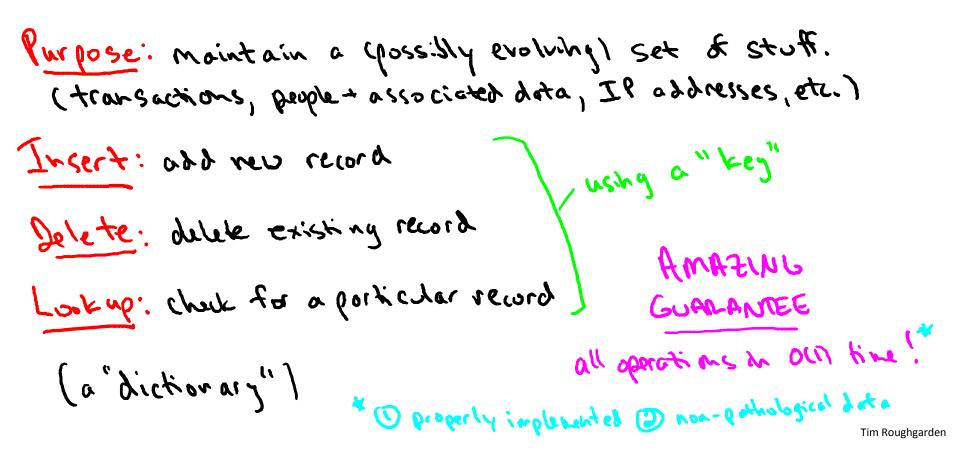


# Data Structures

# Hash Tables and Applications

Design and Analysis of Algorithms I

## Hash Table: Supported Operations



#### **Application:** De-Duplication

Given! a "stream" of objects. / thear scan through a huge file or, objects arriving in real time

Tim Roughgarden

#### Application: The 2-SUM Problem Input: unsorted array Alot n integers. Target sum t. Goel: determine whether or not there are the numbers Xy in A with X+Y=+ Naive solution: O(n2) time via exhaustive search. Better: D sort A (O(nlogn) time) @ for each x in A, Olut Olulogn) ---- look for t-x in A via Jive binaray Search Amating: (Dirsect elements of A @ for each x in A, Lookup into hosh table H +-+ in H - Ocnitine Tim Roughgarden

### - historical application i symbol tables in compilers - historical application i symbol tables in compilers - blocking network traffic - search algorithms legging and tree exploration - use hash table to avoid exploring any configuration (e.g., arrangement & closs pieces) more than once

-exc.

Tim Roughgarden