

Análisis de Perfiles

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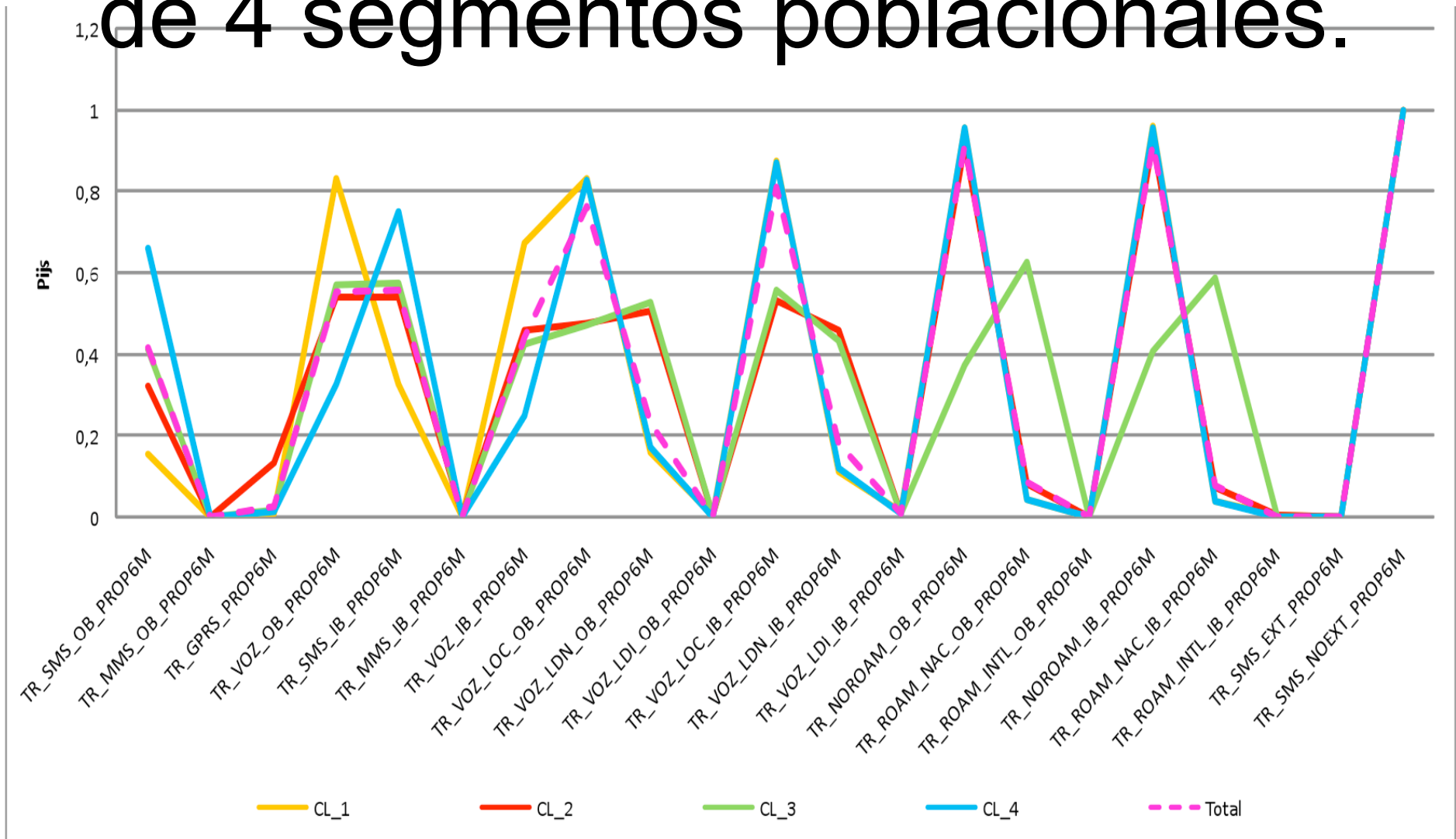
Objetivos:

Testear hipótesis acerca del “comportamiento” promedio de individuos de una o varias poblaciones.

