CS210
Discussion

Week 10

UMass Boston

Attendance

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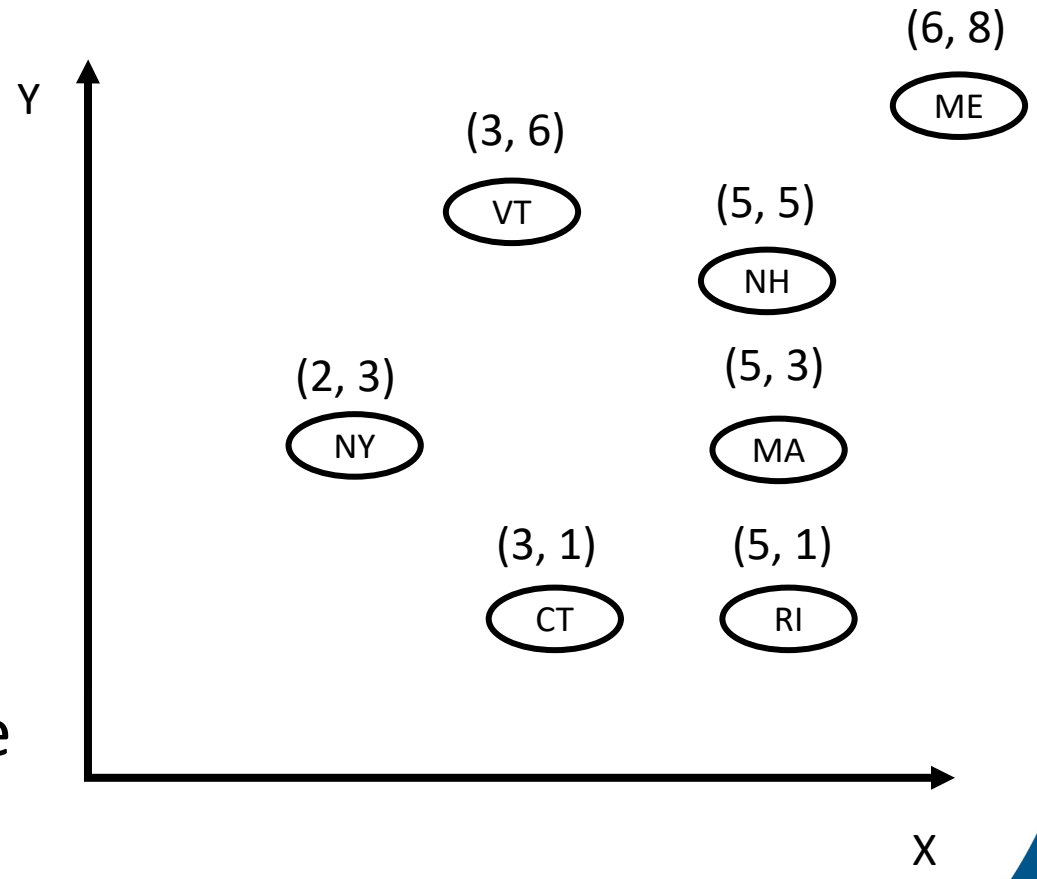
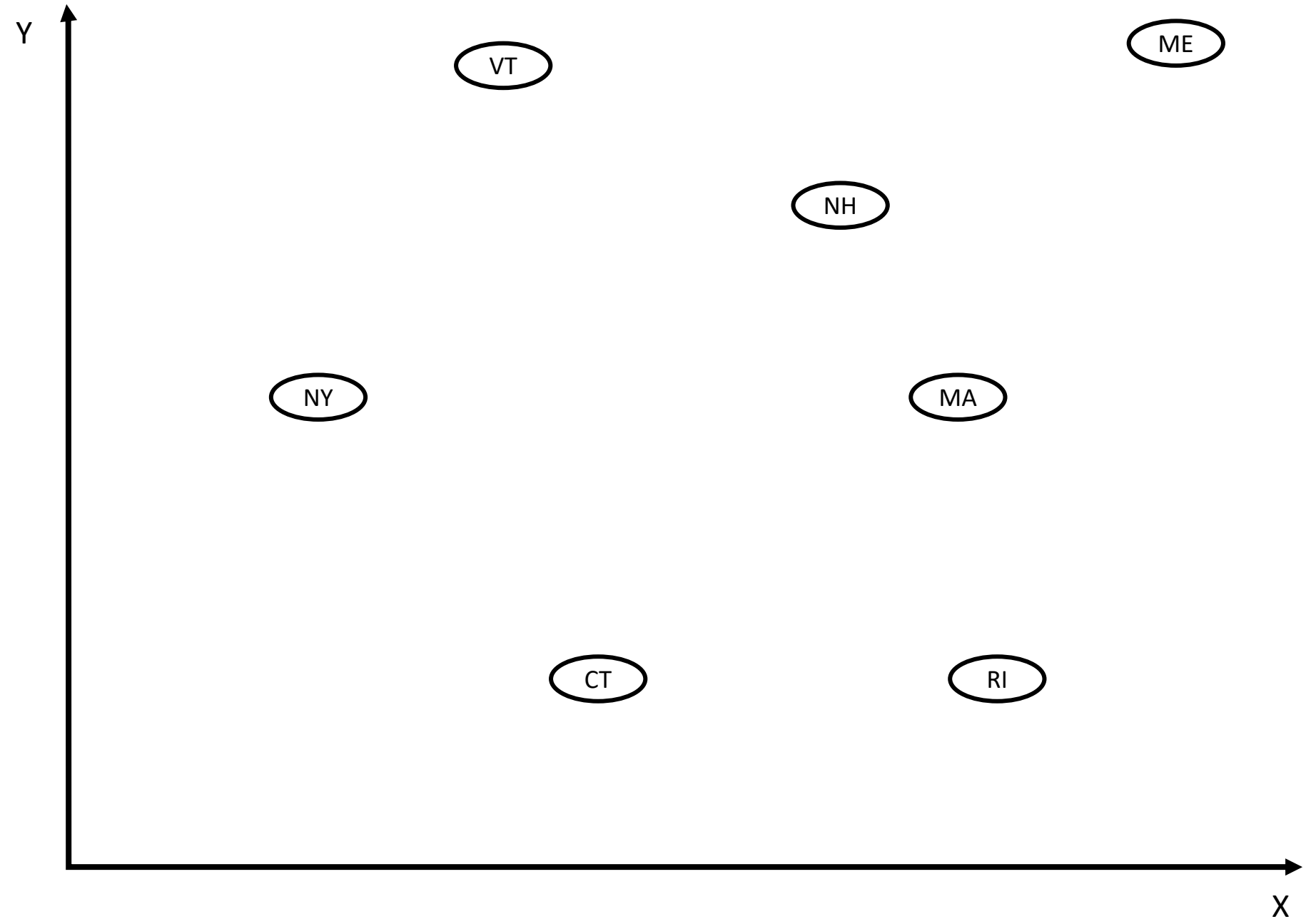
Today

