Name: Aniruddh Kulkarni

Roll No: 1081

Subject: Statistical Methods

Tutorial: Tutorial 10

	Lab Exercise 10	
	Luo exercise 10	
1.	Consider the following with respect to DV's	
	wistable and following with respect to by s	
	DV 1 DV 2	
	Population 1 9,6,9 3,2,7	
	with $\overline{x_i} = 8$	
	Population 2 0,2 4,0	
	Population 3 3,1,2 8,9,7	
	Find SStreatment, SS residual, Total SS corrected	
	$\gamma_2 = 2$	
	Construct MANOVA table	
	Find Wilks Lambda	
	Conduct F Test	
	The court and th	
	The sample sizes are $n_1 = 3$, $n_2 = 2$, $n_3 = 3$	
	Among the phoenistich acres di	
	Arranging the observation pairs xij in rows we get	
	[9][6][9]	
11-21	3 2 1.7 (+ 4 4) (0 3 0)	
1 12	t = 4 + + + = 0	
101-11	[0] [2] -s/ [+ A +/ [2] [8]	
	4 0	
elignesh® BOOK & COPY CENTRE		describ

	3 1 2 01 3213 dal	
	8 9 7	
	Consider the following with respect to DV's	4
	$\bar{\chi} = 4$	
	5_ 8 49 11 49	
	Fogulation 969 32.7	
	with $\overline{x_1} = 8$	
	Topulation 2. 0.2. 4.0 4.0	0
	$\overline{22} = 1$ $f. p. 8$ $g. 1 = \overline{2}$	
	$\sqrt{2} = 1$ f. p. 8 S. 1.8 × monthlygof	
	Find SStorentinent SS mandral Total SS corrected	
	$\frac{1}{2}$ = 2	
	8 aldat AVONAM tourtena)	
	$\overline{\chi} = 4$ with a strong self where	
	_ 5 _	
	Conduct F Test	
	For DV1	
	Observation = mean + treatment + residual	
	Observation = Mean + treatment + residuon	
	$\alpha i j = \overline{\lambda} + (\overline{\lambda i} + \overline{\lambda}) + (\lambda i j - \overline{\lambda} i)$	
	(969) (444) (8.444)	1 -2 1
	0 2 = 4 4 + 1-4 -3 +	-1 1 /
	(3 1 2) (4 4 4) (2-4 -2 2)	1-10
	[0][+]	
Elignesh® BOOK & COPY CENTRE		4-11/19

$SSobs = 9^{2} + 6^{2} + 9^{2} + 0^{2} + 2^{2} + 3^{2} + 1^{2} + 2^{2}$ $= 81 + 36 + 81 + 0 + 4 + 9 + 1 + 4$ $= 216$ $SSmean = 4^{2} + 4^{2} + 4^{2} + 4^{2} + 4^{2} + 4^{2} + 4^{2} + 4^{2}$ $= 128$
$= 81 + 36 + 81 + 0 + 4 + 9 + 1 + 4$ $= 216$ $SSmean = 4^2 + 4^2 $
$= 81 + 36 + 81 + 0 + 4 + 9 + 1 + 4$ $= 216$ $SSmean = 4^2 + 4^2 $
$= 216$ $SSmean = 4^2 +$
$SSmean = 4^2 + 4^2 + 4^2 + 4^2 + 4^2 + 4^2 + 4^2 + 4^2$
E+ 8 + 8 + (8-) + (1-) + (1-) + (1-) = 0+28 2 2
$SStr = 4^{2} + 4^{2} + 4^{2} + (-3)^{2} + (-3)^{2} + (-2)^{2} + (-2)^{2} + (-2)^{2}$
= 78 = 2
(1-) + $1+$ $(1-)$ + $(1-)$
SSTES = $ ^2 + (-2)^2 + ^2 + (-1)^2 + ^2 + ^2 + (-1)^2 + 0^2$
01 = 25 connected = 55 obs - 55 mean
SS corrected = SSobs - SSmean
= 216 - 128 + 42 = 88
= 3Str + SSres
25062 = 25men + 55to + 25men = 2do22
For DY 2
cross product contributions
observation = mean + treatment + residual
(P)1 + (8)8 + (0)2 + (+)0 + effect + (2)2 + (8)P = JatoT
(T) e + 10 (T) e + 10 (T)
$\alpha \dot{\eta} = \overline{\chi} + (\overline{\chi} \dot{\zeta} - \overline{\chi}) + (\alpha \dot{\zeta} - \overline{\chi} \dot{\zeta})$
$\begin{pmatrix} 3 & 2 & 7 \\ 1 $
0 140 5
001 =
elignesh® BOOK & COPY CENTRE

```
SSobs = 3^2 + 2^2 + 7^2 + 4^2 + 0^2 + 8^2 + 9^2 + 7^2
    = 9 + 4 + 49 + 16 + 0 + 64 + 81 + 49
       = 272
SSmean = 8 \times 5^2 = 200
SSto = (-1)^{2} + (-1)^{2} + (-1)^{2} + (-3)^{2} + (-3)^{2} + 3^{2} + 3^{2} + 3^{2}
SSTES = (-1) + (-2) + 3 + (2) + (-2) + 0^2 + 1^2 + (-1)
ss connected = SS obs - SS mean
           = SStront2SSres 22 = batoning 22
           = 24 + 480 - 10
           = 72
SSObs = SSmean + SStr + SSTEA
Cross product contributions
Total = 9(3) + 6(2) + 9(7) + 0(4) + 2(0) + 3(8) + 1(9)
   (3x = 149x) + (x - 1x) + x =
Mean = 4(5) + 4(5) + 4(5) + 4(5) + 4(5) + 4(5)
                                    +4(5) + 4(5)
  = 8x4x5
   = 160
```

```
Treatment = 4(-1) + 4(-1) + 4(-1) + (-3)(-3) + (-3)(-3)
           +(-2)(3)+(-2)(3)-2(3)
     = 3(4)(-1) + 2(-3)(-3) + 3(-2)(3)
    = - 12
Residual = (-1) + (-2) (-2) + 1(3) + (-1) (2) + 1(-3)
               + 1(-1) +0
Total corrected cross product = Total cross - mean cross
                      280- product product
                    To carry out == Test
MANOVA TABLE
Source of Variation Matrix of SS Degrees of
                Treatment (W)
               78
                108=111 8-312 3+2+3-3
 Residual (B)
                1 24
              88 -11
Total connected
              -11: 72
      that treatment differences exist.
```

