CS 6150 Algorithms

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Undergrad algos

Recurrences: $T(n) = 2T(n/2) + cn$

Divide & Conquer: Merge sort

Dynamic Programming: Knapsack: Seam Carving (?)

Greedy Algorithms: Variants of Job Scheduling

- Strings
- Graph
- Number problem
- Geometry

} abstractions

Complexity theory: Study of problems

2014

- Recurrences
- D & C
- Dynamic Prog
- Greedy Alg

} X

- Flows
- NP-hardness } X
- Randomization
- Approximation

2015

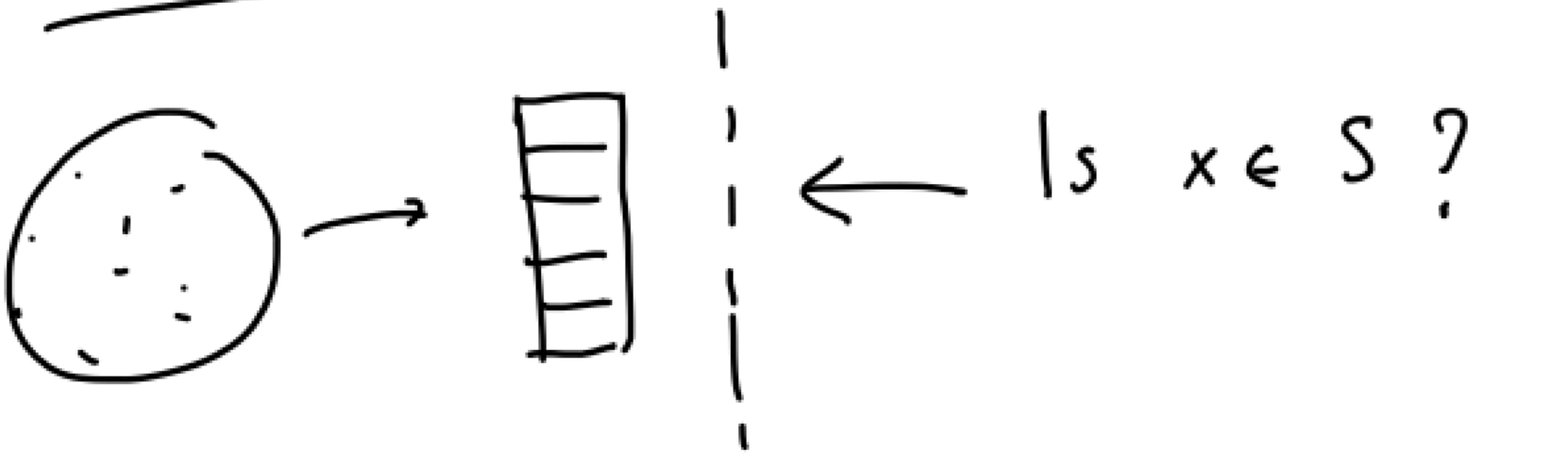
- Randomization
- Approximation
- LPs, flows, duality
- Advanced Optimization
  - SDPs
  - MWU
- high dimensional
- Learning theory

Randomized Algorithm:

Not: algorithm with data drawn from a distribution

Is: an algorithm wik a bad gambling addiction

HASHING

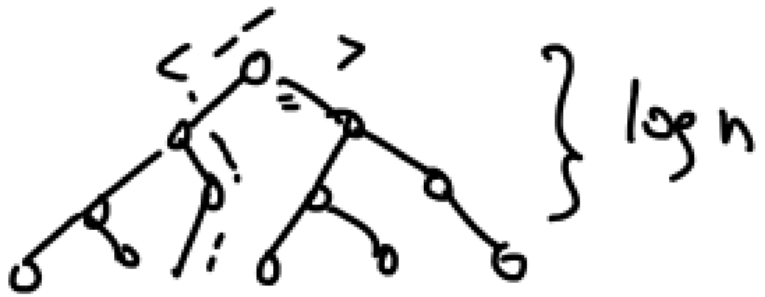


Universe U $|U| = u$

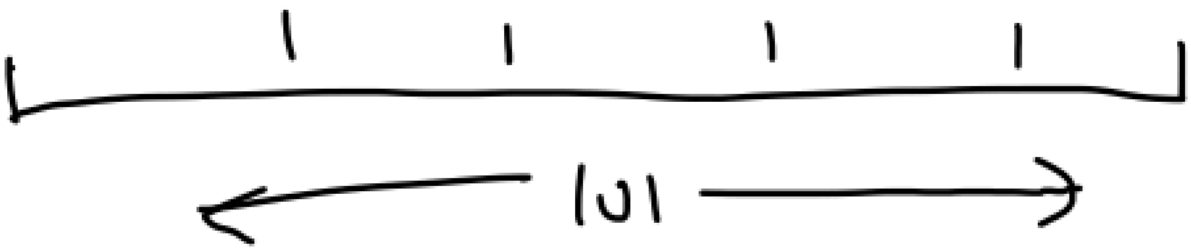
$u >> n$

Set of elements S $|S| = n$

– Binary Search Tree :

