

Advanced Matrix Operations

Spoken Tutorial Project

<http://spoken-tutorial.org>

National Mission on Education through ICT

<http://sakshat.ac.in>

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21 March 2018



Learning Objectives

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- ▶ **find frobenius and infinity norm of a matrix**



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In this tutorial, you will learn to,

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



System Specifications



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► **Ubuntu Linux 16.04**



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▶ **Python 3.4.3**



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- ▶ **Python 3.4.3**
- ▶ **IPython 5.1.0**



Pre-requisite

To practise this tutorial, you should know about -



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- ▶ **Lists, arrays and accessing parts of arrays**



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- ▶ **performing basic matrix operations**



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If not, see the relevant Python tutorials on <http://spoken-tutorial.org>



flatten()



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- ▶ **flatten()** returns a copy of the array collapsed into one dimension



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- ▶ **flatten()** returns a copy of the array collapsed into one dimension
- ▶ **It can be used to convert a multidimensional matrix into a single dimension matrix**



Frobenius norm of a matrix

- It is defined as the square root of the sum of the absolute squares of its elements



Exercise 1

- Find out the Frobenius norm of the inverse 4x4 matrix.

$m =$

$\begin{bmatrix} 1, & 0, & 3, & 4, \\ 5, & 6, & 7, & 0, \\ 9, & 10, & 11, & 12, \\ 13, & 14, & 15, & 16 \end{bmatrix}$



Infinity norm



Infinity norm

- It is defined as the maximum value of sum of the absolute value of elements in each row



Exercise 2

- Find the infinity norm of the matrix \mathbf{im}



Singular Value Decomposition (SVD)

► In linear algebra,



Singular Value Decomposition (SVD)

- ▶ In linear algebra,
 - ▶ the singular value decomposition is factorization of a real or complex matrix



Summary

- ▶ Calculate the norm of a matrix using the function `norm()`
- ▶ Calculate **SVD** of a matrix using the function `svd()`



Evaluation

1. $\text{norm}(A, \text{ord}='fro')$ is the same as $\text{norm}(A)$

- ▶ True
- ▶ False



Solution

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

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- ▶ Please visit the FOSSEE Forum
<http://forums.fossee.in/>
- ▶ Choose the Software and post your question.



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- ▶ 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
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