

บรรณานุกรม

ภาษาไทย

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ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

โปรแกรมหลักสำหรับวิเคราะห์การจำแนกกลุ่ม 2 กลุ่ม ด้วยวิธีการทางสถิติต่าง ๆ โดย

ใช้ข้อมูลจำลอง

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C
C.....
C.....
C.....:THESIS      : A COMPARISON OF DISCRIMINANT METHODS .....
C.....:              : IN MULTIVARIATE ANALYSIS .....
C.....:AUTHOR       : MASS PITANAI TRIAMCHARBENPORN .....
C.....:DEPARTMENT  : STATISTICS .....
C.....:FACULTY     : COMMERCIAL AND ACCOUNTING .....
C.....:
C  VARIABLES          DESCRIPTION .....
C.....:
C  A(I,J,K)          SIMULATE DATA IN POPULATION I ; VARIABLE J ; IN
C.....:                      CASE K
C  T(I,J,K;E)        SIMULATE DATA IN POPULATION I ; CELL J ; VARIABLE
C.....:                      K , IN CASE E
C  MEAN(I,J)         MEAN OF SURVEY DATA IN POPULATION I ; VARIABLE J
C  COR(I,J)          CORRELATION OF SURVEY DATA BETWEEN VARIABLE I
C.....:                      AND J
C  M1(I)             MISCLASSIFICATION ERROR POPULATION I IN METHOD 1
C  M2(I)             MISCLASSIFICATION ERROR POPULATION I IN METHOD 2
C  M3(I)             MISCLASSIFICATION ERROR POPULATION I IN METHOD 3
C  AV1(I)            AVERAGE MISCLASSIFICATION ERROR POPULATION I IN
C.....:                      METHOD 1
C  AV2(I)            AVERAGE MISCLASSIFICATION ERROR POPULATION I IN
C.....:                      METHOD 2
C  AV3(I)            AVERAGE MISCLASSIFICATION ERROR POPULATION I IN
C.....:                      METHOD 3
C  NS                SAMPLE SIZE , 50 , 75 , 100 AND 200
C  ISLSD             INITIALIZE BY 973255
C.....:
C
C  DIMENSION A(2,15,200),Y(2,64,9,200),IR(2,64),M1(2),M2(2),
C.....: *M3(2),SM1(2),SM2(2),SM3(2),AV1(2),AV2(2),AV3(2),PERM(3),
C.....: *COR(9,9),MEAN(2,9),IC(2,200),D(9,9),NN(4)
C.....: INTEGER VP,VQ,TV
C.....: REAL MEAN
C.....: DATA SM1,SM2,SM3/6*0.0/
C.....: ISLSD = 973255

```

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```

C :=====
C :
C :      INPUT DATA
C :
C :=====

```

```

NN(1)=30
NN(2)=50
NN(3)=100
NN(4)=200
VP = 3
VQ = 1
IROUND = 200
M = 2*VQ
TV = VP+VQ

```

```

C

```

```

C :=====
C :
C :      READ MEAN AND CORRELATION
C :
C :=====
C

```

```

10 READ(5,10)((MEAN(I,J),J=1,VP),I=1,2)
   FORMAT(F6.4,30X,2F6.4)
11 READ(5,11)((COR(I,J),J=1,VP),I=1,VP)
   FORMAT(F6.4,30X,2F6.4)
C   WRITE(6,13)((MEAN(I,J),J=1,VP),I=1,2)
C13  FORMAT(2(5X,F8.5))
C   WRITE(6,13)((COR(I,J),J=1,VP),I=1,VP)
   CALL SETUP(IDK,D,VP,COR)
   IF (IDK.EQ. 0) THEN
     WRITE(6,12)
12  FORMAT(5X,'*** CANNOT CONTINUE ... YOU MUST INPUT NEW CORRELATION
      * METRIC ***')
     GO TO 1000
   ENDIF

```

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```

C
C :=====
C :
C : GENERATE CELL
C :
C :=====
C
DO 550 IPDP=1,4
NS=NN(IPDP)
ISEED=973253
CALL CELL(VP,VQ,A,NS,IC,ISEED,A)
DO 100 IP = 1,IROUND
C
C :=====
C :
C : GENERATE MULTIVARIATE
C :
C :=====
C
110 CALL MULHOR(VP,VQ,TV,NS,A,ISEED,D,MEAN,IC,IR,Y,M)
C WRITE(6,15)
C WRITE(6,15)
C WRITE(6,15)
C WRITE(6,17)11(A(I,J,K),K=1,NS),J=1,TV),I=1,2)
C WRITE(6,15)
C15 FORMAT(5X,'=====')
C16 FORMAT(5X,'..... DATA VARIABLE .....')
C17 FORMAT(1X,2(5X,F10.3))
C :=====
C :
C : METHOD 2
C :
C :=====
IV=0
METHOD=2
CALL FUNC(A,NS,M2,IV,TV,DET,METHOD)
IF (DET.EQ. 0.) GO TO 110
C :=====
C :
C : METHOD 1
C :
C :=====
IV=VQ
METHOD=1
CALL FUNC(A,NS,M1,IV,TV,DET,METHOD)
C :=====
C :
C : METHOD 3
C :
C :=====
CALL OPTINS,IK,Y,M3,VP,TV,M)
DO 120 I=1,2
SM1(I)=SM1(I)+M1(I)
SM2(I)=SM2(I)+M2(I)
SM3(I)=SM3(I)+M3(I)
120 CONTINUE
100 CONTINUE
DO 150 I=1,2
AV1(I)=SM1(I)/IROUND

```

