BAB VI
PENUTUP

6.1   Kesimpulan

Berdasarkan hasil penelitian mengenai klasifikasi penderita penyakit hepatitis dengan menggunakan metode SVM, dapat disimpulkan bahwa :

1. Klasifikasi Penderita Penyakit Hepatitis dapat diaplikasikan dengan menggunakan metode SVM dengan menggunakan persamaan primal SVM, dimana sistem terdiri 4 bagian utama, input data, Normalisasi dan Kernel data, Training SVM, serta pengujian.

2. Metode *Support Vector Machine* dengan Kernel *Linear* dengan menggunakan dataset *Hepatitis Domain* dengan 19 atribut, rata - rata akurasi yang didapatkan adalah 82.08 % pada data latih sebesar 80, sedangkan rata – rata akurasi yang diperoleh pada 15 atribut data adalah 84.93 %.

3. Nilai C yang menghasilkan akurasi tertinggi pada dataset dengan jumlah atribut 19 adalah nilai C = 30 pada data latih 80, sedangkan untuk dataset dengan jumlah atribut 15 adalah nilai C = 40 ,50,60 pada data latih 80.

4. Hasil nilai pengukuran nilai *sensitivity* dan *spesitivity* menunjukkan bahwa tingkat pengenalan kelas positif pada sistem lebih tinggi daripada kelas negatif, hal ini disebabkan karena prosentase nilai kelas positif jauh lebih tinggi dari kelas negatif pada dataset yang digunakan.

6.2   Saran

Pada penelitian ini, terdapat beberapa hal yang dapat dieksplorasi dan dijadikan bahan dalam penelitian lebih lanjut, antara lain adalah :

1. Adanya proses penanganan terhadap *missing value* terhadap dataset

2. Pada proses pelatihan SVM dapat menggunakan persamaan dual SVM dengan mencari nilai α (alpha) untuk mendapatkan nilai *w* (*weight*) dan *b* (bias).

3. Penelitian lebih lanjut,dapat digunakan data dengan kelas lebih dari dua, karena keterbatasan pada program ini hanya menggunakan data dengan kelas sama dengan dua.

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LAMPIRAN

| 1. Title: Hepatitis Domain
|
| 2. Sources:
| (a) unknown
| (b) Donor: G.Gong (Carnegie-Mellon University) via
| Bojan Cestnik
| Jozef Stefan Institute
| Jamova 39
| 61000 Ljubljana
| Yugoslavia (tel.: (38)(+61) 214-399 ext.287) }
| (c) Date: November, 1988
|
| 3. Past Usage:
| 1. Diaconis,P. & Efron,B. (1983). Computer-Intensive Methods in
| Statistics. Scientific American, Volume 248.
| -- Gail Gong reported a 80% classfication accuracy
| 2. Cestnik,G., Konenenko,I, & Bratko,I. (1987). Assistant-86: A
| Knowledge-Elicitation Tool for Sophisticated Users. In I.Bratko
| & N.Lavrac (Eds.) Progress in Machine Learning, 31-45, Sigma Press.
| -- Assistant-86: 83% accuracy
|
| 4. Relevant Information:
| Please ask Gail Gong for further information on this database.
|
| 5. Number of Instances: 155
|
| 6. Number of Attributes: 20 (including the class attribute)
|
| 7. Attribute information:
| 1. Class: DIE, LIVE
| 2. AGE: 10, 20, 30, 40, 50, 60, 70, 80
| 3. SEX: male, female
| 4. STEROID: no, yes
| 5. ANTIVIRALS: no, yes
| 6. FATIGUE: no, yes
| 7. MALAISE: no, yes
| 8. ANOREXIA: no, yes
| 9. LIVER BIG: no, yes
| 10. LIVER FIRM: no, yes
| 11. SPLEEN PALPABLE: no, yes
| 12. SPIDERS: no, yes
| 13. ASCITES: no, yes
| 14. VARICES: no, yes
| 15. BILIRUBIN: 0.39, 0.80, 1.20, 2.00, 3.00, 4.00

