
8Kints.txt
16Kints.txt
32Kints.txt


TwoSumFast
0.4
0.3
0.3
0.2
0.2
0.1
0.1
0.0
图表区
1Kints.txt
2Kints.txt
4Kints.txt
8Kints.txt
16Kints.txt
32Kints.txt


TwoSum vs TwoSumFast
0.6
0.5
0.4
0.3
0.2
0.1
0.0
垂直 (值) 轴 主要网格线
1Kints.txt
2Kints.txt
4Kints.txt
8Kints.txt
16Kints.txt
32Kints.txt
TwoSum
TwoSumFast


ThreeSum
6000.0
5000.0
4000.0
3000.0
2000.0
1000.0
0.0
1Kints.txt
2Kints.txt
4Kints.txt
8Kints.txt
16Kints.txt
32Kints.txt


ThreeSumFast
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
1Kints.txt
2Kints.txt
4Kints.txt
8Kints.txt
16Kints.txt
32Kints.txt


ThreeSum vs ThreeSumFast
6000.0
5000.0
4000.0
3000.0
2000.0
1000.0
0.0
5460.7
803.3
108.0
0.7
3.5
13.9
图表区
1Kints.txt
2Kints.txt
4Kints.txt
8Kints.txt
16Kints.txt
32Kints.txt
ThreeSum
ThreeSumFast

Q1 - O(N^2)

Estimate：32K：0.1 * (32/16)^2 = 0.4s
Accurate：32K: 0.5s
Error = 0.1s
Estimate：1M: 0.4 * (32)^2 = 409.6s
(1M = 1024K = 32*32K)
Accurate: 509.4s
Error = 99.8s

Q2 - O(N log(N))

8K:16K = (8k)log(8K) : (16k)log(16K) = 2(log(16)+log(N)/(log(N))) > k:1
but when N is big enough, log(k) << log(N) we can assume:
klog(kN):log(N) = k((log(k)+log(N))/log(N)) = klog(N):log(N) = k:1

Estimate: 32K: 0.0 * (32/16) = 0.0s
Accurate: 32K: 0.3s
Error = 0.3s
Estimate 1M: 0.3 * (32) = 9.6s

Q3 - O(N^3)

Estimate: 32K: 803.3* 2^3 = 6426.4s
Accurate: 32K: 5460.7s
Error = 965.7s
1M: 5460.7 * 32^3 = 178936217.6s

Q4 - O(N^2 log(N))

It's the same as Question 2, thus we can assume that k^2log(N):log(N) = k^2:1

Estimate: 32K: 3.5*2^2 = 14s
Accurate: 32K: 13.9s
Error = 0.1s
Estimate: 1M: 13.9 * 32^2 = 14233.6s