```

AV2(I)=SM2(I)/I*ROUND
AV3(I)=SM3(I)/I*ROUND
130 CONTINUE
DO 2222 I=1,2
SM1(I)=0.
SM2(I)=0.
SM3(I)=0.
2222 CONTINUE
PERM(1)=(AV1(1)+AV1(2))*100/(NS+NS)
PERM(2)=(AV2(1)+AV2(2))*100/(NS+NS)
PERM(3)=(AV3(1)+AV3(2))*100/(NS+NS)
C :=====
C :
C : OUTPUT DATA
C :
C :=====
C
20 WRITE(6,20)NS
FORMAT(//5X,'SAMPLE SIZE = ',I3//)
WRITE(6,30)VP
30 FORMAT(5X,'CONTINUOUS VARIABLES = ',I2,' (Y1,Y7,Y8)'//)
WRITE(6,40)VQ
40 FORMAT(5X,'BINARY VARIABLES = ',I2,' (X6)'//)
WRITE(6,50)I1,PERM(I),I=1,3
50 FORMAT(//,5X,'METHOD = ',I2,' PERCENTAGE OF MISSING = ',F8.3,
* '2'//)
WRITE(6,60)I*ROUND,I=SEED
60 FORMAT(//,5X,'THE ROUND = ',I3
* //,5X,'ISEED = ',I13)
550 CONTINUE
1000 STOP
END

```

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โปรแกรมย่อยสำหรับการสร้าง cell

```

C
C :===== :
C : :
C : SUBROUTINE GENERATE CELL :
C : :
C :===== :
C
SUBROUTINE CELL(IP,IQ,M,N,IC,ISEED,A)
DIMENSION IC(2,200),A(2,15,200)
DO 100 I=1,N
DO 100 J=1,2
CALL RANDU(ISEED,IY,RD)
IC(J, I) = RD*M+1
100 CONTINUE
DO 200 I=1,2
DO 200 J=1,N
MM = IC(I, J)-1
DO 200 K=1,IQ
B = MM/2.0
IB = MM/2
IF ( B .EQ. IB ) THEN
A(I,K,J) = 0.0
ELSE
A(I,K,J) = 1.0
ENDIF
MM = IB
200 CONTINUE
RETURN
END

```

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จุฬาลงกรณ์มหาวิทยาลัย

โปรแกรมย่อย สำหรับสร้างตัวเลขสุ่ม ให้มีการแจกแจงสม่ำเสมอ $U(0,1)$

```

C =====
C :
C : SUBROUTINE RANDOM VARIABLE :
C :
C :
C =====
      SUBROUTINE RANDU (IX,IY,RD)
      IY=IX*65539
      IF (IY)100,200,200
100  IY=IY+2147+83047+1
200  RD=IY
      RD=RD*.40566132-9
      IX=IY
      RETURN
      END

```

```

C
C : =====
C :
C : SUBROUTINE SETUP RECDKD :
C :
C :
C :
C
      SUBROUTINE REC(IR,M)
      DIMENSION IR(2,64)
      DO 100 I=1,2
      DO 100 J=1,64
      IR(I,J) = 0
100  CONTINUE
      RETURN
      END

```

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จุฬาลงกรณ์มหาวิทยาลัย

โปรแกรมย่อยสำหรับคำนวณ Triangular Matrix

```

C =====
C :
C :      SUBROUTINE SETUP      :
C :
C =====
C      SUBROUTINE SETUP(1DK,99,1V,R)
      DIMENSION DD(9,9),R(9,9)
      DO 100 I=1,1V
      DO 100 J=1,1V
      DD(I,J)=R(I,J)
100  CONTINUE
      NEXT = 2
      IW=1
252  DO 200 I=NEXT,1V
      OV=DD(I,IW)/DD(IW,IW)
      DO 200 J=NEXT,1V
      DD(I,J)=DD(I,J)-DD(IW,J)*OV
200  CONTINUE
      IF (NEXT .GE. 1V) GO TO 260
      IW=NEXT
      NEXT=NEXT+1
      GO TO 252
260  DET=1.0
      DO 300 I=1,1V
300  DET=DET*DD(I,I)
      DET=ABS(DET)
C      WRITE(6,14)DET
C14  FORMAT(5X,'DETERMINANT = ',F10.3)
      IF (DET .LT. 0.0001) GO TO 500
      IF (R(1,1) .LE. 0.0) R(1,1)=1.0
      ROOT=SQRT(R(1,1))
      DO 350 I=1,1V
      DD(I,1)=R(I,1)/ROOT
      DO 350 J=2,1V
      DD(I,J)=0.
350  CONTINUE

```

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```

      DO 360 I=2,IV
      SUM=0.0
      NL=I-1
      DO 365 K=1,NL
      SUM=SUM+DD(I,K)*DD(I,K)
365  CONTINUE
      DIFF=R(I,I)-SUM
      IF (DIFF .LE. 0.) GO TO 501
      JIFF=ABS(DIFF)
      JD(I,I)=SQRT(DIFF)
      DO 370 J=2,I
      IF (J .EQ. 1) GO TO 370
      SUM1=0.
      NL=J-1
      DO 375 K=1,NL
      SUM1=SUM1+DD(I,K)*DD(J,K)
375  CONTINUE
      DD(I,J)=(R(I,J)-SUM1)/DD(J,J)
370  CONTINUE
360  CONTINUE
      IDK=1
      RETURN
501  WRITE(6,112)
112  FORMAT(5X, '***CANNOT FIND TRIANGULAR MATRIX DIFF < 0.***')
      GO TO 502
500  WRITE(6,111)
111  FORMAT(5X, '***DETERMINANT IS LESS THAN 0.0001 ***')
502  IDK=0
      RETURN
      END

