Quiz8_u0742607

April 2, 2020

[1]:
```
# load in the data
X = [8.9, 10.0, 7.9, 8.1, 8.3,
     13.8, 12.6, 8.1, 9.5,
     16.5, 13.6, 14.2, 13.3]

Y= [12.2, 12.2, 9.8, 9.2, 9.0,
    14.2, 12.8, 7.3, 8.5,
    15.3, 12.2, 12.7, 11.1]
```

[2]:
```
# a function to generate the test statistic
def calcTestStat(X, Y, test='Wilcoxon'):

    # generate a sorted list of differences
    D=[(X[i] - Y[i]) for i in range(len(X))]
    D = sorted(D, key=abs)

    if test == 'Wilcoxon':
        return sum([i+1 for i in range(len(D)) if D[i] > 0]), D
    elif test == 'PairedSample':
        return sum([d for d in D if d >0]), D
```

[3]:
```
# helper method used to calculate all possible sums
def getAllSums(arr, l, r, result, sum = 0):
    result.add(sum)
    # Print current subset
    if l > r:
        return

    # Subset including arr[l]
    getAllSums(arr, l + 1, r, result, sum + arr[l])

    # Subset excluding arr[l]
    getAllSums(arr, l + 1, r, result, sum)
    return result
```

[4]:
```
# a function to run the test
def runTest(X, Y, alpha, test):
```

```
    domainSize = 2**len(X)
    T, D = calcTestStat(X, Y, test)

    # get a set of all possible sums
    if test == 'Wilcoxon':
        allSums = getAllSums([i for i in range(len(D))], 0, len(D) - 1, set())
    elif test == 'PairedSample':
        allSums = getAllSums([abs(d) for d in D], 0, len(D) - 1, set())
    resultList = []
    i=0
    for sums in allSums:
        if i < int(domainSize*alpha):
            resultList.append(sums)
            i += 1
    print(resultList)

    testAlpha = T / domainSize
    print("Crit Value:{}".format(resultList[len(resultList)-1]))
    print("Test value:{}".format(T))

    return T < resultList[len(resultList)-1]
```

[5]:
```
# now we can run the Wilcoxon Signed Rank Test
if(runTest(X,Y, 0.0005, 'Wilcoxon') == False):
    print("\nThus we fail to reject the null.")
else:
    print("\nWe reject the null!")
```

```
[0, 1, 2, 3]
Crit Value:3
Test value:45

Thus we fail to reject the null.
```

[6]:
```
# now we can run the Paired Sample Test
if(runTest(X,Y, 0.0005, 'PairedSample') == False):
    print("\nThus we fail to reject the null.")
else:
    print("\nWe reject the null!")
```

```
[0, 0.20000000000000107, 0.5999999999999996, 2.0999999999999988]
Crit Value:2.0999999999999988
Test value:8.100000000000001

Thus we fail to reject the null.
```