UMBC

MATLAB Tutorial 06

ENME 303 Computational Methods for Engineers

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Matrices in Matlab

Matrix Creation

- Matlab has built-in functions to create special matrices
  - eye(n) – $I_{n\times n}$ (nxn identity matrix)
  - zeros(n,m) – $0_{n\times m}$ (nxm matrix of zeros)
  - ones(n,m) – (nxm matrix of 1s)
  - rand(n,m) – (nxm matrix of random numbers 0-1)

Matrix Creation

- We can also define our own matrices
- [1 2 3; 4 5 6; 7 8 9]: creates the matrix

$$\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$$

- Can create matrices by stacking row or column vectors

Accessing Matrices

- Can access the ijth element of A using A(i,j)
- Use : instead of i or j to access entire rows or columns
  - A(:,1) returns all of column 1 of A
  - A(2,:) returns all of row 2 of A
- Use a:b as a size to return submatrices
  - A(1:2,2:3) returns the submatrix of rows 1-2 and columns 2-3 of A

Useful Functions

- size(A) – Returns the size of A
  - Returns a 1x2 row vector [rows, columns]
  - Use [rows, columns] = size(A) to get them as separate variables
- det(A) – Returns the determinant of A
- inv(A) – Returns the inverse of A
- rank(A) – Returns the rank of A

Activity

- Create a function to find the inverse of a 2x2 matrix
- Function should check for invertibility first
- Do not use built in det() or inv() function
- Your function should work with the driver posted on GitHub

```
function Ainv = invert(A)
```

Inverse of 2x2 matrix

Let $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$

$$\det(A) = ad - bc$$

$$\text{if } \det(A) \neq 0 \text{ then}$$

$$A^{-1} = \frac{1}{\det(A)} \begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$$

Thanks!