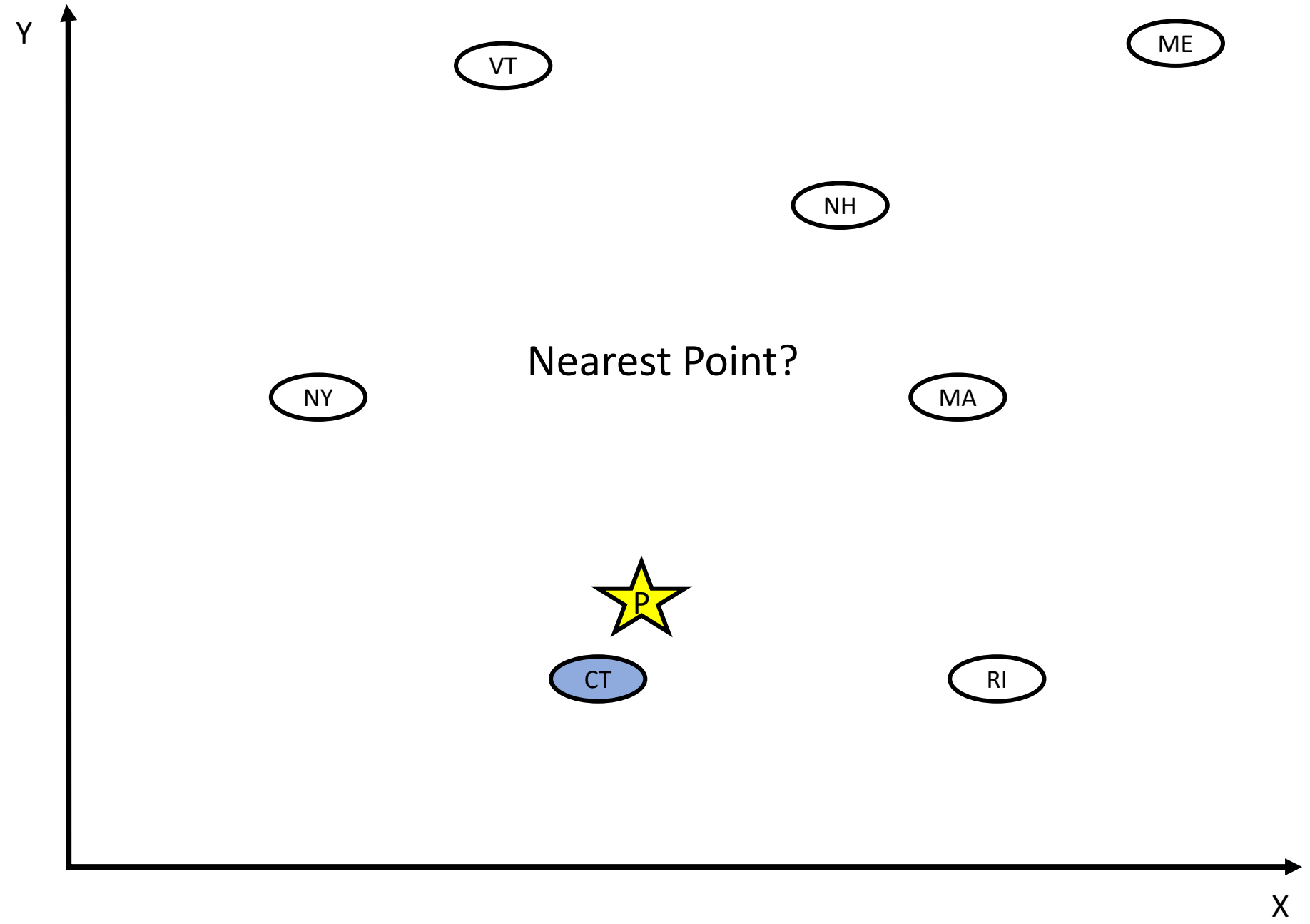
- kdTrees
- Spell Checker
- Exercise hints
- Finish through exercise 2
  - Show us passing Gradescope tests to leave early

