Programming Assignment 03 – Learning

CII-2M3 Introduction to Artificial Intelligence

Group 4

Member:
1. MUHAMMAD DAFFA KHAIRI 1301203150
2. SHINTA DEWI LESTARI SOLEMAN 1301203567
3. MUHAMMAD FADLI RAMADHAN 1301203533

Problem Statement

We want to predict the 'y' value in the test data, but we don't have any kind of knowledge to predict what the value will be. Then, we need to analyze and make a model based on train data, so we can predict the 'y' value in the test data accurately.

Program Design

- Read training/test data

    This program is processing the file input, which is "traintest.xlsx".

- Model training

- Save the trained model

    To find the optimal k value.

- Model testing

    To predict the truth of validation data, then it will be tested with the confusion matrix.

- Model evaluation

    To predict the data test.

- Save output to a file

The Decoding

- read_excel(path, sheet_target) → to read the file "traintest.xlsx"

- reScale(data, method) → to check the data, are they within the same range or not by using the methods of scaling.

- cross_data(train_data, total) → fold the data based on the cross validation based on each index.

- euclidean(X_train, X_test, i, j) → find the distance with the Euclidean method.

- manhattanDist(X_train, X_test, i, j) → find the distance with the manhattan method.

- minkowski(X_train, X_test, i, j, p = 3) → find the distance with the Minkowski method.

- supremum(X_train, X_test, i, j) → find the distance with the Supremum method.

- closest_neighbor(train_data, validate_data,k, method, debug) → to find the closest neighbor.

- kNN(train_data, validate_data, k, method, debug, run_as) → process the kNN algorithm.

- confussion_matrix(trained) → confusion matrix to evaluate the model (k value).

- training_model(data, method, debug, run_as, reScale_method, fold_total) → making a model from kNN

- test_prediction(data, test_data, k_value, method, debug, run_as, reScale_method, model_index,via) → predicting the 'test' database (to predict y value)

- model_report(knn_method, optimal_k, reScale_method, fold_total, end_time, start_time, model_grade) → To show the model report.

Output of the Program

The description of the data.

	id	x1	x2	x3	y
count	296.000000	296.000000	296.000000	296.000000	296.000000
mean	148.500000	52.462838	62.881757	4.111486	0.736486
std	85.592056	10.896367	3.233753	7.291816	0.441285
min	1.000000	30.000000	58.000000	0.000000	0.000000
25%	74.750000	44.000000	60.000000	0.000000	0.000000
50%	148.500000	52.000000	63.000000	1.000000	1.000000
75%	222.250000	61.000000	65.250000	5.000000	1.000000
max	296.000000	83.000000	69.000000	52.000000	1.000000

The detail of 'y' value.

```
1      218
0       78
Name: y, dtype: int64
```

Standardization scaling

	id	x1	x2	x3	y
0	1	0.691713	0.345804	-0.563849	1
1	2	0.141071	-0.891149	0.944691	0
2	3	1.150582	-0.272673	2.453232	0
3	4	-1.694403	-0.891149	-0.563849	1
4	5	-1.327308	1.891995	2.316092	0
...	...	...	...	...	...
291	292	0.599940	0.345804	-0.426709	1
292	293	1.150582	1.273518	-0.563849	1
293	294	0.049297	0.655042	1.081831	0
294	295	0.416392	0.345804	-0.426709	0
295	296	0.141071	-1.200388	0.396131	1

296 rows × 5 columns

Data describing after we do standardization scaling

Model configuration

```
<Model configuration>
Algorithm : KNN
Distance Method : eu
K Value : 3
Scaling Method : std
Cross-Validation : 8 folds
Training Time : 32.48882246017456s
Model Quality :
<-> Accuracy : 91.66666666641203
<-> Precision : 93.54838709647242
<-> Specificity : 66.66666666555555
<-> Recall : 96.66666666634444
<-> F1 : 95.08196721275303
<-> Miss_Rate : 0.03333333333322223
<-> Accuracy_Balance : 81.66666666595
<-> Mathew_Correlation : 0.6825001477017434
<-> Confussion Matrix
    29  2
    1   4
```

