

```

1 C:\Users\Lenovo\anaconda3\python.exe "D:\PycharmProjects\FADML_project\fadml_project_dpsvm_p3_(gen_ai_tool).py"
2 Pregnancies Glucose BloodPressure ... DiabetesPedigreeFunction Age Outcome
3 0       6    148      72 ...        0.627  50   1
4 1       1     85      66 ...        0.351  31   0
5 2       8    183      64 ...        0.672  32   1
6 3       1     89      66 ...        0.167  21   0
7 4       0    137      40 ...        2.288  33   1
8
9 [5 rows x 9 columns]
10
11 (768, 9)
12
13
14 ##### Tuning Custom SVM using Train-validation split #####
15
16 C=0.1, kernel=linear, gamma=None, degree=None || acc=0.7154, prec=0.5854, rec=0.5714, f1=0.5783
17 C=0.5, kernel=linear, gamma=None, degree=None || acc=0.7154, prec=0.5854, rec=0.5714, f1=0.5783
18 C=1, kernel=linear, gamma=None, degree=None || acc=0.7154, prec=0.5854, rec=0.5714, f1=0.5783
19 C=2, kernel=linear, gamma=None, degree=None || acc=0.7154, prec=0.5854, rec=0.5714, f1=0.5783
20 C=5, kernel=linear, gamma=None, degree=None || acc=0.7154, prec=0.5854, rec=0.5714, f1=0.5783
21 C=10, kernel=linear, gamma=None, degree=None || acc=0.7154, prec=0.5854, rec=0.5714, f1=0.5783
22 C=0.1, kernel=rbf, gamma=0.001, degree=None || acc=0.6585, prec=0.0000, rec=0.0000, f1=0.0000
23 C=0.1, kernel=rbf, gamma=0.005, degree=None || acc=0.6585, prec=0.0000, rec=0.0000, f1=0.0000
24 C=0.1, kernel=rbf, gamma=0.01, degree=None || acc=0.6585, prec=0.5000, rec=0.0238, f1=0.0455
25 C=0.1, kernel=rbf, gamma=0.02, degree=None || acc=0.6585, prec=0.5000, rec=0.0238, f1=0.0455
26 C=0.1, kernel=rbf, gamma=0.03, degree=None || acc=0.6667, prec=0.6000, rec=0.0714, f1=0.1277
27 C=0.1, kernel=rbf, gamma=0.04, degree=None || acc=0.6829, prec=0.7143, rec=0.1190, f1=0.2041
28 C=0.1, kernel=rbf, gamma=0.05, degree=None || acc=0.6748, prec=0.6250, rec=0.1190, f1=0.2000
29 C=0.1, kernel=rbf, gamma=0.060000000000000005, degree=None || acc=0.6748, prec=0.6250, rec=0.1190, f1=0.2000
30 C=0.1, kernel=rbf, gamma=0.0699999999999999, degree=None || acc=0.6911, prec=0.7000, rec=0.1667, f1=0.2692
31 C=0.1, kernel=rbf, gamma=0.08, degree=None || acc=0.6911, prec=0.7000, rec=0.1667, f1=0.2692
32 C=0.1, kernel=rbf, gamma=0.09, degree=None || acc=0.6829, prec=0.6364, rec=0.1667, f1=0.2642
33 C=0.1, kernel=rbf, gamma=0.0999999999999999, degree=None || acc=0.6829, prec=0.6364, rec=0.1667, f1=0.2642
34 C=0.1, kernel=rbf, gamma=0.5, degree=None || acc=0.6585, prec=0.0000, rec=0.0000, f1=0.0000
35 C=0.1, kernel=rbf, gamma=1, degree=None || acc=0.6585, prec=0.0000, rec=0.0000, f1=0.0000
36 C=0.5, kernel=rbf, gamma=0.001, degree=None || acc=0.6585, prec=0.0000, rec=0.0000, f1=0.0000