```

ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

โปรแกรมย่อยสำหรับสร้างตัวเลขสุ่มให้มีการแจกแจงแบบพหุ $N(\mu_1, \Sigma)$

```


C
C =====
C :          SUBROUTINE GENERATE          :
C :          MULTIVARIATE                :
C :          :                             :
C =====
C
      SUBROUTINE MULNOR(IV,IQ,ITOL,N,A,ISEED,D,MEAN,IC,IR,Y,M)
      DIMENSION A(2,15,200),D(9,9),MEAN(2,9),IC(2,200),IR(2,64),
      *I(2,64,9,200),Z(9)
      REAL MEAN
      DO 1000 IP =1,2
      DO 1000 I=1,N
      DO 10 I=1,IV
      CALL NORMAL(XX,ISEED)
      Z(I)=XX
10    CONTINUE
      DO 1200 J=1,IV
      IQQ=IQ+J
      A(IP,IQQ,1)=0.
      DO 1300 K=1,J
      A(IP,IQQ,1)=A(IP,IQQ,1)+D(J,K)*Z(K)
1300  CONTINUE
      A(IP,IQQ,1)=A(IP,IQQ,1)+MEAN(IP,J)
1200  CONTINUE
1000  CONTINUE
      CALL REC(1R,M)
      DO 2000 I=1,2
      DO 2000 J=1,N
      ICC = IC(I,J)
      IR(I,ICC) = IR(I,ICC)+1
      IT = 1R(I,ICC)
      IK = 0
      I1J = IQ+1
      DO 1500 K = I1J, ITOL
      IK = IK+1
      Y(I,ICC,IK,IT) = A(I,K,J)
1500  CONTINUE
2000  CONTINUE
      RETURN
      END

```

มหาวิทยาลัยศรีนครินทรวิโรฒ
 จุฬาลงกรณ์มหาวิทยาลัย

โปรแกรมย่อย สำหรับสร้างตัวเลขสุ่มให้มีการแจกแจงแบบปกติ $N(0,1)$

```
C
C =====
C :                               :
C :   SUBROUTINE NORMAL VARIATE   :
C :                               :
C :                               :
C =====
C
SUBROUTINE NORMAL (XX,IX)
A=0.
DO 400 I=1,12
CALL RANDU (IX,IY,Y)
IX=IY
400 A=A+Y
XX=A-6.
RETURN
END
```



ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

โปรแกรมหลักสำหรับวิเคราะห์การจำแนกกลุ่ม 2 กลุ่มด้วยวิธีทางสถิติต่าง ๆ โดยใช้ข้อมูลจริง

```

C.....
C.....
C::::: TITLES      : A COMPARISON OF DISCRIMINANT METHODS      :
C:::::              : IN MULTIVARIATE ANALYSIS                :
C::::: AUTHOR     : MISS PITUMAI TRIAMCHARDENPORN            :
C::::: SUBJECT    : STATISTICS                                :
C::::: FACULTY    : COMMERCE AND ACCOUNTING                 :
C.....
C  VARIABLES      : DESCRIPTION                                :
C.....
C  B(1,0,K)       : SAMPLE SURVEY DATA IN POPULATION I ; VARIABLE J ;
C                  : IN CASE K
C  A(1,0,K)       : RANDOM DATA FROM SAMPLE SURVEY DATA IN POPULATION
C                  : I ; VARIABLE J ; IN CASE (RANDOM) K
C  T(1,0,K,L)     : RANDOM DATA FROM SAMPLE SURVEY DATA IN POPULATION
C                  : I ; CELL J ; VARIABLE K ; IN CASE (RANDOM) K
C  M1(1)         : MISCLASSIFICATION ERROR POPULATION I IN METHOD 1
C  M2(1)         : MISCLASSIFICATION ERROR POPULATION I IN METHOD 2
C  M3(1)         : MISCLASSIFICATION ERROR POPULATION I IN METHOD 3
C  AV(1)         : AVERAGE MISCLASSIFICATION ERROR POPULATION I IN
C                  : METHOD 1
C  AV2(1)        : AVERAGE MISCLASSIFICATION ERROR POPULATION I IN
C                  : METHOD 2
C  AV3(1)        : AVERAGE MISCLASSIFICATION ERROR POPULATION I IN
C                  : METHOD 3
C  NS            : SAMPLE SIZE , 50 , 50 , 100 AND 200
C  ISLED         : INITIALIZED BY 978253
C.....
C                  : DIMENSION B(2,12,614),M1(2),N(2),A(2,12,200),CH(2,614),
C                  : *Y(2,64,8,200),IK(2,64),M2(2),M3(2),SM1(2),SM2(2),SM3(2),AV1(2)
C                  : *,AV2(2),AV3(2),PLM(3),NRN(4)
C                  : INTEGER V2,VP,TV
C                  : DATA SM1,SM2,SM3/6*0.0/

