Advanced Matrix Operations

Spoken Tutorial Project
http://spoken-tutorial.org
National Mission on Education through ICT

http://sakshat.ac.in

Script: Thirumalesh H S

Narrator: Kiran Kishore

IIT Bombay

19 November 2015

Objectives

At the end of this tutorial, you will be able to,

At the end of this tutorial, you will be able to,

▶ **find forbenius and infinity norm of a matrix.**

At the end of this tutorial, you will be able to,

- ▶ **find forbenius and infinity norm of a matrix.**
- ▶ **find singular value decomposition of a matrix.**

System Specifications

System Specifications

- ▶ **Ubuntu Linux 14.04**

System Specifications

- **Ubuntu Linux 14.04**
- **Python 2.7.6**

System Specifications

- Ubuntu Linux 14.04
- `Python 2.7.6`
- `IPython 4.0.0`

To practice this tutorial, you should know how to -

Pre-requisite

To practice this tutorial, you should know how to -

- ▶ **use Lists, for loops, arrays and access parts of arrays**

To practice this tutorial, you should know how to -

- ▶ **use Lists, for loops, arrays and access parts of arrays**
- ▶ **perform basic matrix opearitions**

Pre-requisite

To practice this tutorial, you should know how to -

- ▶ **use Lists, for loops, arrays and access parts of arrays**
- ▶ **perform basic matrix opearitions**

If not, see the pre-requisite Python tutorials on http://spoken-tutorial.org

flatten()

- ▶ **flatten() returns an multidimensoinal array into a single dimension array**

Frobenius norm of a matrix

- **Frobenius norm is defined as,**
  - $\|A\|_F = \sqrt{\sum_{i,j} |a_{i,j}|^2}$

- **Find out the Frobenius norm of the inverse of a 4 by 4 matrix m = arange(1, 17).reshape(4, 4)**

▶ **Infinity norm is defined as,**
$max(\sum_i |a_i|^2)$

- **Find the infinity norm of the matrix `im`**

▶ **Frobenius norm**
  `norm(im5)`

norm() method

- **Frobenius norm**
  `norm(im5)`
- **Infinity norm**
  `norm(im5, ord=inf)`

Singular Value Decomposition `svd`

$M = U\Sigma V^*$

- **U, an `mXm` unitary matrix over K.**
- **Σ, an `mXn` diagonal matrix with non-negative real numbers on diagonal.**

Singular Value Decomposition `svd`

- V^*, **an `nXn` unitary matrix over K, denotes the conjugate transpose of V.**

Summary

In this tutorial, we have learnt to,

Summary

In this tutorial, we have learnt to,

▶ **Calculate the norm of a matrix using the for loop and also using the function `norm()`.**

Summary

In this tutorial, we have learnt to,

- ▶ **Calculate the norm of a matrix using the for loop and also using the function `norm()`.**

- ▶ **Calculate singular value decomposition(SVD) of a matrix using the function `svd()`.**

1. `norm(A,ord='fro')` is the same as `norm(A)` ?

Evaluation

1. **`norm(A,ord='fro')` is the same as `norm(A)` ?**
   - **True**
   - **False**

Solutions

1. **True**

Forum to answer questions

▸ **Do you have questions in THIS Spoken Tutorial?**

▸ **Choose the minute and second where you have the question.**

▸ **Explain your question briefly.**

▸ **Someone from the FOSSEE team will answer them. Please visit**

http://forums.spoken-tutorial.org/

Forum to answer questions

- **Questions not related to the Spoken Tutorial?**
- **Do you have general / technical questions on the Software?**
- **Please visit the FOSSEE Forum**

  http://forums.fossee.in/

- **Choose the Software and post your question.**

Textbook Companion Project

- **The FOSSEE team coordinates coding of solved examples of popular books**

- **We give honorarium and certificate to those who do this**

For more details, please visit this site:

http://tbc-python.fossee.in/

Acknowledgements

- **Spoken Tutorial Project is a part of the Talk to a Teacher project**
- **It is supported by the National Mission on Education through ICT, MHRD, Government of India**
- **More information on this Mission is available at:**
  http://spoken-tutorial. org/NMEICT-Intro

THANK YOU!

For more Information, visit our website http://fossee.in/