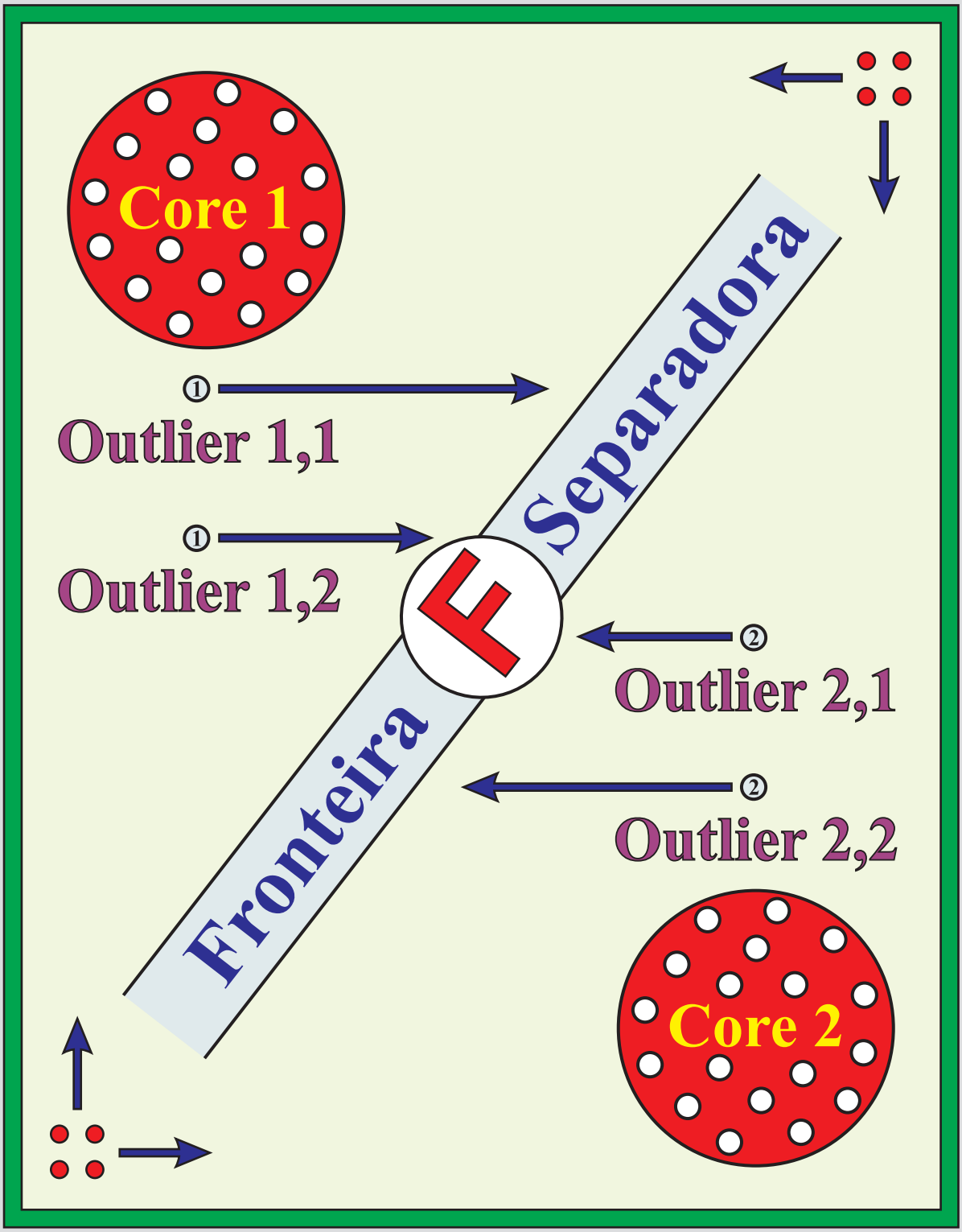
Discriminante de Fischer



The Use of Multiple Measurements in Taxonomic Problems

D

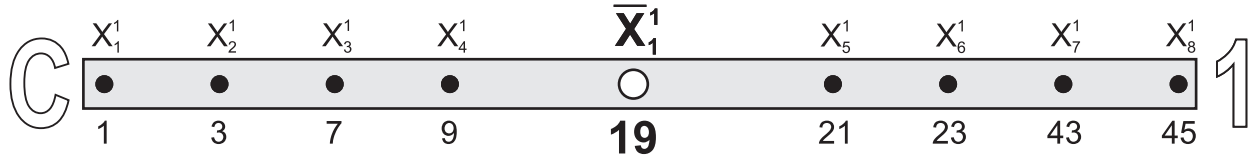
Annals of Eugenics, v.7, p.179, 1936

F

Sir. Ronald Aylmer Fischer

Normal Sum + Between Sum

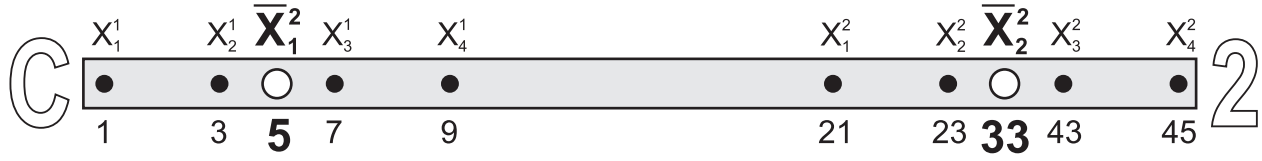
$$N_1^1 = 8$$



$$NS = (1-\mathbf{19})^2 + (3-\mathbf{19})^2 + \ldots + (43-\mathbf{19})^2 + (45-\mathbf{19})^2 = 2096$$

$$BS = 8\cdot(\mathbf{19}-\mathbf{19})^2 = 0$$

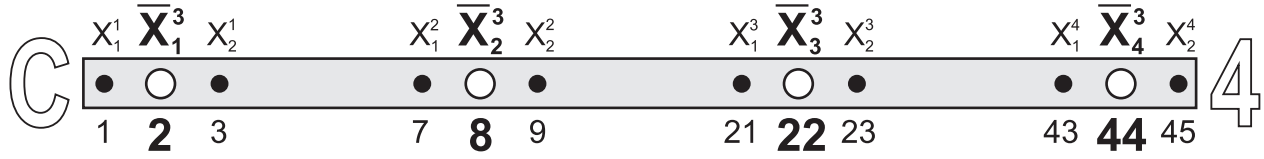
$$N_1^2 = 4 \quad | \quad N_2^2 = 4$$



$$NS = (1-\mathbf{5})^2 + \ldots + (9-\mathbf{5})^2 + (21+\mathbf{33})^2 + \ldots + (45-\mathbf{33})^2 = 528$$

$$BS = 4\cdot(\mathbf{5}-\mathbf{19})^2 + 4\cdot(\mathbf{33}-\mathbf{19})^2 = 1568$$

$$N_1^3 = 2 \quad | \quad N_2^3 = 2 \quad | \quad N_3^3 = 2 \quad | \quad N_4^3 = 2$$



$$NS = (1-\mathbf{2})^2 + (3-\mathbf{2})^2 + (7-\mathbf{8})^2 + (9-\mathbf{8})^2 +$$
$$+ (21-\mathbf{22})^2 + (23-\mathbf{22})^2 + (43-\mathbf{44})^2 + (45-\mathbf{44})^2 = 8$$

$$BS = 2\cdot(\mathbf{2}-\mathbf{19})^2 + \ldots + 2\cdot(\mathbf{22}-\mathbf{19})^2 + 2\cdot(\mathbf{44}-\mathbf{19})^2 = 2088$$