```

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จุฬาลงกรณ์มหาวิทยาลัย

```

C=====
C===== INPUT DATA =====
C=====
      NT(1)=380
      N(2)=614
      NNN(1)=30
      NNN(2)=50
      NNN(3)=100
      NNN(4)=200
      TSEED=973253
      VP=2
      VQ=4
      M=2**VQ
      TV=VP+VQ
      DO 5 I=1,2
      NN=N(I)
      DO 5 K=1,NN
      READ(5,10) (B(I,J,K),J=1,TV)
10  FORMAT(4X,F1.0,1X,F1.0,2X,F1.0,2X,F1.0,12X,F2.0,12X,F2.0)
5   CONTINUE
      DO 4000 IPP=1,4
      NS=NNM(IPP)
      TSEED=973253
      DO 2500 IRR=1,4
      DO 2000 IP=1,50
110  CALL SETJP(IR,CH)
      DO 100 I=1,2
      DO 100 J=1,NS
101  CALL RANDJ(ISEED,IY,RD)
      IRD=RD*N(1)+1
      IF (CH(I,IRD) .EQ. 0.) GO TO 101
      CH(I,IRD)=0.
      C
      WRITE(6,11)I,IRD
111  FORMAT(5X,'PDP= ',I2,' RANDOM RECORD = ',I3)
      DO 111 K=1,TV
      A(I,K,J)=B(I,K,IRD)
111  CONTINUE
      IC=0
      DO 200 IM=1,VQ
      IC=IC+A(I,IM,J)*2**(IM-1)
200  CONTINUE

```

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```

IC=IC+1
IR(I,IC)=IR(I,IC)+1
IT=IR(I,IC)
IK=0
IIQ=VQ+1
DO 115 K=IIQ,TV
IK=IK+1
Y(I,IC,IK,IT)=B(I,K,IRD)
115 CONTINUE
100 CONTINUE
C WRITE(6,15)
C WRITE(6,16)
C WRITE(6,15)
C WRITE(6,17) ((A(I,J,K),K=1,NS),J=1,TV),I=1,2)
C WRITE(6,15)
C15 FORMAT(5X,'=====')
C16 FORMAT(5X,'.....DATA VARIABLE.....')
C17 FORMAT(1X,5(5X,F5.2))
C =====
C : :
C : METHOD 2 :
C : :
C : =====
IV=0
METHOD=2
CALL FUNC(A,NS,M2,IV,TV,DET,METHOD)
IF (DET .EQ. 0.) GO TO 110
C : :
C : :
C : METHOD 1 :
C : :
C : =====
IV=VQ
METHOD=1
CALL FUNC(A,NS,M1,IV,TV,DET,METHOD)

```

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```

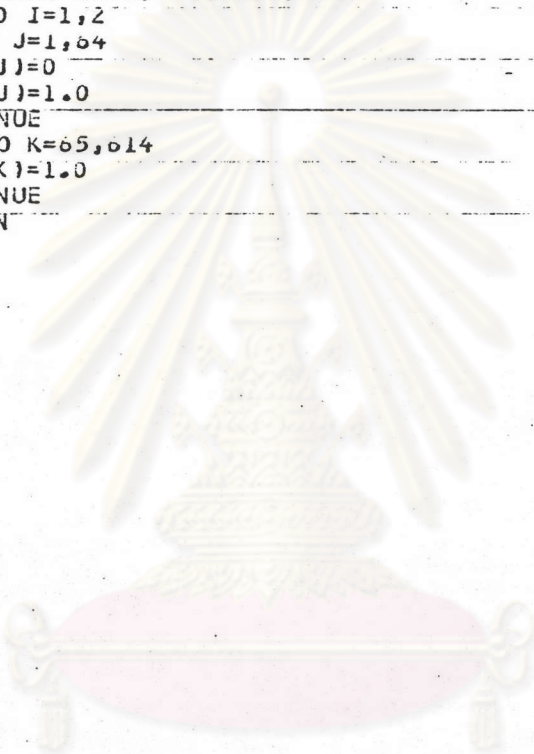
C :=====
C :
C :          METHOD 3
C :
C :=====
      CALL OPT(NS,IR,Y,M3,VP,TV,M)
      DO 120 I=1,2
      SM1(I)=SM1(I)+M1(I)
      SM2(I)=SM2(I)+M2(I)
      SM3(I)=SM3(I)+M3(I)
120  CONTINUE
2000 CONTINUE
      DO 130 I=1,2
      IRJUND=IRR*50
      AV1(I)=SM1(I)/IRJUND
      AV2(I)=SM2(I)/IRJUND
      AV3(I)=SM3(I)/IRJUND
130  CONTINUE
      PERM(1)=(AV1(1)+AV1(2))*100/(NS+NS)
      PERM(2)=(AV2(1)+AV2(2))*100/(NS+NS)
      PERM(3)=(AV3(1)+AV3(2))*100/(NS+NS)
      WRITE(6,20)NS

20  FORMAT(//5X,'SAMPLE SIZE = ',I3//)
      WRITE(6,30)VP
30  FORMAT(5X,'CONTINUOUS VARIABLES = ',I2,' (Y1,Y8)')//)
      WRITE(6,40)VC
40  FORMAT(5X,'BINARY VARIABLES = ',I2,' (X1,X3,X6,X9)')//)
      WRITE(6,50)(I,PERM(I),I=1,3)
50  FORMAT(//,5X,'METHOD = ',I2,' PERCENTAGE OF MISSING = ',F8.3,
      *',',7)
      WRITE(6,60)IRJUND,ISEED
60  FORMAT(//,5X,'THE ROUND = ',I3
      * /,5X,'ISEED = ',I13)
2500 CONTINUE
      DO 4400 IJ=1,2
      SM1(IJ)=0.
      SM2(IJ)=0.
      SM3(IJ)=0.
4400 CONTINUE
4000 CONTINUE
      STOP
      END

