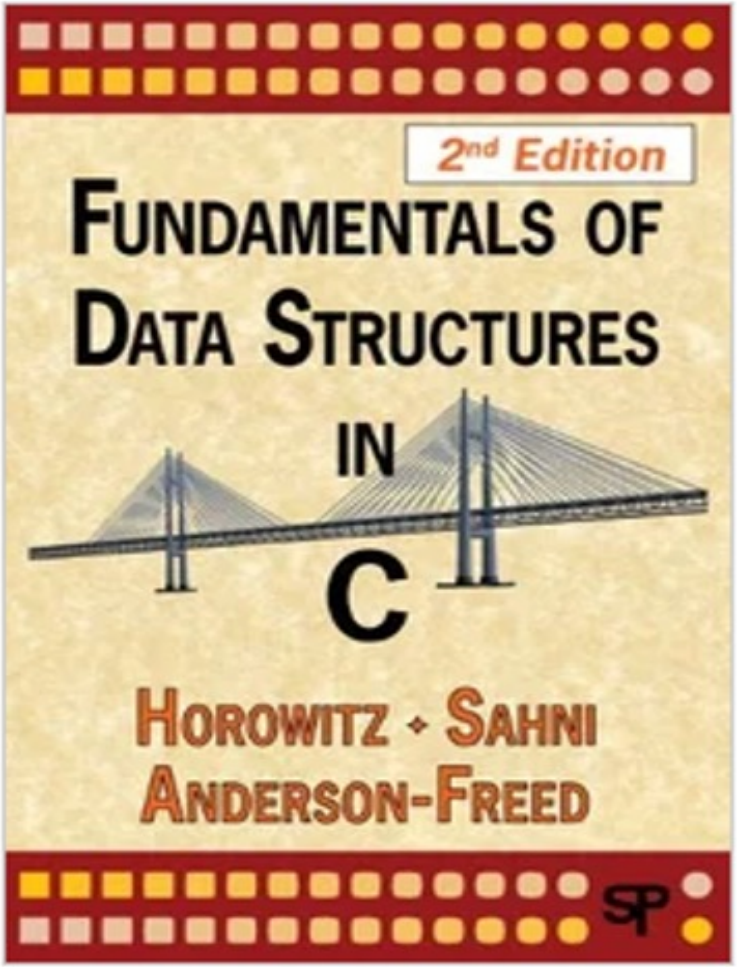
Advanced Data Structures
(高等資料結構)

Hung-Chang Hsiao (蕭宏章)
Professor
Distributed Computing Lab/CSIE/NCKU
分散式計算實驗室/成大資工

References


2nd Edition
FUNDAMENTALS OF
DATA STRUCTURES
IN
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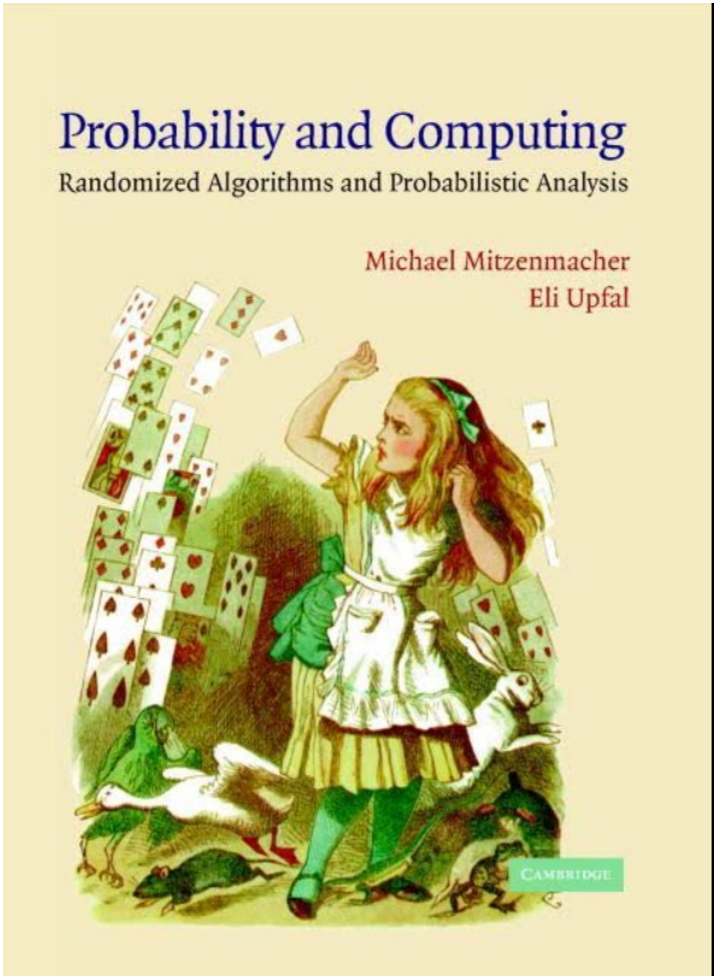
HOROWITZ • SAHNI
ANDERSON-FREED


