

# CS 100: Algorithms and Search

Chris Kauffman

Week 7-1

## Mini-exam 2 Back

### Statistics

Stat	Val	Perc.
Count	69	
Max	40.00	100.00
Avg	32.30	80.75
Median	35.00	87.50
Stddev	7.71	19.28

### Bins

Range	Count
90 - 100	31
80 - 89	15
70 - 79	9
60 - 69	6
50 - 59	2
40 - 49	2
30 - 39	2
20 - 29	1

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



Source

## 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



Source

# 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)

# 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

```
lst1.append(thing) # add thing to the end of list 1
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



Source



# 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

## 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

## Question

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

# Chick



- ▶ 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


216

**\* *NOW HE SINGS;  
NOW HE SOBS***

CHICK COREA

In One

LAST X ONLY



\* From Chick's Lead Sheet

# 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