```

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จุฬาลงกรณ์มหาวิทยาลัย


```
C :-----:
C :
C :      SUBROUTINE SETUP      :
C :-----:
C :-----:
SUBROUTINE SETUP(IR,CH)
DIMENSION IR(2,64),CH(2,614)
DO 100 I=1,2
DO 10 J=1,64
IR(I,J)=0
CH(I,J)=1.0
10 CONTINUE
DO 100 K=65,614
CH(1,K)=1.0
100 CONTINUE
RETURN
END
```



ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

โปรแกรมย่อยสำหรับวิเคราะห์การจำแนกกลุ่ม 2 กลุ่มโดยวิธี Linear Discriminant

Function

```

C
C =====
C : SUBROUTINE DISCRIMINANT :
C : FUNCTION :
C : METHODS 1,2 :
C =====
C
SUBROUTINE FUNC(A, NS, MIS, VV, TV, DET, METHOD)
DIMENSION A(2,15,200), MIS(2), S(15,15), Y(2,15), DIFF(1,15),
*JSUM(15,1), F(15,15), FM(15,15), FI(1,15), AAA(225)
INTEGER TV, VV
MIS(1)=0
MIS(2)=0
IV=TV-VV
DO 50 I=1, IV
DO 50 J=1, IV

S(I, J)=0.0
50 CONTINUE
DO 100 I=1, 2
JJ=VV
DO 100 J=1, IV
JJ=JJ+1
SUM=0.
DO 10 K=1, NS
SUM=SUM+A(I, JJ, K)
10 CONTINUE
Y(I, J)=SUM/NS
100 CONTINUE
C WRITE(6,17)
C WRITE(6,24)
C24 FORMAT(5X, 'VALUE OF MEAN')
C WRITE(6,25)((Y(I, J), J=1, IV), I=1, 2)
C25 FORMAT(5X, 3(F8.3, 5X))
DO 200 I=1, IV
DIFF(1, I)=Y(1, I)-Y(2, I)
DSUM(I, 1)=Y(1, I)+Y(2, I)
200 CONTINUE
DO 400 I=1, 2
DO 400 J=1, NS
KK=VV
DO 300 K=1, IV
KK=KK+1
F(K, I)=A(I, KK, J)-Y(I, K)
F(1, K)=F(K, 1)
300 CONTINUE

```

```

      DO 400 II=1, IV
      DO 400 JJ=1, IV
      FM(II, JJ)=F(II, 1)*F(1, JJ)
      S(II, JJ)=S(II, JJ)+FM(II, JJ)
400  CONTINUE
      SS=1.0
      DO 500 I=1, IV
      DO 500 J=1, IV
      S(I, J)=S(I, J)/(NS+NS-2)
      IF (I .EQ. J) SS=SS*S(I, J)
500  CONTINUE
      C      WRITE(6, 17)
      C      WRITE(6, 25)
      C26  FORMAT(5X, 'THE VARIANCE')
      C      WRITE(6, 19)((S(I, J), J=1, IV), I=1, IV)
      IF (METHOD .NE. 2) GO TO 199
      CALL DETH(DET, S, IV)
      IF (DET.NE. 0.) GO TO 199
      RETURN
199  IF (SS .EQ. 0.) GO TO 299
      CALL INVS(S, IV)
      GO TO 399
299  NX=0
      DO 307 IK=1, IV
      DO 301 J=1, IV
      NX=NX+1
      AAA(NX)=S(IK, J)
301  CONTINUE
307  CONTINUE
      CALL MINV(AAA, IV)
      NX=0
      DO 317 IK=1, IV
      DO 311 J=1, IV
      NX=NX+1
      S(IK, J)=AAA(NX)
311  CONTINUE
317  CONTINUE

```

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จุฬาลงกรณ์มหาวิทยาลัย

```

C 399 WRITE(6,17)
C WRITE(6,18)
C WRITE(6,17)
17 FORMAT(5X,'=====')
C18 FORMAT(5X,'..... INVERSE VARIANCE .....')
C WRITE(6,19)((S(I,J),J=1,IV),I=1,IV)
C19 FORMAT(5X,10F8.3/)
399 SF=0.
DO 700 I=1,IV
DO 600 J=1,IV
SF=DIFF(I,J)*S(I,J)+SF
600 CONTINUE
FI(I,1)=SF
SF=0.
700 CONTINUE
CONS=0.
DO 800 I=1,IV
CONS=CONS+FI(I,1)*DSUM(I,1)
800 CONTINUE
CK=CONS/2.
C WRITE(6,22)CK
C22 FORMAT(5X,'CONSTANC = ',F10.2)
DO 900 I=1,2
DO 900 J=1,NS
CC=0.
KK=VV
DO 950 K=1,IV
KK=KK+1
CC=CC+FI(I,K)*A(I,KK,J)
950 CONTINUE
C WRITE(6,23)CC
C23 FORMAT(5X,'CONSTANC OF POP= ',F10.2)
IF (CC.GT.CK) THEN
IPOP=1
ELSE
IPOP=2
ENDIF
IF (IPOP.NE.1) MIS(I)=MIS(I)+1
900 CONTINUE
RETURN
END

```

ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

โปรแกรมย่อยสำหรับวิเคราะห์การจำแนกกลุ่ม 2 กลุ่ม โดยวิธี Optimum Allocation Rule

```

C
C =====
C :      SUBROUTINE METHOD 3      :
C :      OPTIMAL ALLOCATION RULE  :
C =====
C
      SUBROUTINE OPT(N,IR,Y,MIS,IP,ITV,M)
      DIMENSION Y(2,64,9,200),IK(2,64),
* MIS(2),PIZ(64),YBAR(2,64,9),V(15,15),D(64,1,9),DD(64,9,1)
* ,FI(64,1,9),AAA(225)
      DO 5 I=1,2
      MIS(I)=0
5      CONTINUE
      CALL MEAN(I,Y,IK,YBAR,P,IP,M)
      CALL VAROPT(IP,N,IR,Y,YBAR,V,ITV,M)
C      WRITE(6,111)((V(I,II),II=1,IP),I=1,IP)
C111  FORMAT(5X,'VAR METHOD 3 : ',2(5X,F9.3))
      SSI=1.0
      DO 222 IK=1,IP
      SSI=SSI*V(IK,IK)
222  CONTINUE
      IF (SSI .EQ.0.) GO TO 299
      CALL INV(V,IP)
      GO TO 333

