Lesson 5: Algorithms, inc. Sorting

Chris Harrison

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5 Algorithms

Algorithsm are a process or rules to follow. They should:

- take an input, give an output. For example ...
- be deterministic, i.e. for the same input the output will always be the same, cf functional programming
- and finite, cf computability.

They could be recursive, then they need a base case and recursive step. Typically the recursive step makes the problem smaller, converging on the base case.

An algorithm could:

- involve **heuristics**, finding decent solutions quickly, but not sure to be optimal
- be greedy, so exploit strong local solutions, with no regard to the bigger picture, e.g. hill-climbing
- ad-hoc, an impromptu strategy, unique to a particular problem, hard to generalise.

5.1 Flowcharts

Shapes

5.2 Orders of Growth

Order of growth - worst case, proportional to some function of the input size
Comparison is done in extreme cases, e.g. n log n vs n2
Offline vs online problems
Bubble sort, then shuttle Quick sort
Packing : next fit, first fit, first fit decreasing, full bin
Bin Packing - as a decision problem - is NP Complete
Knapsack problem - portfolio management,