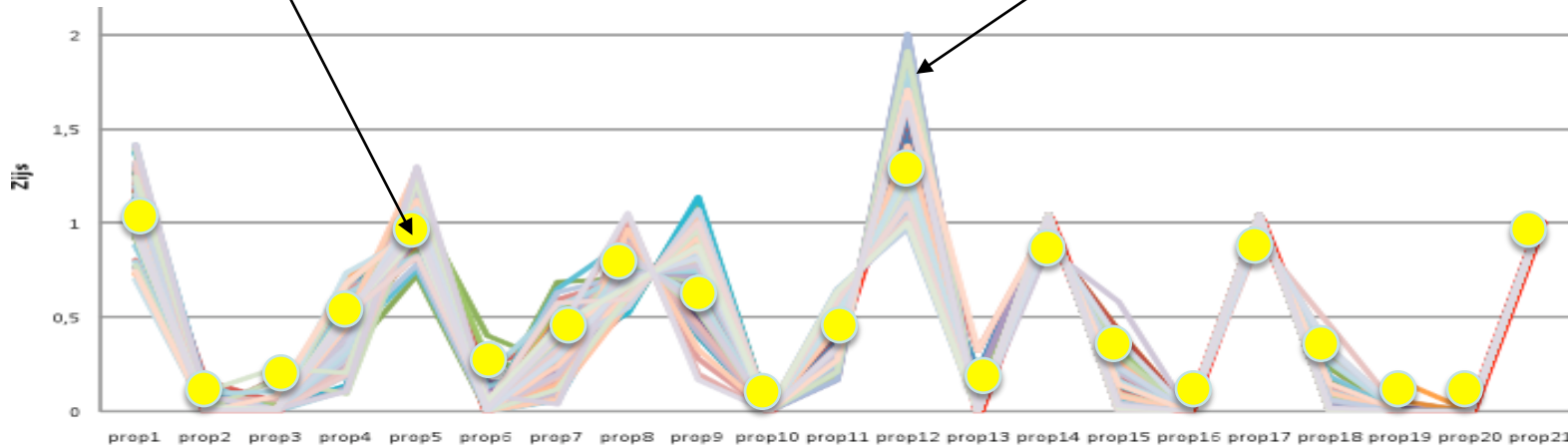
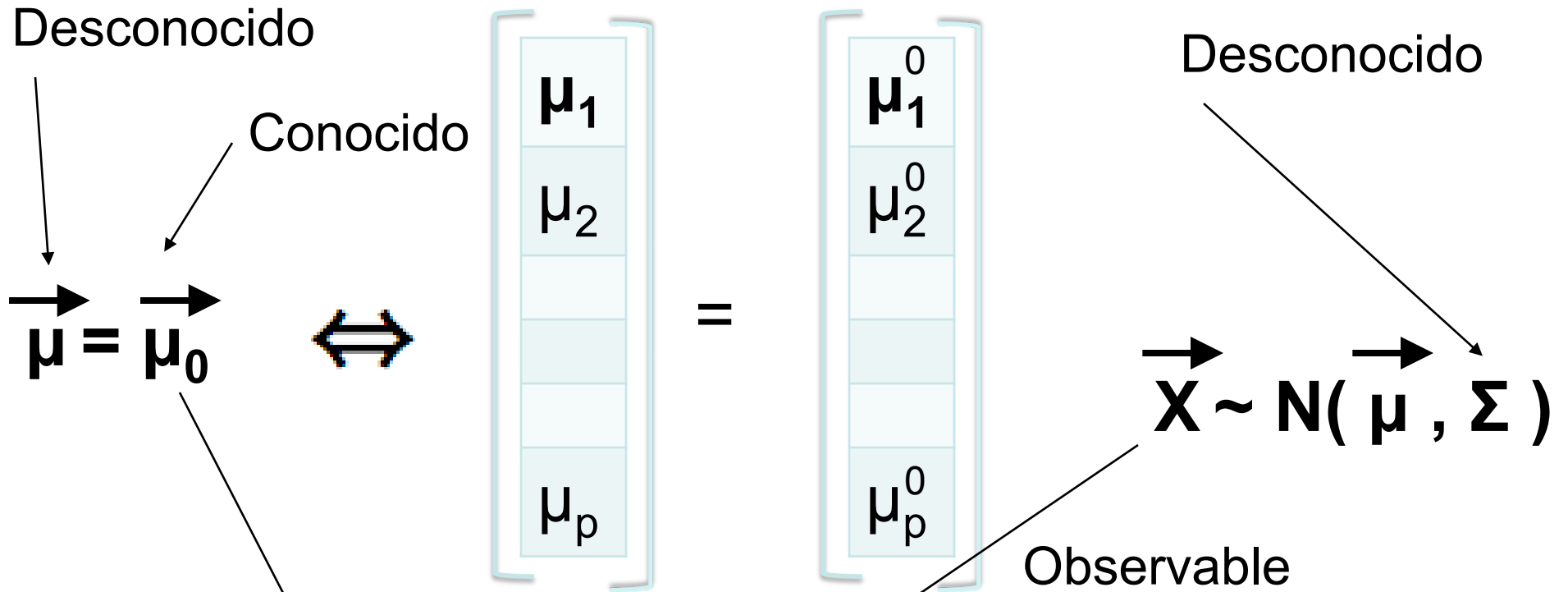
Requerimientos:

Contar con mediciones repetidas sobre un conjunto de variables relacionadas

Ejemplo de análisis de perfiles: Comparación de uso de celular de 4 segmentos poblacionales.



Test de media de una población

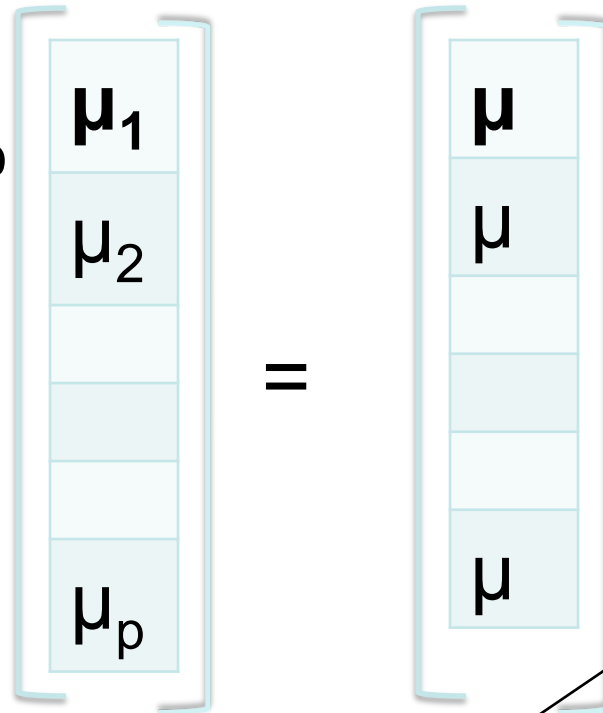


Test de nivel constante (1 población)

