Technical Interviews in Software/Internet Companies

Liangjie Hong
Ph.D. Candidate
Dept. of Computer Science and Engineering

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Who am I?

- 5.5-year Ph.D. student
- internships in
  - a local software company (2008, 2 months)
  - Yahoo! Labs (2010, 3 months)
  - Yahoo! Labs (2011, 3 months)
  - LinkedIn Corp. (2011, 4 months)
- published 10+ technical papers

Who am I?

- Done job hunting recently.
- Will join Yahoo! Labs soon.

My Personal Experience

- Interviewed with
  - Google Research, Yahoo! Labs, IBM Research Walmart Labs, Bosch Research
  - Facebook, Bing, LinkedIn, Yandex, Yelp, Netflix
  - Twitter, StumbleUpon , Quantcast, TapJoy
  - and a post-doc position!

Focus on

- (applied) research positions in companies
  - research scientist, applied scientist, data scientist, research engineer, applied research engineer…
  - hands-on research
  - research & engineering
  - can publish papers

Google Research YAHOO! LABS Microsoft Research

Interviews

phone interview
onsite interview
take-home interview

coding questions
research questions
behavioral questions
research talks

Interviews

- Phone Interview
  - 1 - 2 rounds or more
- Onsite Interview
  - 1 day, 5 - 7 persons
  - 2 days

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  - 1 day, 5 - 7 persons
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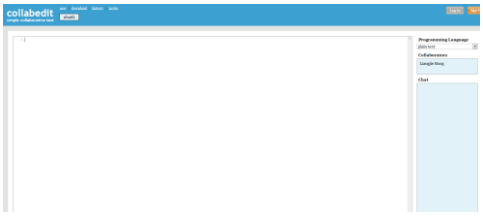
- Engineers, Scientists, Managers, Directors, VPs, HRs

Phone Interview

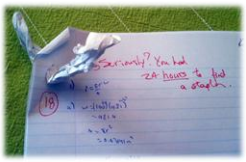
Phone Interview



Onsite Interview

Onsite Interview

Take-home Interview



Other formats…

What are Tech Companies looking for?

What are Tech Companies looking for?

- Coding
  - basic programming skills
    - data structures + algorithms
  - research related programming
- Research
  - research background
  - basic research skills
  - research design
- Behavioral
  - communication skills

Coding Questions

- Basic programming skills
  - search, sort, recursion
- Data structures
  - linked list, array, trees, heap, graph, hash table
- Ideas of programming
  - greedy, dynamic programming

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- Preparation

Coding Questions: Important Techniques

- Binary Search

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  - Can you write a bug-free binary search?

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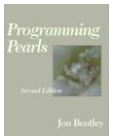
  - Can you write a bug-free binary search?

  It is non-trivial !



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  - Can you think about using it in other scenarios?

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- Binary Search
  - Can you write a bug-free binary search?

    It is non-trivial !
  - Can you think about using it in other scenarios?

    Surprisingly, many…

Coding Questions: Important Techniques

Given sorted arrays A and B of lengths n and m respectively, return an array C containing elements common to A and B. The array C should be free of duplicates.

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$O(n \cdot m)$

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$O(n \cdot m)$, $O(n+m)$

Coding Questions: Important Techniques

Given sorted arrays A and B of lengths n and m respectively, return an array C containing elements common to A and B. The array C should be free of duplicates.

What if $n \ll m$?
$O(n \log m)$

Coding Questions: Important Techniques

- Partition

Coding Questions: Important Techniques

- Partition
  - A very important idea from `QuickSort`
  - Again, can you write a bug-free version?

Coding Questions: Important Techniques

- Partition

  Given an array of balls, which can be one of two colors (RED or BLUE), write a function that partitions the array in-place such that on exit from the function all the balls of the same color are contiguous. It does not matter whether the red or blue balls come first. The return value from the function is the index of the first ball of the second color. If there is only one color of balls in the array then the return value should be 0. It is not legal to change the color of a ball. They must be moved.

