

# 수치해석 2차 과제

20203152 최정민

LUdecomp.py 코드

```
1 import numpy as np
2 def LUdecomp(a):# doolittle분해
3     n = len(a)
4     for k in range(0,n-1):
5         for i in range(k+1,n):
6             if a[i,k] != 0.0:
7                 lam = a[i,k]/a[k,k]
8                 a[i,k+1:n] = a[i,k+1:n] - lam*a[k,k+1:n] #상 삼각행렬
9                 a[i,k] = lam #승수값으로 하 삼각행렬 만들기
10    return a
11 def LUsolve(a,b): #해를 구하는 과정
12     n = len(a)
13     for k in range(1,n):
14         b[k] = b[k] - np.dot(a[k,0:k],b[0:k])
15     b[n-1] = b[n-1]/a[n-1,n-1]
16     for k in range(n-2,-1,-1):
17         b[k] = (b[k]- np.dot(a[k,k+1:n],b[k+1:n]))/a[k,k]
18    return b
```

ex2.7.py 코드

```
1 import numpy as np
2 from LUdecomp import *
3 a = np.array([[3.0, -1.0, 4.0], [-2.0, 0.0, 5.0], [7.0, 2.0, -2.0]])
4 b = np.array([[6.0, 3.0, 7.0], [-4.0, 2.0, -5.0]])
5
6 a = LUdecomp(a) # Decompose [a]//Lu 분해
7 print("A=",a)
8 det = np.prod(np.diagonal(a)) #주 대각성분의 곱
9 print("\nDeterminant =" ,det)
10 for i in range(len(b)): # Back-substitute one
11     x = LUsolve(a,b[i]) # constant vector at a time// 해 구하기
12     print("x",i+1,"=",x)
13
```

실행결과

```
ex2.7 x
C:\Users\govl0\anaconda3\python.exe "C:/KMU/2-1/수치해석/과제/2차과제/예제 2.7/ex2.7.py"
A= [[ 3. -1.  4.]
 [-0.66666667 -0.66666667  7.66666667]
 [ 2.33333333 -6.5  38.5]]

Determinant = -77.0
x 1 = [1. 1. 1.]
x 2 = [-1.00000000e+00  1.00000000e+00  2.30695693e-17]

Process finished with exit code 0
```

## choleski.py 코드

```

1 import numpy as np
2 import math
3 #import error
4 def choleski(a):
5     n = len(a)
6     for k in range(n):
7         try:
8             a[k, k] = math.sqrt(a[k, k] - np.dot(a[k, 0:k], a[k, 0:k]))
9         except ValueError:
10            print('Matrix is not positive definite')
11
12        for i in range(k+1, n):
13            a[i, k] = (a[i, k] - np.dot(a[i, 0:k], a[k, 0:k]))/a[k, k]
14        for k in range(1, n):
15            a[0:k, k] = 0.0
16    return a
17
18 def choleskiSol(L, b):
19     n = len(b)
20     for k in range(n):
21         b[k] = (b[k] - np.dot(L[k, 0:k], b[0:k]))/L[k, k]
22
23     for k in range(n-1, -1, -1):
24         b[k] = (b[k] - np.dot(L[k+1:n, k], b[k+1:n]))/L[k, k]
25    return b

```

## 예제 2.8 코드

```

1 import numpy as np
2 from choleski import *
3 a = np.array([[1.44, -0.36, 5.52, 0.0], [-0.36, 10.33, -7.78, 0.0], [5.52, -7.78, 28.40, 9.0], [0.0, 0.0, 9.0, 61.0]])
4 b = np.array([0.04, -2.15, 0.0, 0.88])
5 aOrig = a.copy()
6 L = choleski(a)
7 x = choleskiSol(L, b)
8 print("x = ", x)
9 print('\nCheck: A*x= \n', np.dot(aOrig, x))

```

## 실행결과

C:\Users\govl0\anaconda3\python.exe "C:/KMU/2-1/수치해석/과제/2차과제/예제 2.8/예제2.8.py"

x = [ 3.09212567 -0.73871706 -0.8475723 0.13947788]

Check: A\*x=

[ 4.00000000e-02 -2.15000000e+00 -3.55271368e-15 8.80000000e-01]

Process finished with exit code 0