Desconocido

Desconocido

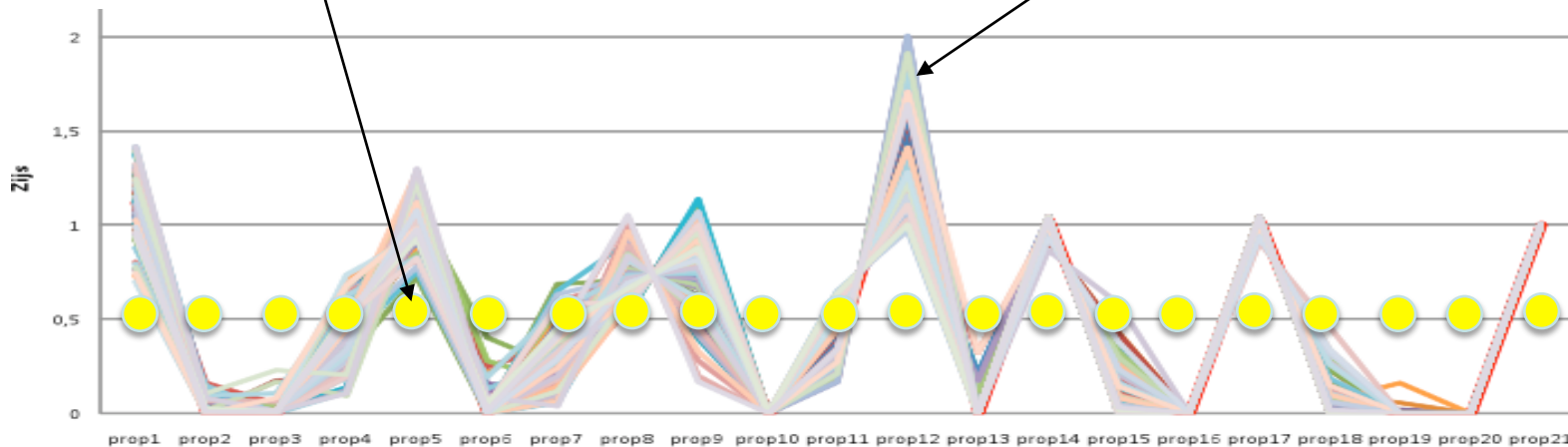
$$\vec{\mu} = \mathbf{1} \mu$$



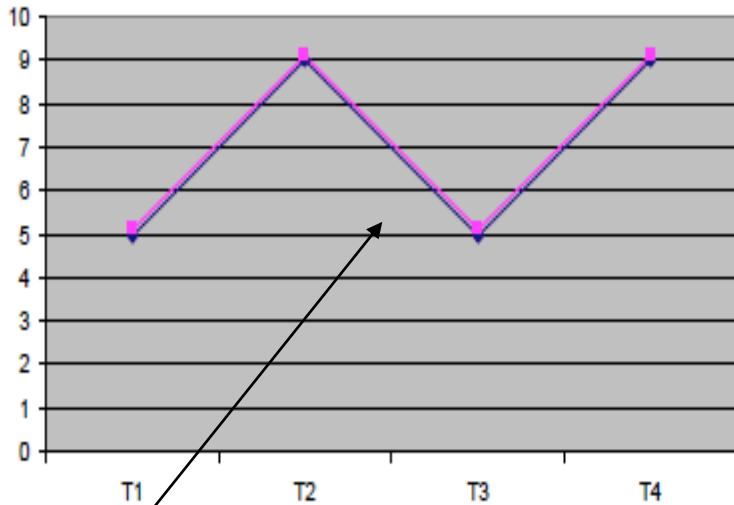
Desconocido

$$\vec{X} \sim N(\vec{\mu}, \Sigma)$$

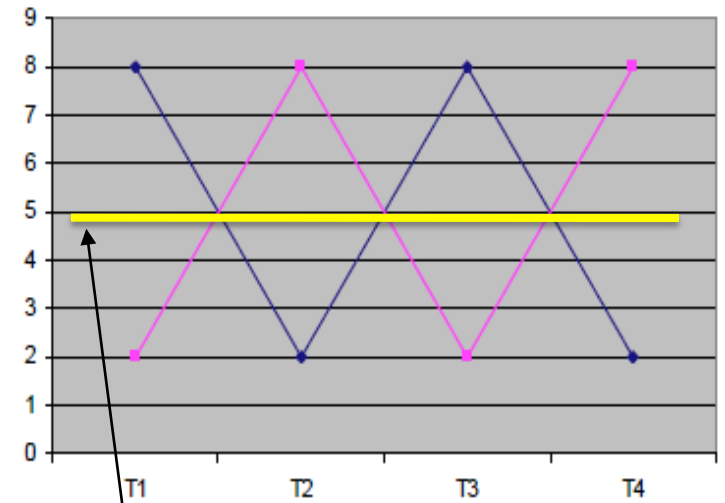
Observable



Test de medias de dos poblaciones

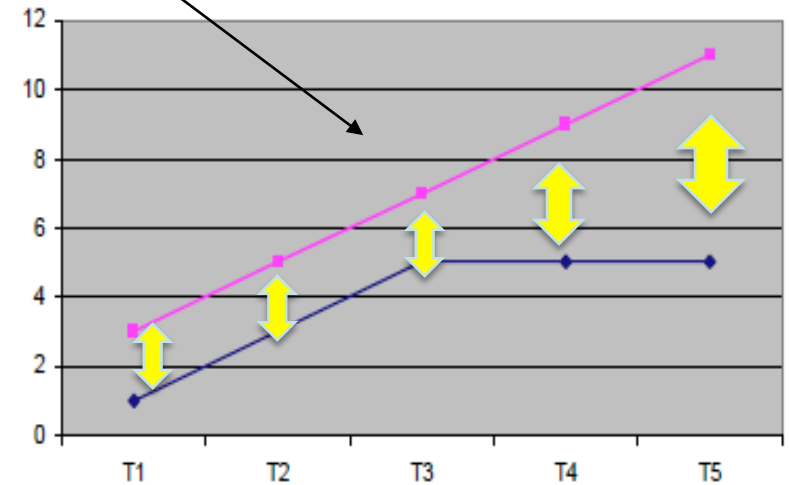
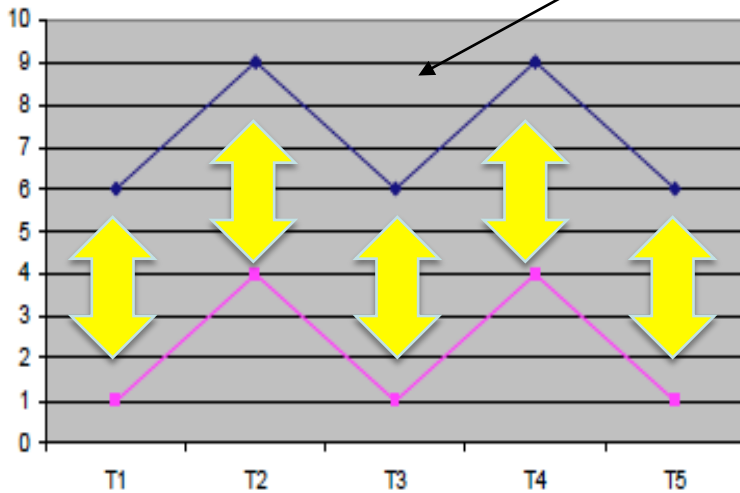


Igualdad de medias



Igual nivel medio

Paralelismo



Test de igualdad de medias

Desconocidos

$\vec{\mu}_1 = \vec{\mu}_2$

\Leftrightarrow

