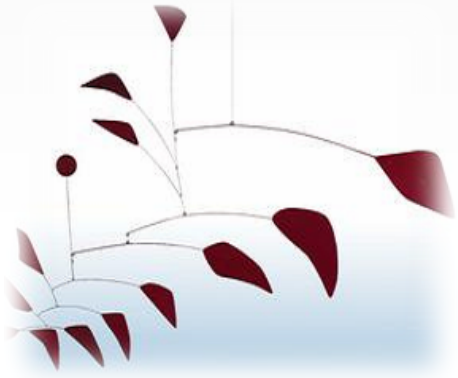


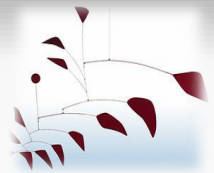
EECS 4101-5101
Advanced Data Structures

Shahin Kamali

A Quick Review and Last Words

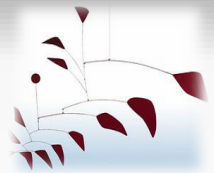
York University

Picture is from the cover of the textbook CLRS.



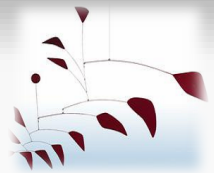
Summary of Topics

- **Introduction:**
  - **Amortization:** consider complexity in the long-run; don't focus on a single operation.



Summary of Topics

- **Introduction:**
  - **Amortization:** consider complexity in the long-run; don't focus on a single operation.
  - **Self-Adjustment:** update your data structure to reflect on patters seen in the input.
  - **Competitiveness:** most decisions in the real-world are online; try to settle worst-case guarantees.



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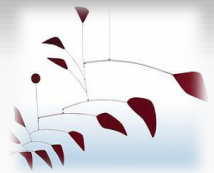
- **Dictionaries:**
  - Move-to-Front Heuristic on Linear Lists.



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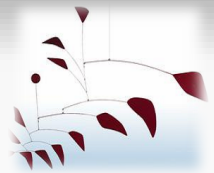

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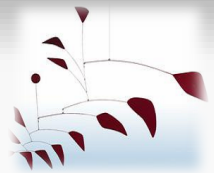
  - Binary Heaps: support insert, extract-min (or extract-max), and decrease-key in $O(\log n)$.



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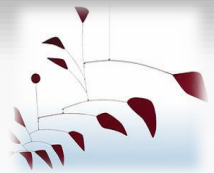
  - Fibonacci Heaps: improve the amortized running time to a constant.



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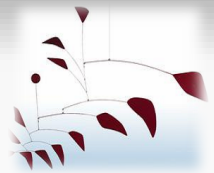
  - Disjoint sets have applications in algorithm design, e.g., in Kruskal's MST algorithm.



Summary of Topics

- **Disjoint Sets:**
  - Disjoint sets have applications in algorithm design, e.g., in Kruskal's MST algorithm.
  - union and find operations can be supported in **almost** constant amortized time, using path-compression and union-by-rank.

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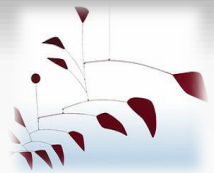
  - Randomized data structures offer security against adversarial attacks, and are often can be reflective to predictions about the input queries.



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  - Use Patricia trees to maintain dictionaries of strings.
  - Store a single string in a suffix tree to answer queries such as pattern matching.

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Observation

You should aim for the stars - and hopefully avoid ending up in the clouds! Roxanne McKee

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- I hope to see you in future courses.