```

ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

```

C =====
C ===== INVERSE MATRIX =====
C =====
299   NX=0
      DO 307 IK=1,IP
      DO 301 J=1,IP
      NX=NX+1
      AAA(NX)=V(IK,J)
301   CONTINUE
307   CONTINUE
      CALL MINV(AAA,IP)
      NX=0
      DO 317 IK=1,IP
      DO 311 J=1,IP
      NX=NX+1
      V(IK,J)=AAA(NX)
311   CONTINUE
317   CONTINUE
C333  WRITE(6,112)(V(I1,JJ),JJ=1,IP),I1=1,IP)
C112  FORMAT(5X,'INV METHOD 3 : ',2(5X,F9.3))
333   DO 20 I=1,M
      DO 20 J=1,IP
      D(I,1,J)=YBAR(1,1,J)-YBAR(2,1,J)
      DD(I,J,1)=(YBAR(1,1,J)+YBAR(2,1,J))/2.0
20    CONTINUE
      SF=J.
      DO 40 I=1,M
      DO 40 J=1,IP
      DO 30 K=1,IP
      SF=D(I,1,K)*V(K,J)+SF
30    CONTINUE
      F1(1,1,J)=SF
      SF=0.
40    CONTINUE
      DO 200 I=1,2
      DO 200 J=1,M
      IZ=IR(I,J)
      IF (IZ.EQ.0) GO TO 200
      IF (IPI(I,J).EQ.0.)OR.(P(2,J).EQ.0.) GO TO 200
      C=P(2,J)/P(1,J)
      C=ALOG(C)
C      WRITE(5,113)C
C113  FORMAT(5X,'CONSTANT METHOD 3 : ',F10.7)
      DO 150 K=1,12
      CC=0.
      DO 100 L=1,IP
      T=Y(1,J,L,K)-DD(J,L,1)
      CC=CC+F1(J,1,L)*T
100   CONTINUE
C      WRITE(6,114)CC
C114  FORMAT(5X,'CONSTANT SAMPLE : ',F13.5)
      IF (CC.GE.C) THEN
          IPOP=1
      ELSE
          IPOP=2
      ENDIF
      IF (IPOP.NE.1) MIS(1)=MIS(1)+1
150   CONTINUE
200   CONTINUE
      RETURN
      END

```

โปรแกรมย่อยสำหรับคำนวณค่าเฉลี่ยของการวิเคราะห์ โดยวิธี Optimum Allocation

Rule

```

C
C =====
C :      SUBROUTINE FIND MEAN      :
C :      I METHODU 3)              :
C =====
C
      SUBROUTINE MEAN(N,Y,IK,YBAR,P,IP,M)
      DIMENSION Y(2,64,9,200),IK(2,64),YBAR(2,64,9),P(2,64)
      DO 5 I=1,2
      DO 5 J=1,4
      DO 6 K=1,IP
      YBAR(I,J,K)=0.
6     CONTINUE
      P(I,J)=0.
5     CONTINUE
      DO 300 I=1,2
      DO 300 J=1,4
      IZ=IK(I,J)
      IF (IZ .EQ. 0) THEN
      DO 50 K=1,IP
      YBAR(I,J,K)=0.
50    CONTINUE
      P(I,J)=0.
      GO TO 300
      ENDIF
      DO 200 K=1,IP
      SUM=0.
      DO 100 L=1,IZ
      SUM=SUM+Y(I,J,K,L)
100   CONTINUE
      YBAR(I,J,K)=SUM/IZ
      C   WRITE(6,223)I,J,K,YBAR(I,J,K)
C223  FORMAT(5X,'POP = ',I2,' CELL = ',I4,' VAR = ',I2,' MEAN = ',F8.3)
200   CONTINUE
      P(I,J)=(IZ*I.0)/N
      C   WRITE(6,224)I,J,P(I,J)
C224  FORMAT(5X,'POP = ',I2,' CELL = ',I4,' PROB = ',F8.3)
300   CONTINUE
      RETURN
      END

```

ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

โปรแกรมย่อยสำหรับคำนวณค่าความแปรปรวนของการวิเคราะห์ โดยวิธี Optimum

Allocation Rule

```

C
C =====
C :      SUBROUTINE FIND VARIANC      :
C :      METHOD 3 )                    :
C =====
C
SUBROUTINE VAROPT(IP,N,IR,Y,YBAR,V,ITV,M)
DIMENSION IR(2,64),Y(2,64,9,200),YBAR(2,64,9)
*,FM(9,9),F(9,9),V(15,15)
DO 50 I=1,IP
DO 50 J=1,IP
V(I,J)=0.
50 CONTINUE
IDF=0
DO 200 I=1,2
DO 200 J=1,M
IZ=IR(I,J)
IF (IZ .EQ. 0) GO TO 200
IDF=IDF+1
DO 110 K=1,IZ
DO 100 L=1,IP
F(L,I)=Y(I,J,L,K)-YBAR(I,J,L)
100 CONTINUE
DO 110 II=1,IP
DO 110 JJ=1,IP
FM(II,JJ)=F(II,1)*F(1,JJ)
110 CONTINUE
V(II,JJ)=V(II,JJ)+FM(II,JJ)
200 CONTINUE
DO 300 I=1,IP
DO 300 J=1,IP
V(I,J)=V(I,J)/(N+N-IDF)
300 CONTINUE
RETURN
END