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  O(n)

Coding Questions: Important Techniques

- Hash

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- Hash
  - Extremely important…
  - Easy to forget to use…

Coding Questions: Important Techniques

- Hash

Let A be a sorted array of integers and S a target integer.

Design `m` efficient algorithm for determine if there exist a pair of indices `i, j` (not necessary distinct) such that A`[i]+A[j]=`S.

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Design `m` efficient algorithm for determine if there exist a pair of indices `i,j` (not necessary distinct) such that `A[i]+A[j]`$=S$.

O(n)

Coding Questions: Other "unusual" stuff

- Streaming

- Big data

Coding Questions: Other "unusual" stuff

- Streaming
  - Calculate median
  - Calculate window-sized max
  - Calculate the most frequent item
  - Calculate the top k frequent item
- Big data
  - Calculate median
  - Sort
  - kth statistics

Coding Questions: How we can prepare?

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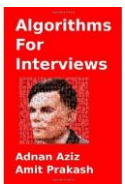
- Books



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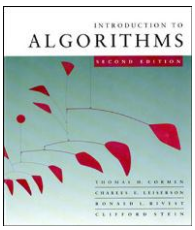

Coding Questions: How we can prepare?

- Websites/Forums

careercup.com LeetCode Online Portal for IT Interview glassdoor.com [TopCoder]

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- Websites/Forums

Coding Questions: How we can prepare?

Two very important suggestions:

Coding Questions: How we can prepare?

Two very important suggestions:

- Don't read code or read the book.
- Try to write code without IDE.

Coding Questions: Programming Languages

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It really doesn't matter.

- C/C++
- Java
- Python
- Scala
- ...

Coding Questions: Programming Languages

It really doesn't matter or not.

- C/C++
- Java
- Python
- Scala
- …

Research Questions:

- research background
- basic knowledge
- CV/resume related
- research design

Research Questions: Research Talk

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- references:

http://matt-welsh.blogspot.com/2012/12/how-to-get-faculty-job-part-2-interview.html

Research Questions: Basic Knowledge

Research Questions: CV/Resume related

Research Questions: CV/Resume related

- describe a project

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- describe a project
- why it's challenging

Research Questions: CV/Resume related

- describe a project
- why it's challenging
- specific research questions

Research Questions: Research Design

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Suppose you are a Social Network Company, design a spam detection algorithm

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Research Questions: Research Design

Suppose you are a Social Network Company, design a spam detection algorithm

- define spam/spammers
- purpose/goal
- state-of-the-art
- how to evaluate

Research Questions: Research Design

Suppose you are a Social Network Company, design a spam detection algorithm

Suppose you are spammers and you are aware of previous strategies, how can you react?

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Suppose you are a Social Network Company again, how to combat with spammers with such knowledge?

Research Questions: Research Design

Suppose you are a Social Network Company, design a spam detection algorithm

Suppose you are spammers and you are aware of previous strategies, how can you react?

Suppose you are a Social Network Company again, how to combat with spammers with such knowledge?

5 Times!

Research Questions: Research Design

- no standard answer
- talk as much as possible
- provide arguments! (why)

Research Questions: Research Design

Defend Yourself !

Behavioral Questions

Behavioral Questions

- important (or not)
- tricky (or not)
- prepare

Behavioral Questions

- why XXX (company/post-doc/faculty)?
- why not XXX (another cool company names)?
- why not post-doc/faculty/companies?

Summary

- Coding + Research + Behavioral

- Prepare, Prepare, Prepare, …
- Practice, Practice, Practice, …

Questions?

Coding Questions: Example

How to detect a circular linked list?

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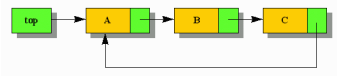

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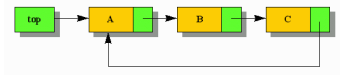

- hash table

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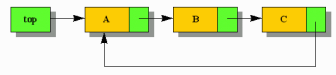

- hash table
- two pointers?

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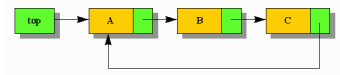

- hash table
- two pointers?

- complexity?