CS636 Homework 2

Due on Oct. 8 2018 Submit

hardcopy in class

Submit electronic copy in moodle

Please submit the code together with the running results of the testing commands. The running results account for 20 points.

Please do not use existing R packages and functions like sort(), order() and so on.

1. **Write a** function**, F(x), which takes x as the input parameter. It calculates and prints the value of the following mathematical function.**

$$f(x)=\begin{cases}\dfrac{5}{(x-1)^2}, x<1\\ 2, x=1\\ \dfrac{5}{(x-1)^3}, x>1\end{cases}$$

Testing commands: F(1); F(10); F(0.3);

2. **The Fibonacci sequence 1, 1, 2, 3, 5, 8, 13, 21…… starts with two 1s, and each term afterwards is the sum of its two predecessors. Please write a function, Fib(n), which takes n as the input parameter. It will return the n-th number in the Fibonacci sequence.**

Testing commands: Fib(1); Fib(2); Fib(100);

3, **The merge operation plays an important role in merge sort algorithm. Suppose you have two sorted sequences S1 and S2, merge operation will combine these two sequences into a single ordered sequence. Please write a function, Merge(S1, S2), which accepts two ordered vectors S1 and S2 as parameters. It will return a single ordered sequence. For example,**

S1 = c(1,3,5,7);
S2=c(2,4,6,10);
Merge(S1, S2) will return c(1,2,3,4,5,6,7,10)

Testing commands: **Merge(seq(1, 50, by=3), seq(2, 30, by=2))**

4, **One of the most important algorithms is the quick sort, which is based on the quick sort partition. Here we implement a simple version of the partition function. Please write a function, Partition(pivot, vect), which takes two parameters. The function partitions the sequence, vect, into two parts (part1 <= pivot; part2 > pivot) based on the pivot. For example,**

Pivot = 6;
Vect = c(1, 5, 3, 7, 9, 6, 4, 2, 10, 8);
List = Partition(Pivot, Vect);
List[[1]] is c(1,5,3,4,2, 6) and List[[2]] is c(7, 9, 10, 8).

Note that Partition returns a list.

Testing commands: **Partition(50, sample(1:100, 100, replace=F))**