Model training

[{'vali_id': 1, 'closest': [1, 45, 94, 292, 8, 59, 295, 127, 240, 55, 63, 135, 203, 175, 196, 199, 254, 276, 74]}, {'vali_id': 2, 'closest': [2, 51, 193, 296, 67, 49, 129, 209, 291, 144, 192, 14, 190, 185, 266, 163, 11, 107, 82]}, {'vali_id': 3, 'closest': [3, 248, 201, 133, 38, 56, 243, 11, 69, 49, 136, 152, 144, 252, 186, 159, 190, 130, 163]}, {'vali_id': 4, 'closest': [4, 66, 281, 23, 280, 285, 174, 222, 148, 83, 65, 234, 113, 58, 251, 87, 263, 173, 244]}, {'vali_id': 5, 'closest': [5, 103, 260, 182, 220, 98, 138, 167, 252, 221, 223, 136, 95, 186, 84, 131, 213, 19, 294]}, {'vali_id': 6, 'closest': [6, 90, 126, 257, 157, 82, 83, 65, 234, 185, 282, 129, 209, 281, 177, 23, 285, 113, 148]}, {'vali_id': 7, 'closest': [7, 290, 128, 74, 153, 92, 15, 134, 267, 227, 135, 203, 13, 233, 91, 169, 236, 85, 124]}, {'vali_id': 8, 'closest': [8, 59, 295, 94, 292, 1, 63, 55, 45, 127, 24, 89, 240, 226, 53, 199, 233, 188, 135]}, {'vali_id': 9, 'closest': [9, 18, 137, 171, 177, 139, 99, 282, 61, 187, 77, 263, 289, 132, 27, 294, 58, 145, 204]}, {'vali_id': 10, 'closest': [10, 146, 110, 278, 268, 235, 271, 46, 88, 206, 208, 198, 191, 115, 219, 164, 48, 172, 181]}, {'vali_id': 11, 'closest': [11, 144, 193, 69, 2, 49, 3, 248, 190, 51, 56, 129, 209, 185, 296, 12, 163, 203, 243]}, {'vali_id': 12, 'closest': [12, 197, 190, 85, 69, 144, 20, 153, 183, 13, 249, 92, 119, 225, 72, 54, 255, 273, 15]}, {'vali_id': 13, 'closest': [13, 15, 85, 153, 290, 92, 183, 7, 249, 119, 225, 20, 57, 54, 255, 273, 91, 169, 236]}, {'vali_id': 14, 'closest': [14, 267, 259, 107, 192, 134, 266, 72, 128, 215, 166, 291, 205, 231, 227, 51, 270, 296, 233]}, {'vali_id': 15, 'closest': [15, 290, 153, 13, 7, 74, 92, 57, 229, 128, 269, 85, 135, 203, 224, 80, 91, 169, 236]}, {'vali_id': 16, 'closest': [16, 3, 293, 38, 149, 168, 141, 108, 160, 70, 214, 125, 104, 143, 105, 245, 266, 146, 259]}, {'vali_id': 17, 'closest': [17, 180, 118, 155, 117, 218, 253, 41, 44, 237, 231, 279, 116, 246, 265, 93, 123, 270, 215]}, {'vali_id': 18, 'closest': [18, 9, 137, 171, 99, 187, 27, 177, 132, 77, 145, 139, 204, 289, 282, 61, 263, 253, 58]}, {'vali_id': 19, 'closest': [19, 250, 194, 178, 112, 156, 98, 35, 195, 288, 97, 32, 210, 200, 142, 167, 247, 258, 111]}, {'vali_id': 20, 'closest': [20, 119, 225, 54, 255, 273, 85, 162, 183, 272, 197, 249, 91, 169, 236, 92, 13, 109, 15]}, {'vali_id': 21, 'closest': [21, 228, 242, 34, 205, 25, 294, 200, 199, 189, 72, 283, 163, 259, 49, 80, 35, 178, 230]}, {'vali_id': 22, 'closest': [22, 40, 213, 246, 88, 279, 181, 277, 217, 81, 44, 235, 271, 41, 237, 28, 239, 191, 46]}, {'vali_id': 23, 'closest': [23, 200, 148, 281, 4, 174, 222, 66, 65, 285, 234, 251, 83, 58, 113, 177, 263, 173, 87]}, {'vali_id': 24, 'closest': [24, 28, 239, 53, 188, 89, 226, 181, 217, 211, 8, 59, 295, 63, 198, 265, 283, 22, 116]}, {'vali_id': 25, 'closest': [25, 189, 200, 205, 230, 35, 283, 21, 228, 156, 284, 242, 178, 294, 64, 215, 199, 163, 217]}, {'vali_id': 26, 'closest': [26, 213, 186, 95, 157, 170, 185, 243, 131, 56, 260, 193, 248, 163, 129, 