Least Square Fit

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

http://sakshat.ac.in
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Learning Objectives

► **Generate the least square fit line for a given set of points**

System Specifications

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▶ **Ubuntu Linux 16.04**

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▶ **`Python 3.4.3`**

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- **Ubuntu Linux 16.04**
- **Python 3.4.3**
- **IPython 5.1.0**

Pre-requisite

▶ **Using plot interactively**

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▶ **Loading data from files**

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- ▶ **Using arrays and matrices**

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▶ **Theoretical knowledge of least square method**

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

► **Please download the file pendulum.txt from the Code files link of this tutorial**

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- ▶ **Save it in the current working directory**

► **Generate a least square fit line for L v/s t^2 using the data in the file pendulum.txt**

► **Fit a line through points for the equation** $T^2 = m * L + c$

Least Square Fit line

▶ **Fit a line through points for the equation** $T^2 = m * L + c$

▶ **where m represents the slope of the line and c represents the intercept of the line**

Least Square Fit line

▶ **Fit a line through points for the equation** $T^2 = m * L + c$

▶ **where m represents the slope of the line and c represents the intercept of the line**

▶ **We will obtain m and c using linear regression**

▶ **First generate the two matrices tsq and A**

Steps for Least Square Fit line

▶ **First generate the two matrices tsq and A**

▶ **Use the lstsq function to find the values of the slope m and intercept c**

Matrix Formulation

- **In matrix form, the equation can be represented as tsq = A * p**

Matrix Formulation

- In matrix form, the equation can be represented as tsq = A * p
- tsq is a one-dimensional array of size n

tsq = A * p
- ▶ **A is a matrix of size nx2**

Matrix Formulation

tsq = A * p
- **A is a matrix of size nx2**
  - **The first column will contain the length of the pendulum**

tsq = A * p
- **A is a matrix of size nx2**
  - The first column will contain the length of the pendulum
  - The second column will contain the number 1

Matrix Formulation

tsq = A * p

- **p is a one-dimensional array of size 2**

Matrix Formulation

tsq = A * p

- ▶ **p** **is a one-dimensional array of size 2**

  - ▶ **The first row contains the slope of the line**

tsq = A * p

- **p is a one-dimensional array of size 2**
  - The first row contains the slope of the line
  - The second row contains the intercept of the line

p is $\begin{bmatrix} m \\ c \end{bmatrix}$

We need to find p to plot the line

Summary

▶ **Generate a least square fit using matrices**

▶ **Use the function lstsq() to generate a least square fit line**

Evaluation

1. **What does ones_like([1, 2, 3]) produce**
   - `array([1, 1, 1])`
   - `[1, 1, 1]`
   - `[1.0, 1.0, 1.0]`
   - **Error**

Solution

1. **`array([1, 1, 1])`**

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

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▶ **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/