Genetic Algorithm & Fuzzy Logic

Semester-5

Practical - 7

Name: Shivam Tawari

Roll no: A-58

Aim: Implementation of different fuzzy set operations

Theory:

What is Fuzzy Set ?

Fuzzy refers to something that is unclear or vague . Hence, Fuzzy Set is a Set where every key is associated with value, which is between 0 to 1 based on the certainty .This value is often called as degree of membership. Fuzzy Set is denoted with a Tilde Sign on top of the normal Set notation.

Operations on Fuzzy Set with Code :

1. **Union :**

Consider 2 Fuzzy Sets denoted by A and B, then let's consider Y be the Union of them, then for every member of A and B, Y will be:

degree_of_membership(Y)= max(degree_of_membership(A), degree_of_membership(B))

2. **Intersection :**

Consider 2 Fuzzy Sets denoted by A and B, then let's consider Y be the Intersection of them, then for every member of A and B, Y will be:

degree_of_membership(Y)= min(degree_of_membership(A), degree_of_membership(B))

3. **Complement :**

Consider a Fuzzy Sets denoted by A, then let's consider Y be the Complement of it, then for every member of A, Y will be:

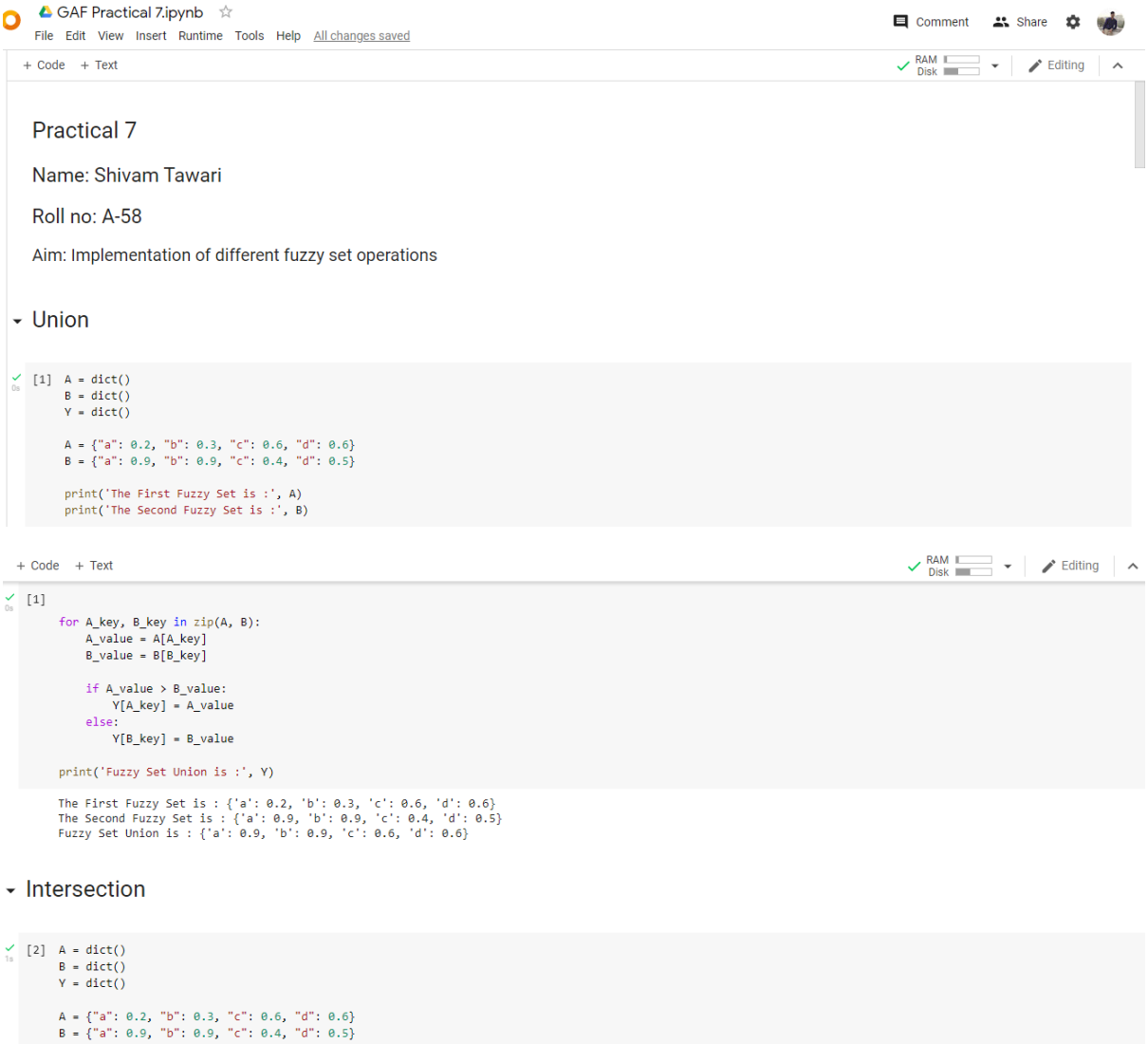
degree_of_membership(Y)= 1 - degree_of_membership(A)