37 C=0.5, kernel=rbf, gamma=0.005, degree=None || acc=0.6667, prec=0.6000, rec=0.0714, f1=0.1277
38 C=0.5, kernel=rbf, gamma=0.01, degree=None || acc=0.7154, prec=0.7692, rec=0.2381, f1=0.3636
39 C=0.5, kernel=rbf, gamma=0.02, degree=None || acc=0.7561, prec=0.7727, rec=0.4048, f1=0.5312
40 C=0.5, kernel=rbf, gamma=0.03, degree=None || acc=0.7480, prec=0.7391, rec=0.4048, f1=0.5231
41 C=0.5, kernel=rbf, gamma=0.04, degree=None || acc=0.7480, prec=0.7391, rec=0.4048, f1=0.5231
42 C=0.5, kernel=rbf, gamma=0.05, degree=None || acc=0.7317, prec=0.6957, rec=0.3810, f1=0.4923
43 C=0.5, kernel=rbf, gamma=0.0600000000000005, degree=None || acc=0.7317, prec=0.6957, rec=0.3810, f1=0.4923
44 C=0.5, kernel=rbf, gamma=0.0699999999999999, degree=None || acc=0.7480, prec=0.7200, rec=0.4286, f1=0.5373
45 C=0.5, kernel=rbf, gamma=0.08, degree=None || acc=0.7480, prec=0.7200, rec=0.4286, f1=0.5373
46 C=0.5, kernel=rbf, gamma=0.09, degree=None || acc=0.7398, prec=0.7083, rec=0.4048, f1=0.5152
47 C=0.5, kernel=rbf, gamma=0.0999999999999999, degree=None || acc=0.7317, prec=0.6957, rec=0.3810, f1=0.4923
48 C=0.5, kernel=rbf, gamma=0.5, degree=None || acc=0.7073, prec=0.7143, rec=0.2381, f1=0.3571
49 C=0.5, kernel=rbf, gamma=1, degree=None || acc=0.6748, prec=1.0000, rec=0.0476, f1=0.0909
50 C=1, kernel=rbf, gamma=0.001, degree=None || acc=0.6585, prec=0.5000, rec=0.0238, f1=0.0455
51 C=1, kernel=rbf, gamma=0.005, degree=None || acc=0.7073, prec=0.7143, rec=0.2381, f1=0.3571
52 C=1, kernel=rbf, gamma=0.01, degree=None || acc=0.7561, prec=0.7727, rec=0.4048, f1=0.5312
53 C=1, kernel=rbf, gamma=0.02, degree=None || acc=0.7317, prec=0.6800, rec=0.4048, f1=0.5075
54 C=1, kernel=rbf, gamma=0.03, degree=None || acc=0.7480, prec=0.7200, rec=0.4286, f1=0.5373
55 C=1, kernel=rbf, gamma=0.04, degree=None || acc=0.7317, prec=0.6800, rec=0.4048, f1=0.5075
56 C=1, kernel=rbf, gamma=0.05, degree=None || acc=0.7480, prec=0.7037, rec=0.4524, f1=0.5507
57 C=1, kernel=rbf, gamma=0.0600000000000005, degree=None || acc=0.7480, prec=0.7037, rec=0.4524, f1=0.5507
58 C=1, kernel=rbf, gamma=0.0699999999999999, degree=None || acc=0.7398, prec=0.6923, rec=0.4286, f1=0.5294
59 C=1, kernel=rbf, gamma=0.08, degree=None || acc=0.7480, prec=0.7037, rec=0.4524, f1=0.5507
60 C=1, kernel=rbf, gamma=0.09, degree=None || acc=0.7642, prec=0.7241, rec=0.5000, f1=0.5915
61 C=1, kernel=rbf, gamma=0.0999999999999999, degree=None || acc=0.7642, prec=0.7241, rec=0.5000, f1=0.5915
62 C=1, kernel=rbf, gamma=0.5, degree=None || acc=0.7398, prec=0.7273, rec=0.3810, f1=0.5000
63 C=1, kernel=rbf, gamma=1, degree=None || acc=0.6667, prec=0.5556, rec=0.1190, f1=0.1961
64 C=2, kernel=rbf, gamma=0.001, degree=None || acc=0.6585, prec=0.5000, rec=0.0476, f1=0.0870