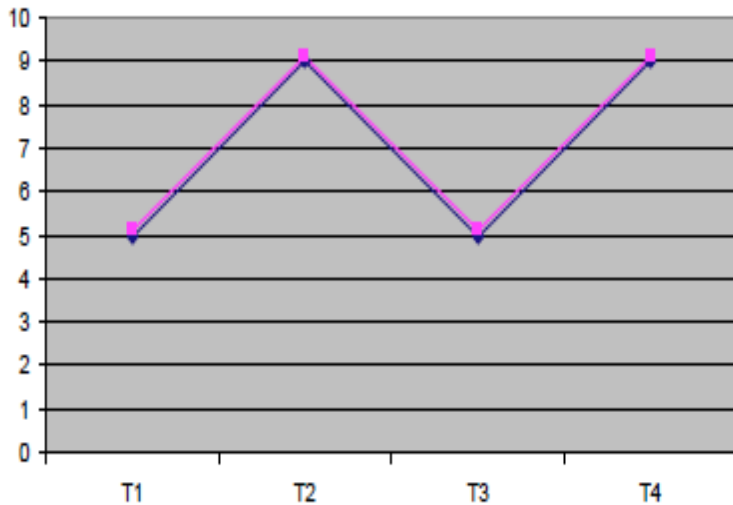


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Desconocidos

$\vec{X}_1 \sim N(\vec{\mu}_1, \Sigma)$
 $\vec{X}_2 \sim N(\vec{\mu}_2, \Sigma)$



Observables

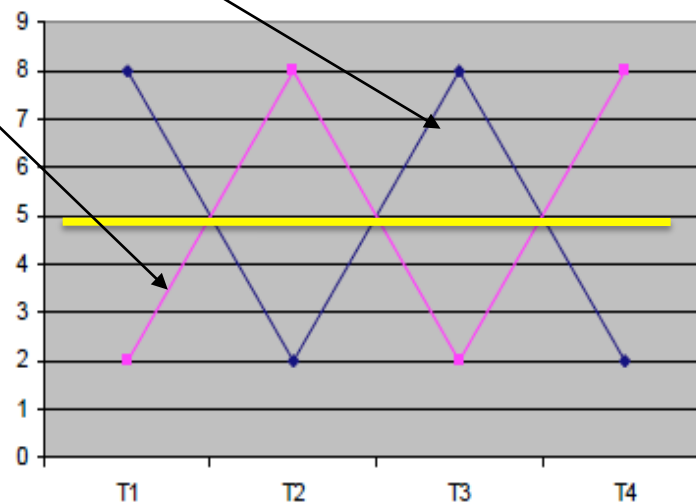
Test de igual nivel medio

Desconocidos

$$\vec{1} \mu_1 = \vec{1} \mu_2 \iff \sum_{i=1}^p \frac{\mu_i^1}{p} = \sum_{i=1}^p \frac{\mu_i^2}{p}$$

Desconocido

$$\begin{aligned} \vec{X}_1 &\sim N(\vec{\mu}_1, \Sigma) \\ \vec{X}_2 &\sim N(\vec{\mu}_2, \Sigma) \end{aligned}$$



