SOFT COMPUTING ASSIGNMENT -3

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AP21110010201

Write a Python program to implement a Perceptron. The input is your semester marks. Do not use the built-in functions of Perceptron.

Note: Upload the source file of the Python program and a Word document file that contains the Python program along with the results.

```
import numpy as np
import pandas as pd

class Perceptron:
    def __init__(self, input_size, learning_rate=1, iterations=10):
        self.weights = np.zeros(input_size + 1)
        self.learning_rate = learning_rate
        self.iterations = iterations

    def activation_function(self, x):
        return 1 if x >= 0 else 0

    def predict(self, x):
        z = np.dot(x, self.weights[1:]) + self.weights[0]
        return self.activation_function(z)

    def train(self, X, y):
        for _ in range(self.iterations):
            print(f"\nIteration {_+1}:")
            for xi, target in zip(X, y):
                prediction = self.predict(xi)
                print(f"Sample: {xi}")
```

```
                        print(f"Prediction: {prediction}, Target:
 {target}")
                print(f"Current weights: {self.weights}")
                if prediction != target:
                            self.weights[1:] += self.learning_rate *
 (target-prediction) * xi
                    self.weights[0] += self.learning_rate * (target
 )
                    print(f"Updated weights: {self.weights}")
                    print(f"Updated bias: {self.weights[0]}")
                else:
                    print("No Update in weights required")
                print("\n")
    def evaluate(self, X, y):
        predictions = [self.predict(xi) for xi in X]
        accuracy = np.mean(predictions == y)
        return accuracy

df = pd.read_csv('random_data.csv')

X = df[['c1', 'c2', 'c3', 'c4', 'c5', 'c6']].values
y = df['result'].values

perceptron = Perceptron(input_size=X.shape[1], learning_rate=1,
 iterations=10)

perceptron.train(X, y)
accuracy = perceptron.evaluate(X, y)
print(f"Training accuracy: {accuracy * 100:.2f}%")

new_marks = np.array([7,0,2,3,4,5])
prediction = perceptron.predict(new_marks)
print(f"Prediction for new marks (Pass=1, Fail=0): {prediction}")
```

```
Iteration 1:
Sample: [32 21 93 78 93 53]
Prediction: 1, Target: 1
Current weights: [0. 0. 0. 0. 0. 0. 0.]
No Update in weights required


Sample: [81  9  8 35 82 31]
Prediction: 1, Target: 0
Current weights: [0. 0. 0. 0. 0. 0. 0.]
Updated weights: [  0. -81.  -9.  -8. -35. -82. -31.]
Updated bias: 0.0


Sample: [ 8  5 31 49 21 17]
Prediction: 0, Target: 0
Current weights: [  0. -81.  -9.  -8. -35. -82. -31.]
No Update in weights required


Sample: [80 47 25 37 27 56]
Prediction: 0, Target: 0
Current weights: [  0. -81.  -9.  -8. -35. -82. -31.]
No Update in weights required
```

```
Sample: [53 68 95 50  8  4]
Prediction: 0, Target: 0
Current weights: [  0. -81.  -9.  -8. -35. -82. -31.]
No Update in weights required


Sample: [73 63 66 56 34 76]
Prediction: 0, Target: 1
Current weights: [  0. -81.  -9.  -8. -35. -82. -31.]
Updated weights: [  1.  -8.  54.  58.  21. -48.  45.]
Updated bias: 1.0


Sample: [ 0 37 12 41 19 16]
Prediction: 1, Target: 0
Current weights: [  1.  -8.  54.  58.  21. -48.  45.]
Updated weights: [  1.  -8.  17.  46. -20. -67.  29.]
Updated bias: 1.0


Sample: [78 17 47 86 79 26]
Prediction: 0, Target: 1
Current weights: [  1.  -8.  17.  46. -20. -67.  29.]
Updated weights: [ 2. 70. 34. 93. 66. 12. 55.]
Updated bias: 2.0
```

```
Sample: [71 65 64 42  6 85]
Prediction: 1, Target: 1
Current weights: [ 2. 70. 34. 93. 66. 12. 55.]
No Update in weights required


Sample: [21 49 67 93 80 32]
Prediction: 1, Target: 1
Current weights: [ 2. 70. 34. 93. 66. 12. 55.]