NS + BS = 2096

Cálculo do Discriminante de Fisher

N = Número de Lições , S = Covariância , $\overline{A}$ e $\overline{B}$ = Médias dos Valores

$$\mathbb{D}[x]=\left[\frac{\sqrt{[\overline{A}-\overline{B}]^2}}{\left[\left(\frac{NA-1}{(NA-1)+(NB-1)}\right)\cdot SA+\left(\frac{NB-1}{(NA-1)+(NB-1)}\right)\cdot SB\right]}\right]\cdot X$$

Discriminante Alegorizado

$$\mathbb{D}[x]=[\overline{A}-\overline{B}]^{T}\cdot\left[\left(\frac{NA-1}{(NA-1)+(NB-1)}\right)^{(\%A)}\cdot SA+\left(\frac{NB-1}{(NA-1)+(NB-1)}\right)^{(\%B)}\cdot SB\right]^{-1}\cdot X$$

Discriminante Matriciado

$$X^{\bar{i}} \qquad \mathbf{F}=\frac{1}{2}\cdot(\mathbb{D}[\overline{A}]+\mathbb{D}[\overline{B}]) \Longrightarrow \begin{cases}\mathbb{D}[X^{i}]>\mathbf{F}(\text{Aloca em A})\\ \mathbb{D}[X^{i}]<\mathbf{F}(\text{Aloca em B})\end{cases} \qquad X^{\bar{i}}$$

F: Constante Separadora

Descriminação Secunda

A

Grupo A			Grupo B		
X_1^A		X_2^A	X_1^B		X_2^B
11	Core	17	1	Core	1
12		18	3		4
13		21	5		6
			7		9
NA = 3			NB = 4		

B

NA - 1 = 2

NB - 1 = 3

Médias dos Dados

$$\overline{A} = \begin{bmatrix} \overline{X}_1 \\ \overline{X}_2 \end{bmatrix} = \begin{bmatrix} 12{,}00 \\ 18{,}66 \end{bmatrix} \quad \therefore \quad SA = \begin{bmatrix} 0{,}66 & 1{,}33 \\ 1{,}33 & 2{,}88 \end{bmatrix}$$

$$(\%A) = 0{,}40 \quad \therefore \quad (\%B) = 0{,}60$$

$$\overline{B} = \begin{bmatrix} \overline{X}_1 \\ \overline{X}_2 \end{bmatrix} = \begin{bmatrix} 4{,}00 \\ 5{,}00 \end{bmatrix} \quad \therefore \quad SB = \begin{bmatrix} 5{,}00 & 6{,}50 \\ 6{,}50 & 8{,}50 \end{bmatrix}$$

Covariâncias dos Dado9s

$$D[x] = \begin{bmatrix} 12{,}00 - 4 \\ 18{,}66 - 5 \end{bmatrix}^{T} \cdot \left[\left(\frac{3-1}{2+3} \right)^{0{,}40} \cdot \begin{bmatrix} 0{,}66 & 1{,}33 \\ 1{,}33 & 2{,}88 \end{bmatrix} + \left(\frac{4-1}{2+3} \right)^{0{,}60} \cdot \begin{bmatrix} 5{,}00 & 6{,}50 \\ 6{,}50 & 8{,}50 \end{bmatrix} \right]^{-1} \cdot X$$

$$D[x] = \begin{bmatrix} 8{,}00 \\ 13{,}66 \end{bmatrix}^{T} \cdot \left[\begin{bmatrix} 0{,}26 & 0{,}53 \\ 0{,}53 & 1{,}15 \end{bmatrix} + \begin{bmatrix} 3{,}00 & 3{,}90 \\ 3{,}90 & 5{,}10 \end{bmatrix} \right]^{-1} \cdot \begin{bmatrix} X_1 \\ X_2 \end{bmatrix}$$

$$D[x] = [8{,}00 \quad 13{,}66] \cdot \begin{bmatrix} 3{,}26 & 4{,}43 \\ 4{,}43 & 6{,}25 \end{bmatrix}^{-1} \cdot \begin{bmatrix} X_1 \\ X_2 \end{bmatrix} \quad \therefore \quad [\text{Matriz Inversa}]^{-1}$$