209, 257, 221, 11]}, {'vali_id': 27, 'closest': [27, 204, 99, 145, 132, 42, 114, 151, 171, 296, 187, 18, 102, 266, 107, 192, 9, 166, 77]}, {'vali_id': 28, 'closest': [28, 239, 24, 188, 211, 217, 53, 89, 198, 226, 88, 22, 44, 154, 35, 142, 41, 258]}, {'vali_id': 29, 'closest': [29, 165, 75, 62, 122, 287, 50, 226, 150, 216, 178, 258, 176, 200, 53, 127, 142, 254, 276]}, {'vali_id': 30, 'closest': [30, 32, 210, 184, 120, 208, 115, 52, 195, 172, 154, 238, 142, 219, 190, 198, 258, 112]}, {'vali_id': 31, 'closest': [31, 16, 141, 168, 68, 104, 149, 214, 125, 293, 39, 108, 241, 105, 160, 70, 245, 143, 254]}, {'vali_id': 32, 'closest': [32, 210, 30, 184, 120, 208, 195, 115, 52, 172, 154, 250, 112, 142, 238, 258, 219, 10, 198]}, {'vali_id': 33, 'closest': [33, 71, 212, 121, 73, 81, 46, 206, 207, 96, 277, 235, 271, 40, 268, 191, 110, 278, 262]}, {'vali_id': 34, 'closest': [34, 242, 228, 21, 60, 199, 200, 205, 294, 150, 264, 72, 25, 29, 259, 292, 176, 178, 152]}, {'vali_id': 35, 'closest': [35, 178, 200, 226, 142, 25, 258, 156, 188, 53, 198, 28, 239, 154, 283, 24, 172, 181, 115]}, {'vali_id': 36, 'closest': [36, 140, 79, 147, 241, 125, 100, 105, 224, 168, 269, 31, 88, 245, 149, 57, 104, 214, 16]}]
[{'vali_id': 38, 'closest': [38, 133, 152]}, {'vali_id': 39, 'closest': [39, 293, 16]}, {'vali_id': 40, 'closest': [40, 277, 81]}, {'vali_id': 41, 'closest': [41, 44, 237]}, {'vali_id': 42, 'closest': [42, 114, 102]}, {'vali_id': 43, 'closest': [43, 76, 160]}, {'vali_id': 44, 'closest': [44, 41, 279]}, {'vali_id': 45, 'closest': [45, 1, 94]}, {'vali_id': 46, 'closest': [46, 206, 235]}, {'vali_id': 47, 'closest': [47, 161, 122]}, {'vali_id': 48, 'closest': [48, 219, 238]}, {'vali_id': 49, 'closest': [49, 163, 2]}, {'vali_id': 50, 'closest': [50, 287, 216]}, {'vali_id': 51, 'closest': [51, 2, 296]}, {'vali_id': 52, 'closest': [52, 238, 219]}, {'vali_id': 53, 'closest': [53, 188, 226]}, {'vali_id': 54, 'closest': [54, 255, 119]}, {'vali_id': 55, 'closest': [55, 63, 94]}, {'vali_id': 56, 'closest': [56, 243, 49]}, {'vali_id': 57, 'closest': [57, 80, 100]}, {'vali_id': 58, 'closest': [58, 263, 177]}, {'vali_id': 59, 'closest': [8, 59, 295]}, {'vali_id': 60, 'closest': [60, 34, 242]}, {'vali_id': 61, 'closest': [61, 139, 244]}, {'vali_id': 62, 'closest': [62, 75, 165]}, {'vali_id': 63, 'closest': [63, 55, 8]}, {'vali_id': 64, 'closest': [64, 230, 237]}, {'vali_id': 65, 'closest': [65, 234, 148]}, {'vali_id': 66, 'closest': [66, 4, 281]}, {'vali_id': 67, 'closest': [67, 291, 64]}, {'vali_id': 68, 'closest': [68, 141, 108]}, {'vali_id': 69, 'closest': [69, 190, 144, 49, 11]}, {'vali_id': 70, 'closest': [70, 143, 254]}, {'vali_id': 71, 'closest': [33, 71, 212]}, {'vali_id': 72, 'closest': [72, 259, 190]}, {'vali_id': 73, 'closest': [73, 46, 206]}]