No Update in weights required



Iteration 2:
Sample: [32 21 93 78 93 53]
Prediction: 1, Target: 1
Current weights: [ 2. 70. 34. 93. 66. 12. 55.]
No Update in weights required


Sample: [81  9  8 35 82 31]
Prediction: 1, Target: 0
Current weights: [ 2. 70. 34. 93. 66. 12. 55.]
Updated weights: [  2. -11.  25.  85.  31. -70.  24.]
Updated bias: 2.0
```

```
Sample: [ 8  5 31 49 21 17]
Prediction: 1, Target: 0
Current weights: [  2. -11.  25.  85.  31. -70.  24.]
Updated weights: [  2. -19.  20.  54. -18. -91.   7.]
Updated bias: 2.0


Sample: [80 47 25 37 27 56]
Prediction: 0, Target: 0
Current weights: [  2. -19.  20.  54. -18. -91.   7.]
No Update in weights required


Sample: [53 68 95 50  8  4]
Prediction: 1, Target: 0
Current weights: [  2. -19.  20.  54. -18. -91.   7.]
Updated weights: [  2. -72. -48. -41. -68. -99.   3.]
Updated bias: 2.0


Sample: [73 63 66 56 34 76]
Prediction: 0, Target: 1
Current weights: [  2. -72. -48. -41. -68. -99.   3.]
Updated weights: [  3.   1.  15.  25. -12. -65.  79.]
Updated bias: 3.0
```

```
Sample: [ 0 37 12 41 19 16]
Prediction: 1, Target: 0
Current weights: [  3.   1.  15.  25. -12. -65.  79.]
Updated weights: [  3.   1. -22.  13. -53. -84.  63.]
Updated bias: 3.0


Sample: [78 17 47 86 79 26]
Prediction: 0, Target: 1
Current weights: [  3.   1. -22.  13. -53. -84.  63.]
Updated weights: [ 4. 79. -5. 60. 33. -5. 89.]
Updated bias: 4.0


Sample: [71 65 64 42  6 85]
Prediction: 1, Target: 1
Current weights: [ 4. 79. -5. 60. 33. -5. 89.]
No Update in weights required


Sample: [21 49 67 93 80 32]
Prediction: 1, Target: 1
Current weights: [ 4. 79. -5. 60. 33. -5. 89.]
No Update in weights required
```

```
Iteration 3:
Sample: [32 21 93 78 93 53]
Prediction: 1, Target: 1
Current weights: [ 4. 79. -5. 60. 33. -5. 89.]
No Update in weights required


Sample: [81  9  8 35 82 31]
Prediction: 1, Target: 0
Current weights: [ 4. 79. -5. 60. 33. -5. 89.]
Updated weights: [  4.  -2. -14.  52.  -2. -87.  58.]
Updated bias: 4.0


Sample: [ 8  5 31 49 21 17]
Prediction: 1, Target: 0
Current weights: [  4.  -2. -14.  52.  -2. -87.  58.]
Updated weights: [   4.  -10.  -19.   21.  -51. -108.   41.]
Updated bias: 4.0


Sample: [80 47 25 37 27 56]
Prediction: 0, Target: 0
Current weights: [   4.  -10.  -19.   21.  -51. -108.   41.]
No Update in weights required
```

```
Sample: [53 68 95 50  8  4]
Prediction: 0, Target: 0
Current weights: [   4.  -10.  -19.   21.  -51. -108.   41.]
No Update in weights required


Sample: [73 63 66 56 34 76]
Prediction: 0, Target: 1
Current weights: [   4.  -10.  -19.   21.  -51. -108.   41.]
Updated weights: [  5.  63.  44.  87.   5. -74. 117.]
Updated bias: 5.0


Sample: [ 0 37 12 41 19 16]
Prediction: 1, Target: 0
Current weights: [  5.  63.  44.  87.   5. -74. 117.]
Updated weights: [  5.  63.   7.  75. -36. -93. 101.]
Updated bias: 5.0


Sample: [78 17 47 86 79 26]
Prediction: 1, Target: 1
Current weights: [  5.  63.   7.  75. -36. -93. 101.]