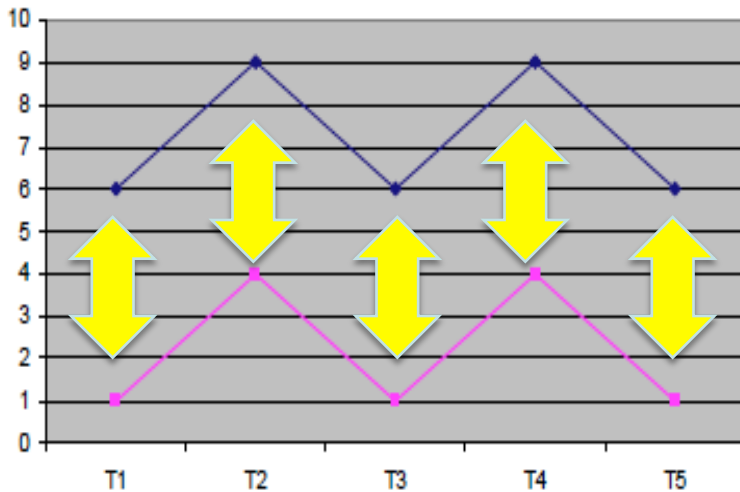
Observables

Test de perfiles paralelos

Desconocidos

$$\vec{\mu}_1 - \vec{\mu}_2 = c \vec{1} \iff$$

$$\begin{bmatrix} \mu_1^1 \\ \mu_1^2 \\ \vdots \\ \mu_1^p \end{bmatrix} - \begin{bmatrix} \mu_2^1 \\ \mu_2^2 \\ \vdots \\ \mu_2^p \end{bmatrix} = \begin{bmatrix} c \\ c \\ \vdots \\ c \end{bmatrix}$$



Desconocidos

$$\begin{aligned} \vec{X}_1 &\sim N(\vec{\mu}_1, \Sigma) \\ \vec{X}_2 &\sim N(\vec{\mu}_2, \Sigma) \end{aligned}$$

Observables

Ejemplo 1: Dos tipos de craneos

| OBSERVACION | LONGITUD | ANCHURA | ALTURA | ALT.CARA | ANCH.CARA | TIPO |
|-------------|----------|---------|--------|----------|-----------|------|
| 1 | 190,5 | 152,5 | 145 | 73,5 | 136,5 | 1 |
| 2 | 172,5 | 132,0 | 126 | 63,0 | 121,0 | 1 |
| 3 | 167,0 | 130,0 | 126 | 69,5 | 119,5 | 1 |
| 4 | 169,5 | 150,5 | 134 | 64,5 | 128,0 | 1 |
| 5 | 175,0 | 138,5 | 126 | 77,5 | 135,5 | 1 |
| 6 | 177,5 | 142,5 | 143 | 71,5 | 131,0 | 1 |
| 7 | 179,5 | 142,5 | 128 | 70,5 | 134,5 | 1 |
| 8 | 170,5 | 138,0 | 134 | 73,5 | 133,5 | 1 |
| ⋮ | ⋮ | ⋮ | ⋮ | ⋮ | ⋮ | ⋮ |
| 26 | 190,0 | 142,0 | 147 | 70,0 | 137,0 | 2 |
| 27 | 200,0 | 139,5 | 144 | 82,5 | 146,0 | 2 |
| 28 | 185,0 | 134,5 | 140 | 81,5 | 137,0 | 2 |
| 29 | 174,5 | 143,5 | 133 | 74,0 | 136,5 | 2 |
| 30 | 195,5 | 144,0 | 139 | 78,5 | 144,0 | 2 |
| 31 | 197,0 | 131,5 | 135 | 80,5 | 139,0 | 2 |
| 32 | 182,5 | 131,0 | 135 | 68,5 | 136,0 | 2 |

Ejemplo 2: Expresión oral y escrita

- Audición (L)
- Conversación (S)
- Lectura (R)
- Escritura (W)

| L1 | S1 | R1 | W1 | L2 | S2 | R2 | W2 |
|----|----|----|----|----|----|----|----|
| 34 | 66 | 39 | 97 | 33 | 56 | 36 | 81 |
| 35 | 60 | 39 | 95 | 21 | 39 | 33 | 74 |
| 32 | 57 | 39 | 94 | 29 | 47 | 35 | 89 |

| | | | | | | | | |
|----|----|--|----|----|----|----|----|--|
| 29 | 5 | Postovsky (1970) investigo los efectos del retraso en la realización | | | | | | |
| 37 | 5 | de prácticas orales al comienzo del aprendizaje de una lengua. | | | | | | |
| 35 | 5 | Para ello selecciono 28 parejas de alumnos, emparejándolos de forma | | | | | | |
| 34 | 5 | que se controlaran ciertas variables relacionadas con la edad, | | | | | | |
| 25 | 4 | educación, modo de empleo del lenguaje, inteligencia y aptitud en el | | | | | | |
| 29 | 5 | lenguaje. En el primer grupo se empleo una condición experimental, con | | | | | | |
| 25 | 4 | un retraso de cuatro semanas en la practica oral, mientras que el | | | | | | |
| 26 | 4 | segundo fue considerado como un control sin retraso en las practicas | | | | | | |
| 27 | 3 | orales. | | | | | | |
| 30 | 36 | 22 | 62 | 21 | 43 | 30 | 85 | |
| 36 | 50 | 39 | 92 | 30 | 45 | 34 | 70 | |

