5.3) n_{ij} = # predict i and truly j

$n_{i\cdot}$ = # predict i

$n_{\cdot j}$ = # true j

$(n_{k+1})_{11} = (n_k)_{11} \cdot a$, $(n_{k+1})_{1\cdot} = (n_k)_{1\cdot}\, b$, $a, b \geq 1$

$$\frac{(n_k)_{11}}{(n_k)_{1\cdot}} < \frac{(n_k)_{11}\, a}{(n_k)_{1\cdot}\, b} \Rightarrow \underline{\frac{a}{b} > 1}$$

mar. 11-08:16

5.4) ROC: $y = TPR = \frac{TP}{P} = \frac{TP}{TP + FN}$

$1 - x = TNR = \frac{TN}{N} = \frac{TN}{TN + FP}$

Random: Randomly order your data, and choose a fraction p to be positive.

$\Rightarrow p(N+P)$ classified as positive (on average)

$TP = p(N+P)\frac{P}{P+N} = \underline{pP}$

$TN = (1-p)(N+P)\frac{N}{P+N} = (1-p)N$

$\underline{y = x} \Rightarrow \frac{TP}{P} = 1 - \frac{TN}{N} \Rightarrow \underline{\frac{TP}{P} + \frac{TN}{N} = 1}$

$\Rightarrow \frac{TP}{P} + \frac{TN}{N} = \frac{pP}{P} + \frac{(1-p)N}{N} = p + (1-p) = \underline{1}$ $\square$

5.5) Yes, but just flip your labels.

mar. 11-08:30

ISLR

4.1) $e^{\beta_0 + \beta_1 X} = \alpha$, $p(X) = p$

(4.2) $p = \frac{\alpha}{1+\alpha}$

(4.3) $\frac{p}{1-p} = \alpha$

$\Rightarrow p = \alpha(1-p) = \alpha - \alpha p$

$\Rightarrow p(1+\alpha) = \alpha \Rightarrow \underline{p = \frac{\alpha}{1+\alpha}}$

4.9) odds $= \frac{p}{1-p} \Rightarrow p = \frac{odds}{1 + odds}$

a) $0.37 = \frac{p}{1-p} \Rightarrow p = \frac{0.37}{1 + 0.37} = \underline{\underline{0.27}}$

b) $p = 0.16 \Rightarrow odds = \frac{0.16}{1 - 0.16} = \underline{\underline{0.19}}$

mar. 11-08:45