

**CSE4.401: DATABASE SYSTEMS**  
**ASSIGNMENT 3 (R-Tree Implementation)**

DEADLINE: 11:55 pm, 26th Feb 2022

In this assignment, you have to implement the R-tree with its basic functionalities supporting below mentioned queries.

**Programming Languages Allowed:** Python and C++

**Implementation:**

1. Implement a R-tree to handle the following type of queries
  - a. INSERT (X1,Y1) - Insert object (X1,Y1) into the R-tree
  - b. FIND (X1,Y1) - print YES if it is already inserted, else NO
  - c. RANGE (X1,Y1,X2,Y2) - print number of objects present in the given rectangle (X1,Y1,X2,Y2) , where X1,Y1 corresponds to the lower left point and X2,Y2 corresponds to the upper right point (all X1,Y1,X2 and Y2 included)
2. Constraints:
  - a.  $-10^9 \leq X1, X2, Y1, Y2 \leq 10^9$
  - b. The number of queries will be less than  $10^6$ .

**NOTE: Assume order of R-Tree is 12. Hard code this value in the code.**

**Input:**

1. The input argument consists of a file name.
2. Each line in the file consists of one of the above-mentioned queries.

**Output:**

1. Write outputs of the corresponding queries in a separate file or command-line.

## Deliverables

Create a folder with RollNumber\_Assignment3 and put the following into it

1. Python/C++ source codes
2. A README file explaining how to execute your code and the basic implementation details.

Zip the folder and upload.

**NOTE: You are not allowed to use inbuilt data structures to handle these queries**

**Strict action will be taken for copying in the Assignments.**