16. ALK PHOSPHATE: 33, 80, 120, 160, 200, 250
17. SGOT: 13, 100, 200, 300, 400, 500,
18. ALBUMIN: 2.1, 3.0, 3.8, 4.5, 5.0, 6.0
19. PROTIME: 10, 20, 30, 40, 50, 60, 70, 80, 90
20. HISTOLOGY: no, yes

The BILIRUBIN attribute appears to be continuously-valued. I checked
this with the donater, Bojan Cestnik, who replied:

  About the hepatitis database and BILIRUBIN problem I would like to say
  the following: BILIRUBIN is continuous attribute (= the number of it's
  "values" in the ASDOHEPA.DAT file is negative!!!); "values" are quoted
  because when speaking about the continuous attribute there is no such
  thing as all possible values. However, they represent so called
  "boundary" values; according to these "boundary" values the attribute
  can be discretized. At the same time, because of the continious
  attribute, one can perform some other test since the continuous
  information is preserved. I hope that these lines have at least roughly
  answered your question.

8. Missing Attribute Values: (indicated by "?")
   Attribute Number: Number of Missing Values:
            1:   0
            2:   0
            3:   0
            4:   1
            5:   0
            6:   1
            7:   1
            8:   1
            9:   10
           10:   11
           11:   5
           12:   5
           13:   5
           14:   5
           15:   6
           16:   29
           17:   4
           18:   16
           19:   67
           20:   0

9. Class Distribution:
   DIE: 32
   LIVE: 123
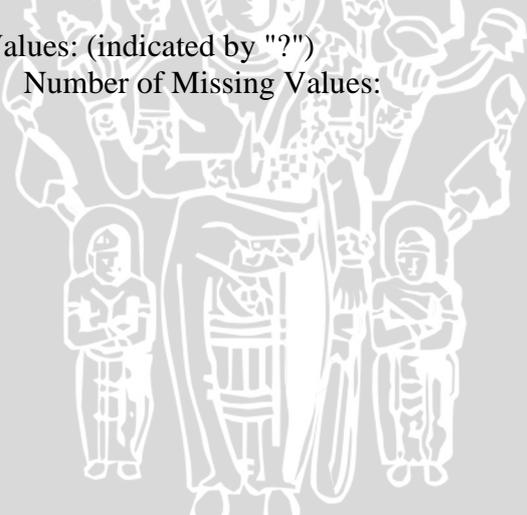
-1, 1. | DIE, LIVE.

AGE: continuous
SEX: 1, 2 | male, female
STEROID: 1, 2 | no, yes
ANTIVIRALS: 1, 2 | no, yes
FATIGUE: 1, 2 | no, yes
MALAISE: 1, 2 | no, yes
ANOREXIA: 1, 2 | no, yes
LIVER BIG: 1, 2 | no, yes
LIVER FIRM: 1, 2 | no, yes
SPLEEN PALPABLE: 1, 2 | no, yes
SPIDERS: 1, 2 | no, yes
ASCITES: 1, 2 | no, yes
VARICES: 1, 2 | no, yes
BILIRUBIN: continuous
ALK PHOSPHATE: continuous
SGOT: continuous
ALBUMIN: continuous
PROTIME: continuous
HISTOLOGY: 1, 2 | no, yes