Salida de SPSS

| | | N |
|-------|---|----|
| GRUPO | 1 | 28 |
| | 2 | 28 |

Estadísticos descriptivos

| | GRUPO | Media | Desv. típ. | N |
|----|-------|-------|------------|----|
| L1 | 1 | 29,14 | 4,790 | 28 |
| | 2 | 28,50 | 5,302 | 28 |
| | Total | 28,82 | 5,017 | 56 |
| S1 | 1 | 48,64 | 8,866 | 28 |
| | 2 | 44,14 | 8,036 | 28 |
| | Total | 46,39 | 8,686 | 56 |
| R1 | 1 | 35,89 | 4,086 | 28 |
| | 2 | 34,32 | 4,651 | 28 |
| | Total | 35,11 | 4,409 | 56 |
| W1 | 1 | 86,68 | 9,464 | 28 |
| | 2 | 81,07 | 12,356 | 28 |
| | Total | 83,87 | 11,265 | 56 |

Contrastes multivariados(b)

| Efecto | | Valor | F | Gl de la hipótesis | Gl del error | Significación | Eta al cuadrado parcial |
|-----------|--------------------|--------|------------|--------------------|--------------|---------------|-------------------------|
| Intercept | Traza de Pillai | ,987 | 947,528(a) | 4,000 | 51,000 | ,000 | ,987 |
| | Lambda de Wilks | ,013 | 947,528(a) | 4,000 | 51,000 | ,000 | ,987 |
| | Traza de Hotelling | 74,316 | 947,528(a) | 4,000 | 51,000 | ,000 | ,987 |
| | Raíz mayor de Roy | 74,316 | 947,528(a) | 4,000 | 51,000 | ,000 | ,987 |
| GRUPO | Traza de Pillai | ,125 | 1,823(a) | 4,000 | 51,000 | ,139 | ,125 |
| | Lambda de Wilks | ,875 | 1,823(a) | 4,000 | 51,000 | ,139 | ,125 |
| | Traza de Hotelling | ,143 | 1,823(a) | 4,000 | 51,000 | ,139 | ,125 |
| | Raíz mayor de Roy | ,143 | 1,823(a) | 4,000 | 51,000 | ,139 | ,125 |

a Estadístico exacto

b Diseño: Intercept+GRUPO

Salida de SPSS

Prueba de muestras independientes

| | | Prueba de Levene para la igualdad de varianzas | | Prueba T para la igualdad de medias | | | | | | |
|----|----------------------------------|--|------|-------------------------------------|----|------------------|----------------------|-----------------------------|---|----------|
| | | F | Sig. | t | gl | Sig. (bilateral) | Diferencia de medias | Error típ. de la diferencia | 95% Intervalo de confianza para la diferencia | |
| | | | | | | | | | Inferior | Superior |
| L1 | Se han asumido varianzas iguales | ,217 | ,643 | ,476 | 54 | ,636 | ,64 | 1,350 | -2,064 | 3,350 |
| S1 | Se han asumido varianzas iguales | ,994 | ,323 | 1,990 | 54 | ,052 | 4,50 | 2,261 | -,034 | 9,034 |
| R1 | Se han asumido varianzas iguales | ,019 | ,892 | 1,343 | 54 | ,185 | 1,57 | 1,170 | -,774 | 3,917 |
| W1 | Se han asumido varianzas iguales | 1,047 | ,311 | 1,906 | 54 | ,062 | 5,61 | 2,941 | -,290 | 11,504 |

Salida del Test de Hotelling

Contrastes multivariados^c

| Efecto | Valor | F | Gl de la hipótesis | Gl del error | Sig. |
|----------------------|----------|-----------------------|--------------------|--------------|------|
| Tipo Traza de Pillai | 1,410 | 12,913 | 10,000 | 54,000 | ,000 |
| Lambda de Wilks | ,001 | 222,376 ^a | 10,000 | 52,000 | ,000 |
| Traza de Hotelling | 1127,557 | 2818,892 | 10,000 | 50,000 | ,000 |
| Raíz mayor de Roy | 1126,859 | 6085,037 ^b | 5,000 | 27,000 | ,000 |

a. Estadístico exacto

b. El estadístico es un límite superior para la F el cual ofrece un límite inferior para el nivel de significación.

c. Diseño: Tipo

Ejemplo 3: Pulso Cardíaco

| Sexo | Fumar | Pulso1 | Pulso2 | Sexo | Fumar | Pulso1 | Pulso2 |
|------|-------|--------|--------|------|-------|--------|--------|
| 1 | 1 | 62 | 126 | 1 | 1 | 70 | 122 |
| 2 | 1 | 78 | 154 | 1 | 2 | 80 | 136 |
| 1 | 2 | 64 | 128 | 2 | 1 | 76 | 148 |
| 2 | 2 | 96 | 155 | 2 | 2 | 78 | 148 |
| 1 | 1 | 66 | 128 | 2 | 2 | 76 | 136 |
| 2 | 1 | 96 | 165 | 2 | 2 | 80 | 158 |
| 1 | 2 | 68 | 120 | 1 | 2 | 68 | 116 |
| 2 | 2 | 72 | 138 | 1 | 2 | 70 | 120 |
| 2 | 1 | 88 | 160 | 1 | 1 | 68 | 126 |
| 1 | 1 | 90 | 144 | 1 | 1 | 70 | 144 |
| 2 | 2 | 82 | 140 | 2 | 2 | 86 | 144 |
| 1 | 2 | 74 | 134 | 1 | 2 | 72 | 126 |
| 2 | 1 | 66 | 148 | 2 | 2 | 84 | 136 |
| 2 | 2 | 68 | 142 | 2 | 2 | 72 | 142 |
| 1 | 1 | 92 | 134 | 2 | 2 | 80 | 138 |
| 1 | 2 | 68 | 116 | 1 | 1 | 70 | 144 |
| 1 | 2 | 76 | 136 | 1 | 1 | 70 | 144 |
| 2 | 2 | 86 | 144 | 1 | 1 | 70 | 144 |
| 2 | 1 | 88 | 160 | 1 | 1 | 70 | 144 |
| 1 | 1 | 66 | 128 | 2 | 2 | 80 | 138 |

- Sexo: codificada como 1 (hombre) y 2 (mujer)
- Fumar: codificada como 1 (fumador) y 2 (no fumador)
- Pulso 1: pulso en reposo
- Pulso 2: Pulso tras recorrer una milla.

