CS21: INTRODUCTION TO COMPUTER SCIENCE

Prof. Mathieson
Fall 2017
Swarthmore College
Outline Nov 17:

- Quiz 4: first 25-30min
- Recap sorting from last time
- Insertion Sort demo
- Runtimes in action
- Can we create a faster sorting algorithm?

Notes

- Lab 8 due **tomorrow** night!
- Office hours **today** 3-5pm (in lab 240)
- Lab 9 posted, due Mon after Thanksgiving
Sorting
Insertion Sort demo

- [https://visualgo.net/bn/sorting](https://visualgo.net/bn/sorting)
Runtime Comparison demo


<table>
<thead>
<tr>
<th>Play All</th>
<th>Insertion</th>
<th>Selection</th>
<th>Bubble</th>
<th>Shell</th>
<th>Merge</th>
<th>Heap</th>
<th>Quick</th>
<th>Quick3</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>Random</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>Nearly Sorted</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>Reversed</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>Few Unique</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
</tbody>
</table>
Runtime in action

• /cs21/inclass/week10/sort_runtime.py

• Idea: if we double the length of the list, we should see the runtime quadruple (x4)
Can we do better than $O(n^2)$?

- Idea: thinking along the lines of binary search, what if we could divide the list in half and sort both pieces, then merge them together?