Asymptotic Complexity

• Rate of growth as a function of size of input
• $f(x) \in O(n^2)$ means the execution time of the algorithm A grows no faster than $kn^2$, where $n$ is the size of the input. I.e., this an upper bound
Upper Bound vs. Tight Upper Bound

• Technically speaking, big O notation gives us an upper bound.
  – Can abuse it by choosing a very conservative upper bound
  – Big theta, \( \Theta \), defines a tight upper bound

• Most people use \( O \) rather than \( \Theta \) when talking about the efficiency of an algorithm as opposed to inherent difficulty of a problem.
Complexity of a Problem

• A problem is in complexity class C if there exists an O(C) algorithm that solves that problem.
• Typically we show that a problem is O(C) by exhibiting an O(C) algorithm that solves the problem.