Fuzzy Set.ipynb

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[2]
```
#Performing operation of Fuzzy set

A = {"x1": 0.2, "x2": 0.6, "x3": 0.5, "x4": 0.6, "x5": 0.4}
B = {"x1": 0.3, "x2": 0.2, "x3": 0.4,"x4": 0.5, "x5": 0.6}
C = {"x1": 0.4, "x2": 0.7, "x3": 1, "x4": 0.2, "x5": 0.3}
D = {"x1": 0.3, "x2": 0.6, "x3": 0.4,"x4": 0.8, "x5": 0.5}
```

```
#Function Union
def union(A, B):
  U = {}
  for A_key, B_key in zip(A, B):
    U[A_key] = max(A[A_key], B[B_key])
  return U
```

[7]
```python
#Complement Function
def complement(A):
  C = {}
  for key, value in A.items():
    C[key] = 1 - value
  return C
```

[8]
```python
#Intersection Function
def intersection(A, B):
  I = {}
  for A_key, B_key in zip(A, B):
    I[A_key] = min(A[A_key], B[B_key])
  return I
```

[9]
```python
#Difference Function
def difference(A, B):
  D = {}
  for A_key, B_key in zip(A, B):
    D[A_key] = min(A[A_key], 1-B[B_key])
  return D
```

[10]
```python
#Compute Max-Min from fuzzy relations
def max_min(A, B):
  row1 = len(A)
  col1 = len(A[0])
  row2 = len(B)
  col2 = len(B[0])

  M = [[0 for _ in range(col2)] for _ in range(row1)]

  for i in range(row1):
    for j in range(col2):
      M[i][j] = 0
      for k in range(col1):
          M[i][j] = max(M[i][j], min(A[i][k], B[k][j]))
  return M
```

[11]
```python
#Function to compute Cartesian Product
def cartesian_product(A, B):
  M = [[0 for _ in range(len(B))] for _ in range(len(A))]
  for i, A_value in enumerate(A.values()):
    for j, B_value in enumerate(B.values()):
      M[i][j] = min(A_value, B_value)
  return M
```

```
[4] U = union(A, B)
    print("Union of A and B: ",U)
```

```
Union of A and B:  {'x1': 0.3, 'x2': 0.6, 'x3': 0.5, 'x4': 0.6, 'x5': 0.6}
```

```
[12] C = complement(A)
     print("complement of A: ",C)
```

```
complement of A:  {'x1': 0.8, 'x2': 0.4, 'x3': 0.5, 'x4': 0.4, 'x5': 0.6}
```

```
[13] I = intersection(A, B)
     print("Intersection of A and B: ",I)
```

```
Intersection of A and B:  {'x1': 0.2, 'x2': 0.2, 'x3': 0.4, 'x4': 0.5, 'x5': 0.4}
```

```
[14] D = difference(A, B)
     print("Difference of A and B: ", D)
```

```
Difference of A and B:  {'x1': 0.2, 'x2': 0.6, 'x3': 0.5, 'x4': 0.5, 'x5': 0.4}
```

```
[18] C1 = cartesian_product(A, B)
     print(M1)
```

```
[[0.2, 0.2, 0.2, 0.2, 0.2], [0.3, 0.2, 0.4, 0.5, 0.6], [0.3, 0.2, 0.4, 0.5, 0.5], [0.3, 0.2, 0.4, 0.5, 0.6], [0.3, 0.2, 0.4, 0.4, 0.4]]
```

```
[19]
     C2 = cartesian_product(C, D)
     print(M2)
```

```
[[0.2, 0.6, 0.5, 0.5, 0.4], [0.2, 0.4, 0.4, 0.4, 0.4], [0.2, 0.5, 0.5, 0.5, 0.4], [0.2, 0.4, 0.4, 0.4, 0.4], [0.2, 0.6, 0.5, 0.5, 0.4]]
```

```
[20] max_min(C1, C2)
```

```
[[0.2, 0.2, 0.2, 0.2, 0.2],
 [0.2, 0.6, 0.5, 0.5, 0.4],
 [0.2, 0.5, 0.5, 0.5, 0.4],
 [0.2, 0.6, 0.5, 0.5, 0.4],
 [0.2, 0.4, 0.4, 0.4, 0.4]]
```