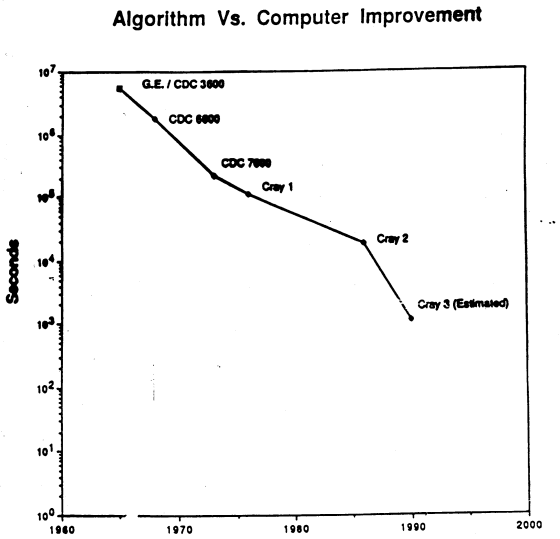
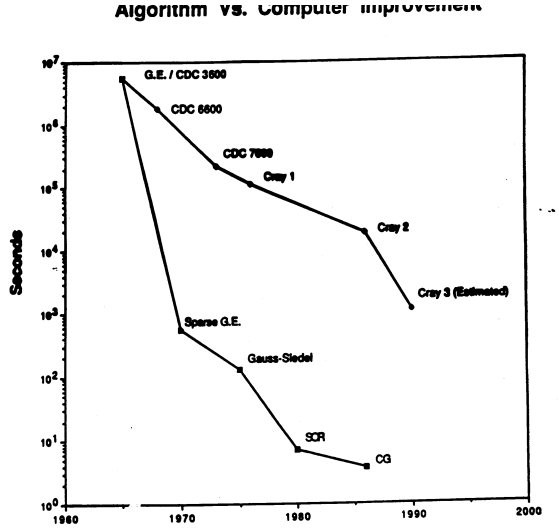
# CSE 421

Introduction to Algorithms




(from Sandia via Martin Shultz)




(from Sandia via Martin Shultz)

## How do you Quantify "Efficiency"?

Approach 1: Implement, Measure & Extrapolate

Pro: Can be very accurate

Con:

- how good was the implementation
- how portable are the results
- how "typical" were the test cases
- what's the worst case (real-time)
- how reliable are extrapolations
- what insight do the numbers give

Lots of work!

# Quantifying Efficiency (cont.)

Approach 2: "Asymptotic analysis"

In the limit
how does run time (space, ...)

grow
as a function of
problem size,
in worst case.

E.g.: "simple matrix multiply takes $n^3$ steps."

Cons:
"size" may not be key parameter
worst case may be rare
"limit" may be impractically large

Pro: We've often lucky & "cons" aren't!
Easy. First-order comparisons