Applied Machine Learning

HW2

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Q4:

(a)

Linear SVC : Number of Support Vectors = [14 14] Accuracy = 97.87735849056604 %

(b)

Linear SVC : n = 50 - Number of support vectors = [1 1] Accuracy = 98.11320754716981 %
Linear SVC : n = 100 - Number of support vectors = [2 2] Accuracy = 98.11320754716981 %
Linear SVC : n = 200 - Number of support vectors = [4 4] Accuracy = 98.11320754716981 %
Linear SVC : n = 800 - Number of support vectors = [7 7] Accuracy = 98.11320754716981 %

(c)

1: False.
Polynomial SVC : Training Error for degree = 2 and C = 0.0001 = 1.8577834721332454 %
Number of Support Vectors = [239 239]
Polynomial SVC : Training Error for degree = 5 and C = 0.0001 = 0.5124919923126248 %
Number of Support Vectors = [17 17]

2: True.
Polynomial SVC : Training Error for degree = 2 and C = 0.001 = 0.6406149903907754 %
Number of Support Vectors = [71 71]
Polynomial SVC : Training Error for degree = 5 and C = 0.001 = 0.4484304932735439 %
Number of Support Vectors = [13 13]

3: False.
Polynomial SVC : Training Error for degree = 2 and C = 0.01 = 0.4484304932735439 %
Number of Support Vectors = [26 26]
Polynomial SVC : Training Error for degree = 5 and C = 0.01 = 0.384368994234463 %
Number of Support Vectors = [12 13]

4: False.
Polynomial SVC : Testing Error for degree = 2 and C = 1 = 1.8867924528301883 %
Number of Support Vectors = [12 12]
Polynomial SVC : Testing Error for degree = 5 and C = 1 = 1.8867924528301883 %
Number of Support Vectors = [11 16]

(d)

Lowest Training Error is at C = 1000000
RBF SVC : Training error for C = 0.01 = 0.384368994234463 %
RBF SVC : Training error for C = 1 = 0.4484304932735439 %
RBF SVC : Training error for C = 100 = 0.32030749519538215 %
RBF SVC : Training error for C = 10000 = 0.2562459961563124 %
RBF SVC : Training error for C = 1000000 = 0.12812299807815064 %

Lowest Test Error is at C = 100, 10000
RBF SVC : Testing error for C = 0.01 = 2.1226415094339646 %
RBF SVC : Testing error for C = 1 = 2.1226415094339646 %
RBF SVC : Testing error for C = 100 = 1.8867924528301883 %
RBF SVC : Testing error for C = 10000 = 1.8867924528301883 %
RBF SVC : Testing error for C = 1000000 = 2.1226415094339646 %

Q5:
(a)
Linear SVC : Number of Support Vectors = [542 542] Testing Error = 2.400000000000002 %
Training Error = 0.0%

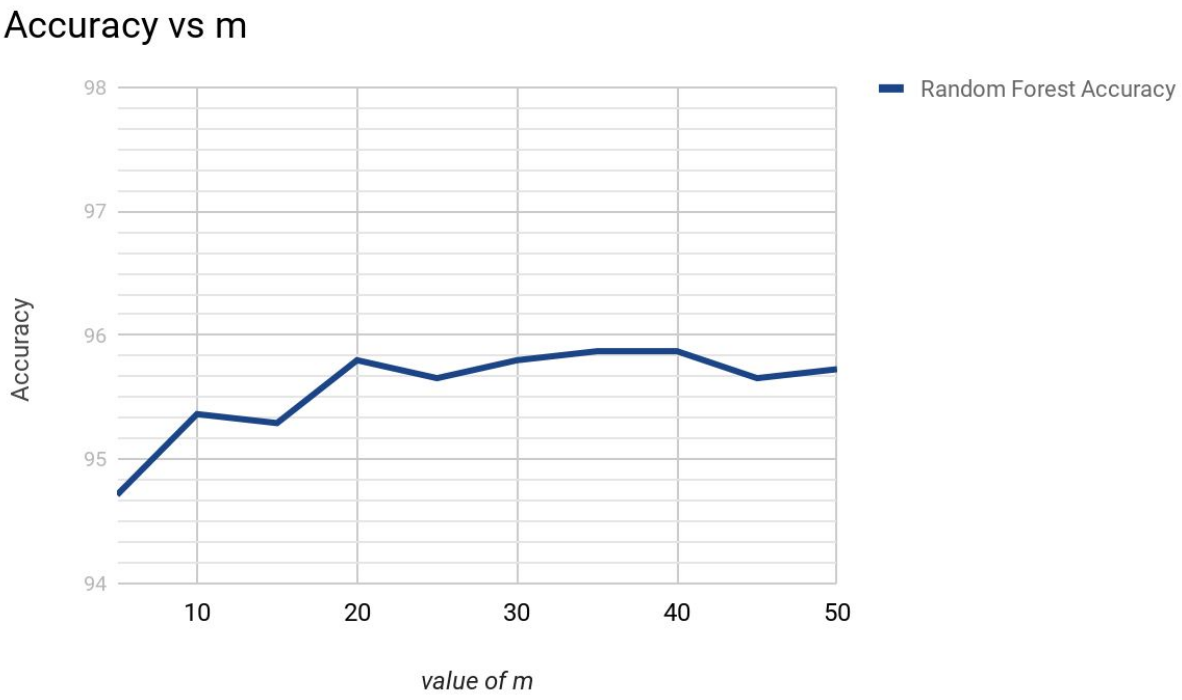
(b)
RBF SVC : Number of Support Vectors = [3000 3000] Testing Error = 50.0%
RBF SVC : Training error = 0.0%
Polynomial SVC : Number of Support Vectors = [817 938] Testing Error = 2.100000000000002 %
Polynomial SVC : Training error = 0.0%

All the kernels yield the same Training Error = 0.0%
Polynomial Kernel yields smallest Testing Error.

Q6:
(a)
My model Accuracy = 94.4967414916727 %
Time taken by my model = 3.984781265258789 Sec

Sklearn Accuracy = 94.2795076031861 %
Time taken Sklearn model = 0.08421492576599121 Sec

(b)


Accuracy vs m
Random Forest Accuracy
Accuracy
98
97
96
95
94
10
20
30
40
50
value of m

(c)

OOB Accuracy vs m