Salida de SPSS

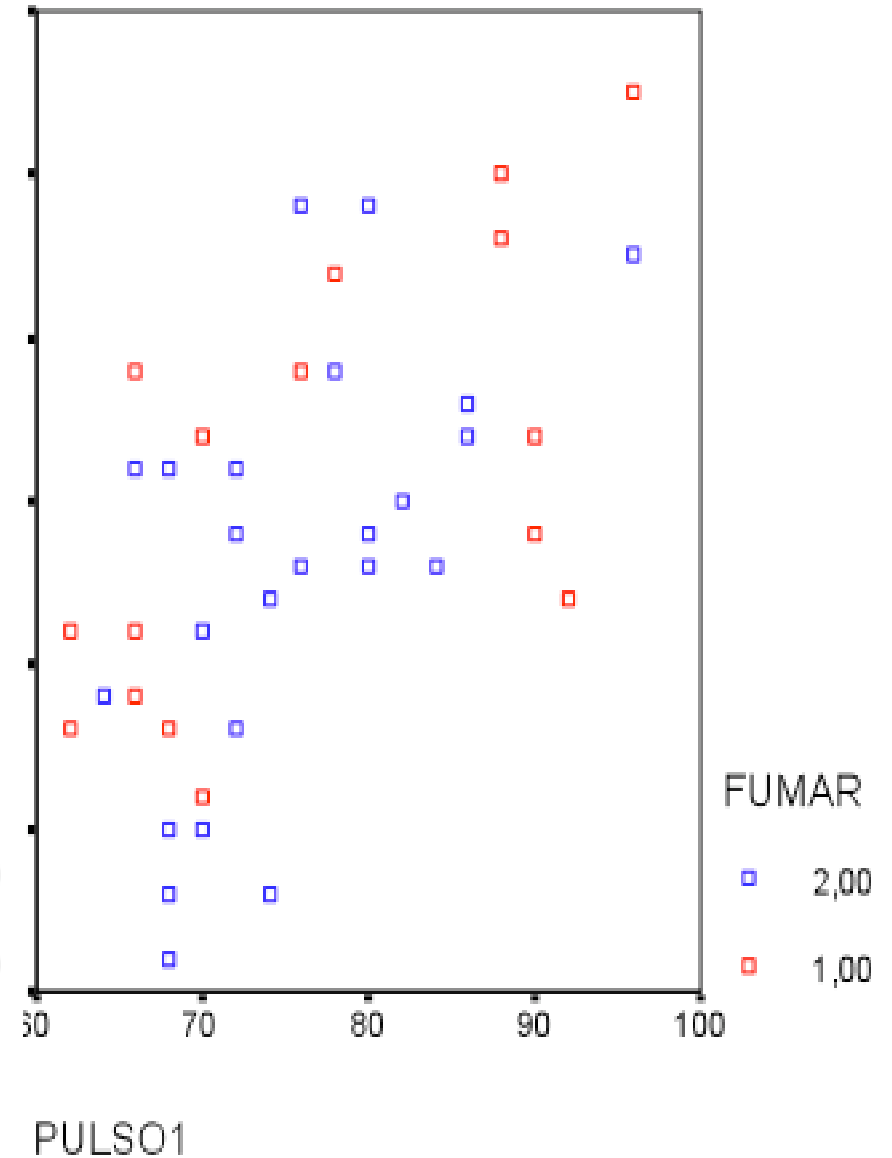
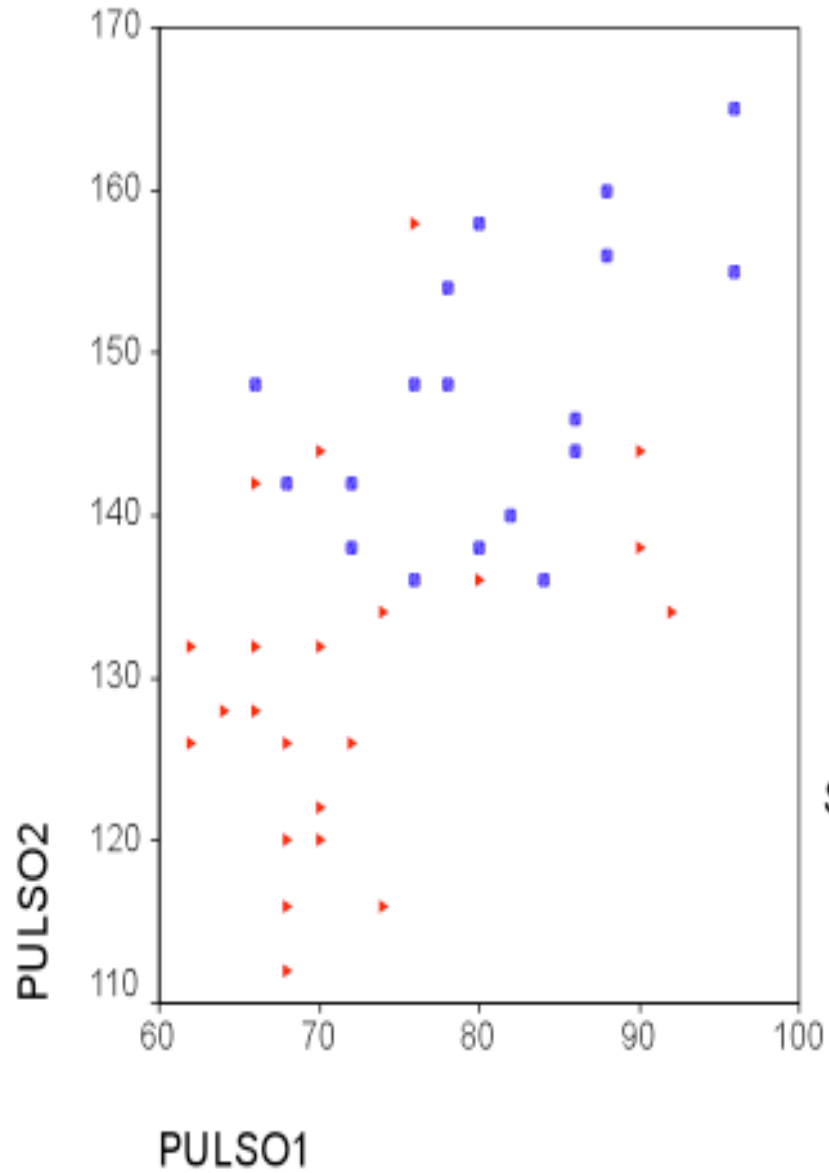
| | SEXO | Media | Desv. t _{íp.} | N |
|---------|-------|----------|------------------------|----|
| PULSO 1 | 1,00 | 72,0909 | 8,69542 | 22 |
| | 2,00 | 80,6667 | 8,51297 | 18 |
| | Total | 75,9500 | 9,53791 | 40 |
| PULSO 2 | 1,00 | 130,2727 | 10,90732 | 22 |
| | 2,00 | 147,4444 | 8,81324 | 18 |
| | Total | 138,0000 | 13,14417 | 40 |