4. **Difference :**

Consider 2 Fuzzy Sets denoted by A and B, then let's consider Y be the Intersection of them, then for every member of A and B, Y will be:

degree_of_membership(Y)= min(degree_of_membership(A), 1-degree_of_membership(B))

Code:



```
[2] for A_key, B_key in zip(A, B):
        A_value = A[A_key]
        B_value = B[B_key]

        if A_value < B_value:
            Y[A_key] = A_value
        else:
            Y[B_key] = B_value
    print('Fuzzy Set Intersection is :', Y)
```

```
The First Fuzzy Set is : {'a': 0.2, 'b': 0.3, 'c': 0.6, 'd': 0.6}
The Second Fuzzy Set is : {'a': 0.9, 'b': 0.9, 'c': 0.4, 'd': 0.5}
Fuzzy Set Intersection is : {'a': 0.2, 'b': 0.3, 'c': 0.4, 'd': 0.5}
```

Complement

```
[3] A = dict()
    Y = dict()

    A = {"a": 0.2, "b": 0.3, "c": 0.6, "d": 0.6}

    print('The Fuzzy Set is :', A)


    for A_key in A:
```

```
[3] for A_key in A:
        Y[A_key]= 1-A[A_key]

    print('Fuzzy Set Complement is :', Y)
```

```
The Fuzzy Set is : {'a': 0.2, 'b': 0.3, 'c': 0.6, 'd': 0.6}
Fuzzy Set Complement is : {'a': 0.8, 'b': 0.7, 'c': 0.4, 'd': 0.4}
```

Difference

```
[4] A = dict()
    B = dict()
    Y = dict()

    A = {"a": 0.2, "b": 0.3, "c": 0.6, "d": 0.6}
    B = {"a": 0.9, "b": 0.9, "c": 0.4, "d": 0.5}

    print('The First Fuzzy Set is :', A)
    print('The Second Fuzzy Set is :', B)


    for A_key, B_key in zip(A, B):
        A_value = A[A_key]
        B_value = B[B_key]
```

```
[4] A = {"a": 0.2, "b": 0.3, "c": 0.6, "d": 0.6}
    B = {"a": 0.9, "b": 0.9, "c": 0.4, "d": 0.5}

    print('The First Fuzzy Set is :', A)
    print('The Second Fuzzy Set is :', B)


    for A_key, B_key in zip(A, B):
        A_value = A[A_key]
        B_value = B[B_key]
        B_value = 1 - B_value

        if A_value < B_value:
            Y[A_key] = A_value
        else:
            Y[B_key] = B_value

    print('Fuzzy Set Difference is :', Y)
```

```
The First Fuzzy Set is : {'a': 0.2, 'b': 0.3, 'c': 0.6, 'd': 0.6}
The Second Fuzzy Set is : {'a': 0.9, 'b': 0.9, 'c': 0.4, 'd': 0.5}
Fuzzy Set Difference is : {'a': 0.09999999999999998, 'b': 0.09999999999999998, 'c': 0.6, 'd': 0.5}
```

Conclusion: Hence, Implementation of different fuzzy set operations has been successfully.