```

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จุฬาลงกรณ์มหาวิทยาลัย

โปรแกรมย่อยสำหรับหา Determinant

```

C
C =====
C :
C :   SUBROUTINE DETERMINANT
C :
C : =====
C
      SUBROUTINE DETM(DET,R,IV)
      DIMENSION DD(15,15),R(15,15)
      DOUBLE PRECISION DD
      DO 100 I=1,1V
      DO 100 J=1,1V
9      DD(I,J)=R(I,J)
100    CONTINUE
      NEXT = 2
      IH=1
252    DO 200 I=NEXT,1V
      UV=DD(I,IH)/DD(IH,IH)
      DO 200 J=NEXT,1V
      DD(I,J)=DD(I,J)-DD(IH,J)*UV
200    CONTINUE
      IF (NEXT .GE. 1V) GO TO 260
      IH=NEXT
      NEXT=NEXT+1
      GO TO 252
260    DET=1.0
      DO 300 I=1,1V
300    DET=DET*DD(I,I)
      DET=ABS(DET)
      C
      WRITE(6,14)DET
C14   FORMAT(5X,'DETERMINANT = ',F10.3)
      RETURN
      END

```

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จุฬาลงกรณ์มหาวิทยาลัย

โปรแกรมย่อยสำหรับหา Inverse

```

C
C =====
C :      SUBROUTINE INVERSE      :
C :      METRIX                  :
C =====
C
      SUBROUTINE INV(S, IV)
      DIMENSION S(15,15)
      DO 20 K=1, IV
      S(K,K)=-1/S(K,K)
      DO 5 I=1, IV
      IF (I-K)3,5,3
      S(I,K)=-S(I,K)*S(K,K)
3      CONTINUE
      DO 10 I=1, IV
      DO 10 J=1, IV
      IF ((I-K)*(J-K))9,10,9
      S(I,J)=S(I,J)-S(I,K)*S(K,J)
10      CONTINUE
      DO 20 J=1, IV
      IF (J-K)18,20,18
18      S(K,J)=-S(K,J)*S(K,K)
20      CONTINUE
      DO 25 I=1, IV
      DO 25 J=1, IV
      S(I,J)=-S(I,J)
25      CONTINUE
      RETURN
      END

```

ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

```

C
C =====
C ===== SUBROUTINE MINV =====
C =====
C
SUBROUTINE MINV(A,N)
DIMENSION A(225),L(225),M(225)
C
J = 1.0
NK = -N
DO 8J K=1,N
NK = NK + N
L(K) = K
M(K) = K
KK = NK + K
BIGA = A(KK)
DO 20 J = K,N
IZ = N * (J-1)
DO 20 I = K,N
IJ = IZ + I
10 IF (ABS(BIGA)-ABS(A(IJ))) 15,20,20
15 BIGA = A(IJ)
L(K) = I
M(K) = J
20 CONTINUE
C
C INTERCHANGE ROWS
C
J = L(K)
IF (J-K) 35,35,25
25 KI = K-N
DO 30 I = 1,N
KI = KI + N
HOLD = -A(KI)
JI = KI - K + J
A(KI) = A(JI)
30 A(JI) = HOLD

```

ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

```

C
C INTERCHANGE COLUMNS
C
35 I = M(K)
   IF ( I-K) 43,45,38
38 JP = N * (I-1)
   DO 40 J = 1,N
   JK = NK + J
   JI = JP + J
   HOLD = - A(JK)
   A(JK) = A(JI)
40 A(JI) = HOLD
C
C DIVIDED COLUMN BY MINUS PIVOT (VALUE OF PIVOT SYSTEM IS CONTAINED IN
C BIGT)
C
45 IF (BIGA) 43,46,48
46 J = 0.0
   RETURN
48 DO 53 I=1,N
   IF (I-K) 50,55,50
50 IK = NK + I
   PPP = A(IK) / (-1 * BIGA)
   A(IK) = PPP
55 CONTINUE
C
C RECODE MATRIX
C
   DO 55 I=1,N
   IK = NK + I
   HOLD = A(IK)
   IJ = I - N

   DO 65 J = 1,N
   IJ = IJ + N
   IF (I-K) 60,65,60
60 IF (J-K) 62,65,62
62 KJ = IJ - 1 + K
   A(IJ) = HOLD * A(KJ) + A(IJ)
65 CONTINUE

```

ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

```

C
C   DIVIDED ROW BY PIVOT
C
      KJ = K - N
      DO 75 J=1,N
      KJ = KJ + J
      IF(IJ-K) 70,75,70
70    A(KJ) = A(KJ) / BIGA
75    CONTINUE
C
C   PRODUCT OF PIVOT
C
      D = D * BIGA

C
C   REPLACE PIVOT BY RECIPUCAL
C
      A(KK) = 1.0 / BIGA
80    CONTINUE

C   FINAL ROW AND COLUMN INTERCHANGE
C
      K = N
100   K = (K-1)
      IF (K) 150,150,105
105   I = I (K)
      IF (I-K) 120,120,108
108   JQ = N * (K-1)
      JR = N * (I-1)
      DO 110 J=1,N
      JK = JQ + J
      HOLD = A(JK)
      JI = JR + J
      A(JK) = -A(JI)
110   A(JI) = HOLD
120   J = M(K)
      IF(J-K) 100,100,125
125   KI = K - N
      DO 130 I=1,N
      KI = KI + N
      HOLD = A(KI)
      JI = KI - K + J
      A(KI) = - A(JI)
130   A(JI) = HOLD
      GO TO 100
150   RETURN
      END

