
ACSE_la

unknown

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CONTENTS

A GAUSSIAN ELIMINATION ROUTINE

This package implements Gaussian elimination¹ for `numpy.ndarray` objects, along with hand-written matrix multiplication.

See `acse_la.gauss()` and `acse_la.gauss.matmul()` 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*) – ‘ $n \times n$ ’ array
- **b** (`np.array` or *list of lists*) – ‘ $m \times n$ ’ 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>

Notes

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

members det

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

Matrix product of matrix *a* and matrix *b*.

Parameters

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

Returns out – The matrix product of the inputs.

Return type list of lists

Raises ValueError – If the number of columns of *a* is not the same as the number of rows *b*.

Notes

The output dimension depends on the dimensions of the input.

- For input matrices *a* = n x m and *b* = m x l, the output matrix will have dimensions n x l.

Examples

For 2-D arrays:

```
>>> a = np.array([[1, 2],
...               [3, 4]])
>>> b = np.array([[5, 1],
...               [6, 2]])
>>> matmul(a, b)
[[17, 5], [39, 11]]
```

For a 2-D array and 1-D array: `>>> a = np.array([[1, 2], ... [3, 4]]) >>> b = np.array([5, 6]) >>> matmul(a, b)`
[17, 39]

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

Returns an array with dimension shape, filled with zeros.

Parameters shape (*tuple*) – Shape of output matrix

Returns out – Matrix with dimension p x q

Return type list of lists

Examples

```
>>> zeromat(2, 3)
[[0, 0, 0], [0, 0, 0]]
>>> zeromat(1, 3)
[[0, 0, 0]]
>>> zeromat(2, 1)
[[0], [0]]
```

References

PYTHON MODULE INDEX

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acse_la, ??

acse_la.det, ??