ACSE_la

unknown

Oct 28, 2020

CONTENTS

A GAUSSIAN ELIMINATION ROUTINE

This package implements Gaussian elimination[1] 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 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

Notes

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

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

`acse_la.gauss.`**`zeromat`**(*shape*)

    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

a