

Multivariate Statistical Techniques

Matrix Operations in Octave

The Matrix

```
octave: A = [2,1;3,2;-2,2]
```

```
A =
```

```
  2   1
  3   2
 -2   2
```

```
octave: A
```

```
A =
```

```
  2   1
  3   2
 -2   2
```

Multiplication by a Scalar

```
octave: c = 3
```

```
c = 3
```

```
octave: c*A
```

```
ans =
```

```
  6   3
  9   6
 -6   6
```

Matrix Addition & Subtraction

```
octave: B = [1,1;4,2;-2,1]
```

```
B =
```

```
  1   1
  4   2
 -2   1
```

```
octave: C = A + B
```

```
C =
```

```
  3   2
  7   4
 -4   3
```

```
octave: D = A - B
```

```
D =
```

```
  1   0
 -1   0
  0   1
```

Matrix Multiplication

```
octave: D = [2,1,3;-2,2,1]
D =
```

```
    2    1    3
   -2    2    1
```

```
octave: C = D*A
C =
```

```
    1   10
    0    4
```

```
octave: C = A*D
C =
```

```
    2    4    7
    2    7   11
   -8    2   -4
```

```
octave: D = [2,1,3]
D =
```

```
    2    1    3
```

```
octave: C = D*A
C =
```

```
    1   10
```

```
octave: C = A*D
error: operator *: nonconformant arguments (op1 is 3x2, op2 is 1x3)
error: evaluating binary operator `*' near line 44, column 6
error: evaluating assignment expression near line 44, column 3
```

Transpose of a Matrix

```
octave: AT = A'
AT =
```

```
    2    3   -2
    1    2    2
```

```
octave: ATT = AT'
ATT =
```

```
    2    1
    3    2
   -2    2
```

Common Vectors

Unit Vector

```
octave: U = ones(3,1)
U =
```

```
    1
    1
    1
```

Common Matrices

Unit Matrix

Using Stata

```
octave: U = ones(3,2)
U =
```

```
1 1
1 1
1 1
```

Diagonal Matrix

```
octave: S = [2,1,4;3,2,2;-2,2,3]
S =
```

```
2 1 4
3 2 2
-2 2 3
```

```
octave: D = diag(S)
D =
```

```
2
2
3
```

```
octave: D = diag(diag(S),0)
D =
```

```
2 0 0
0 2 0
0 0 3
```

Identity Matrix

```
octave: I = eye(3)
I =
```

```
1 0 0
0 1 0
0 0 1
```

Symmetric Matrix

```
octave: C = [2,1,5;1,3,4;5,4,-2]
C =
```

```
2 1 5
1 3 4
5 4 -2
```

```
octave: CT = C'
CT =
```

```
2 1 5
```

```
1  3  4
5  4 -2
```

Inverse of a Matrix

```
octave: A = [4,2,2;4,6,8;-2,2,4]
A =
```

```
4  2  2
4  6  8
-2  2  4
```

```
octave: AI = inv(A)
AI =
```

```
1.00000 -0.50000  0.50000
-4.00000  2.50000 -3.00000
2.50000 -1.50000  2.00000
```

```
octave: A*AI
ans =
```

```
1  0  0
0  1  0
0  0  1
```

```
octave: AI*A
ans =
```

```
1  0  0
0  1  0
0  0  1
```

Inverse & Determinant of a Matrix

```
octave: C = [2,1,6;1,3,4;6,4,-2]
C =
```

```
2  1  6
1  3  4
6  4 -2
```

```
octave: CI = inv(C)
CI =
```

```
0.215686 -0.254902  0.137255
-0.254902  0.392157  0.019608
0.137255  0.019608 -0.049020
```

```
octave: d = det(C)
d = -102
```

c

Number of Rows & Columns

```
octave: X = [3,2;2,-2;4,6;3,1]
X =
```

```
3  2
2 -2
4  6
```

```
3 1
```

```
octave: r = rows(A)
```

```
r = 3
```

```
octave: c = columns(X)
```

```
c = 2
```

Computing Column & Row Sums

```
octave: A = [2,1;3,2;-2,2]
```

```
A =
```

```
2 1
3 2
-2 2
```

```
octave: c = sum(A)
```

```
c =
```

```
3 5
```

```
octave: r = sum(A')
```

```
r =
```

```
3 5 0
```

```
octave: a = sum(sum(A))
```

```
a = 8
```

Computing Column & Row Means

```
octave: cm = sum(A)/rows(A)
```

```
cm =
```

```
1.0000 1.6667
```

```
octave: rm = sum(A')/columns(A)
```

```
rm =
```

```
1.50000 2.50000 0.00000
```

Horizontal Concatenation

```
octave: A
```

```
A =
```

```
2 1
3 2
-2 2
```

```
octave: B = [1,1;3,4;2,2]
```

```
B =
```

```
1 1
3 4
2 2
```

```
octave: C = [A,B]
```

C =

2	1	1	1
3	2	3	4
-2	2	2	2

Vertical Concatenation (Appending)

octave: C = [A;B]

C =

2	1
3	2
-2	2
1	1
3	4
2	2

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