```

ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

ข้อมูลจริงที่ใช้ในการวิเคราะห์การจำแนกกลุ่ม 2 กลุ่ม

00381010010010011315	370510151515000015000	1
01581010011111011315	290203151515001215173	1
0195100001101011315	290408151515151515173	1
01301010011011011329	240401121215120815173	1
01281000011011011372	250203151515151515170	1
00530000011010011345	330510151515101215103	1
01321110011011011329	280102101010120815000	1
007010100100110011315	260404151515000015003	1
01071000010011011329	310308151515121510173	1
00581010011010011358	350412101515001510173	1
02951010011111111315	260102101010101010173	1
02971000111111111358	270408151515120815173	1
00541000011010011343	260202151515121015170	1
02010110011010111315	250202151515151515173	1
01671000011000111329	300206151515101015173	1
0077001001110011343	330510151515151515173	1
01831100010010111358	240201151515151515003	1
0195000001101011315	290006101015101015103	1
00570010011010011329	300206151515151515173	1
00590110011010011315	250001101000150015003	1
02641010011011111330	250201101015151515003	1
01290010011011011315	300208151515080815173	1
0199001001101011315	280103101015100015173	1
02601000011011111315	320510101015100615173	1
02400000010011111329	410223101515121515173	1
01261000010011011358	290303101515000810102	1
00590110011010011329	290006151515151515173	1
00681100010110011315	300208081208101515173	1
02601000011011111315	320308151515151215002	1
00541000011010011358	430315101215100015173	1
02630010011011111315	300608101006100010173	1
01310110011011011315	280306121015120815173	1
01270100011011011315	290008101515101515103	1
02780100010111111315	340410101015101515170	1
0141010001011011315	360112101015101515103	1
02590000011011111315	290206100815100015172	1
03060000010000011315	290206101015000015003	1
01250000011011011343	320106101515101015003	1
00370010011010011315	250202101015101015173	1
02590000011011111315	290005151515151515173	1
00530000011010011344	320308101010101008172	1
01261000011011011315	320409151015061215173	1
02601000011011111315	280202121215121515173	1
02200000010000111329	260204101215101215082	1
02100010010110111315	330110101015081512173	1
01290010011011011329	340521101515100815173	1
00690010011000011329	320309101015080615103	1
01080100010011011343	270403151215100815123	1
02601000011011111329	320209101010101515122	1
02650110011011111315	260102081015081515103	1
02100010010110111329	250501081015031515173	1
03060000010000011329	270103101010000012003	1
02760000010111111315	320210121215121215173	1
01301010011011011343	570132151515151515173	1
01310110011011011343	290002101015001515173	1
007010100110110011315	320309101210080615003	1
00680000010110011343	300206101015000015002	1

0202111001101011358	250004151510101515101	1
00581010011010011315	370311151515101515101	1
0155110001111101329	240004151515100815101	1
0151011001101011343	250003151510000815101	1
00181000011000011343	310309151515101015171	1
01131110010011011343	240002101510001215101	1
0130101001101011358	310108151515151515101	1
01541000011111011358	240001101515100815171	1
01301010011011011388	200005151515030815071	1
00351000010010011315	250103101515101015171	1
00080100010000011329	330408121515000815001	1
00550100012010011315	240001101515100815001	1
00581010011010011343	360414101515101215001	1
02951010011111111315	320407101515151515171	1
01091100010011011315	240002151515100015001	1
0201011001101011329	200000151515121515171	1
02411000010011111358	310105151515001510171	1
01231100011011011358	200002151515121015171	1
01111010010011011315	250103151515101515171	1
02441010010011111329	270204151515120815171	1
01251000011011011315	290402151515121015171	1
01281100011011011358	240001151515121015171	1
01851010010010111315	290502151515100815101	1
0071010010110011343	280206121512150015171	1
00541000010010011372	250204151515121015171	1
0262110001101111329	280205151515150815173	1
01080100010011011358	240002151515000815000	1
00541000011010011358	430516151512101015173	1
00561100011010011315	240001151515100815100	1
0260100001101111329	270304151515100815173	1
00590110011010011329	260001151515151015173	1
00601110011010011315	290002151515121015170	1
0201011001101011315	240001151515121015173	1
01831100010010111315	200001101010121515173	1
0078101001110011372	280205151515121515173	1
00601110011010011343	230002101015120815122	1
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ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

ประวัติผู้เขียน

นางสาว ทิพย์ เตரியมเจริญพร เกิดเมื่อวันที่ 13 มกราคม พ.ศ. 2504
ที่จังหวัดนครศรีธรรมราช สำเร็จการศึกษาระดับปริญญาตรี (ลัทธิ) จากมหาวิทยาลัยเชียงใหม่
เมื่อปีการศึกษา 2525 และได้เข้าศึกษาต่อระดับปริญญาโทในภาควิชาลัทธิ บัณฑิตวิทยาลัย
จุฬาลงกรณ์มหาวิทยาลัย ปีการศึกษา 2526 ปัจจุบันรับราชการในตำแหน่งนักวิชาการศึกษา 4
สำนักเทคโนโลยีการศึกษา มหาวิทยาลัยสุโขทัยธรรมาธิราช



ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย