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SNU Technical Interview Workshop Day I

Yongwhan Lim
Senior Quantitative Software Engineer

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Yongwhan Lim

Senior Quantitative Software Engineer at Two Sigma



- Currently:
 - Senior Quantitative Software Engineer at Two Sigma
 - Lecturer in EECS at MIT
 - Associate in Computer Science at Columbia University
 - ICPC Head Coach at Columbia University
 - ICPC Judge for Greater New York and Mid-Central Regionals in North America
- Previously:
 - Research Software Engineer at Google Research
- Education:
 - Stanford
 - Math (BS '11) and CS (BS '11)
 - CS (MS '13)
 - MIT
 - Operations Research (PhD, started in 2013 but on an extended leave-of-absence since 2016)



<https://www.cs.columbia.edu/~yongwhan/>



Overview

- Part I
 - Interview Types
 - Technical Interview
 - Interview Topics
 - 2 Sample Interview Questions
 - Interview Preparation Resources
- Part II: Questions and Answers (Q&A's)

Part I

Interview Types

- Technical Interview
 - tests technical skill-sets required for a job.
- Behavioral Interview
 - tests soft skills (e.g., effective communication, conflict resolution, etc.)



Interview Types

- **Technical Interview**
 - tests technical skill-sets required for a job.
- Behavioral Interview
 - tests soft skills (e.g., effective communication, conflict resolution, etc.)

Technical Interview Overview (Company Dependent)

- Recruiter Call
- 0-1 Online Coding Challenge
 - automated screening with 2-3 questions.
- 2-3 Technical Phone Screenings
 - first technical conversation with human.
- 4-7 Interviews Onsite
 - similar to phone screening but more in-depth.
 - you may get probed on your claimed expertise.
- 0-5 Fit Calls and Negotiation

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Interview Topics Overview

- Data Structures and Algorithms
- (> entry level) System Design Problems



Interview Topics Overview

- **Data Structures and Algorithms**
- (> entry level) System Design Problems

Interview Topics Overview

- **Fundamentals**
 - Primitive Types
 - Arrays and Linked Lists
 - Binary Trees
 - Heaps
 - Sorting
- **Important**
 - Stacks and Queues
 - Hash Tables
 - Binary Search Trees
 - Searching
 - Recursion
- **Real Differentiators**
 - Strings
 - Dynamic Programming
 - Greedy Algorithms and Invariants
 - Graphs

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Sample Interview Question #1

- **Problem Statement** (LeetCode [#1201](#): Medium)
 - An **ugly number** is a positive integer that is divisible by a, b, or c.
 - Given four integers n, a, b, and c, return nth **ugly number**.

Sample Interview Question #1

- **Problem Statement** (LeetCode [#1201](#): Medium)
 - An **ugly number** is a positive integer that is divisible by a, b, or c.
 - Given four integers n, a, b, and c, return nth **ugly number**.
- **Constraints**
 - $n, a, b, c \leq 1,000,000,000$

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Ideas?

Sample Interview Question #1

- Binary Search Solution (Logarithmic):

Now, do you see it?

Sample Interview Question #1

- Binary Search Solution (Logarithmic):

```
#include<bits/stdc++.h>
using namespace std;

int nthUglyNumber(int n, int a, int b, int c) {
    int low = 1, high = INT_MAX;
    while(low < high) {
        int mid = low + ((high - low) >> 1);
        if(eval(mid, a, b, c) >= n) {
            high = mid;
        } else {
            low = mid + 1;
        }
    }
    return low;
}
```

```
typedef long long ll;

ll lcm(ll a, ll b) {
    return a/__gcd(a,b)*b;
}

ll eval(ll x, ll a, ll b, ll c) {
    return x/a + x/b + x/c - x/lcm(a,b) - x/lcm(a,c) - x/lcm(b,c) + x/lcm(a,lcm(b,c));
}
```

Sample Interview Question #2

- **Problem Statement** (LeetCode [#1312](#): Hard)
 - Given a string *s*. In one step you can insert any character at any index of the string.
 - Return *the minimum number of steps* to make *s* palindrome.
 - A **Palindrome String** is one that reads the same backward as well as forward.

Sample Interview Question #2

- **Problem Statement** (LeetCode [#1312](#): Hard)
 - Given a string s . In one step you can insert any character at any index of the string.
 - Return *the minimum number of steps* to make s palindrome.
 - A **Palindrome String** is one that reads the same backward as well as forward.
- **Constraints**
 - $1 \leq |s| \leq 500$
 - s consists of lowercase English letters.

Sample Interview Question #2

- **Problem Statement** (LeetCode [#1312](#): Hard)
 - Given a string s . In one step you can insert any character at any index of the string.
 - Return *the minimum number of steps* to make s palindrome.
 - A **Palindrome String** is one that reads the same backward as well as forward.
- **Constraints**
 - $1 \leq |s| \leq 500$
 - s consists of lowercase English letters.

Ideas?

Sample Interview Question #2

- Dynamic Programming Solution (Quadratic):

Now, do you see it?

Sample Interview Question #2

- Dynamic Programming Solution (Quadratic):

```
#include<bits/stdc++.h>
using namespace std;

int minInsertions(string &s) {
    int n = s.size();
    vector<vector<int>> dp(n, vector<int>(n,0));
    for (int i = 1; i < n; i++)
        for (int j = 0, k = i; k < n; j++, k++)
            dp[j][k] = (s[j]==s[k]) ? dp[j+1][k-1] : min(dp[j][k-1],dp[j+1][k])+1;
    return dp[0][n-1];
}
```

Interview Preparation Resources

- **Popular Websites**
 - LeetCode
 - CodeForces
 - AtCoder
 - TopCoder
 - CodeChef

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Interview Preparation Resources

- Popular Websites
 - LeetCode
 - CodeForces
 - AtCoder
 - TopCoder
 - CodeChef
- Try to solve all problems from biweekly/weekly LeetCode contest fast.
 - Here, fast means under 1 hour for all four questions!
- Aim to be on **division I** at CodeForces
 - This will trivialize most of the technical interview.

Interview Preparation Resources

- Standard
 - *Elements of Programming Interview* by Adnan Aziz, et. al.
 - *Cracking the Coding Interview* by Gayle Laakmann McDowell
- Overkill
 - *Competitive Programming 4* by Steven Halim, et. al.
 - *Guide to Competitive Programming* by Antti Laaksonen

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Part II

Q & A's



Q & A's

- How do you overcome nervousness?



Q & A's

- Could you provide a live solving of a technical question?



Q & A's

- Is interview process as an intern different from full-time technical interview?



Q & A's

- How do you get past the automatic filter?



Q & A's

- What are topics to prepare, the best way to prepare, and expectations on programming language?



Q & A's

- Will interviewer evaluate applicants' technical knowledge other than coding skills?



Q & A's

- Are there any specific machine learning and artificial intelligence technical questions that frequently show up in interviews (and that we should prepare for)?



Q & A's

- If I do not have too much background on a position I am applying for, how do I leave a good impression to interviewer still?

Contact Information

- Emails:
 - yongwhan.lim@twosigma.com
 - yongwhan@mit.edu
 - yongwhan.lim@columbia.edu
- Personal Website: <https://cs.columbia.edu/~yongwhan>
- LinkedIn Profile: <https://www.linkedin.com/in/yongwhan/>
 - Feel free to send me a connection request.
 - Always happy to make connections with promising students!