No Update in weights required
```

```
Sample: [71 65 64 42  6 85]
Prediction: 1, Target: 1
Current weights: [  5.  63.   7.  75. -36. -93. 101.]
No Update in weights required


Sample: [21 49 67 93 80 32]
Prediction: 0, Target: 1
Current weights: [  5.  63.   7.  75. -36. -93. 101.]
Updated weights: [  6.  84.  56. 142.  57. -13. 133.]
Updated bias: 6.0



Iteration 4:
Sample: [32 21 93 78 93 53]
Prediction: 1, Target: 1
Current weights: [  6.  84.  56. 142.  57. -13. 133.]
No Update in weights required


Sample: [81  9  8 35 82 31]
Prediction: 1, Target: 0
Current weights: [  6.  84.  56. 142.  57. -13. 133.]
Updated weights: [  6.   3.  47. 134.  22. -95. 102.]
Updated bias: 6.0
```

```
Sample: [ 8  5 31 49 21 17]
Prediction: 1, Target: 0
Current weights: [  6.   3.  47. 134.  22. -95. 102.]
Updated weights: [   6.   -5.   42.  103.  -27. -116.   85.]
Updated bias: 6.0


Sample: [80 47 25 37 27 56]
Prediction: 1, Target: 0
Current weights: [   6.   -5.   42.  103.  -27. -116.   85.]
Updated weights: [   6.  -85.   -5.   78.  -64. -143.   29.]
Updated bias: 6.0


Sample: [53 68 95 50  8  4]
Prediction: 0, Target: 0
Current weights: [   6.  -85.   -5.   78.  -64. -143.   29.]
No Update in weights required


Sample: [73 63 66 56 34 76]
Prediction: 0, Target: 1
Current weights: [   6.  -85.   -5.   78.  -64. -143.   29.]
Updated weights: [   7.  -12.   58.  144.   -8. -109.  105.]
Updated bias: 7.0
```

```
Sample: [ 0 37 12 41 19 16]
Prediction: 1, Target: 0
Current weights: [   7.  -12.   58.  144.   -8. -109.  105.]
Updated weights: [   7.  -12.   21.  132.  -49. -128.   89.]
Updated bias: 7.0


Sample: [78 17 47 86 79 26]
Prediction: 0, Target: 1
Current weights: [   7.  -12.   21.  132.  -49. -128.   89.]
Updated weights: [  8.  66.  38. 179.  37. -49. 115.]
Updated bias: 8.0


Sample: [71 65 64 42  6 85]
Prediction: 1, Target: 1
Current weights: [  8.  66.  38. 179.  37. -49. 115.]
No Update in weights required


Sample: [21 49 67 93 80 32]
Prediction: 1, Target: 1
Current weights: [  8.  66.  38. 179.  37. -49. 115.]
No Update in weights required
```

```
Iteration 5:
Sample: [32 21 93 78 93 53]
Prediction: 1, Target: 1
Current weights: [  8.  66.  38. 179.  37. -49. 115.]
No Update in weights required


Sample: [81  9  8 35 82 31]
Prediction: 1, Target: 0
Current weights: [  8.  66.  38. 179.  37. -49. 115.]
Updated weights: [   8.  -15.   29.  171.    2. -131.   84.]
Updated bias: 8.0


Sample: [ 8  5 31 49 21 17]
Prediction: 1, Target: 0
Current weights: [   8.  -15.   29.  171.    2. -131.   84.]
Updated weights: [   8.  -23.   24.  140.  -47. -152.   67.]
Updated bias: 8.0


Sample: [80 47 25 37 27 56]
Prediction: 1, Target: 0
Current weights: [   8.  -23.   24.  140.  -47. -152.   67.]
Updated weights: [   8. -103.  -23.  115.  -84. -179.   11.]
Updated bias: 8.0
```

```
Sample: [53 68 95 50  8  4]
Prediction: 0, Target: 0
Current weights: [   8. -103.  -23.  115.  -84. -179.   11.]
No Update in weights required


Sample: [73 63 66 56 34 76]
Prediction: 0, Target: 1
Current weights: [   8. -103.  -23.  115.  -84. -179.   11.]
