Python Machine Learning: The 5th Book Circle

Data Compression Algorithm: Principle Component Analysis and Linear Discriminant Analysis

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Disclaimer

All opinions and statements in this presentation are mine and do not in any way represent the company

Any comment or correction of error is welcome, please contact me

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Acknowledgement

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Here I would like to thank for Binru Huang and Caj Zell in my group. The discussion between us made me understanding of PCA/LDA deeper

The Fifth Book Circle of Python Machine Learning

In this presentation belongs to **algorithm** part of the book

- If you have time, please read the book first. This slide could be used as complementary resource for the book
- We will try to go through every algorithm in chapter 5 of book Python Machine Learning, also show the mathematics behind each algorithm. But we only use the mathematics conclusion to explain algorithm rather than showing mathematical derivation
- All of us need to debug the python code, in order to get practice of implementing machine learning algorithm

Overview

Algorithms in Chapter 5

From this slide we go through the data compression/dimension reduction algorithms PCA(unsupervised) and LDA(supervised) in chapter 5

Data set ($\mathbf{y}$, $\mathbf{X}$)

Suppose we have L samples, each sample has D features/dimensions(So the input $\mathbf{X}$ is L by D matrix, label $\mathbf{y}$ is L by 1 vector). If we only consider the l^{th} data sample pair, $\mathbf{x}_l$ is 1 by D vector which represents D features/dimension for l^{th} training data sample, $\mathbf{w}$ is D by 1 vector which represents weight and y_l represents the label of l^{th} data sample

Outline for Section 1

The Main Idea Behind PCA

Model The Idea as a Least Square Error Problem

Maximize Variance Problem to Replace of LS Problem

Eigen Decomposition: Solution to Maximize Variance Problem

SVD

SVD: The Other View of PCA

MIMO

OFDM

Outline for Section 2

LDA

Outline for Section 3

Kernel PCA for Nonlinear Mapping

Outline for Section 4

Conclusion

Conclusion

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References

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Question?