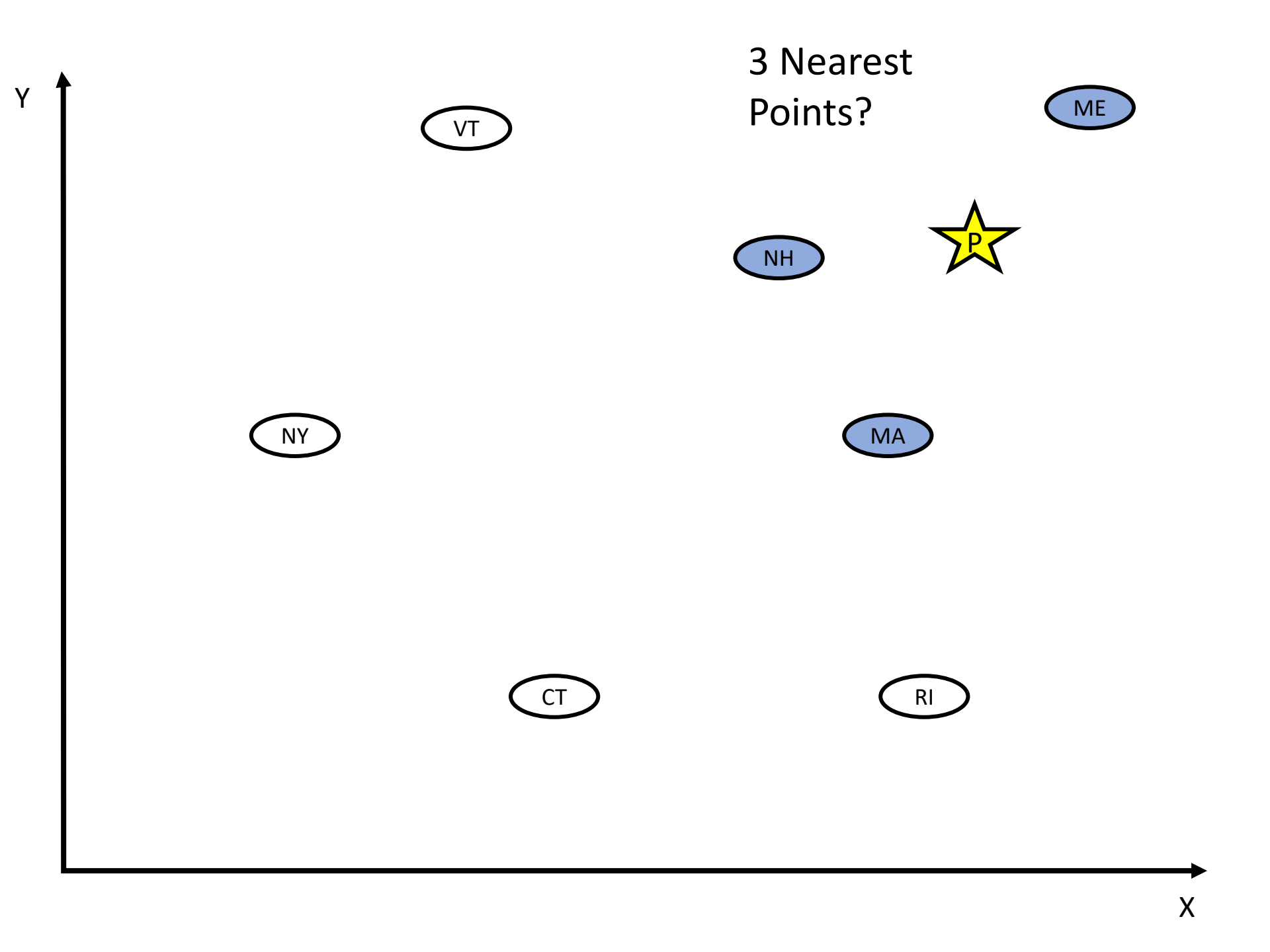
KdTrees

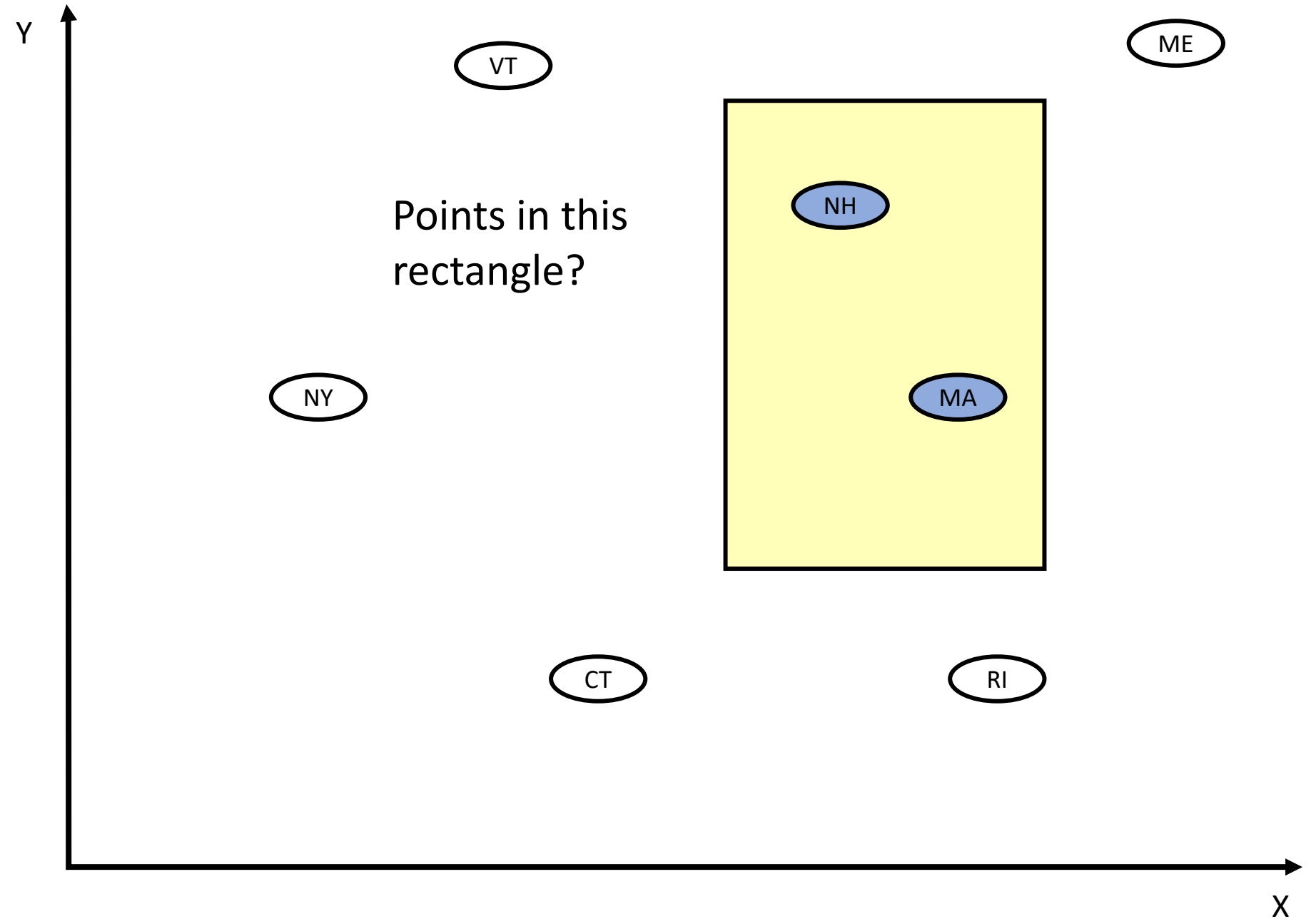
- Symbol table implementation
- Stores Points from a plane
- A value is stored at each point
- Ex. Points on a map holding a string value denoting the state they're in

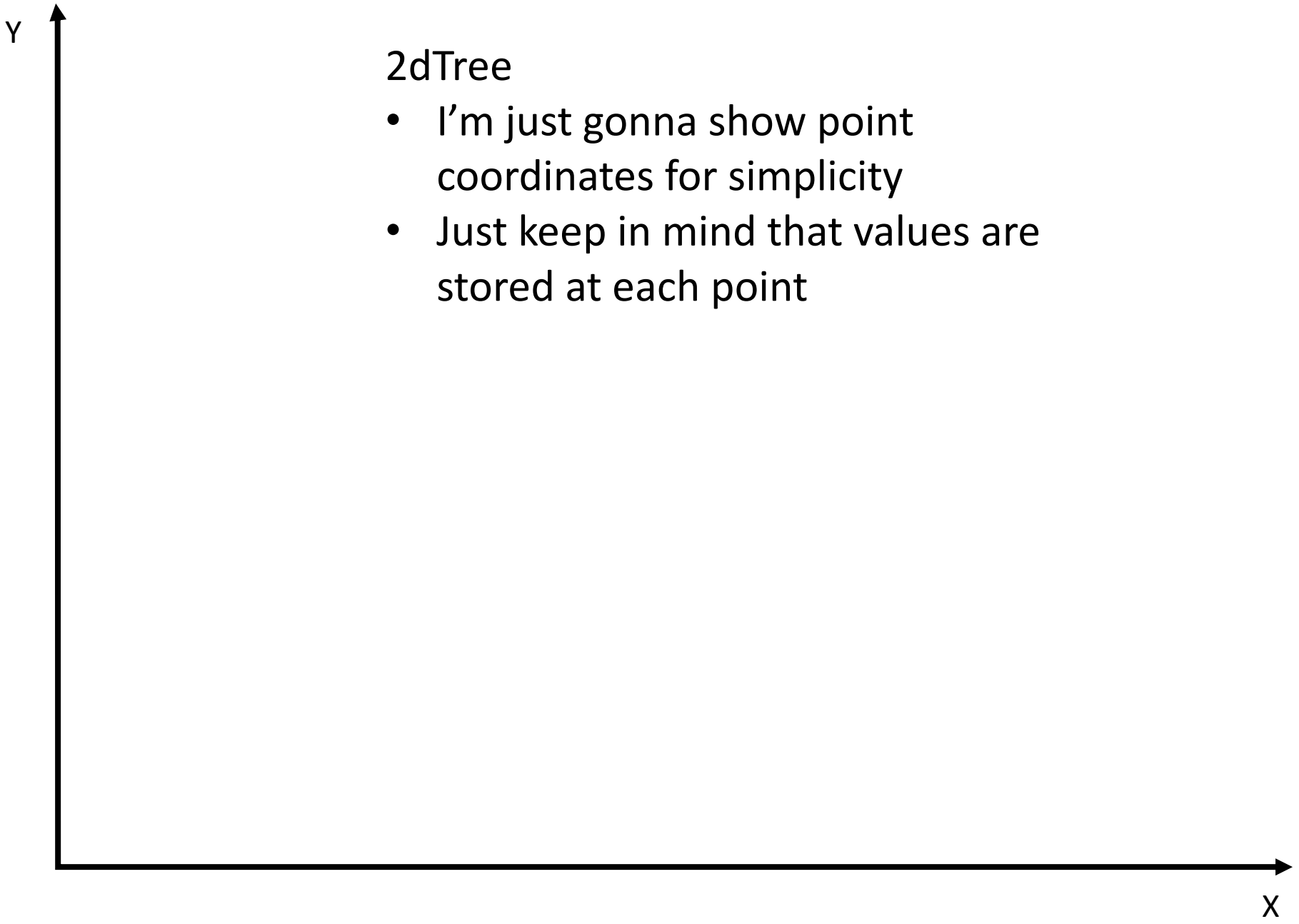



Y
VT
ME
NH
NY
MA
CT
RI
X


Y
VT
ME
NH
Nearest Point?
NY
MA
P
CT
RI
X

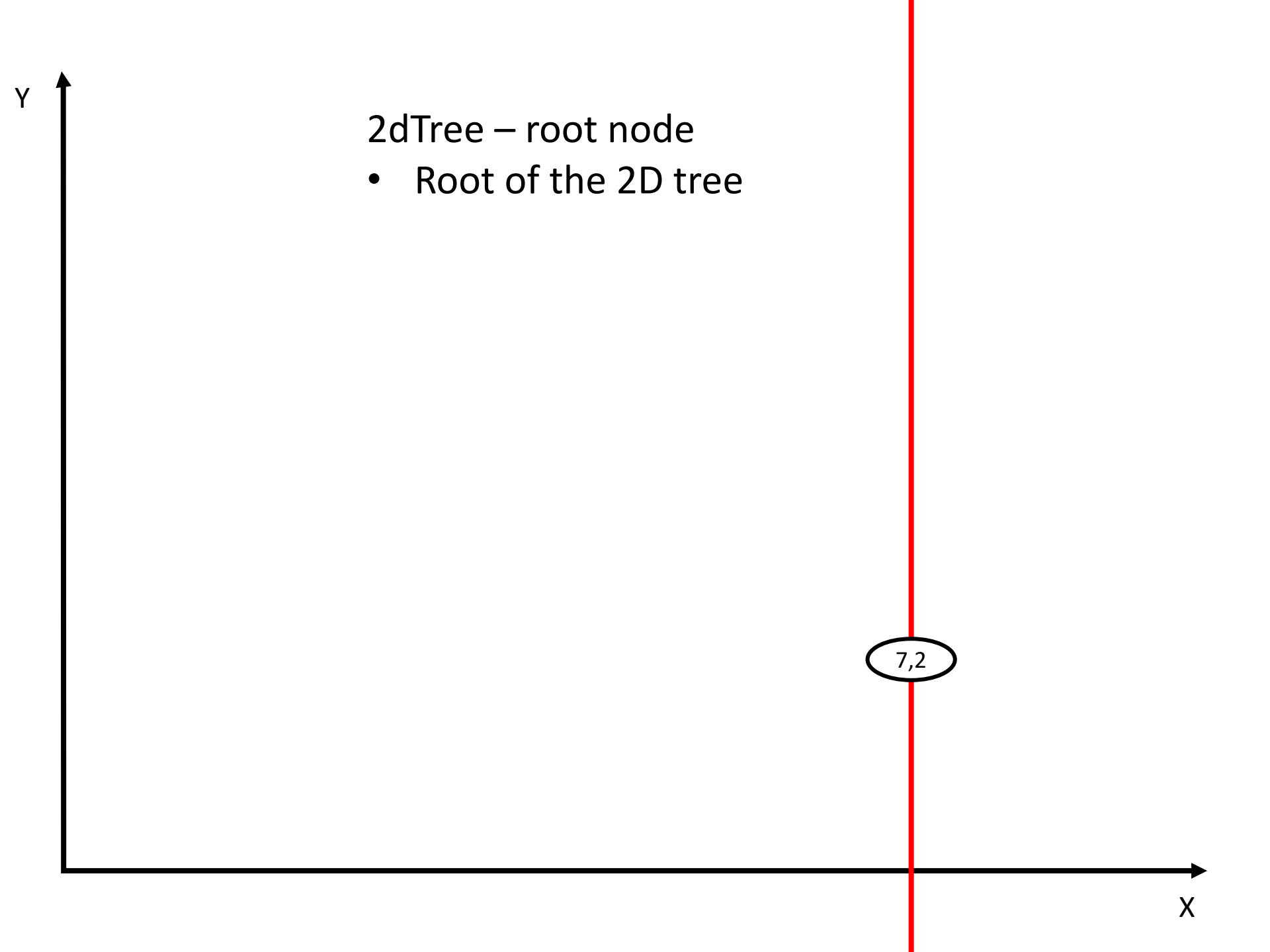

3 Nearest Points?
Y
X
VT
ME
P
NH
NY
MA
CT
RI

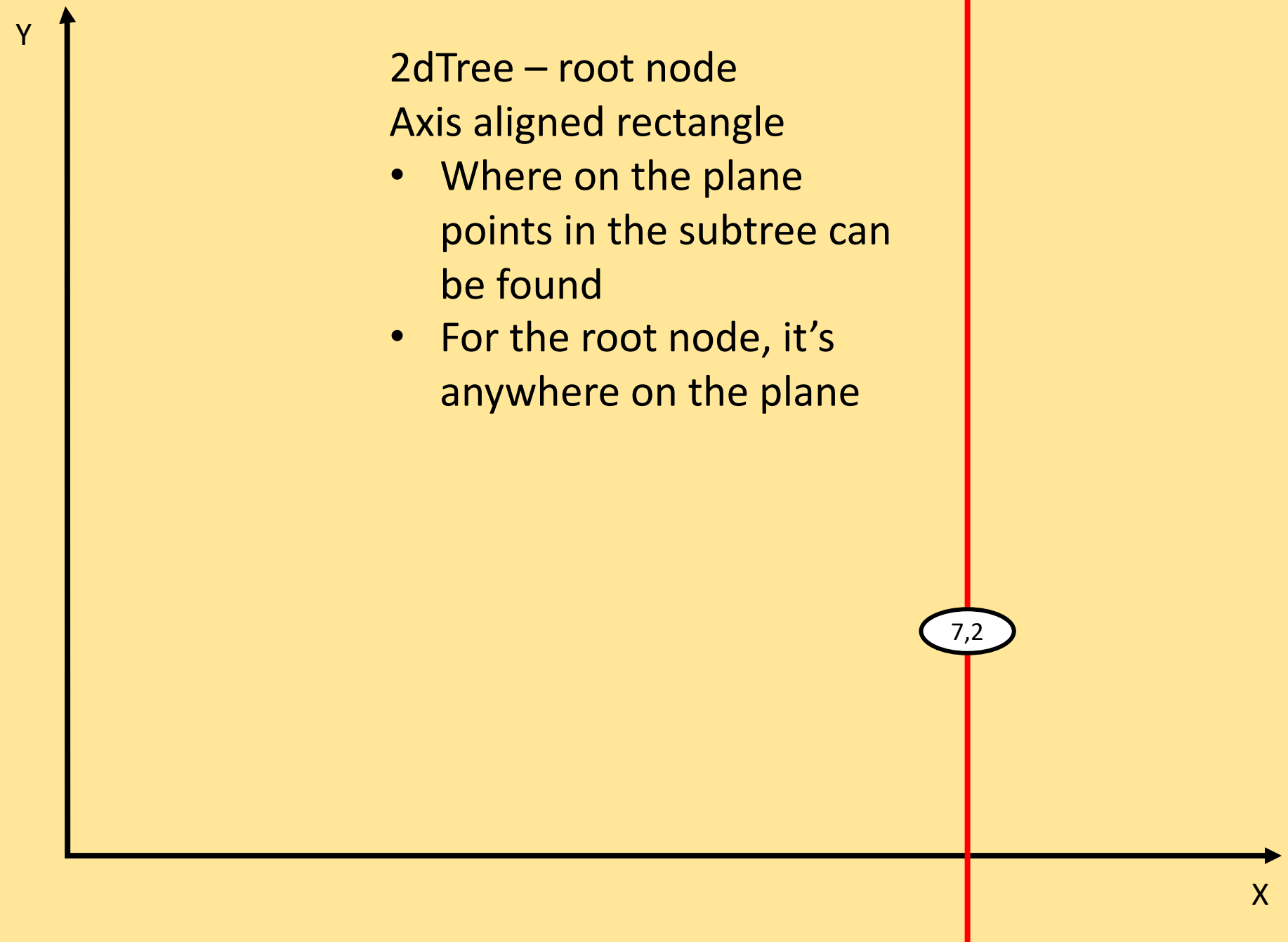

Y
VT
ME
Points in this rectangle?
NH
NY
MA
CT
RI
X



2dTree

- I’m just gonna show point coordinates for simplicity
- Just keep in mind that values are stored at each point

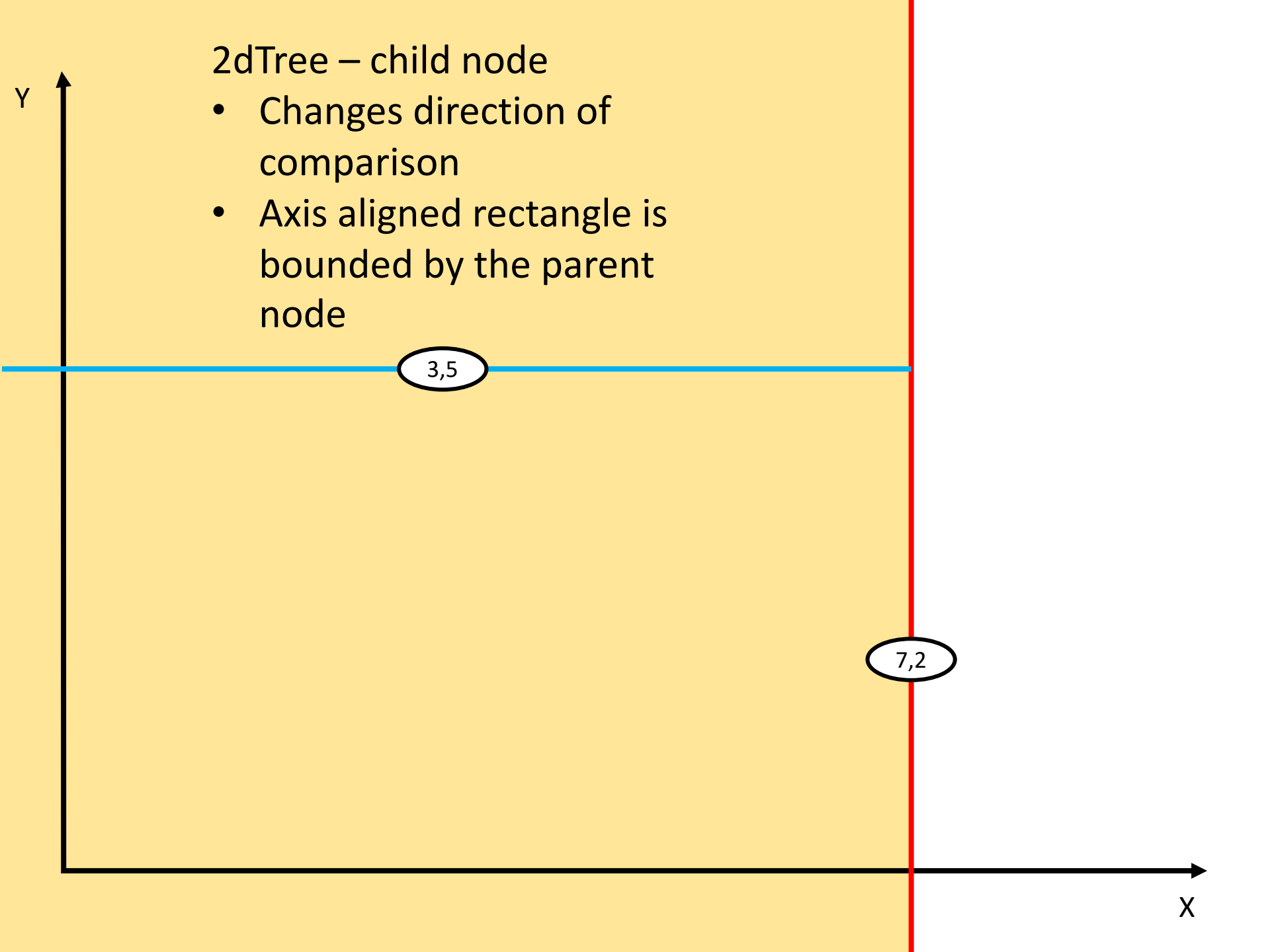

Y
2dTree – root node
• Root of the 2D tree
7,2
X

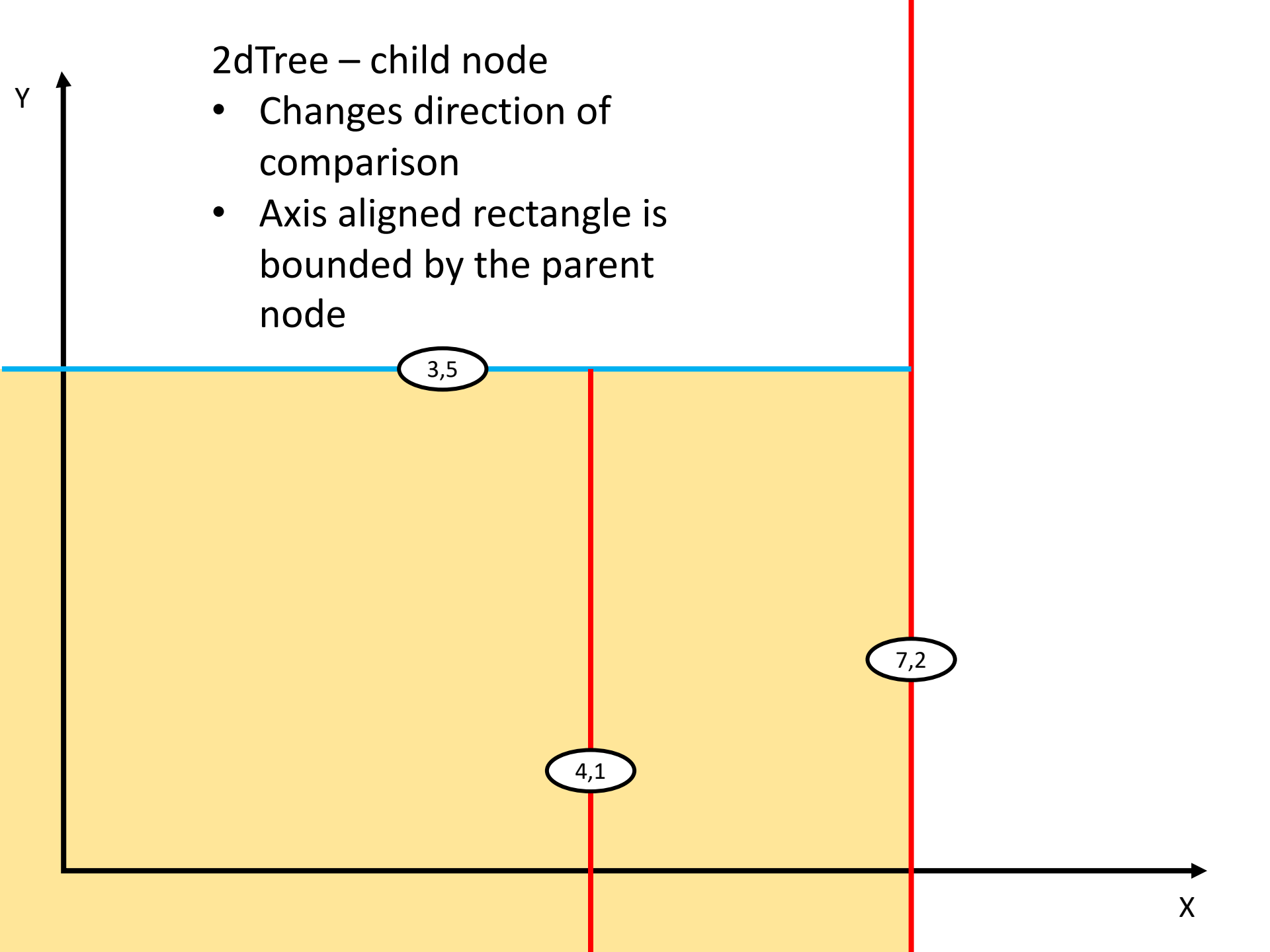


2dTree – root node

Axis aligned rectangle

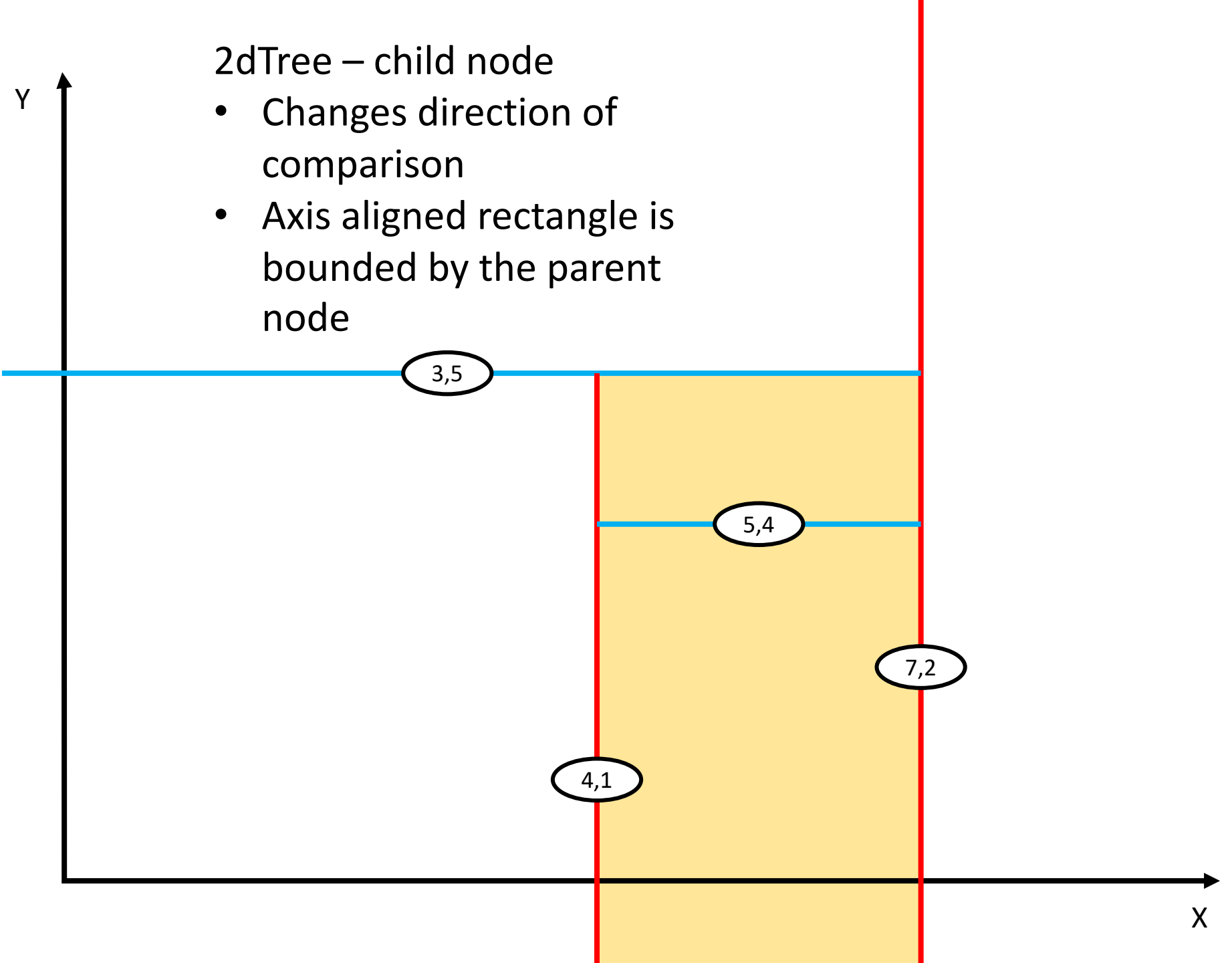
- Where on the plane points in the subtree can be found
- For the root node, it's anywhere on the plane

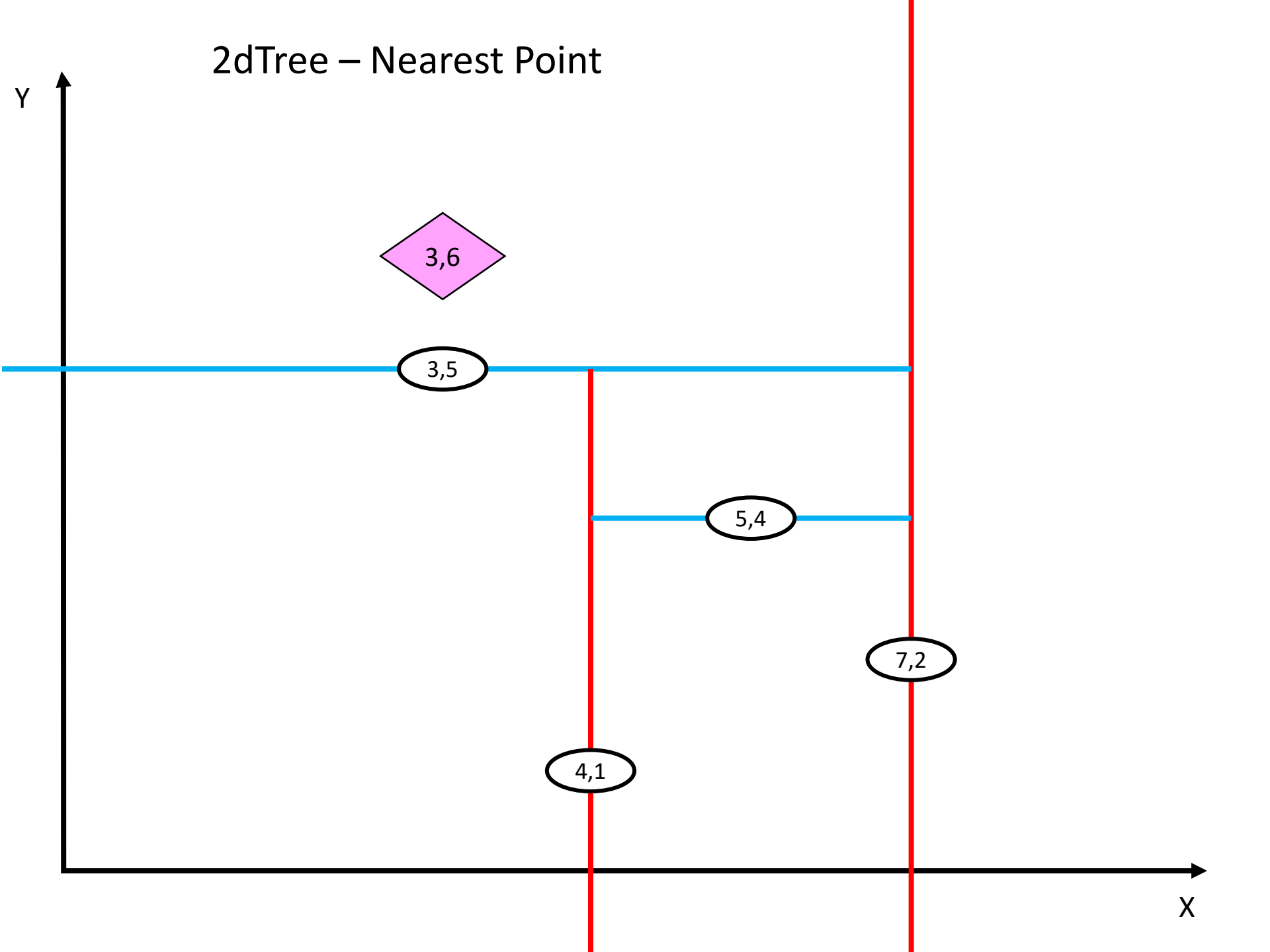

2dTree – child node
• Changes direction of comparison
• Axis aligned rectangle is bounded by the parent node
Y
3,5
7,2
X


2dTree – child node
• Changes direction of comparison
• Axis aligned rectangle is bounded by the parent node
Y
3,5
7,2
4,1
X

2dTree – child node

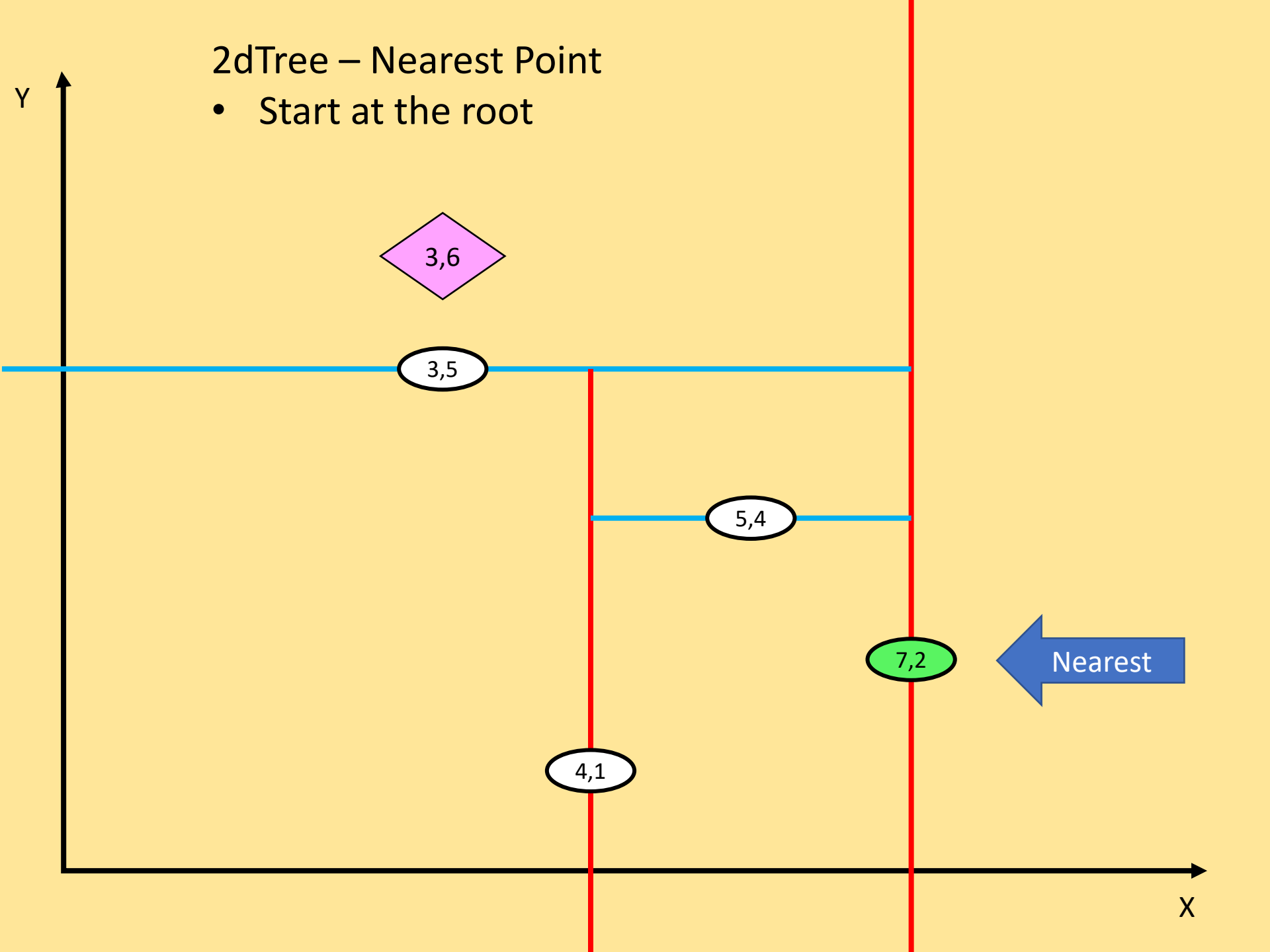
- Changes direction of comparison
- Axis aligned rectangle is bounded by the parent node