[{'vali_id': 38, 'closest': [38, 133, 152, 252, 136]}, {'vali_id': 39, 'closest': [39, 293, 16, 108, 160]}, {'vali_id': 40, 'closest': [40, 277, 81, 22, 191]}, {'vali_id': 41, 'closest': [41, 44, 237, 279, 116]}, {'vali_id': 42, 'closest': [42, 114, 102, 145, 109]}, {'vali_id': 43, 'closest': [43, 76, 160, 176, 67]}, {'vali_id': 44, 'closest': [44, 41, 279, 246, 265]}, {'vali_id': 45, 'closest': [45, 1, 94, 292, 240]}, {'vali_id': 46, 'closest': [46, 206, 235, 271, 73, 110, 278]}, {'vali_id': 47, 'closest': [47, 161, 122, 195, 287, 247, 50]}, {'vali_id': 48, 'closest': [48, 219, 238, 268, 110, 278, 52]}, {'vali_id': 49, 'closest': [49, 163, 2, 56, 69, 21, 190]}, {'vali_id': 50, 'closest': [50, 287, 216, 122, 165, 75, 176]}, {'vali_id': 51, 'closest': [51, 2, 296, 192, 67, 291, 193]}, {'vali_id': 52, 'closest': [52, 238, 219, 30, 32, 218, 48]}, {'vali_id': 53, 'closest': [53, 188, 226, 24, 258, 2, 62]}, {'vali_id': 54, 'closest': [54, 255, 119, 225, 273, 20, 162]}, {'vali_id': 55, 'closest': [55, 63, 94, 1, 292, 8, 59]}, {'vali_id': 56, 'closest': [56, 243, 49, 136, 186, 163, 95]}, {'vali_id': 57, 'closest': [57, 80, 100, 224, 269, 147, 15]}, {'vali_id': 58, 'closest': [58, 263, 177, 61]}, {'vali_id': 59, 'closest': [8, 59, 295, 94, 292, 1, 63]}, {'vali_id': 60, 'closest': [60, 34, 242, 72, 199, 259, 21]}, {'vali_id': 61, 'closest': [61, 139, 244, 87, 282, 58, 263]}, {'vali_id': 62, 'closest': [62, 75, 165, 258, 29, 226, 122]}, {'vali_id': 63, 'closest': [63, 55, 8, 59, 233, 295, 94]}, {'vali_id': 64, 'closest': [64, 230, 237, 291, 275, 67, 277]}, {'vali_id': 65, 'closest': [65, 234, 148, 282, 177, 23, 58]}, {'vali_id': 66, 'closest': [66, 4, 281, 23, 285, 208, 83]}, {'vali_id': 67, 'closest': [67, 291, 64, 51, 192, 289, 230]}, {'vali_id': 68, 'closest': [68, 141, 108, 16, 31, 160, 214]}, {'vali_id': 69, 'closest': [69, 190, 144, 49, 11, 12, 72]}, {'vali_id': 70, 'closest': [70, 143, 254, 276, 149, 293, 39]}, {'vali_id': 71, 'closest': [33, 71, 212, 121, 73, 81, 46]}, {'vali_id': 72, 'closest': [72, 259, 190, 14, 153, 242, 205]}, {'vali_id': 73, 'closest': [73, 46, 206, 212, 33, 71, 268]}]
[{'vali_id': 38, 'closest': [38, 133, 152, 252, 136, 56, 159, 3, 243]}, {'vali_id': 39, 'closest': [39, 293, 16, 108, 160, 70, 143, 149, 68]}, {'vali_id': 40, 'closest': [40, 277, 81, 22, 191, 88, 235, 271, 246]}, {'vali_id': 41, 'closest': [41, 44, 237, 279, 116, 246, 265, 17, 217]}, {'vali_id': 42, 'closest': [42, 114, 102, 145, 109, 195, 132, 158, 27]}, {'vali_id': 43, 'closest': [43, 76, 160, 176, 176, 188, 110, 278, 146, 268]}, {'vali_id': 44, 'closest': [44, 41, 279, 246, 265, 237, 116, 211, 180]}, {'vali_id': 45, 'closest': [45, 1, 94, 292, 240, 127, 135, 203, 55]}, {'vali_id': 46, 'closest': [46, 206, 235, 271, 73, 110, 278, 146, 268]}, {'vali_id': 47, 'closest': [47, 161, 122, 195, 287, 247, 50, 37, 184]}, {'vali_id': 48, 'closest': [48, 219, 238, 268, 110, 278, 52, 146, 10, 73]}, {'vali_id': 49, 'closest': [49, 163, 2, 56, 69, 21, 190, 51, 294]}, {'vali_id': 50, 'closest': [50, 287, 216, 122, 165, 75, 176, 62, 29]}, {'vali_id': 51, 'closest': [51, 2, 296, 192, 67, 291, 193, 266, 14]}, {'vali_id': 52, 'closest': [52, 238, 219, 30, 32, 210, 48, 120, 200]}, {'vali_id': 53, 'closest': [53, 188, 226, 24, 258, 28, 62, 239, 177, 2]}, {'vali_id': 55, 'closest': [55, 63, 94, 1, 292, 8, 