Q: Write a program to implement functions for computing height, core, boundary, support of given fuzzy set. Your functions should take fuzzy set as input and return above values

Solution:

**Code available at: **

```python
class FuzzySet:
    def __init__(self):
        self.elements = []
        self.memberships = []

    def add_element(self, element, membership):
        if membership < 0 or membership > 1:
            print("Invalid membership value. Membership value should be between 0 and 1.")
            again_membership = float(input(f"Enter membership value of {element} AGAIN! (between 0 and 1): "))
            self.elements.append(element)
            self.memberships.append(again_membership)
        else:
            self.elements.append(element)
            self.memberships.append(membership)

    def height(self):
        print(max(self.memberships))

    def supportA(self, other_set):
        support = []
```

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        for i in range(len(other_set.elements)):

            if other_set.elements[i] in self.elements and
self.memberships[self.elements.index(other_set.elements[i])] >= other_set.memberships[i]:

                if(other_set.memberships[i] > 0):

                    support.append(other_set.elements[i])

        if(len(support) > 0):

            print("Support of Fuzzy Set A: ", support)

        else:

            print("Support of Fuzzy Set A: NULL")




    def coreA(self, other_set):

        core = []

        for i in range(len(other_set.elements)):

            if other_set.elements[i] in self.elements and
self.memberships[self.elements.index(other_set.elements[i])] >= other_set.memberships[i]:

                if(other_set.memberships[i] == 1):

                    core.append(other_set.elements[i])

        if(len(core) > 0):

            print("Core of Fuzzy Set A: ", core)

        else:

            print("Core of Fuzzy Set A: NULL")


    def boundaryA(self, other_set):

        boundary = []

        for i in range(len(other_set.elements)):

            if other_set.elements[i] in self.elements and
self.memberships[self.elements.index(other_set.elements[i])] >= other_set.memberships[i]:

                if(other_set.memberships[i] < 1 and other_set.memberships[i] >0):
```

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            boundary.append(other_set.elements[i])
    if(len(boundary) > 0):
      print("Boundary of Fuzzy Set A: ", boundary)
    else:
      print("Boundary of Fuzzy Set A: NULL")



  def print_set(self):
    for i in range(len(self.elements)):
        print(self.elements[i], self.memberships[i])



union = FuzzySet()


n = int(input("Enter the number of elements in Union Set: "))


for i in range(n):
    element = input(f"Enter element {i+1} in Union Set: ")
    membership = float(input(f"Enter membership value of {element} in Union Set (between 0
and 1): "))
    union.add_element(element, membership)


setA = FuzzySet()


n = int(input("\nEnter the number of elements in set A: "))


for i in range(n):
    element = input(f"Enter element {i+1} in set A: ")
```

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    membership = float(input(f"Enter membership value of {element} in set A (between 0 and 1): "))
    setA.add_element(element, membership)



print("\nUnion Set:")
union.print_set()
print("\nSet A:")
setA.print_set()

print("\nHeight of Fuzzy Set A:")
setA.height()

print("\nSupport: For Fuzzy Set A over Union set (X)")
union.supportA(setA)

print("\nCore: For Fuzzy Set A over Union set (X)")
union.coreA(setA)

print("\nBoundary: For Fuzzy Set A over Union set (X)")
union.boundaryA(setA)
```

OUTPUT

Enter the number of elements in Union Set: 6

Enter element 1 in Union Set: 2

Enter membership value of 2 in Union Set (between 0 and 1): 0.5

Enter element 2 in Union Set: 4

Enter membership value of 4 in Union Set (between 0 and 1): 0.6

Enter element 3 in Union Set: 8

Enter membership value of 8 in Union Set (between 0 and 1): 1

Enter element 4 in Union Set: 10

Enter membership value of 10 in Union Set (between 0 and 1): 1

Enter element 5 in Union Set: 11

Enter membership value of 11 in Union Set (between 0 and 1): 0.4

Enter element 6 in Union Set: 12

Enter membership value of 12 in Union Set (between 0 and 1): 0

Enter the number of elements in set A: 3

Enter element 1 in set A: 2

Enter membership value of 2 in set A (between 0 and 1): 0.4

Enter element 2 in set A: 8

Enter membership value of 8 in set A (between 0 and 1): 1

Enter element 3 in set A: 12

Enter membership value of 12 in set A (between 0 and 1): 0

Union Set:

2 0.5

4 0.6

8 1.0

10 1.0

11 0.4

12 0.0

Set A:

2 0.4

8 1.0

12 0.0

Height of Fuzzy Set A:

1.0

Support: For Fuzzy Set A over Union set (X)

Support of Fuzzy Set A: ['2', '8']

Core: For Fuzzy Set A over Union set (X)

Core of Fuzzy Set A: ['8']

Boundary: For Fuzzy Set A over Union set (X)

Boundary of Fuzzy Set A: ['2']