65 C=2, kernel=rbf, gamma=0.005, degree=None || acc=0.7317, prec=0.6667, rec=0.4286, f1=0.5217
66 C=2, kernel=rbf, gamma=0.01, degree=None || acc=0.7398, prec=0.6667, rec=0.4762, f1=0.5556
67 C=2, kernel=rbf, gamma=0.02, degree=None || acc=0.7398, prec=0.6786, rec=0.4524, f1=0.5429
68 C=2, kernel=rbf, gamma=0.03, degree=None || acc=0.7398, prec=0.6923, rec=0.4286, f1=0.5294
69 C=2, kernel=rbf, gamma=0.04, degree=None || acc=0.7398, prec=0.6923, rec=0.4286, f1=0.5294
70 C=2, kernel=rbf, gamma=0.05, degree=None || acc=0.7561, prec=0.7143, rec=0.4762, f1=0.5714
71 C=2, kernel=rbf, gamma=0.0600000000000005, degree=None || acc=0.7317, prec=0.6800, rec=0.4048, f1=0.5075
72 C=2, kernel=rbf, gamma=0.0699999999999999, degree=None || acc=0.7642, prec=0.7241, rec=0.5000, f1=0.5915
73 C=2, kernel=rbf, gamma=0.08, degree=None || acc=0.7642, prec=0.7241, rec=0.5000, f1=0.5915
74 C=2, kernel=rbf, gamma=0.09, degree=None || acc=0.7642, prec=0.7241, rec=0.5000, f1=0.5915
75 C=2, kernel=rbf, gamma=0.0999999999999999, degree=None || acc=0.7642, prec=0.7241, rec=0.5000, f1=0.5915
76 C=2, kernel=rbf, gamma=0.5, degree=None || acc=0.7154, prec=0.6207, rec=0.4286, f1=0.5070

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77 C=2, kernel=rbf, gamma=1, degree=None || acc=0.6992, prec=0.6923, rec=0.2143, f1=0.3273
78 C=5, kernel=rbf, gamma=0.001, degree=None || acc=0.7154, prec=0.6842, rec=0.3095, f1=0.4262
79 C=5, kernel=rbf, gamma=0.005, degree=None || acc=0.7236, prec=0.5833, rec=0.6667, f1=0.6222
80 C=5, kernel=rbf, gamma=0.01, degree=None || acc=0.7480, prec=0.6486, rec=0.5714, f1=0.6076
81 C=5, kernel=rbf, gamma=0.02, degree=None || acc=0.7480, prec=0.6667, rec=0.5238, f1=0.5867
82 C=5, kernel=rbf, gamma=0.03, degree=None || acc=0.7561, prec=0.7143, rec=0.4762, f1=0.5714
83 C=5, kernel=rbf, gamma=0.04, degree=None || acc=0.7642, prec=0.7241, rec=0.5000, f1=0.5915
84 C=5, kernel=rbf, gamma=0.05, degree=None || acc=0.7561, prec=0.7143, rec=0.4762, f1=0.5714
85 C=5, kernel=rbf, gamma=0.060000000000000005, degree=None || acc=0.7642, prec=0.7241, rec=0.5000, f1=0.5915
86 C=5, kernel=rbf, gamma=0.0699999999999999, degree=None || acc=0.7642, prec=0.7097, rec=0.5238, f1=0.6027
87 C=5, kernel=rbf, gamma=0.08, degree=None || acc=0.7724, prec=0.7188, rec=0.5476, f1=0.6216
88 C=5, kernel=rbf, gamma=0.09, degree=None || acc=0.7805, prec=0.7273, rec=0.5714, f1=0.6400
89 C=5, kernel=rbf, gamma=0.0999999999999999, degree=None || acc=0.7724, prec=0.7059, rec=0.5714, f1=0.6316
90 C=5, kernel=rbf, gamma=0.5, degree=None || acc=0.6911, prec=0.5588, rec=0.4524, f1=0.5000
91 C=5, kernel=rbf, gamma=1, degree=None || acc=0.6911, prec=0.6111, rec=0.2619, f1=0.3667
