

Model

Stat 543
5-26-15

$$\ln\left(\frac{p}{1-p}\right) = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \dots + \varepsilon$$

Example: p = prob (death penalty)
 x_1 = Aggravation level (1 to 6)
 x_2 = victim's race (1 = white)

From the output,

$$\ln\left(\frac{p}{1-p}\right) = -6.68 + 1.57 x_1 + 1.81 x_2$$

Suppose Agglevel = 3 vicrace = 1

$$\begin{aligned}\ln\left(\frac{p}{1-p}\right) &= -6.68 + 1.57(3) + 1.81(1) \\ &= -.25\end{aligned}$$

$$\frac{p}{1-p} = e^{-.25} = .779 = \text{odds of that person getting the death penalty}$$

$$\frac{p}{1-p} = x$$

$$\begin{aligned}p &= x(1-p) \\ &= x - px\end{aligned}$$

$$p + px = x$$

$$p(1+x) = x$$

$$\boxed{p = \frac{x}{1+x}}$$

$$p = \frac{.779}{1.779} = .44$$

This person has a 44% chance of receiving the death penalty.

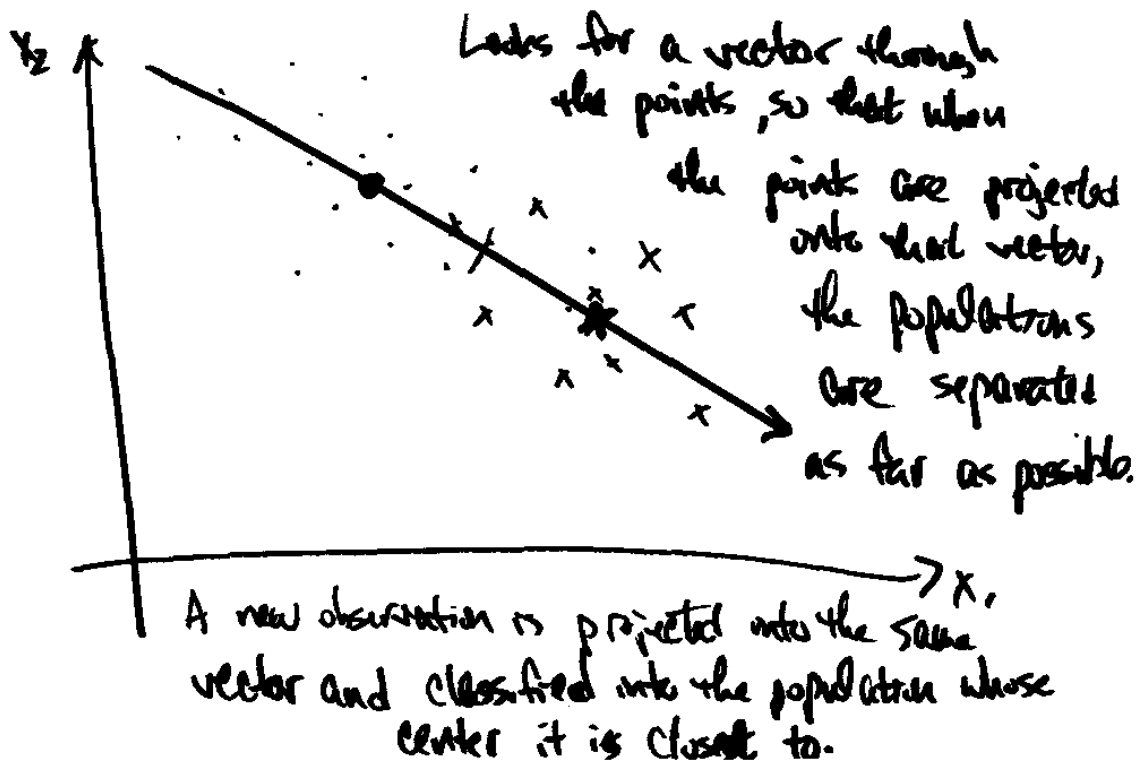
Not also from the output:

$$e^{1.57} = 4.66 \leftarrow \text{odds ratios}$$

$$e^{1.81} = 6.11 \leftarrow \text{odds ratios}$$

↑ changing score from 0 to 1 multiplies the odds by 6.11

Discriminant Analysis



Types of Correlations

X	Y
5	8
3	4
7	6
9	9
8	6

$$r = .628$$

This is the
Pearson product-moment correlation

It measures the linear dependence
between X and Y.

$$\text{Spearman's } \rho = r_s$$

rank X	X \ Y	rank Y
2	5 8	4
1	3 4	1
3	7 6	2.5
5	9 9	5
4	8 6	2.5

Now find Pearson's
correlation between
the ranks of X and
ranks of Y

$$\rho = .667$$

Kendall's Tau

Consider every possible pair of points

(5,8)	(3,4)	c
(5,8)	(7,6)	d
(5,8)	(9,9)	c
(5,8)	(8,6)	d
(3,4)	(7,6)	c
(3,4)	(9,9)	c
(3,4)	(8,6)	c
(7,6)	(9,9)	c
(7,6)	(8,6)	—
(9,9)	(8,6)	c

Concordant $x \uparrow y \uparrow$
or $x \downarrow y \downarrow$

Discordant $x \uparrow y \downarrow$
or $x \downarrow y \uparrow$

$$C = 7 \quad D = 2$$

$$\tau = \frac{C-D}{C+D} = \frac{7-2}{7+2} = \frac{5}{9} = .556$$

	C1	C2	C3	C4
	AggrLev	VicRace	Death	Freq
1	1	1	1	2
2	1	0	1	1
3	2	1	1	2
4	2	0	1	1
5	3	1	1	6
6	3	0	1	2
7	4	1	1	9
8	4	0	1	2
9	5	1	1	9
10	5	0	1	4
11	6	1	1	17
12	6	0	1	4
13	1	1	0	60
14	1	0	0	181
15	2	1	0	15
16	2	0	0	21
17	3	1	0	7
18	3	0	0	9
19	4	1	0	3
20	4	0	0	4
21	5	1	0	0
22	5	0	0	3
23	6	1	0	0
24	6	0	0	0

Tabulated statistics: AggrLev, Death

Using frequencies in Freq

Rows: AggrLev Columns: Death

	0	1	All
1	241	3	244
2	36	3	39
3	16	8	24
4	7	11	18
5	3	13	16
6	0	21	21
All	303	59	362

Cell Contents: Count

Tabulated statistics: VicRace, Death

Using frequencies in Freq

Rows: VicRace Columns: Death

	0	1	All
0	218	14	232
1	85	45	130
All	303	59	362

Cell Contents: Count

Binary Logistic Regression: Death versus AggrLev, VicRace

Link Function: Logit

Response Information

Variable	Value	Count	
Death	1	59	(Event)
	0	303	
	Total	362	

Frequency: Freq

Logistic Regression Table

Predictor	Coef	SE Coef	Z	P	Odds Ratio	95% CI	
						Lower	Upper
Constant	-6.67598	0.757445	-8.81	0.000			
AggrLev	1.53966	0.186726	8.25	0.000	4.66	3.23	6.72
VicRace	1.81065	0.536116	3.38	0.001	6.11	2.14	17.49

Log-Likelihood = -56.738

Test that all slopes are zero: G = 208.402, DF = 2, P-Value = 0.000