CS5314
Randomized Algorithms

General Info, Scope, Textbook Assessment, ...
General Information

• Web page:

• 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%

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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!