92 C=10, kernel=rbf, gamma=0.001, degree=None || acc=0.7398, prec=0.6087, rec=0.6667, f1=0.6364
93 C=10, kernel=rbf, gamma=0.005, degree=None || acc=0.7398, prec=0.5833, rec=0.8333, f1=0.6863
94 C=10, kernel=rbf, gamma=0.01, degree=None || acc=0.7398, prec=0.6250, rec=0.5952, f1=0.6098
95 C=10, kernel=rbf, gamma=0.02, degree=None || acc=0.7398, prec=0.6667, rec=0.4762, f1=0.5556
96 C=10, kernel=rbf, gamma=0.03, degree=None || acc=0.7561, prec=0.7000, rec=0.5000, f1=0.5833
97 C=10, kernel=rbf, gamma=0.04, degree=None || acc=0.7480, prec=0.7037, rec=0.4524, f1=0.5507
98 C=10, kernel=rbf, gamma=0.05, degree=None || acc=0.7561, prec=0.7000, rec=0.5000, f1=0.5833
99 C=10, kernel=rbf, gamma=0.060000000000000005, degree=None || acc=0.7642, prec=0.7097, rec=0.5238, f1=0.6027
100 C=10, kernel=rbf, gamma=0.0699999999999999, degree=None || acc=0.7724, prec=0.7188, rec=0.5476, f1=0.6216
101 C=10, kernel=rbf, gamma=0.08, degree=None || acc=0.7724, prec=0.7059, rec=0.5714, f1=0.6316
102 C=10, kernel=rbf, gamma=0.09, degree=None || acc=0.7724, prec=0.7059, rec=0.5714, f1=0.6316
103 C=10, kernel=rbf, gamma=0.0999999999999999, degree=None || acc=0.7724, prec=0.6944, rec=0.5952, f1=0.6410
104 C=10, kernel=rbf, gamma=0.5, degree=None || acc=0.6748, prec=0.5294, rec=0.4286, f1=0.4737
105 C=10, kernel=rbf, gamma=1, degree=None || acc=0.6748, prec=0.5455, rec=0.2857, f1=0.3750
106 C=0.1, kernel=polynomial, gamma=None, degree=2 || acc=0.7398, prec=0.6389, rec=0.5476, f1=0.5897
107 C=0.1, kernel=polynomial, gamma=None, degree=3 || acc=0.7154, prec=0.5745, rec=0.6429, f1=0.6067
108 C=0.1, kernel=polynomial, gamma=None, degree=4 || acc=0.6829, prec=0.6364, rec=0.1667, f1=0.2642
109 C=0.5, kernel=polynomial, gamma=None, degree=2 || acc=0.7317, prec=0.6452, rec=0.4762, f1=0.5479
110 C=0.5, kernel=polynomial, gamma=None, degree=3 || acc=0.6748, prec=0.5185, rec=0.6667, f1=0.5833
111 C=0.5, kernel=polynomial, gamma=None, degree=4 || acc=0.6016, prec=0.4314, rec=0.5238, f1=0.4731
112 C=1, kernel=polynomial, gamma=None, degree=2 || acc=0.7642, prec=0.6585, rec=0.6429, f1=0.6506
113 C=1, kernel=polynomial, gamma=None, degree=3 || acc=0.6585, prec=0.5000, rec=0.6429, f1=0.5625
114 C=1, kernel=polynomial, gamma=None, degree=4 || acc=0.6179, prec=0.4324, rec=0.3810, f1=0.4051
115 C=2, kernel=polynomial, gamma=None, degree=2 || acc=0.7642, prec=0.6585, rec=0.6429, f1=0.6506
116 C=2, kernel=polynomial, gamma=None, degree=3 || acc=0.7236, prec=0.6000, rec=0.5714, f1=0.5854
117 C=2, kernel=polynomial, gamma=None, degree=4 || acc=0.6179, prec=0.4576, rec=0.6429, f1=0.5347
118 C=5, kernel=polynomial, gamma=None, degree=2 || acc=0.7398, prec=0.6316, rec=0.5714, f1=0.6000