Updated weights: [   9.  -30.   40.  181.  -28. -145.   87.]
Updated bias: 9.0


Sample: [ 0 37 12 41 19 16]
Prediction: 1, Target: 0
Current weights: [   9.  -30.   40.  181.  -28. -145.   87.]
Updated weights: [   9.  -30.    3.  169.  -69. -164.   71.]
Updated bias: 9.0


Sample: [78 17 47 86 79 26]
Prediction: 0, Target: 1
Current weights: [   9.  -30.    3.  169.  -69. -164.   71.]
Updated weights: [ 10.  48.  20. 216.  17. -85.  97.]
Updated bias: 10.0
```

```
Sample: [71 65 64 42  6 85]
Prediction: 1, Target: 1
Current weights: [ 10.  48.  20. 216.  17. -85.  97.]
No Update in weights required


Sample: [21 49 67 93 80 32]
Prediction: 1, Target: 1
Current weights: [ 10.  48.  20. 216.  17. -85.  97.]
No Update in weights required



Iteration 6:
Sample: [32 21 93 78 93 53]
Prediction: 1, Target: 1
Current weights: [ 10.  48.  20. 216.  17. -85.  97.]
No Update in weights required


Sample: [81  9  8 35 82 31]
Prediction: 1, Target: 0
Current weights: [ 10.  48.  20. 216.  17. -85.  97.]
Updated weights: [  10.  -33.   11.  208.  -18. -167.   66.]
Updated bias: 10.0
```

```
Sample: [ 8  5 31 49 21 17]
Prediction: 1, Target: 0
Current weights: [  10.  -33.   11.  208.  -18. -167.   66.]
Updated weights: [  10.  -41.    6.  177.  -67. -188.   49.]
Updated bias: 10.0


Sample: [80 47 25 37 27 56]
Prediction: 0, Target: 0
Current weights: [  10.  -41.    6.  177.  -67. -188.   49.]
No Update in weights required


Sample: [53 68 95 50  8  4]
Prediction: 1, Target: 0
Current weights: [  10.  -41.    6.  177.  -67. -188.   49.]
Updated weights: [  10.  -94.  -62.   82. -117. -196.   45.]
Updated bias: 10.0


Sample: [73 63 66 56 34 76]
Prediction: 0, Target: 1
Current weights: [  10.  -94.  -62.   82. -117. -196.   45.]
Updated weights: [  11.  -21.    1.  148.  -61. -162.  121.]
Updated bias: 11.0
```

```
Sample: [ 0 37 12 41 19 16]
Prediction: 0, Target: 0
Current weights: [  11.  -21.    1.  148.  -61. -162.  121.]
No Update in weights required


Sample: [78 17 47 86 79 26]
Prediction: 0, Target: 1
Current weights: [  11.  -21.    1.  148.  -61. -162.  121.]
Updated weights: [ 12.  57.  18. 195.  25. -83. 147.]
Updated bias: 12.0


Sample: [71 65 64 42  6 85]
Prediction: 1, Target: 1
Current weights: [ 12.  57.  18. 195.  25. -83. 147.]
No Update in weights required


Sample: [21 49 67 93 80 32]
Prediction: 1, Target: 1
Current weights: [ 12.  57.  18. 195.  25. -83. 147.]
No Update in weights required
```

```
Iteration 7:
Sample: [32 21 93 78 93 53]
Prediction: 1, Target: 1
Current weights: [ 12.  57.  18. 195.  25. -83. 147.]
No Update in weights required


Sample: [81  9  8 35 82 31]
Prediction: 1, Target: 0
Current weights: [ 12.  57.  18. 195.  25. -83. 147.]
Updated weights: [  12.  -24.    9.  187.  -10. -165.  116.]
Updated bias: 12.0


Sample: [ 8  5 31 49 21 17]
Prediction: 1, Target: 0
Current weights: [  12.  -24.    9.  187.  -10. -165.  116.]
Updated weights: [  12.  -32.    4.  156.  -59. -186.   99.]
Updated bias: 12.0


Sample: [80 47 25 37 27 56]
Prediction: 0, Target: 0
Current weights: [  12.  -32.    4.  156.  -59. -186.   99.]
