Quiz 3 sample solution

Note Title 10/7/2007

Qn 1

- train on 1-6, test on 7-9:
  a best rule is N ↦ G, D ↦ B
  (with 1 error on 1-6), gives 1 error on 7-9

- train on 1-3, 7-9, test on 4-6:
  a best rule is N ↦ G, D ↦ B
  (with 1 error on 1-3, 7-9), gives 1 error on 4-6

- train on 4-9, test on 1-3:
  a best rule is Q ↦ G, L ↦ B
  (with 1 error on 4-9), gives 1 error on 1-3

⇒ 3/9 errors, error rate is 33.3%.

Qn 2

We choose to use the C4.5 recommended one-sided confidence interval of 25% for estimating conservative error rates. Therefore, cons. err. rates will be computed by adding 0.69 std devs to the regular error rate.

(1) Node D error rate

err rate is $6/20 = 0.3$

std dev is $\sqrt{\frac{0.3 \times 0.7}{20}} = 0.10$

$\therefore$ cons. err. rate $= 0.3 + 0.69 \times 0.10 = 0.37$

(2) Node E error rate

err rate is $2/10 = 0.2$

std dev is $\sqrt{\frac{0.2 \times 0.8}{10}} = 0.13$

$\therefore$ cons. err. rate $= 0.2 + 0.69 \times 0.13 = 0.29$

(3) Expected conservative error rate of D & E combined:

$\frac{20}{30}$ instances at D, $\frac{10}{30}$ at E, so apply these weights to get:

expected cons. err. rate $= \frac{20}{30} \times 0.37 + \frac{10}{30} \times 0.29$

$= 0.34$ ——— (✱)

(4) Error rate at C if pruned

If pruned, would have 16 G and 14 B at C.

err rate is $14/30 = 0.47$

std dev is $\sqrt{\frac{0.47 \times 0.53}{30}} = 0.09$

∴ cons. err. rate $= 0.47 + 0.69 \times 0.09 = 0.53$ — (†)

(5) Conclusion:

Since (†) is greater than (✱), do <u>not</u> prune.