<u>cliquesh</u>

(8-	Wilk's Lambda = (W) + (1-) + (la tra
	+ (-2)(3) W + 92) (3) - 2(3)	
	= 3(4)(-1) + 2(-3)(-3) +013(-2)(3)	
	1 24	
70 11	88 -11	
(8-)1.	(S)(1-) + (8-11+ (72) (2-) + (1-) = loubises	
1	0+(1-)/+	
	= 10(24)-	O
11021 00	88(72) - 2	
doubs	1011 - 22000 latal - tophara 22000 betserra Jatar	
30000	031-P41-	
	To carry out F-Test	
	10 000 1000	
	11-11 Eno-g-1 = 1-10.0385	1/8-3-1
	9-4 \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	3-11
40	Source of Variation Matrix of 12 Source	
in in	and cross product freede	0
1	Trentment (NPI.8 = 18 -12]	
	-12 48	
e.	$V_1 = 2(9-1) = 4$	0.00
	$v_2 = 2 (zne - g - 1) = 80$	
3	Since $8.19 > F4.8 (0.01)$	
	Total connected [88 -11 (3+2+3)-	
	8.19 > 7.01 we reject to and conclude	
	that treatment differences exist	
	111000 00000000000000000000000000000000	
<u>Cliquesh</u> ®		diamila
BOOK & COPY CENTRE		

2.	Group Observations Sample mean vectors
	x= nixi + naxa + n3x3 = 2-136
	$l=1$ (private) $n_1=271$ $\overline{\chi}_1=2.066$
	0.480
	l=2 (non profit) N2 = 138 -6.82
	0.360
	L=3 (govt) N3 = 107
- 520.0	8240 1580 Ent = 516
0-23 0 6-307	019.0 438.0
	$\overline{\chi_2} = 2.167 \qquad \overline{\chi_3} = \boxed{2.273}$
three	Ho there is no of 124.0 average (196.0) and the
	transport 0.124 a ran st 0.125 same to sout
0	0.418 0.383
40.1	HI: the average costs differ depending on the tup
	3types of owners: private, non-profit & government
	$\Delta \Sigma_{3} \circ 0 = W = W $
	18+WI
	4 dependent variables => $p=4$
	0=420=3 anved -
	Since matrices si seem to be compatible, we can obtain
	was (*1/-1/(2-9-103)
	$W = (n_1 - 1) S_1 + (n_2 - 1) S_2 + (n_3 - 1) S_3$
	= \ 516 -4-2 \ \ - \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \
	= 182.962
	4.408 8.2
T2 8	0.633 1.484
Eignesh BOOK & COPY CENTRE	[9.581 2.488 0.394 6.538]

exotone	abservations shape mea			Guora	1.0
	$\pi = n_1 \pi_1 + n_2 \pi_2 + n_3 \pi_3 =$	2-13	36		
	n1 + n2+ n3	0.5	79	a) [=]	
	084.0	0.10	2	1	
	12 = 38 - 1.82	0.3	80]	L=2 Cno	
	048.03	-			
	$B = \sum n(\overline{x} - \overline{x})(\overline{x} - \overline{x})$) =	3-475		
	l=1		1-111	1.225	
	2 nt = 516		0.821		0.235
			0.584	0.610	0.230 0.307
	13 = 2.273		rena l	72 =	11
	Ho there is no difference in average	je w	sts an	long the	Three
	types of owners: private, non	bro.	fit, gove	enament	
	Hi : the average costs differ des	andi	na on	the tun	- of
tagm	H1: the average costs differ dep ownership	remail	9 011	na igp	evj
1113111			000	10	
	We have $\Lambda^* = W = 0.7714$	+			
	1W+B1	Č			0
	1 D D = 4	Vaire	ndent v	A depe	
	p=4 & $q=3$ gives				
austr	con to be compatible. He can of	12 80	Asserted	Since n	
	$\left(\sum n_{1}-p-2\right) \left(1-\sqrt{\Lambda^{*}}\right)$	\		Man	
	P	$ \bot $			
	n2-1) 52+ (n3-1) 53)) +	15 (1-1)	M= (L	
	= (516-4-2) (1	- 1	0.7714		
	4	To	-7714		
	2.8	0	- 1/70	0.1.	
_ @	0.633 1.484		7.6678	24	
elignesh BOOK & COPY CENTRE	2.488 0.344 6.538	18	2.6		La

	Let $\alpha = 0.01$, so that $F_2(4) \times 2(510)$ (0.01)
	$\chi^{2}8(0.01)/8 = 2.51$
	Since $17.67 > F8.1020 (0.1) = 2.51$
	we reject to and conclude that average costs differ, depending upon type of ownership
	depending upon type of ownership
4	
100000	
elignesh® BOOK & COPY CENTRE	