


Data structures and algorithms interview questions amazon pdf

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Crush your interview with our guide Lead Data Scientist Interview Questions Managing a team of data scientists is a highly technical and demanding role that requires a candidate to be a jack-of-all-trades when it comes to developing data driven products and architectures. A typical team working on data science projects will encompass data scientists with a highly analytical capability as well as those whose role emphasizes a software engineering component dealing with production quality code. Finally, the team can include big data engineers, database specialists and roles with a strong research component such as machine learning engineers and natural language processing engineers. Thus at its core, the data scientist lead requires the efficient orchestration of a highly technical team and an in-depth understanding of the challenges of the different roles that comprise the team. The ideal background for this candidate is an experienced data manager who has worked in a team and has both a strong theoretical background in fields such as machine learning and predictive modelling but also very strong software engineering skills. To be an effective lead, the ideal candidate will also have great communication skills, be well organized and able to prioritize and plan in a way that mitigates many of the risks that come with doing research and analyzing massive quantities of data. Finally, top candidates will also demonstrate a good understanding of data-driven services at the product level and how individual features impact the way customers interact and engage with a company's product line. A data science lead interview should include questions that could be asked for a general data scientist role. For examples of these, check out our interview questions for the data scientist (analysis) and data scientist (coding) roles. In addition to these, questions for the data scientist lead should focus on leadership and management skills: Role-specific questions Discuss the common pitfalls and risks in planning a data science project such as building a model that predicts whether a bank customer will default on their loan. What is the biggest team that you have ever managed and what challenges had you faced? Do you have experience in managing agile teams? A model your team has built performs 90% accuracy. What do you need to know in order to interpret whether this is good or not? Discuss a data-driven product that has really impressed you in recent years How do you think one becomes a data scientist? What do you look for when you want someone to join your team? What is big data, really? Are you familiar with big data architectures? Off the top of your head describe a product that uses data from twitter to build something that people could conceivably pay money for. How do you stay current in your job and what are the challenges to doing this when you are a data scientist How would you evaluate a feature such as Spotify's Discover Weekly playlist? In my previous post: Algorithms and Data Structures Interview Preparation & Walkthrough—Part 1, we talked about how to do Complexity Time and Space analysis, and also see the common Big-O factors with examples. In this post, I will start talking about Array in depth, and cover some interview questions and hopefully by the end of the reading, you would have a good glance about Array. Once we are familiar with Array, I will talk about String and how to use Array to solve String problems. Array is a data structure that contains a group of elements. The most basic implementation of an array is a static array. The reason it's called static is the size is fixed. The read/write access to a certain position is O(1). Implementation of Static Array class StaticArraydef initialize(length)self.store = Array.new(length)end# O(1)def []=(index, value)self.store[index] = valueendprotectedattr\_accessor :storeendWe create a Dynamic Array from Static Array as follow. The read/write access is also O(1). Let's implement some general methods i.e. pop(), push(), shift() and unshift() for it. The key here is, when we reach the array size, we want to resize it and double its space, in order to push() or unshift() new elements to the array. Implementation of Dynamic Array require relative "static array" class DynamicArrayattr\_reader :lengthdef initialize@length = 0@capacity = 8@store = StaticArray.new(8)end# O(1)def []=(index)check\_index(index@store[index]end# O(1)def []=(index, value)check\_index(index@store[index] = valueend# O(1)def popcheck\_index(0)@length -= 1@store[@length + 1]end# O(1) amortized; O(n) worst case.def push(val)resize! if @length == @capacity@store[@length + 1] = val@length += 1end# O(n): has to shift over all the elements.def shiftcheck\_index(0)idx = 0first\_el = @store[0]while idx < @length - 1@store[idx] = @store[idx + 