2019-05-07 Bucket Sorts

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- The idea is that we're sorting based on categorical "buckets"
- Example:
    - Sorting based on last name, class standing, age, etc.
- Buckets could also be numbers (e.g. 0, 1, 2, 3, etc.)
- Observation: not everything can be placed in categorical buckets or it is not useful to do so.
    - Thus, these buckets sorts are not "generalizable"
        - Doesn't work for all data types

Radix Sort

- Has 10 buckets with values 0, 1, 2, ... 9
- Begin by considering each number's 10^0s digit (1s place), put into appropriate bucket
- Next, examine 10^1s place (10s place), do same thing
- Keep going until all numbers divided by 10^N equal 0

Example:

{9, 89, 101, 243, 900, 878, 444, 332, 383, 123, 671, 290, 199, 57}

Bucket	1s	10s	100s	1000s
0	900, 290	900, 101, 9	9, 57, 89	9, 57, 89, 101, 123, 199, 243, 290 332, 383, 444, 671, 878, 900
1	101, 671		101, 123, 199	
2	332	123	243, 290	
3	243, 383, 123	332	332, 383	
4	444	243, 444	444	
5		57		
6			671	
7	57	671, 878		
8	878	383, 89	878	
9	9, 89, 199	290, 199	900	

- Efficiency O(M*N) M = # of digits, N = # of items
- Radix sort works well when numbers don't have very many digits
- Whether or not radix sort is faster than an NLogN sort depends on whether Log2(N) is larger or smaller than M.