DATASET HEPATITIS DOMAIN

Atr 1	Atr 2	Atr 3	Atr 4	Atr 5	Atr 6	Atr 7	Atr 8	Atr 9	Atr 10	Atr 11	Atr 12	Atr 13	Atr 14	Atr 15	Atr 16	Atr 17	Atr 18	Atr 19	Class
51	2	2	2	1	2	1	1	2	1	1	2	2	?	?	?	?	?	2	-1
39	2	2	1	1	1	2	1	1	2	2	2	2	2.3	280	98	3.8	40	2	-1
62	2	2	2	1	1	2	?	?	2	2	2	2	1	?	60	?	?	2	-1
37	2	1	2	1	2	2	1	2	2	1	2	2	0.6	67	28	4.2	?	2	-1
57	2	1	2	1	1	1	1	2	2	1	1	2	4.1	?	48	2.6	73	2	-1
34	2	2	2	1	1	2	2	1	2	1	2	2	2.8	127	182	?	?	2	-1
58	2	1	2	1	2	2	2	1	1	1	2	2	2	167	242	3.3	?	2	-1
44	2	2	2	1	1	2	1	2	1	2	2	1	0.9	135	55	?	41	1	-1
30	2	1	2	1	1	1	1	1	2	1	1	1	2.5	165	64	2.8	?	1	-1
38	2	2	2	1	1	1	1	1	2	1	1	1	1.2	118	16	2.8	?	1	-1
42	2	2	2	1	1	1	1	1	1	1	2	1	4.6	?	55	3.3	?	1	-1
59	2	2	2	1	1	2	1	1	1	1	2	2	1.5	107	157	3.6	38	1	-1
47	2	1	2	2	2	2	1	2	1	2	2	1	2	84	23	4.2	66	1	-1
48	2	2	2	1	1	2	1	1	2	1	1	1	4.8	123	157	2.7	31	1	-1
47	2	1	2	1	1	2	1	1	2	2	1	1	1.7	86	20	2.1	46	1	-1
35	2	2	2	1	2	2	?	?	1	1	1	2	1.5	138	58	2.6	?	1	-1
33	2	2	2	1	1	2	1	2	2	2	1	2	0.7	63	80	3	31	1	-1
42	2	2	1	1	1	2	1	2	2	1	2	2	0.5	62	68	3.8	29	1	-1
61	2	2	2	1	1	2	?	?	2	1	2	2	?	?	?	?	?	1	-1
56	2	2	2	1	1	1	2	1	2	1	2	2	2.9	90	153	4	?	1	-1
50	2	1	2	1	2	2	1	1	1	2	1	1	2.8	155	75	2.4	32	1	-1
57	2	2	2	1	1	2	1	2	2	1	1	2	4.6	82	55	3.3	30	1	-1
31	2	2	2	1	1	1	1	2	1	2	2	2	8	?	101	2.2	?	1	-1
38	2	2	2	2	2	2	1	1	2	2	2	2	0.4	243	49	3.8	90	1	-1
47	2	1	2	1	1	2	1	1	2	1	1	1	1	166	30	2.6	31	1	-1
54	2	2	2	1	1	2	?	?	1	2	1	2	3.9	120	28	3.5	43	1	-1
49	2	2	2	1	1	2	1	2	1	1	2	2	1.4	85	70	3.5	35	1	-1
45	2	1	2	1	1	1	1	2	2	1	1	2	1.9	?	114	2.4	?	1	-1
41	2	1	2	1	2	2	1	1	1	1	2	1	4.2	65	120	3.4	?	1	-1
70	2	2	2	1	1	1	?	?	?	?	?	?	1.7	109	528	2.8	35	1	-1
46	2	1	2	1	1	1	1	2	2	1	1	1	7.6	?	242	3.3	50	1	-1
43	2	1	2	1	2	2	1	1	1	1	1	2	1.2	100	19	3.1	42	1	-1
30	1	2	2	2	2	2	2	2	2	2	2	2	1	85	18	4	?	2	1
50	2	2	2	1	2	2	2	2	2	2	2	2	0.9	135	42	3.5	?	2	1
78	2	1	2	1	2	2	1	2	2	2	2	2	0.7	96	32	4	?	2	1
31	2	1	1	2	2	2	1	2	2	2	2	2	0.7	46	52	4	80	2	1
34	2	1	2	2	2	2	1	2	2	2	2	2	1	?	200	4	?	2	1
34	2	1	2	2	2	2	1	2	2	2	2	2	0.9	95	28	4	75	2	1
23	2	1	2	2	2	2	1	2	2	2	2	2	1	?	?	?	?	2	1

