MAT3008 수치해석 Homework#2 report

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Test environment:

Apple M3, Sonoma 14.5
Apple clang 15.0.0

00. Total Result:

```
***** result for lineq1.dat *****

Gauss-Jordan Elimination:
2.000000 -1.000000 -1.000000 -1.000000
LU decomposition:
3.000000 1.000001 -4.000001 -2.000000
Singular Value Decomposition:
1.733333 -1.533333 -0.200000 -0.733333

LU decomposition with mprove():
0.999999 -3.000001 2.000002 0.000000

determinant: -0.000000
Inverse matrix:
-33554432.000000 -12582912.000000 12582911.000000 4194304.500000
-67108888.000000 -25165830.000000 25165832.000000 8388610.000000
100663312.000000 37748740.000000 -37748740.000000 -12582915.000000
33554432.000000 12582912.000000 -12582911.000000 -4194304.500000
```

```
***** result for lineq2.dat *****

Gauss-Jordan Elimination:
-2.873565 -0.612356 0.976277 0.635818 -0.553441
LU decomposition:
-2.873566 -0.612357 0.976277 0.635819 -0.553441
Singular Value Decomposition:
-2.873564 -0.612357 0.976277 0.635818 -0.553440

LU decomposition with mprove():
-2.873566 -0.612357 0.976277 0.635819 -0.553441

determinant: 3835.999512
Inverse matrix:
0.354536 0.766945 0.207769 -0.595412 0.253128
0.035454 0.126695 0.195777 -0.159541 0.050313
-0.138686 -0.098540 -0.096715 0.124088 0.016423
-0.052138 -0.303962 -0.023201 0.234619 -0.044578
0.149114 0.459333 0.051356 -0.171011 0.042492
```

```
***** result for lineq3.dat *****

Gauss-Jordan Elimination:
-0.326608 1.532292 -1.044825 -1.587448 2.928480 -2.218931
LU decomposition:
-0.326608 1.532292 -1.044826 -1.587447 2.928480 -2.218930
Singular Value Decomposition:
-0.326608 1.532290 -1.044823 -1.587447 2.928478 -2.218929

LU decomposition with mprove():
-0.326608 1.532292 -1.044825 -1.587448 2.928480 -2.218930

determinant: 16178.401367
Inverse matrix:
-0.162205 0.122801 0.024068 -0.016431 -0.022840 0.046132
0.169407 -0.041117 0.228313 -0.087624 0.180306 -0.395655
-0.011636 0.122745 -0.117407 -0.180981 0.015910 0.186766
0.105669 -0.051726 -0.108916 0.299774 0.000859 -0.190541
-0.053026 -0.042361 0.160508 -0.224034 0.161811 0.015024
-0.062341 -0.064694 -0.234216 0.351126 -0.364828 0.434633
```

01. Solving equation $A_i x_i = b_i, i = 1,2,3$

Implement:대체로 NR에 포함되어있는 methods를 그대로 사용. 데이터를 사용하기 위한 data copy와 gaussj()등의 매개변수 type에 맞춰 vector를 matrix로 변환하는 등 처리과정을 추가함. SVD에서는 svbksb를 이용해 $A = U\Sigma V^T$ 를 계산.

Trouble shooting: 특기사항 없음

02. Applying iterative improvement

Implement:대체로 NR에 포함되어있는 methods를 그대로 사용. 기존 LU décomposition 함수 lu()의 형태를 최대한 유지한 채로 mprove()를 더하는 정도 수정함.

Trouble shooting: 특기사항 없음

03. Finding inverse and determinant

Implement:대체로 NR에 포함되어있는 methods를 그대로 사용. LU decomposition을 이용해 inverse와 determinant를 도출함.

Trouble shooting: 특기사항 없음