| | | N |
|------|------|----|
| SEXO | 1,00 | 22 |
| | 2,00 | 18 |

Contrastes multivariados(b)

| Efecto | | Valor | F | Gl de la hipótesis | Gl del error | Significación | Eta al cuadrado parcial |
|-----------|--------------------|---------|-------------|--------------------|--------------|---------------|-------------------------|
| Intercept | Traza de Pillai | ,995 | 3877,602(a) | 2,000 | 37,000 | ,000 | ,995 |
| | Lambda de Wilks | ,005 | 3877,602(a) | 2,000 | 37,000 | ,000 | ,995 |
| | Traza de Hotelling | 209,600 | 3877,602(a) | 2,000 | 37,000 | ,000 | ,995 |
| | Raíz mayor de Roy | 209,600 | 3877,602(a) | 2,000 | 37,000 | ,000 | ,995 |
| SEXO | Traza de Pillai | ,439 | 14,477(a) | 2,000 | 37,000 | ,000 | ,439 |
| | Lambda de Wilks | ,561 | 14,477(a) | 2,000 | 37,000 | ,000 | ,439 |
| | Traza de Hotelling | ,783 | 14,477(a) | 2,000 | 37,000 | ,000 | ,439 |
| | Raíz mayor de Roy | ,783 | 14,477(a) | 2,000 | 37,000 | ,000 | ,439 |

Salida de SPSS



Salida de SPSS

Estadísticos descriptivos

| | FUMAR | Media | Desv. tip. | N |
|--------|-------|----------|------------|----|
| PULSO1 | 1,00 | 76,7500 | 11,99722 | 16 |
| | 2,00 | 75,4167 | 7,72301 | 24 |
| | Total | 75,9500 | 9,53791 | 40 |
| PULSO2 | 1,00 | 141,0625 | 13,28392 | 16 |
| | 2,00 | 135,9583 | 12,92278 | 24 |
| | Total | 138,0000 | 13,14417 | 40 |

| | | N |
|-------|------|----|
| FUMAR | 1,00 | 16 |
| | 2,00 | 24 |

Contrastes multivariados(b)

| Efecto | | Valor | F | Gl de la hipótesis | Gl del error | Significación | Eta al cuadrado parcial |
|-----------|--------------------|---------|-------------|--------------------|--------------|---------------|-------------------------|
| Intercept | Traza de Pillai | ,992 | 2173,672(a) | 2,000 | 37,000 | ,000 | ,992 |
| | Lambda de Wilks | ,008 | 2173,672(a) | 2,000 | 37,000 | ,000 | ,992 |
| | Traza de Hotelling | 117,496 | 2173,672(a) | 2,000 | 37,000 | ,000 | ,992 |
| | Raíz mayor de Roy | 117,496 | 2173,672(a) | 2,000 | 37,000 | ,000 | ,992 |
| FUMAR | Traza de Pillai | ,040 | ,777(a) | 2,000 | 37,000 | ,467 | ,040 |
| | Lambda de Wilks | ,960 | ,777(a) | 2,000 | 37,000 | ,467 | ,040 |
| | Traza de Hotelling | ,042 | ,777(a) | 2,000 | 37,000 | ,467 | ,040 |
| | Raíz mayor de Roy | ,042 | ,777(a) | 2,000 | 37,000 | ,467 | ,040 |