59, 233, 45]}, {'vali_id': 56, 'closest': [56, 243, 49, 136, 186, 163, 95, 252, 38]}, {'vali_id': 57, 'closest': [57, 80, 100, 224, 269, 147, 15, 229, 13]}, {'vali_id': 58, 'closest': [58, 263, 177, 61, 139, 244, 234, 251, 25]}, {'vali_id': 59, 'closest': [8, 59, 295, 94, 292, 1, 63, 55, 45]}, {'vali_id': 60, 'closest': [60, 34, 242, 72, 199, 259, 21, 264, 140]}, {'vali_id': 61, 'closest': [61, 139, 244, 87, 282, 58, 263, 113, 177]}, {'vali_id': 62, 'closest': [62, 75, 165, 258, 29, 226, 122, 53, 287]}, {'vali_id': 63, 'closest': [63, 55, 8, 59, 233, 295, 94, 77, 277, 41, 215]}, {'vali_id': 65, 'closest': [65, 234, 148, 282, 177, 23, 58, 174, 222]}, {'vali_id': 66, 'closest': [66, 4, 281, 23, 285, 208, 83, 174, 222]}, {'vali_id': 67, 'closest': [67, 291, 64, 51, 192, 289, 230, 266, 2]}, {'vali_id': 68, 'closest': [68, 141, 108, 16, 31, 160, 214, 293, 39]}, {'vali_id': 69, 'closest': [69, 190, 144, 49, 11, 12, 72, 60, 2]}, {'vali_id': 70, 'closest': [70, 143, 254, 276, 149, 293, 39, 240, 245]}, {'vali_id': 71, 'closest': [33, 71, 212, 121, 73, 81, 46, 206, 207]}, {'vali_id': 72, 'closest': [72, 259, 190, 14, 153, 242, 205, 267, 199]}, {'vali_id': 73, 'closest': [73, 46, 206, 212, 33, 71, 268, 110, 278]}]
[{'vali_id': 38, 'closest': [38, 133, 152, 252, 136, 56, 159, 3, 243, 49, 138]}, {'vali_id': 39, 'closest': [39, 293, 16, 108, 160, 70, 143, 149, 68, 214, 277]}, {'vali_id': 40, 'closest': [40, 277, 81, 22, 191, 88, 235, 271, 246, 164, 46]}, {'vali_id': 41, 'closest': [43, 76, 160, 176, 216, 150, 108, 39, 293, 50, 37]}, {'vali_id': 41, 'closest': [42, 114, 102, 145, 109, 15, 132, 158, 27, 204, 171]}, {'vali_id': 43, 'closest': [44, 41, 279, 246, 265, 237, 116, 211, 180, 118, 155]}, {'vali_id': 45, 'closest': [45, 1, 94, 292, 240, 127, 135, 203, 55, 175, 196]}, {'vali_id': 46, 'closest': [46, 206, 235, 271, 73, 110, 278, 146, 268, 191, 81]}, {'vali_id': 47, 'closest': [47, 161, 122, 195, 287, 247, 50, 37, 184, 86, 216]}, {'vali_id': 48, 'closest': [48, 219, 238, 268, 110, 278, 52, 146, 10, 73, 208]}, {'vali_id': 49, 'closest': [49, 163, 2, 56, 69, 21, 190, 51, 294, 192, 267]}, {'vali_id': 51, 'closest': [52, 238, 219, 30, 32, 210, 48, 120, 200, 184, 110]}, {'vali_id': 51, 'closest': [51, 2, 296, 192, 67, 291, 193, 266, 14]}, {'vali_id': 52, 'closest': [52, 238, 219, 30, 32, 210, 48, 120, 200, 184, 110]}, {'vali_id': 53, 'closest': [53, 188, 226, 24, 258, 28, 62, 239, 177, 61]}, {'vali_id': 54, 'closest': [54, 255, 119, 225, 273, 20, 162, 272, 85, 183, 91]}, {'vali_id': 55, 'closest': [55, 63, 94, 1, 292, 8, 59, 233, 45, 135, 203]}, {'vali_id': 56, 'closest': [56, 243, 49, 136, 186, 163, 95, 252, 38, 260, 3]}, {'vali_id': 57, 'closest': [57, 80, 100, 224, 269, 147, 15, 229, 13, 153, 290]}, {'vali_id': 58, 'closest': [58, 263, 177, 61, 139, 244, 234, 251, 173, 87, 65]}, {'vali_id': 59, 'closest': [8, 59, 295, 94, 292, 1, 63, 55, 45, 127, 24]}, {'vali_id': 60, 'closest': [60, 34, 242, 72, 199, 259, 21, 264, 140, 190, 229]}, {'vali_id': 61, 'closest': [61, 139, 244, 87, 282, 58, 263, 113, 177, 234,

