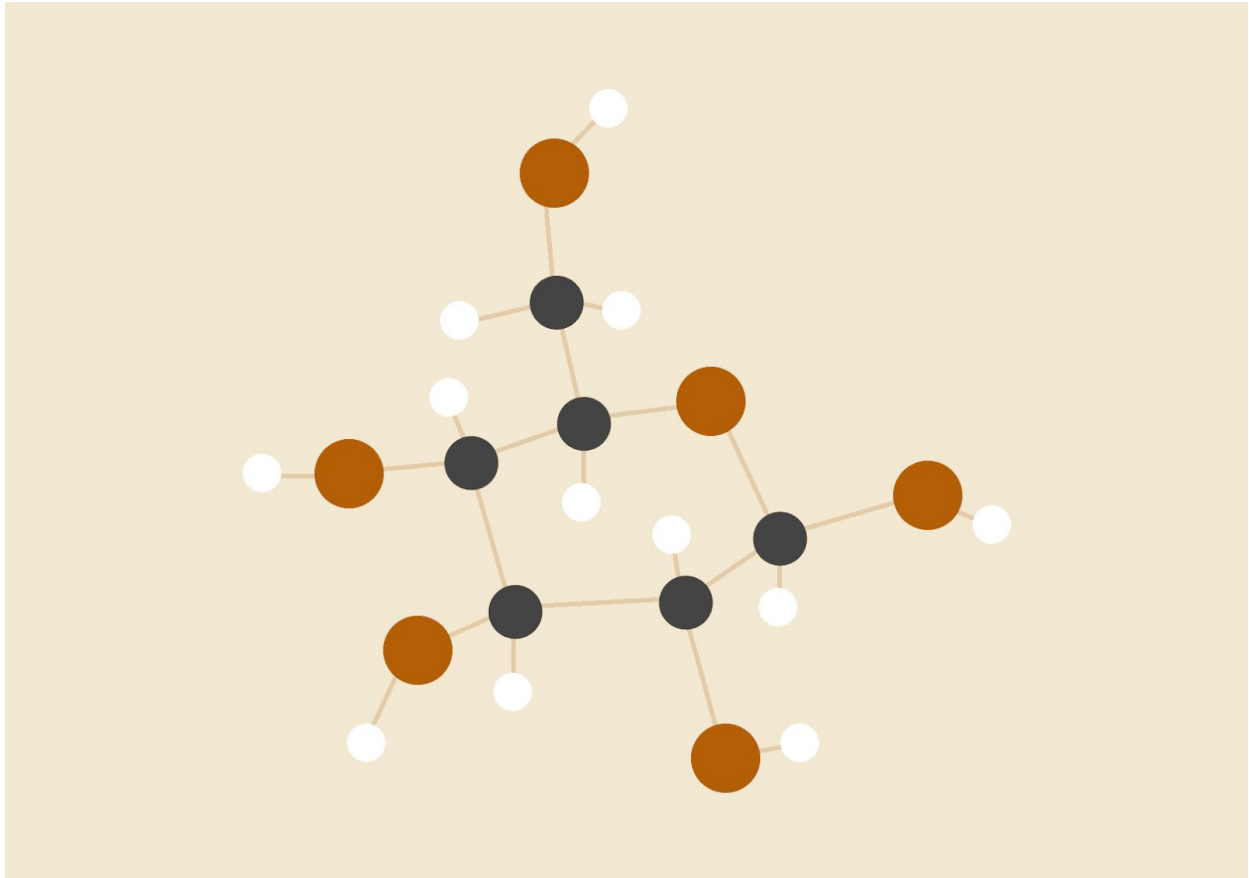


ASSIGNMENT 8

Data Structures Laboratory



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BTech CSE

Problem Statement 1:

Implement Dijkstra's algorithm in Java to find all shortest paths between all pair of vertices in a weighted graph. Modify this algorithm to find all shortest paths between two nodes, if more than one occurs. Following this, compute betweenness centrality measure of each node. Betweenness Centrality of a node/vertex, w which is the number of all shortest paths between u and v summed over all u and v divided by the number of all shortest paths between u and v through w .

Algorithms and Implementation:

- A slightly modified Dijkstra's Algorithm is implemented
- JGraphT graph libraries are used to represent the graph
- Sets and Maps are used in implementation of Dijkstra on graph
- Betweenness Centrality of each node is calculated in a recursive manner to find all shortest paths.

Snapshots and Computation Time

```
ark11418@rishi-G5:~/CSN261/L8$ javac q1.java
ark11418@rishi-G5:~/CSN261/L8$ java q1
w:BC(w)
V0:8.23333
V1:2.35
V2:0
V3:0
V4:2.61667
V5:5.53333
V6:4.66667
V7:1.5
V8:3.58333
V9:1.55833
Execution time :43 ms
ark11418@rishi-G5:~/CSN261/L8$
```

Problem Statement 2:

Create a project/program in Java called Unscramble Word. Given a string of 'N' characters print all the words present in a dictionary of length 'M' such that $3 < M \leq N$. Use dictionary present in Linux @ /usr/share/dict/words. Implement this code in java and the student may use inbuilt data structures such as Maps, Sets, etc. (For fast execution, use of Trie is suggested). Input: A String Output: All unscrambled words of given string present in the dictionary categorized by length of word. Also print the total number of words of each length.

Algorithms and Implementation:

- Maps are used to keep a track of the words in the dictionary
- Techniques of recursion have been used to generate all the permutation of a string of a given length.

Snapshots and Computation Time

```
ark11418@rishi-G5:~/CSN261/L8$ javac problem2.java
ark11418@rishi-G5:~/CSN261/L8$ java problem2
Input = great
Length = 5: gater grate great retag targe Count = 5
Length = 4: ager agre gaet gare gate gear geat geta grat rage rate tare tear tera trag Count = 15
Execution time :88876617 ns
ark11418@rishi-G5:~/CSN261/L8$
```