Probability and Computing
Randomized Algorithms and Probabilistic Analysis
Michael Mitzenmacher
Eli Upfal
CAMBRIDGE

Introduction to Lecturer
(Prof. Hung-Chang Hsiao)

- Theory
  - Distributed system, e.g., file systems, databases and resource management
  - Parallel/distributed algorithms
  - Randomized algorithms (probability and computing)
- Practices
  - 大型分散式系統軟體開發
  - Apache Open Source Projects developments
  - 企業贊助/產學合作

Course Lectures

- Sets: DEAP and F-heap
- Search trees:
  - B-tree, AVL and red-black
  - Digital search trees: Trie and PATRICIA
- Geographical structures: Rectangle tree
- Randomized data structures and algorithms
  - Math tools
  - Skip lists and bloom filters
  - CLT and hash tables
  - Random graphs and gossip algorithms

Why to Study Data Structures?

- 素養
- 程式效能
- 修課學分
- 選才檢定
- ...

Web Site

- Moodle: 所有的訊息公佈以Moodle為主

Grades

- Two versions
  - 紙本測驗 (期中考) 70% (or 60%)
  - 報告 (自行挑選論文) 20% (or 30%)
- 點名
  - 共10%
  - 點名未到一次扣總分1分，最多扣10分
- Programming作業
  - None

考試時間 (暫定)

- 期中考：預計學期最後一個月之前一週
  - 12th (or 13th) week的上課時間
  - That is, May 9th (or May 16th)
- 第18週不上課，處理成績疑義

論文簡報

- 請參考課程網頁的論文簡報template
- 原則學期的最後四（或五）週
  - 視修課學生人數而定
- 助教將在moodle公告

考試的命題形式

```
BFS(G, s)
for each vertex u ∈ G.V - {s}
   u.color = WHITE
   u.d = ∞
   u.π = NIL
s.color = GRAY
s.d = 0
s.π = NIL
Q = ϕ
ENQUEUE(Q, s)
while Q ≠ ϕ
   u = DEQUEUE(Q)
   for each v ∈ G.Adj[u]
         if v.color = = WHITE
               v.color = GRAY
               v.d = (1)
               v.π = u
               ENQUEUE(Q, v)
   u.color = BLACK
```

4) **[4%]** You are given a Bloom filter with the three hash functions as follows, where *modf*(.) returns the fractional part of a floating point number.

$$f_1(x) = floor(modf(x * 0.31) * 16)$$
$$f_2(x) = floor(modf(x * 0.24) * 16)$$
$$f_3(x) = floor(modf(x * 0.13) * 16)$$

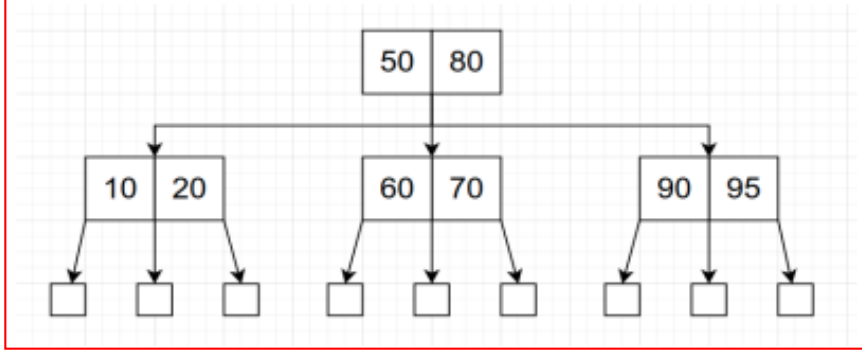
Bloom Filter

Index	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Value	0	1	1	0	0	1	0	0	0	1	0	0	1	1	0	0

Which of the followings is (are) true?

(A) 8 is not in
(B) 8 may be in
(C) 8 is in
(D) 9 is not in
(E) 9 may be in
(F) 9 is in

5) **[2%]** A B-tree is shown in the following. We remove the data items 70, 10, 60 and 95 in order over the B-tree. What is the resultant of B-tree after the deletions?



Data Structures and Algorithms

- 資料結構
  - 給定某一目的所提供的資料讀寫、新增或移除操作
  - 該些操作的演算法設計與實作
    - 本課程"僅"講授資料結構的"演算法設計"
    - 我們認為同學們已經具備"程式實作"的能力
    - 換言之，只要有想法（演算法），則同學能實現出來

TA's

- 聚焦在課程知識的討論

每次上課時間

- 150分鐘，每週
  - 白天班 (星期五)：9:00~11:30
  - 夜間在職專班（星期五）：18:30~9:00
- 中間不下課
- 因為會實施點名，因此不要跑錯教室

Thanks and Any Questions?