ACSE_la

unknown

Oct 30, 2020

CONTENTS

CHAPTER

ONE

A GAUSSIAN ELIMINATION ROUTINE

This package implements Gaussian elimination[1] for `numpy.ndarray` objects, along with hand-written matrix multiplication and a hand written Bareiss Algorithm[2] for computing determinants.

See *`acse_la.gauss()`*, `acse_la.gauss.matmul()` and `acse_la.det.det()` for more information.

`acse_la.`**`gauss`**(*a*, *b*)

Given two matrices, *a* and *b*, with *a* square, the determinant of *a* and a matrix *x* such that a*x = b are returned. If *b* is the identity, then *x* is the inverse of *a*.

Parameters

- **a** (*np.array or list of lists*) – 'n x n' array
- **b** (*np. array or list of lists*) – 'm x n' array

Examples

```
>>> a = [[2, 0, -1], [0, 5, 6], [0, -1, 1]]
>>> b = [[2], [1], [2]]
>>> det, x = gauss(a, b)
>>> det
22.0
>>> x
[[1.5], [-1.0], [1.0]]
>>> A = [[1, 0, -1], [-2, 3, 0], [1, -3, 2]]
>>> I = [[1, 0, 0], [0, 1, 0], [0, 0, 1]]
>>> Det, Ainv = gauss(A, I)
>>> Det
3.0
>>> Ainv
[[2.0, 1.0, 1.0],
[1.3333333333333333, 1.0, 0.6666666666666666],
[1.0, 1.0, 1.0]]
```

[1] https://mathworld.wolfram.com/GaussianElimination.html
[2] http://informatika.stei.itb.ac.id/~rinaldi.munir/Matdis/2016-2017/Makalah2016/Makalah-Matdis-2016-051.pdf

Notes

See https://en.wikipedia.org/wiki/Gaussian_elimination for further details.

acse_la.gauss.**matmul**(*a*, *b*)

Given *a* an n x m matrix and *b* an m x l matrix, the product of a and b is returned, as an n x l matrix.

Parameters

- **a** (*np.array or list of lists*) – 'n x m' array
- **b** (*np. array or list of lists*) – 'm x l' array

Examples

```
>>> a = [[1, 2], [3, 4]]
>>> b = [[5],[6]]
>>> mul_1 = matmul(a, b)
>>> mul_1
[[17], [39]]
>>> c = [[5, 1], [6, 2]]
>>> mul_2 = matmul(a, c)
>>> mul_2
[[17, 5], [39, 11]]
```

acse_la.gauss.**zeromat**(*p*, *q*)

Create an p x q matrix with all its entries be 0.

Parameters

- **p** (*integer*) –
- **q** (*integer*) –

Examples

```
>>> p = 5
>>> q = 6
>>> z_mat = zeromat(p, q)
>>> z_mat
[[0, 0, 0, 0, 0, 0],
[0, 0, 0, 0, 0, 0],
[0, 0, 0, 0, 0, 0],
[0, 0, 0, 0, 0, 0],
[0, 0, 0, 0, 0, 0]]
```

acse_la.det.**det**(*a*)

An "Bareiss Algorithm" to compute the determinant of a square matrix a.

Parameters **a** (*np.array or list of lists*) – 'n x n' array

Notes

See http://informatika.stei.itb.ac.id/~rinaldi.munir/Matdis/2016-2017/Makalah2016/Makalah-Matdis-2016-051.pdf Page.4 for further details.

References

PYTHON MODULE INDEX

a