39	2	1	2	1	2	2	1	1	2	2	2	2	0.7	?	48	4.4	?	2	1
30	2	1	2	2	2	2	1	2	2	2	2	2	1	?	120	3.9	?	2	1
39	2	2	1	2	2	2	2	1	2	2	2	2	1.3	78	30	4.4	85	2	1
32	2	1	1	1	2	2	1	1	2	1	2	2	1	59	249	3.7	54	2	1
41	2	1	1	1	2	2	1	1	2	2	2	2	0.9	81	60	3.9	52	2	1
30	2	1	2	1	2	2	1	1	2	2	2	2	2.2	57	144	4.9	78	2	1
47	2	2	1	2	2	2	1	2	2	2	2	2	?	?	60	?	?	2	1
38	2	2	2	1	1	1	1	2	2	2	1	2	2	72	89	2.9	46	2	1
66	2	1	2	1	2	2	1	2	2	2	2	2	1.2	102	53	4.3	?	2	1
40	2	2	2	1	2	2	1	1	2	2	2	2	0.6	62	166	4	63	2	1
38	2	1	2	2	2	2	1	2	2	2	2	2	0.7	53	42	4.1	85	1	1
38	2	2	1	2	2	2	2	1	2	2	2	2	0.7	70	28	4.2	62	2	1
22	1	1	1	1	2	2	1	2	2	2	2	2	0.9	48	20	4.2	64	2	1
27	2	1	2	1	1	1	2	1	1	1	2	2	1.2	133	98	4.1	39	2	1
31	2	1	2	2	2	2	1	2	2	2	2	2	1	85	20	4	100	2	1
42	2	1	2	2	2	2	1	2	2	2	2	2	0.9	60	63	4.7	47	2	1
25	1	2	1	2	2	2	1	2	2	2	2	2	0.4	45	18	4.3	70	2	1
27	2	2	2	1	1	2	1	2	2	2	2	2	0.8	95	46	3.8	100	2	1
49	2	2	1	1	1	1	1	1	2	1	2	2	0.6	85	48	3.7	?	2	1
58	1	1	2	1	2	2	1	1	2	1	2	2	1.4	175	55	2.7	36	2	1
61	2	2	2	1	2	2	2	1	2	2	2	2	1.3	78	25	3.8	100	2	1
51	2	2	1	1	1	2	1	2	2	2	2	2	1	78	58	4.6	52	2	1
41	1	1	1	1	1	1	1	2	2	2	2	2	0.7	81	53	5	74	2	1
26	1	2	2	2	2	2	1	1	2	2	2	2	0.5	135	29	3.8	60	2	1
35	2	1	2	1	2	2	1	2	2	2	2	2	0.9	58	92	4.3	73	2	1
23	2	1	2	1	1	1	1	2	1	2	2	2	1.3	194	150	4.1	90	2	1
20	1	2	2	1	1	1	2	1	1	1	2	2	2.3	150	68	3.9	?	2	1
42	2	2	2	2	2	2	1	2	2	2	2	2	1	85	14	4	100	2	1
65	2	1	2	1	1	2	1	1	1	1	1	2	0.3	180	53	2.9	74	1	1
52	2	2	1	2	2	2	1	2	2	2	2	2	0.7	75	55	4	21	2	1
23	2	1	2	2	2	2	?	?	?	?	?	?	4.6	56	16	4.6	?	2	1
33	2	1	2	2	2	2	1	2	2	2	2	2	1	46	90	4.4	60	2	1
56	2	2	2	1	2	2	1	2	2	2	2	2	0.7	71	18	4.4	100	2	1
34	2	1	2	2	2	2	1	2	2	2	2	2	?	?	86	?	?	2	1
28	2	1	2	1	1	2	1	2	2	2	2	2	0.7	74	110	4.4	?	2	1
37	2	2	2	2	2	2	1	1	2	1	2	2	0.6	80	80	3.8	?	2	1
28	1	1	2	1	1	2	1	1	2	2	2	2	1.8	191	420	3.3	46	2	1
36	2	2	2	2	2	2	1	2	1	2	2	2	0.8	85	44	4.2	85	2	1
38	2	1	1	1	1	1	1	2	2	1	2	2	0.7	125	65	4.2	77	2	1
39	2	2	2	2	2	2	1	2	2	2	2	2	0.9	85	60	4	?	2	1
39	2	1	2	2	2	2	1	2	2	2	2	2	1	85	20	4	?	2	1
44	2	1	2	2	2	2	1	2	2	2	2	2	0.6	110	145	4.4	70	2	1