1]idx += 1end@length -= 1first\_elend# O(n): has to shift over all the elements.def unshift(val)resize! if @length == @capacityidx = @lengthwhile idx > 0@store[idx] = @store[idx - 1]idx -= 1end@store[0] = val@length += 1@storeendprotectedattr\_accessor :capacity, :storeattr\_writer :lengthdef check\_index(index)raise "out of bounds" if (@length < index + 1 || index < 0)end# O(n): has to copy over all the elements to the new store.def resize!new\_store = StaticArray.new(@capacity \* 2)idx = 0while idx < @lengthnew\_store[idx] = @store[idx]idx += 1end@store = new\_store@capacity \*= 2endendWhat is amortization? If you read carefully enough, you would notice there is a keyword "amortized" in the code snippet. What does that mean? When we want to append (or push) a new element to the Array and it reaches its size limit, we want to double the size. However, resize! method allocates a larger region, moves the whole array, and deletes the previous. This is a O(n) operation. But if we're only doing it every O(1/n) times, then on average it can still come out to O(n \* 1/n) = O(1). That's called amortized cost. Time Complexity and Space Complexity for Dynamic Array In average and worst cases, Access O(1) Search O(n) Insertion O(n)(at the end of Array is O(1) amortized, at the beginning or middle of Array is O(n) Deletion O(n) Space O(n) We now know accessing an element in Array is fast (O(1)), whereas searching/adding/removing is relatively slow (O(n)), which sometimes requires looping through the whole array. Ring Buffer It is a data structure that uses a Static Array as if it were connected end-to-end. require\_relative "static\_array" class RingBufferattr\_reader :lengthdef initialize@length = 0@capacity = 8@start\_idx = 0@store = StaticArray.new(@capacity)end# O(1)def []=(index)check\_index(index)ring\_index = (index + @start\_idx) % @capacity@store[ring\_index]end# O(1)def []=(index, val)check\_index(index)ring\_index = (index + @start\_idx) % @capacity@store[ring\_index] = valend# O(1)def popcheck\_index(0)@length -= 1,val = @store[(@length + @start\_idx) % @capacity]@store[(@length + @start\_idx) % @capacity] = nilvalend# O(1) amortizeddef push(val)resize! if @length == @capacity@store[(@length + @start\_idx) % @capacity] = val@length += 1end# O(1)def shiftcheck\_index(0)val = @store[@start\_idx]@store[@start\_idx] = nil@start\_idx = (@start\_idx + 1) % @capacity@length -= 1valend# O(1) amortizeddef unshift(val)resize! if @length == @capacity@start\_idx = (@start\_idx - 1) % @capacity@store[@start\_idx] = val@length += 1valendprotectedattr\_accessor :capacity, :start\_idx, :storeattr\_writer :lengthdef check\_index(index)raise "index out of bounds" if (index < 0 || index > @length - 1)enddef resize!new\_store = StaticArray.new(@capacity \* 2)idx = 0while idx < @lengthnew\_store[idx] = @store[(@start\_idx + idx) % @capacity]idx += 1end@store = new\_store@start\_idx = 0@capacity \*= 2endendTo master Array data structure and questions, we at least need to be very familiar with: Loop operation. Sense of using pointer(s) to record location(s). Swap technique. Basic Math. Common array methods and the time complexity of them, i.e. pop(), push(), shift(), unshift(), forEach(), sort(), slice(), splice(), reverse(), concat(), filter(), map() ... etc. Some advantages of using Array: ● Constant time access and allows random access ● Grouping like items And some disadvantages... ● Insertion and deletion can be expensive for large arrays ● Dynamic arrays have cost to resize, and limited by the size allocated Enough said, here are some popular interview questions for your practice: Move Zeros—Given an array of numbers, write a function to move all 0's to the end of it while maintaining the relative order of the non-zero elements. (thought process and solution) Stocks 101—When to buy/sell the stock? Given an array contains the daily price for a stock. Try to find the maximum profit. (thought process and solution) Find Duplicates—Given an array of numbers, return true if any number appears more than once in the array, otherwise return false. (thought process and solution) String Now we know about Array, let's talk about String—which is nothing but a Character-based Array. You just need to learn techniques to solve Array questions, and you are a String Master by nature! Before diving into String related questions, we need to get familiar with: String related methods, i.e. charAt(), includes(), trim(), concat(), slice(), split(), substring(), toUpperCase(), toLowerCase(), toString()...etc. Two pointers. Swap elements within Array. Recursion. In my next post, I will talk about Data Structures for Queue, Stack and Linked List. Before You Go — There's no better way to support me than to give me a follow on Medium (Victor Lin). Let me know that I should write more! Did you know that you can give up to 50 's by pressing down on the button? 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