



What is reservoir sampling?

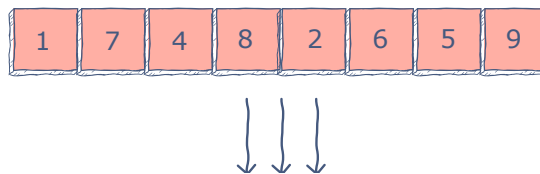
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Reservoir sampling is a randomized algorithm that is used to select k out of n samples; n is usually very large or unknown. For example, reservoir sampling can be used to obtain a sample of size k from a population of people with brown hair. This algorithm takes $O(n)$ to select k elements with uniform probability.

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Reservoir sampling is used to randomly take k out of n samples. Here $k = 4$.

Algorithm



1. Copy the first k elements from the input array to the output array.
2. Iterate from k to $n - 1$ (both inclusive). In each iteration j :
 - 2.1 Generate a random number num from 0 to j .
 - 2.2 If num is less than k , replace the element at index num in the output array with the item at index j in the input array.

Code

 Python3



```
1 # Including dependancies
2 import random
3 # Defining the parameters
4 n = 8
5 k = 4
6 # The array to be sampled
7 input_array = [1, 7, 4, 8, 2, 6, 5, 9]
8 output = []
9 # Initializing the output array to the first k elements
10 # of the input array
11 for i in range(k):
12     output.append(input_array[i])
13 # Iterating over k to n-1
14 for j in range(k,n):
15     # Generating a random number
16     index = random.randint(0, j)
17     # Replacing an element in the output with an element
18     # in the input if the randomly generated number is less
19     # than k.
20     if index < k:
21         output[index] = input_array[j]
22 print("Input array:")
23 print(input_array)
24 print("Output array:")
25 print(output)
```

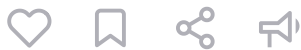


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