40	2	1	1	1	2	2	1	1	1	2	2	2	1.2	85	31	4	100	2	1
30	2	1	2	1	2	2	1	2	2	2	2	2	0.7	50	78	4.2	74	2	1
37	2	2	2	1	1	1	1	2	2	2	2	2	0.8	92	59	?	?	2	1
34	2	2	2	?	?	?	?	?	?	?	?	?	?	?	?	?	?	2	1
30	2	1	1	2	2	2	1	2	2	2	2	2	0.7	52	38	3.9	52	2	1
64	2	1	1	1	1	2	2	1	2	2	2	2	1	80	38	4.3	74	2	1
45	1	2	2	1	1	2	1	2	1	2	2	2	1	85	75	?	?	2	1
37	2	1	2	2	2	2	1	2	2	2	2	2	0.7	26	58	4.5	100	2	1
32	2	1	2	2	2	2	1	2	2	2	2	2	0.7	102	64	4	90	2	1
32	2	1	2	1	1	1	1	2	2	1	2	1	3.5	215	54	3.4	29	2	1
36	2	2	2	2	2	2	2	1	1	2	2	2	0.7	164	44	3.1	41	2	1
49	2	1	2	1	1	2	1	2	2	2	2	2	0.8	103	43	3.5	66	2	1
27	2	1	2	2	2	2	1	2	2	2	2	2	0.8	?	38	4.2	?	2	1
56	2	2	2	2	2	2	1	2	2	2	2	2	0.7	62	33	3	?	2	1
39	2	1	2	1	2	2	1	2	2	2	2	2	1	34	15	4	54	2	1
44	2	2	2	1	1	2	1	2	2	2	2	2	1.6	68	68	3.7	?	2	1
24	2	1	2	2	2	2	1	2	2	2	2	2	0.8	82	39	4.3	?	2	1
51	2	1	2	1	1	1	?	?	?	?	?	?	0.9	76	271	4.4	?	2	1
36	2	2	2	1	1	1	1	1	2	2	2	2	1	?	45	4	57	2	1
50	2	1	2	2	2	2	1	2	2	2	2	2	1.5	100	100	5.3	?	2	1
32	2	2	1	1	1	2	1	2	2	2	2	2	1	55	45	4.1	56	2	1
34	1	2	1	2	2	2	1	1	2	2	2	2	0.6	30	24	4	76	2	1
34	2	2	2	1	2	2	1	2	1	2	2	2	1	72	46	4.4	57	2	1
28	2	1	2	2	2	2	1	2	2	2	2	2	0.7	85	31	4.9	?	2	1
23	2	1	2	1	1	1	1	2	2	2	2	2	0.8	?	14	4.8	?	2	1
36	2	1	2	2	2	2	1	2	2	2	2	2	0.7	62	224	4.2	100	2	1
30	2	2	2	2	2	2	1	2	2	2	2	2	0.7	100	31	4	100	2	1
67	1	2	2	1	1	2	1	2	?	?	?	?	1.5	179	69	2.9	?	2	1
62	1	1	2	1	1	2	1	1	2	1	2	2	1.3	141	156	3.9	58	2	1
28	2	2	2	1	1	1	1	1	2	2	2	2	1.6	44	123	4	46	2	1
38	2	2	2	1	1	1	2	1	2	2	2	2	0.6	76	18	4.4	84	1	1
50	1	2	2	1	2	2	2	1	1	1	2	2	0.9	230	117	3.4	41	1	1
33	2	1	2	2	2	2	?	?	2	2	2	2	1	?	60	4	?	1	1
52	2	2	2	2	2	2	1	2	2	2	2	2	1.5	?	69	2.9	?	1	1
40	2	2	1	1	1	1	2	1	2	2	2	2	0.6	40	69	4.2	67	1	1
30	2	2	2	1	1	2	1	1	2	1	2	2	0.8	147	128	3.9	100	1	1
44	2	2	2	1	1	2	2	1	2	1	2	2	3	114	65	3.5	?	1	1
60	2	2	2	1	2	2	2	1	1	1	2	2	?	?	40	?	?	1	1
22	2	1	2	2	2	2	1	2	2	2	2	2	0.7	?	24	?	?	1	1
27	2	2	2	1	2	2	1	1	2	2	2	2	2.4	168	227	3	66	1	1
51	2	2	2	1	1	1	1	1	1	1	2	1	4.6	215	269	3.9	51	1	1
25	2	1	2	2	2	2	1	2	2	2	2	2	0.6	?	34	6.4	?	1	1