Model training

[0, 36]
[3, 86.1111111108719, {'Accuracy': 86.1111111108719, 'Precision': 92.30769230733729, 'Specificity': 77.77777777691358, 'Recall': 88.88888888855968, 'F1': 90.56603773545734, 'Miss_Rate': 0.1111111111106996, 'Accuracy_Balance': 83.33333333273663, 'Mathew_Correlation': 0.644503386635489, 'Matrix': (24, 2, 3, 7)}]
[5, 83.33333333310185, {'Accuracy': 83.33333333310185, 'Precision': 86.20689655142688, 'Specificity': 55.55555555493827, 'Recall': 92.59259259224967, 'F1': 89.28571428534548, 'Miss_Rate': 0.07407407407379973, 'Accuracy_Balance': 74.07407407359398, 'Mathew_Correlation': 0.5267865840075195, 'Matrix': (25, 4, 2, 5)}]
[7, 86.1111111108719, {'Accuracy': 86.1111111108719, 'Precision': 84.37499999973632, 'Specificity': 44.44444443950616, 'Recall': 99.9999999962964, 'F1': 91.52542372845365, 'Miss_Rate': 0.0, 'Accuracy_Balance': 72.2222222179013, 'Mathew_Correlation': 0.612372435057936, 'Matrix': (27, 5, 0, 4)}]
[9, 77.7777777756172, {'Accuracy': 77.7777777756172, 'Precision': 80.64516129006243, 'Specificity': 33.33333333296296, 'Recall': 92.59259259224967, 'F1': 86.20689655137711, 'Miss_Rate': 0.07407407407379973, 'Accuracy_Balance': 62.96296296260631, 'Mathew_Correlation': 0.3246172270321174, 'Matrix': (25, 6, 2, 3)}]
[11, 77.7777777756172, {'Accuracy': 77.7777777756172, 'Precision': 80.64516129006243, 'Specificity': 33.33333333296296, 'Recall': 92.59259259224967, 'F1': 86.20689655137711, 'Miss_Rate': 0.07407407407379973, 'Accuracy_Balance': 62.96296296260631, 'Mathew_Correlation': 0.3246172270321174, 'Matrix': (25, 6, 2, 3)}]
[13, 80.55555555533178, {'Accuracy': 80.55555555533178, 'Precision': 81.24999999997461, 'Specificity': 33.33333333296296, 'Recall': 96.29629629593965, 'F1': 88.13559321999058, 'Miss_Rate': 0.03703703703689987, 'Accuracy_Balance': 64.81481481445131, 'Mathew_Correlation': 0.4082482904638235, 'Matrix': (26, 6, 1, 3)}]
[15, 80.55555555533178, {'Accuracy': 80.55555555533178, 'Precision': 83.33333333305556, 'Specificity': 44.44444443950616, 'Recall': 92.59259259224967, 'F1': 87.7192982452564, 'Miss_Rate': 0.07407407407379973, 'Accuracy_Balance': 68.51851851810014, 'Mathew_Correlation': 0.43033148291193474, 'Matrix': (25, 5, 2, 4)}]
[17, 80.55555555533178, {'Accuracy': 80.55555555533178, 'Precision': 83.33333333305556, 'Specificity': 44.44444443950616, 'Recall': 92.59259259224967, 'F1': 87.7192982452564, 'Miss_Rate': 0.07407407407379973, 'Accuracy_Balance': 68.51851851810014, 'Mathew_Correlation': 0.43033148291193474, 'Matrix': (25, 5, 2, 4)}]
[19, 80.55555555533178, {'Accuracy': 80.55555555533178, 'Precision': 83.33333333305556, 'Specificity': 44.44444443950616, 'Recall': 92.59259259224967, 'F1': 87.7192982452564, 'Miss_Rate': 0.07407407407379973, 'Accuracy_Balance': 68.51851851810014, 'Mathew_Correlation': 0.43033148291193474, 'Matrix': (25, 5, 2, 4)}]
[37, 73]
[3, 86.1111111108719, {'Accuracy': 86.1111111108719, 'Precision': 86.20689655142688, 'Specificity': 59.9999999994, 'Recall': 96.15384615347634, 'F1': 90.9090909087105, 'Miss_Rate': 0.0384615384639053, 'Accuracy_Balance': 78.07692307643816, 'Mathew_Correlation': 0.6355038162094888, 'Matrix': (25, 4, 1, 6)}]
[5, 77.7777777756172, {'Accuracy': 77.7777777756172, 'Precision': 79.99999999973333, 'Specificity': 39.9999999996, 'Recall': 92.30769230733729, 'F1': 85.71428571392985, 'Miss_Rate': 0.07692307692278107, 'Accuracy_Balance': 66.15384615346865, 'Mathew_Correlation': 0.38829013735766, 'Matrix': (24, 6, 2, 4)}]