119 C=5, kernel=polynomial, gamma=None, degree=3 || acc=0.6829, prec=0.5319, rec=0.5952, f1=0.5618
120 C=5, kernel=polynomial, gamma=None, degree=4 || acc=0.6341, prec=0.4634, rec=0.4524, f1=0.4578
121 C=10, kernel=polynomial, gamma=None, degree=2 || acc=0.7317, prec=0.6452, rec=0.4762, f1=0.5479
122 C=10, kernel=polynomial, gamma=None, degree=3 || acc=0.6829, prec=0.5319, rec=0.5952, f1=0.5618
123 C=10, kernel=polynomial, gamma=None, degree=4 || acc=0.6341, prec=0.4634, rec=0.4524, f1=0.4578
124
125 Best Hyperparameters for Custom SVM: {'C': 10, 'kernel': 'rbf', 'gamma': 0.005, 'degree': None}
126 Best Scores for Custom SVM: {'acc': 0.7398373983739838, 'prec': 0.5833333333333334, 'rec': 0.8333333333333334, 'f1': 0.6862745098039216}
127
128 Custom SVM Final Test Results:
129 Accuracy: 0.5779
130 Precision: 0.4561
131 Recall: 0.9455
132 F1 Score: 0.6154
133
134     precision    recall   f1-score   support
135
136      -1       0.93     0.37     0.53      99
137       1       0.46     0.95     0.62      55
138
139     accuracy         0.58     154
140   macro avg     0.69     0.66     0.57     154
141 weighted avg     0.76     0.58     0.56     154
142
143
144
145 ##### Tuning LinearSVC using K-Fold CV #####
146
147 C=0.01 || Avg acc=0.7605, Avg prec=0.7001, Avg rec=0.5392, Avg f1=0.6036
148 C=0.05 || Avg acc=0.7654, Avg prec=0.7057, Avg rec=0.5477, Avg f1=0.6114
149 C=0.1 || Avg acc=0.7654, Avg prec=0.7057, Avg rec=0.5477, Avg f1=0.6114
150 C=0.5 || Avg acc=0.7654, Avg prec=0.7057, Avg rec=0.5477, Avg f1=0.6114
151 C=1 || Avg acc=0.7654, Avg prec=0.7057, Avg rec=0.5477, Avg f1=0.6114
152 C=2 || Avg acc=0.7654, Avg prec=0.7057, Avg rec=0.5477, Avg f1=0.6114

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File - fadml_project_dpsvm_p3_(gen_ai_tool)

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153 C=5 || Avg acc=0.7654, Avg prec=0.7057, Avg rec=0.5477, Avg f1=0.6114
154 C=10 || Avg acc=0.7654, Avg prec=0.7057, Avg rec=0.5477, Avg f1=0.6114
155 C=20 || Avg acc=0.7654, Avg prec=0.7057, Avg rec=0.5477, Avg f1=0.6114
156
157 Best Hyperparameters for LinearSVC: C = 0.05
158 Best Scores for LinearSVC: {'acc': 0.7654151242728715, 'prec': 0.7056659548891007, 'rec': 0.5476789063451467, 'f1': 0.6113992373498076}
159
160 Sklearn LinearSVC Final Test Results:
161 Accuracy: 0.7597
162 Precision: 0.6607
163 Recall: 0.6727
164 F1 Score: 0.6667
165
166      precision  recall f1-score support
167
168      -1    0.82    0.81    0.81     99
169       1    0.66    0.67    0.67     55
170
171      accuracy         0.76    154
172   macro avg    0.74    0.74    0.74    154
173 weighted avg    0.76    0.76    0.76    154
174
175
176 Process finished with exit code 0
177
```