45	2	2	2	1	1	1	1	2	2	2	2	2	2.3	?	648	?	?	1	1
54	2	2	1	2	2	2	2	1	2	2	2	2	1	155	225	3.6	67	1	1
7	2	1	2	2	2	2	1	1	1	2	2	2	0.7	256	25	4.2	?	1	1
52	2	2	2	1	2	2	1	2	2	2	2	2	1	85	30	4	?	1	1
45	2	2	2	1	2	2	1	1	1	2	2	2	1.2	81	65	3	?	2	1
36	2	2	2	2	2	2	1	2	2	2	2	2	1.1	141	75	3.3	?	1	1
69	1	1	2	1	2	2	1	2	2	2	2	2	3.2	119	136	?	?	1	1
24	2	2	2	1	2	2	1	2	2	2	2	2	1	?	34	4.1	?	1	1
50	2	1	2	2	2	2	1	2	2	2	2	2	1	139	81	3.9	62	1	1
54	2	1	2	1	2	2	2	1	2	2	2	2	3.2	85	28	3.8	?	1	1
20	2	2	2	1	1	1	1	2	2	1	1	2	1	160	118	2.9	23	1	1
42	2	1	2	2	2	2	1	2	1	2	2	2	1.5	85	40	?	?	1	1
37	2	2	2	1	2	2	1	2	2	1	2	2	0.9	?	231	4.3	?	1	1
50	2	1	2	2	2	2	1	1	1	1	2	2	1	85	75	4	72	1	1
34	1	1	2	1	1	1	2	1	2	1	2	2	0.7	70	24	4.1	100	1	1
28	2	1	2	1	1	1	?	?	2	1	1	2	1	?	20	4	?	1	1
54	2	2	2	1	1	2	1	2	2	2	1	2	1.2	85	92	3.1	66	1	1
54	2	1	2	2	2	2	1	2	2	2	2	2	1	85	30	4.5	0	1	1
48	2	1	2	1	1	1	1	1	2	1	2	2	2	158	278	3.8	?	1	1
72	2	1	1	1	2	2	1	1	2	2	2	2	1	115	52	3.4	50	1	1
25	2	1	2	1	2	2	2	1	1	1	1	1	1.3	181	181	4.5	57	1	1
51	2	1	2	2	2	2	2	1	2	1	2	2	0.8	?	33	4.5	?	1	1
38	2	1	2	2	2	2	1	1	2	1	2	1	1.6	130	140	3.5	56	1	1
45	2	1	1	2	2	2	1	2	2	2	2	2	1.3	85	44	4.2	85	1	1
36	2	2	2	1	1	1	2	1	2	1	2	1	1.7	295	60	2.7	?	1	1
51	2	1	2	1	2	2	1	1	1	1	2	1	1	?	20	3	63	1	1
31	2	2	2	1	2	2	1	2	2	2	2	2	1.2	75	173	4.2	54	1	1
20	2	2	2	2	2	2	1	?	2	2	2	2	0.9	89	152	4	?	1	1
36	2	1	2	2	2	2	1	2	2	2	2	2	0.6	120	30	4	?	1	1
44	2	1	2	1	2	2	1	1	2	2	2	2	0.9	126	142	4.3	?	1	1
61	2	2	2	1	1	2	2	1	2	1	2	2	0.8	75	20	4.1	?	1	1
53	1	2	2	1	2	2	1	2	1	1	2	1	1.5	81	19	4.1	48	1	1