[7, 72.22222222200216, {'Accuracy': 72.22222222200216, 'Precision': 74.99999999976562, 'Specificity': 19.9999999998, 'Recall': 92.30769230733729, 'F1': 82.75862068932034, 'Miss_Rate': 0.07692307692278107, 'Accuracy_Balance': 56.15384615368644, 'Mathew_Correlation': 0.17541160386140559, 'Matrix': (24, 8, 2, 2)}]
[9, 77.7777777756172, {'Accuracy': 77.7777777756172, 'Precision': 78.12499999997586, 'Specificity': 29.9999999997, 'Recall': 96.15384615347634, 'F1': 86.20689655137741, 'Miss_Rate': 0.0384615384639053, 'Accuracy_Balance': 63.07692307658817, 'Mathew_Correlation': 0.37274965820548683, 'Matrix': (25, 7, 1, 3)}]
[11, 80.55555555533178, {'Accuracy': 80.55555555533178, 'Precision': 80.64516129006243, 'Specificity': 39.9999999996, 'Recall': 96.15384615347634, 'F1': 87.71929824525665, 'Miss_Rate': 0.0384615384639053, 'Accuracy_Balance': 68.07692307653816, 'Mathew_Correlation': 0.46824735250351424, 'Matrix': (25, 6, 1, 4)}]
[13, 80.55555555533178, {'Accuracy': 80.55555555533178, 'Precision': 80.64516129006243, 'Specificity': 39.9999999996, 'Recall': 96.15384615347634, 'F1': 87.71929824525665, 'Miss_Rate': 0.0384615384639053, 'Accuracy_Balance': 68.07692307653816, 'Mathew_Correlation': 0.46824735250351424, 'Matrix': (25, 6, 1, 4)}]
[15, 80.55555555533178, {'Accuracy': 80.55555555533178, 'Precision': 80.64516129006243, 'Specificity': 39.9999999996, 'Recall': 96.15384615347634, 'F1': 87.71929824525665, 'Miss_Rate': 0.0384615384639053, 'Accuracy_Balance': 68.07692307653816, 'Mathew_Correlation': 0.46824735250351424, 'Matrix': (25, 6, 1, 4)}]
[17, 80.55555555533178, {'Accuracy': 80.55555555533178, 'Precision': 80.64516129006243, 'Specificity': 39.9999999996, 'Recall': 96.15384615347634, 'F1': 87.71929824525665, 'Miss_Rate': 0.0384615384639053, 'Accuracy_Balance': 68.07692307653816, 'Mathew_Correlation': 0.46824735250351424, 'Matrix': (25, 6, 1, 4)}]
[19, 80.55555555533178, {'Accuracy': 80.55555555533178, 'Precision': 80.64516129006243, 'Specificity': 39.9999999996, 'Recall': 96.15384615347634, 'F1': 87.71929824525665, 'Miss_Rate': 0.0384615384639053, 'Accuracy_Balance': 68.07692307653816, 'Mathew_Correlation': 0.46824735250351424, 'Matrix': (25, 6, 1, 4)}]
[74, 110]
[3, 91.66666666641203, {'Accuracy': 91.66666666641203, 'Precision': 93.33333333330222, 'Specificity': 71.42857142755102, 'Recall': 96.5517241375981, 'F1': 94.91525423691643, 'Miss_Rate': 0.03448275862057075, 'Accuracy_Balance': 83.99014778257455, 'Mathew_Correlation': 0.7219295436604952, 'Matrix': (28, 2, 1, 5)}]
[5, 86.1111111108719, {'Accuracy': 86.1111111108719, 'Precision': 87.4999999997657, 'Specificity': 42.85714285653061, 'Recall': 96.5517241375981, 'F1': 91.80327868817373, 'Miss_Rate': 0.03448275862057075, 'Accuracy_Balance': 69.70443349706436, 'Mathew_Correlation': 0.4962916660546423, 'Matrix': (28, 4, 1, 3)}]
[7, 83.33333333310185, {'Accuracy': 83.33333333310185, 'Precision': 84.84848484822773, 'Specificity': 28.57142857102041, 'Recall': 96.5517241375981, 'F1': 90.32258064482015, 'Miss_Rate': 0.03448275862057075, 'Accuracy_Balance': 62.56157635430925, 'Mathew_Correlation': 0.35975311233691126, 'Matrix': (28, 5, 1, 2)}]
[9, 83.33333333310185, {'Accuracy': 83.33333333310185, 'Precision': 84.84848484822773, 'Specificity': 28.57142857102041, 'Recall': 96.5517241375981, 'F1': 90.32258064482015, 'Miss_Rate': 0.03448275862057075, 'Accuracy_Balance': 62.56157635430925, 'Mathew_Correlation': 0.35975311233691126, 'Matrix': (28, 5, 1, 2)}]
[11, 83.33333333310185, {'Accuracy': 83.33333333310185, 'Precision': 84.84848484822773, 'Specificity': 28.57142857102041, 'Recall': 96.5517241375981, 'F1': 90.32258064482015, 'Miss_Rate': 0.03448275862057075, 'Accuracy_Balance': 62.56157635430925, 'Mathew_Correlation': 0.35975311233691126, 'Matrix': (28, 5, 1, 2)}]