No Update in weights required
```

```
Sample: [53 68 95 50  8  4]
Prediction: 1, Target: 0
Current weights: [  12.  -32.    4.  156.  -59. -186.   99.]
Updated weights: [  12.  -85.  -64.   61. -109. -194.   95.]
Updated bias: 12.0


Sample: [73 63 66 56 34 76]
Prediction: 0, Target: 1
Current weights: [  12.  -85.  -64.   61. -109. -194.   95.]
Updated weights: [  13.  -12.   -1.  127.  -53. -160.  171.]
Updated bias: 13.0


Sample: [ 0 37 12 41 19 16]
Prediction: 0, Target: 0
Current weights: [  13.  -12.   -1.  127.  -53. -160.  171.]
No Update in weights required


Sample: [78 17 47 86 79 26]
Prediction: 0, Target: 1
Current weights: [  13.  -12.   -1.  127.  -53. -160.  171.]
Updated weights: [ 14.  66.  16. 174.  33. -81. 197.]
Updated bias: 14.0
```

```
Sample: [71 65 64 42  6 85]
Prediction: 1, Target: 1
Current weights: [ 14.  66.  16. 174.  33. -81. 197.]
No Update in weights required


Sample: [21 49 67 93 80 32]
Prediction: 1, Target: 1
Current weights: [ 14.  66.  16. 174.  33. -81. 197.]
No Update in weights required



Iteration 8:
Sample: [32 21 93 78 93 53]
Prediction: 1, Target: 1
Current weights: [ 14.  66.  16. 174.  33. -81. 197.]
No Update in weights required


Sample: [81  9  8 35 82 31]
Prediction: 1, Target: 0
Current weights: [ 14.  66.  16. 174.  33. -81. 197.]
Updated weights: [  14.  -15.    7.  166.   -2. -163.  166.]
Updated bias: 14.0


Sample: [ 8  5 31 49 21 17]
Prediction: 1, Target: 0
```

```
Current weights: [  14.  -15.    7.  166.   -2. -163.  166.]
Updated weights: [  14.  -23.    2.  135.  -51. -184.  149.]
Updated bias: 14.0


Sample: [80 47 25 37 27 56]
Prediction: 1, Target: 0
Current weights: [  14.  -23.    2.  135.  -51. -184.  149.]
Updated weights: [  14. -103.  -45.  110.  -88. -211.   93.]
Updated bias: 14.0


Sample: [53 68 95 50  8  4]
Prediction: 0, Target: 0
Current weights: [  14. -103.  -45.  110.  -88. -211.   93.]
No Update in weights required


Sample: [73 63 66 56 34 76]
Prediction: 0, Target: 1
Current weights: [  14. -103.  -45.  110.  -88. -211.   93.]
Updated weights: [  15.  -30.   18.  176.  -32. -177.  169.]
Updated bias: 15.0
```

```
Sample: [ 0 37 12 41 19 16]
Prediction: 1, Target: 0
Current weights: [  15.  -30.   18.  176.  -32. -177.  169.]
Updated weights: [  15.  -30.  -19.  164.  -73. -196.  153.]
Updated bias: 15.0


Sample: [78 17 47 86 79 26]
Prediction: 0, Target: 1
Current weights: [  15.  -30.  -19.  164.  -73. -196.  153.]
Updated weights: [  16.   48.   -2.  211.   13. -117.  179.]
Updated bias: 16.0


Sample: [71 65 64 42  6 85]
Prediction: 1, Target: 1
Current weights: [  16.   48.   -2.  211.   13. -117.  179.]
No Update in weights required


Sample: [21 49 67 93 80 32]
Prediction: 1, Target: 1
Current weights: [  16.   48.   -2.  211.   13. -117.  179.]
No Update in weights required
```

```
Iteration 9:
Sample: [32 21 93 78 93 53]
Prediction: 1, Target: 1
Current weights: [  16.   48.   -2.  211.   13. -117.  179.]
No Update in weights required


Sample: [81  9  8 35 82 31]
Prediction: 1, Target: 0
Current weights: [  16.   48.   -2.  211.   13. -117.  179.]
Updated weights: [  16.  -33.  -11.  203.  -22. -199.  148.]
