CS5314
Randomized Algorithms

General Info, Scope, Textbook Assessment, …

General Information

- Web page:
  - www.cs.nthu.edu.tw/~wkhon/random11.html
- Lecturer:
  - Wing-Kai Hon (韓永楷), wkhon@cs.nthu.edu.tw
- TA:
  - Wisely Ku (古宗翰), thku@cs.nthu.edu.tw
  - Bay-Yuan Hsu (許倍源), bayyuan@cs.nthu.edu.tw
- Meeting times:
  - Mon 1520 — 1710, Thu 1410 —1500
- Consultation: Appointment by email

What shall we study ?

- How randomness and probability can help in the design and analysis of an algorithm

- Design: Can we use randomness to speed up the runtime of an algorithm? --- of course, we need to pay a price for the gain …

- Analysis: Can we use probabilistic arguments to show that a particular algorithm works well for almost all inputs, although it may work poorly for the worst-case input

Textbook & References

- Textbook
  - Probability and Computing
    by Mitzenmacher & Upfal
  - We will follow very closely to this book
- References
  - Randomized Algorithms, by Motwani & Raghavan
  - The Probabilistic Methods, by Alon & Spencer

Part I: Basic Topics

- Chapters 1-3
  - Events, Random Variables, Expectations, Moments, …
- Though basic, these topics have many interesting applications:
  - finding min cut-set of a graph
  - analyzing the runtime of quicksort
  - computing the median, …

Part II: Core Topics

- ## Chapters 4-7
  - Chernoff bounds, Balls-and-Bins, Probabilistic Methods, Markov chains
- ## Some example applications:
  - Analysis of Bucket Sort
  - Hashing
  - Solving 3-Satisfiability

Assessments

5 Assignments: Best four (total) 50%

Remaining one =   5%

3 Exams   =   45%

Total   100%

Study Tips

- Have a fresh mind in lectures & tutorials (don't eat too much before class :-))
- Don't be shy, ask questions
- Try your best to do every assignment

    (Can work in groups and exchange high-level ideas, but must do it yourself separately in the end)

- Read ahead, and try the exercises
- Most importantly: Have fun!