[13, 83.33333333310185, {'Accuracy': 83.33333333310185, 'Precision': 84.84848484822773, 'Specificity': 28.57142857102041, 'Recall': 96.5517241375981, 'F1': 90.32258064482015, 'Miss_Rate': 0.03448275862057075, 'Accuracy_Balance': 62.56157635430925, 'Mathew_Correlation': 0.35975311233691126, 'Matrix': (28, 5, 1, 2)}]
[15, 80.55555555533178, {'Accuracy': 80.55555555533178, 'Precision': 84.37499999997632, 'Specificity': 28.57142857102041, 'Recall': 93.10344827554103, 'F1': 88.5245901635943, 'Miss_Rate': 0.0689655172411415, 'Accuracy_Balance': 60.83743842328716, 'Mathew_Correlation': 0.27296041684200534, 'Matrix': (27, 5, 2, 2)}]
[17, 80.55555555533178, {'Accuracy': 80.55555555533178, 'Precision': 84.37499999997632, 'Specificity': 28.57142857102041, 'Recall': 93.10344827554103, 'F1': 88.5245901635943, 'Miss_Rate': 0.0689655172411415, 'Accuracy_Balance': 60.83743842328716, 'Mathew_Correlation': 0.27296041684200534, 'Matrix': (27, 5, 2, 2)}]
[19, 80.55555555533178, {'Accuracy': 80.55555555533178, 'Precision': 84.37499999997632, 'Specificity': 28.57142857102041, 'Recall': 93.10344827554103, 'F1': 88.5245901635943, 'Miss_Rate': 0.0689655172411415, 'Accuracy_Balance': 60.83743842328716, 'Mathew_Correlation': 0.27296041684200534, 'Matrix': (27, 5, 2, 2)}]
[111, 147]
[3, 83.33333333310185, {'Accuracy': 83.33333333310185, 'Precision': 88.88888888850968, 'Specificity': 66.66666666592592, 'Recall': 88.88888888855968, 'F1': 88.88888888850968, 'Miss_Rate': 0.1111111111106996, 'Accuracy_Balance': 77.7777777724279, 'Mathew_Correlation': 0.5555555555555551, 'Matrix': (24, 3, 3, 6)}]
[5, 80.55555555533178, {'Accuracy': 80.55555555533178, 'Precision': 85.71428571397959, 'Specificity': 55.55555555493827, 'Recall': 88.88888888855968, 'F1': 87.27272727225994, 'Miss_Rate': 0.1111111111106996, 'Accuracy_Balance': 72.2222222174898, 'Mathew_Correlation': 0.4629100498862753, 'Matrix': (24, 4, 3, 5)}]
[7, 83.33333333310185, {'Accuracy': 83.33333333310185, 'Precision': 83.87096774166494, 'Specificity': 44.44444443950616, 'Recall': 96.29629629593965, 'F1': 89.6551724134342, 'Miss_Rate': 0.03703703703689987, 'Accuracy_Balance': 70.37037036994514, 'Mathew_Correlation': 0.5101127853361844, 'Matrix': (26, 5, 1, 4)}]
[9, 83.33333333310185, {'Accuracy': 83.33333333310185, 'Precision': 83.87096774166494, 'Specificity': 44.44444443950616, 'Recall': 96.29629629593965, 'F1': 89.6551724134342, 'Miss_Rate': 0.03703703703689987, 'Accuracy_Balance': 70.37037036994514, 'Mathew_Correlation': 0.5101127853361844, 'Matrix': (26, 5, 1, 4)}]
[11, 88.88888888864197, {'Accuracy': 88.88888888864197, 'Precision': 87.09677419326744, 'Specificity': 55.55555555493827, 'Recall': 99.9999999962964, 'F1': 93.10344827549127, 'Miss_Rate': 0.0, 'Accuracy_Balance': 77.7777777728396, 'Mathew_Correlation': 0.6956003436402515, 'Matrix': (27, 4, 0, 5)}]
[13, 88.88888888864197, {'Accuracy': 88.88888888864197, 'Precision': 87.09677419326744, 'Specificity': 55.55555555493827, 'Recall': 99.9999999962964, 'F1': 93.10344827549127, 'Miss_Rate': 0.0, 'Accuracy_Balance':

Prediction

	id	x1	x2	x3	y
0	297	-1.166456	-0.795495	0.393919	1
1	298	1.843752	1.060660	-1.181758	1
2	299	0.714924	-0.530330	1.181758	0
3	300	-0.413904	0.265165	1.181758	0
4	301	-0.915605	-0.530330	-1.181758	1
5	302	0.213223	-1.060660	-0.393919	1
6	303	0.464074	1.060660	1.181758	0
7	304	-1.291881	1.856155	-0.393919	1
8	305	-0.288478	-0.795495	0.393919	1
9	306	0.840350	-0.530330	-1.181758	1

Result

Thank you!