Updated bias: 16.0


Sample: [ 8  5 31 49 21 17]
Prediction: 1, Target: 0
Current weights: [  16.  -33.  -11.  203.  -22. -199.  148.]
Updated weights: [  16.  -41.  -16.  172.  -71. -220.  131.]
Updated bias: 16.0


Sample: [80 47 25 37 27 56]
Prediction: 0, Target: 0
Current weights: [  16.  -41.  -16.  172.  -71. -220.  131.]
No Update in weights required
```

```
Sample: [53 68 95 50  8  4]
Prediction: 1, Target: 0
Current weights: [  16.  -41.  -16.  172.  -71. -220.  131.]
Updated weights: [  16.  -94.  -84.   77. -121. -228.  127.]
Updated bias: 16.0


Sample: [73 63 66 56 34 76]
Prediction: 0, Target: 1
Current weights: [  16.  -94.  -84.   77. -121. -228.  127.]
Updated weights: [  17.  -21.  -21.  143.  -65. -194.  203.]
Updated bias: 17.0


Sample: [ 0 37 12 41 19 16]
Prediction: 0, Target: 0
Current weights: [  17.  -21.  -21.  143.  -65. -194.  203.]
No Update in weights required


Sample: [78 17 47 86 79 26]
Prediction: 0, Target: 1
Current weights: [  17.  -21.  -21.  143.  -65. -194.  203.]
Updated weights: [  18.   57.   -4.  190.   21. -115.  229.]
Updated bias: 18.0
```

```
Sample: [71 65 64 42  6 85]
Prediction: 1, Target: 1
Current weights: [  18.   57.   -4.  190.   21. -115.  229.]
No Update in weights required


Sample: [21 49 67 93 80 32]
Prediction: 1, Target: 1
Current weights: [  18.   57.   -4.  190.   21. -115.  229.]
No Update in weights required



Iteration 10:
Sample: [32 21 93 78 93 53]
Prediction: 1, Target: 1
Current weights: [  18.   57.   -4.  190.   21. -115.  229.]
No Update in weights required


Sample: [81  9  8 35 82 31]
Prediction: 1, Target: 0
Current weights: [  18.   57.   -4.  190.   21. -115.  229.]
Updated weights: [  18.  -24.  -13.  182.  -14. -197.  198.]
Updated bias: 18.0
```

```
Sample: [ 8  5 31 49 21 17]
Prediction: 1, Target: 0
Current weights: [  18.  -24.  -13.  182.  -14. -197.  198.]
Updated weights: [  18.  -32.  -18.  151.  -63. -218.  181.]
Updated bias: 18.0


Sample: [80 47 25 37 27 56]
Prediction: 1, Target: 0
Current weights: [  18.  -32.  -18.  151.  -63. -218.  181.]
Updated weights: [  18. -112.  -65.  126. -100. -245.  125.]
Updated bias: 18.0


Sample: [53 68 95 50  8  4]
Prediction: 0, Target: 0
Current weights: [  18. -112.  -65.  126. -100. -245.  125.]
No Update in weights required


Sample: [73 63 66 56 34 76]
Prediction: 0, Target: 1
Current weights: [  18. -112.  -65.  126. -100. -245.  125.]
Updated weights: [  19.  -39.   -2.  192.  -44. -211.  201.]
Updated bias: 19.0
```

```
Sample: [ 0 37 12 41 19 16]
Prediction: 0, Target: 0
Current weights: [  19.  -39.   -2.  192.  -44. -211.  201.]
No Update in weights required


Sample: [78 17 47 86 79 26]
Prediction: 0, Target: 1
Current weights: [  19.  -39.   -2.  192.  -44. -211.  201.]
Updated weights: [  20.   39.   15.  239.   42. -132.  227.]
Updated bias: 20.0


Sample: [71 65 64 42  6 85]
Prediction: 1, Target: 1
Current weights: [  20.   39.   15.  239.   42. -132.  227.]
No Update in weights required


Sample: [21 49 67 93 80 32]
Prediction: 1, Target: 1
Current weights: [  20.   39.   15.  239.   42. -132.  227.]
No Update in weights required
```

```
Training accuracy: 50.00%
Prediction for new marks (Pass=1, Fail=0): 1
```