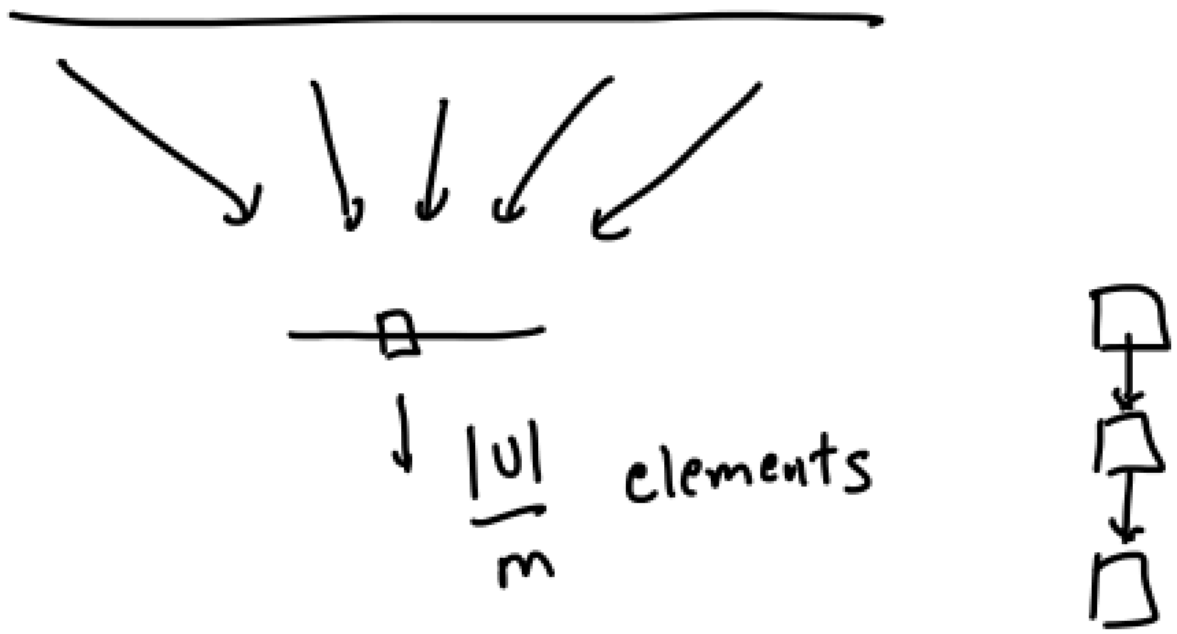


	Space	Query	
BSTs:	n	log n	ordered universe
BigTable	U	1	— Construct a numbering



?.?.	n	1	

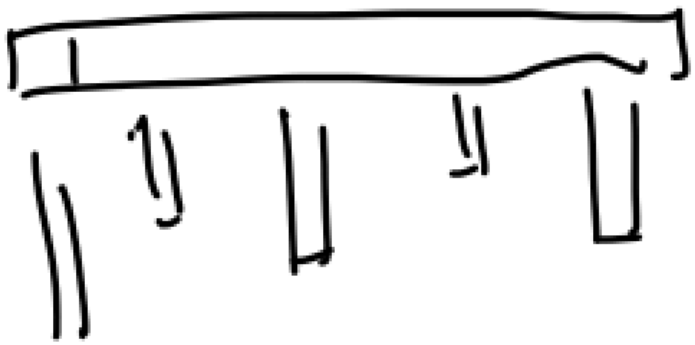
Table of Size m $h: U \to m$



Pick hash function from $U \to [m] = \{0, 1, \ldots m-1\}$ at random

What is the probability that two elements collide?

for any x, y $\Pr[h(x) = h(y)] = \frac{1}{m}$



Expected number of collisions $\approx \frac{n}{m}$

Choose $m \sim n$

$\Leftarrow$ [# collisions] is constant.