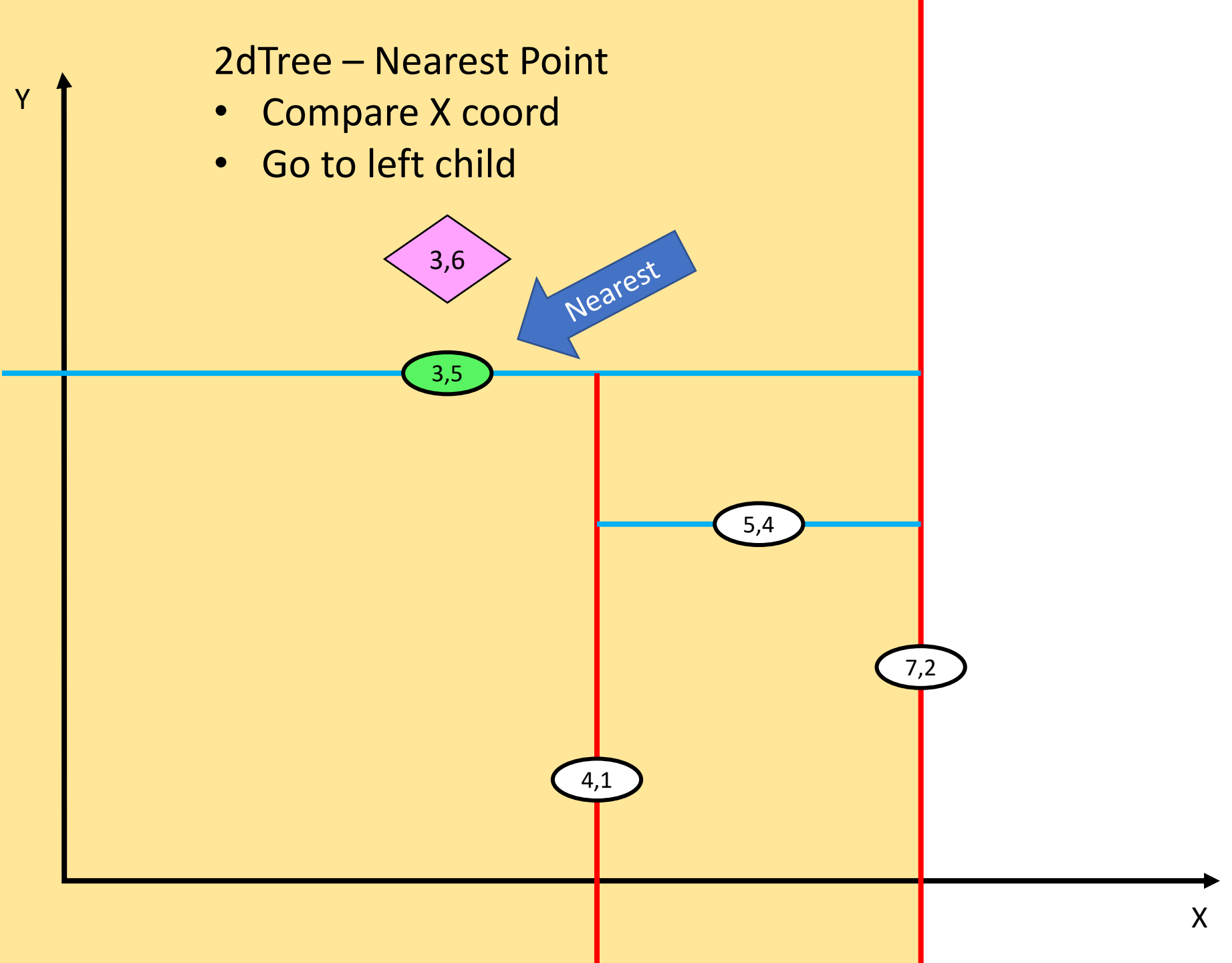


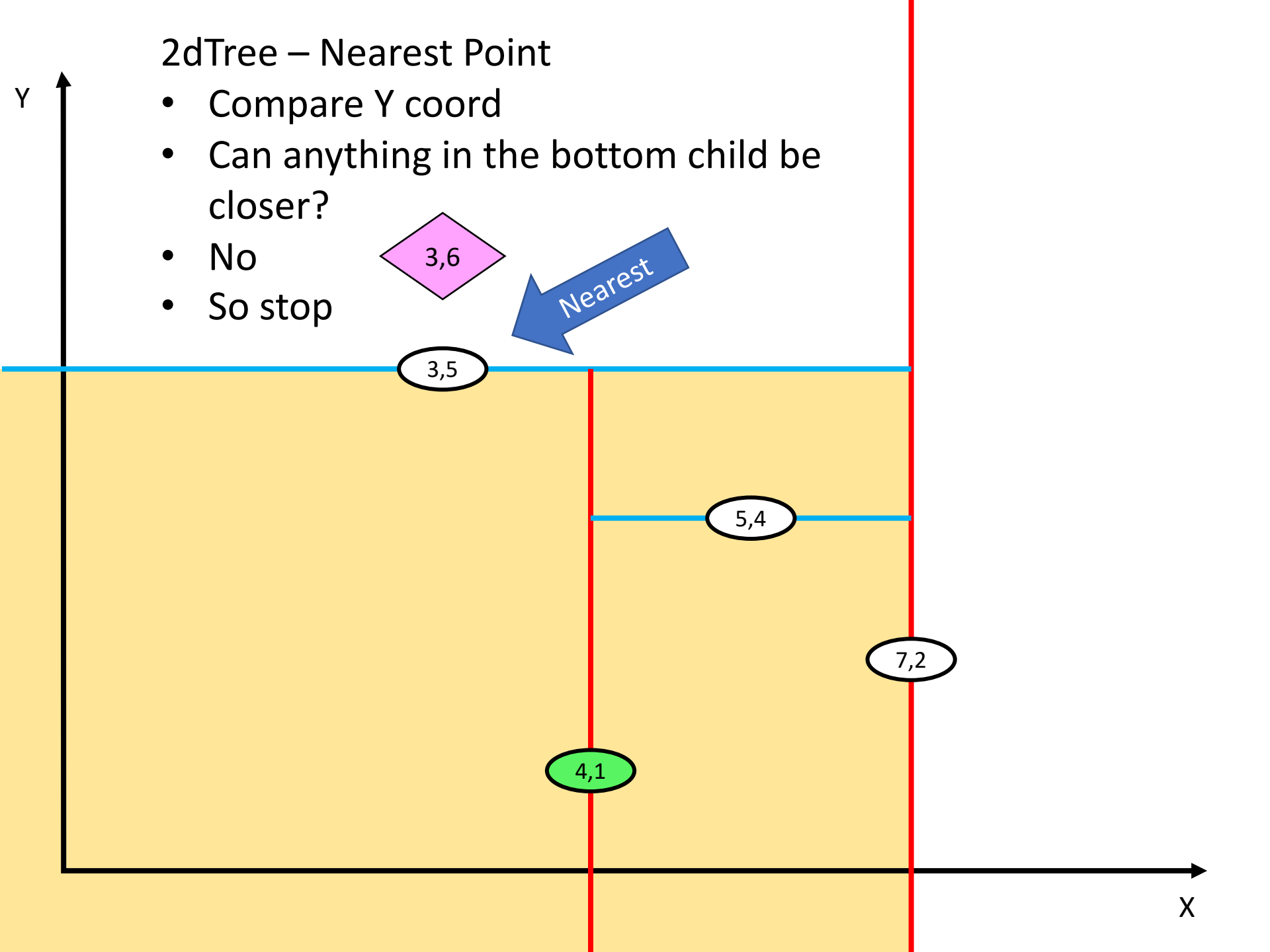

2dTree – Nearest Point
Y
3,6
3,5
5,4
7,2
4,1
X

2dTree – Nearest Point

- Start at the root




2dTree – Nearest Point
• Compare X coord
• Go to left child
Y
3,6
Nearest
3,5
5,4
7,2
4,1
X


2dTree – Nearest Point
• Compare Y coord
• Can anything in the bottom child be closer?
• No
• So stop
Y
3,6
Nearest
3,5
5,4
7,2
4,1
X

Questions?

Spell Checker

Exercise hints - Spell Checker

- Splitting lines
  - Using “,”
  - Using “\\b”

```
line.trim().split( regex: ",");
```

```
String[] words = line.trim().split( regex: "\\b");
```

- Reading StdIn
  - Lines
  - While loop

```
while (!StdIn.isEmpty()) {
    String line = StdIn.readLine();


    ...
}
```

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Exercise Hints

- Creating a generic array
- It's an unordered array, so new entries can go at the end
- Shift key/value pairs to the left to delete a key
- Linear search to find entries (simple loop)
- Comparing Keys
- Keep track of n
- Resize arrays as necessary

```
Key[] someKeys = (Key[]) new Object[2];
```

```
someKey.equals(someOtherKey);
```

```
if (keys.length == n) {
    resize( capacity: 2 * keys.length);
}
```

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