$$D[x] = [8{,}00 \quad 13{,}66] \cdot \begin{bmatrix} +8{,}33 & -5{,}90 \\ -5{,}90 & +4{,}34 \end{bmatrix} \cdot \begin{bmatrix} X_1 \\ X_2 \end{bmatrix} = [-13{,}95 \quad 12{,}08] \cdot \begin{bmatrix} X_1 \\ X_2 \end{bmatrix}$$

$$D[\overline{M}] = \frac{1}{2} \cdot \left([-13{,}95 \quad 12{,}08] \cdot \begin{bmatrix} \mathbf{12{,}00} \\ \mathbf{18{,}66} \end{bmatrix} + [-13{,}95 \quad 12{,}08] \cdot \begin{bmatrix} \mathbf{4} \\ \mathbf{5} \end{bmatrix} \right)$$

$$D[\overline{M}] = 31{,}30 = F$$

$$F = 31{,}30$$

$$D[X^i] = [-13{,}95 + 12{,}08] \cdot \begin{bmatrix} X_1^i \\ X_2^i \end{bmatrix}$$

Descriminação dos Dados

$$D\begin{bmatrix} \mathbf{11} \\ \mathbf{17} \end{bmatrix} = [-13{,}95 + 12{,}08] \cdot \begin{bmatrix} \mathbf{11} \\ \mathbf{17} \end{bmatrix} = (-153{,}45 + 205{,}36) = +51{,}91(\mathbb{A})$$

$$> \mathbf{31} \qquad > \mathbf{F}$$

$$D\begin{bmatrix} \mathbf{1} \\ \mathbf{2} \end{bmatrix} = [-13{,}95 + 12{,}08] \cdot \begin{bmatrix} \mathbf{1} \\ \mathbf{1} \end{bmatrix} = (-13{,}95 + 12{,}08) = -1{,}87(\mathbb{B})$$

$$< \mathbf{31} \qquad < \mathbf{F}$$

$$D\begin{bmatrix} \mathbf{12} \\ \mathbf{18} \end{bmatrix} = [-13{,}95 + 12{,}08] \cdot \begin{bmatrix} \mathbf{12} \\ \mathbf{18} \end{bmatrix} = (-167{,}40 + 217{,}44) = +50{,}04(\mathbb{A})$$

$$> \mathbf{31} \qquad > \mathbf{F}$$

$$D\begin{bmatrix} \mathbf{3} \\ \mathbf{4} \end{bmatrix} = [-13{,}95 + 12{,}08] \cdot \begin{bmatrix} \mathbf{3} \\ \mathbf{4} \end{bmatrix} = (-41{,}85 + 48{,}32) = +6{,}47(\mathbb{B})$$

$$< \mathbf{31} \qquad < \mathbf{F}$$

$$D\begin{bmatrix} \mathbf{13} \\ \mathbf{19} \end{bmatrix} = [-13{,}95 + 12{,}08] \cdot \begin{bmatrix} \mathbf{13} \\ \mathbf{21} \end{bmatrix} = (-181{,}35 + 253{,}68) = +72{,}33(\mathbb{A})$$

$$> \mathbf{31} \qquad > \mathbf{F}$$

$$D\begin{bmatrix} \mathbf{5} \\ \mathbf{6} \end{bmatrix} = [-13{,}95 + 12{,}08] \cdot \begin{bmatrix} \mathbf{5} \\ \mathbf{6} \end{bmatrix} = (-69{,}75 + 72{,}48) = +2{,}73(\mathbb{B})$$

$$< \mathbf{31} \qquad < \mathbf{F}$$

$$D\begin{bmatrix} \mathbf{7} \\ \mathbf{8} \end{bmatrix} = [-13{,}95 + 12{,}08] \cdot \begin{bmatrix} \mathbf{7} \\ \mathbf{9} \end{bmatrix} = (-97{,}65 + 108{,}72) = +11{,}07(\mathbb{B})$$

$$< \mathbf{31} \qquad < \mathbf{F}$$