CS 100: Algorithms and Search

Chris Kauffman

Week 7-1
## Mini-exam 2 Back

### Statistics

<table>
<thead>
<tr>
<th>Stat</th>
<th>Val</th>
<th>Perc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Count</td>
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<td></td>
</tr>
<tr>
<td>Max</td>
<td>40.00</td>
<td>100.00</td>
</tr>
<tr>
<td>Avg</td>
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<td>80.75</td>
</tr>
<tr>
<td>Median</td>
<td>35.00</td>
<td>87.50</td>
</tr>
<tr>
<td>Stddev</td>
<td>7.71</td>
<td>19.28</td>
</tr>
</tbody>
</table>

### Bins

<table>
<thead>
<tr>
<th>Range</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>90 - 100</td>
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</tr>
<tr>
<td>80 - 89</td>
<td>15</td>
</tr>
<tr>
<td>70 - 79</td>
<td>9</td>
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<tr>
<td>60 - 69</td>
<td>6</td>
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<td>50 - 59</td>
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<td>40 - 49</td>
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<td>30 - 39</td>
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</tr>
<tr>
<td>20 - 29</td>
<td>1</td>
</tr>
</tbody>
</table>

Questions?
Logistics

Midterm Grades

- Post over the weekend
- Based on HW 1-3, Mini-exam 1&2, In-class
- Advisory only

HW 4 Due Friday 5pm

- Pair assignment
- Processing lists
- Mini-web search

Reading

- Pattern Ch 5: Algorithms And Heuristics
- Pattern Ch 6: Memory, Information, and Secret Codes
- Zyante: None

Goals Today

- Algorithms, Heuristics, Complexity
- Search Problems
Sock Sorting: In-class Exercise

Problem

- Here’s a bunch of socks
- Someone "sort" them
- **Restriction**: Cannot dump all socks on the table

Everyone Else

- Write down the algorithm the sorter uses
- Work in **pairs** or threes
- Include your Names and NetIDs
Here’s a Second Way

- Chris will sort the socks
- On the same sheet
  - Write down the algorithm you observe Chris Use
  - How is it different from the first algorithm?
- Discuss in 5 minutes
Which Sock Algorithm is Better?

"Better"?

▶ What’s the notion of better for this sock sorting?
▶ Which algorithm would you choose for each of the following situations?

Algorithms:
1. Search the Basket
2. Put on the Table

Scenario 1: Replicates
▶ Basket has 100 total socks
▶ 25 pairs of blue (50 socks)
▶ 25 pairs of red (50 socks)

Scenario 2: All Orphans
▶ Basket has 100 total socks
▶ 5 pairs of blue (10 socks)
▶ 5 pairs of red (10 socks)
▶ 80 dissimilar socks (80 socks)

Scenario 3: All Unique
▶ Basket has 100 total socks
▶ There are 50 different colors of socks (including Chartreuse)
▶ There is one pair of each color (100 socks)
Python Lists are good to model this

- "Pattern" initial example of algorithms: sorting socks
- File socks.py encodes two versions of sorting socks
- Uses functions that change lists
  
  ```python
  lst1.append(thing)  # add thing to the end of list l
  thing = lst2.pop(3) # remove 3rd item, assign to thing
  ```

- Compare to "Pattern" pg 77-78 to see if you follow the logic
- Somewhat complex problem, too hard for a HW

Make sure to turn in your participation sheets

- Names and NetIDs of all group members
- Worth credit for grade
I couldn’t Remember

- Wanted a particular album from my stack of CDs
- Shelf is roughly alphabetical by artist
- Could not remember the name of the artist
- Did remember the album was something like "Now He Sings, Now He Sleeps"
- Genre: jazz, piano trio
- How do I find the CD?
- Discuss with a neighbor
Searches

Linear Search
- Start at the beginning
- Examine, each item sequentially against the search query
- If the query matches the item, report where it is located and quit
- When all items have been scanned report that nothing matched

Question
- Are these algorithms or heuristics?
- What's an algorithm? What's a heuristic?
- What's the difference?

Alternative: "Indexed" Search
- Know a better starting point
  - The artist's name starts with 'C'
  - CDs organized by name
- Search items sequentially at that starting point
- When it's obvious item is not present bail out
  - At 'D' artists, CD must be in the car
Google query "now he sings now he sleeps jazz piano"  
Results: *Now He Sings, Now He Sobs* by Chick Corea  
Chick = 20 Grammy wins, 59 nominations  
He’s kind of a big deal
Music and Programming

- Have a lot in common
- Both written down in a coded form
- A language that is opaque to the uninitiated
- Both involve conditionals, repetition, jumps
- Static and dynamic behavior
- The code is not the action
- Surprising action comes from simple code
- Encoding dynamic as static is difficult
Bigger Questions

➤ How did Google know?
➤ How does Google work?
➤ Tell me in a few minutes
➤ Use google search to help you
Next Time

- **Mini assignment**: Be able to describe how Google search works next time, worth some big bonus cards
- HW 4: Python lists due Friday
- Computers that are Connected
- Encryption and Compression