Deep Learning - Theory and Practice

Basics of Machine Learning

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http://leap.ee.iisc.ac.in/sriram/teaching/DL20/

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Established 1911

INDIAN INSTITUTE OF SCIENCE
भारतीय विज्ञान संस्थान

Matrix Derivatives

$$\left(\frac{\partial \mathbf{a}}{\partial x}\right)_i = \frac{\partial a_i}{\partial x}$$

$$\left(\frac{\partial x}{\partial \mathbf{a}}\right)_i = \frac{\partial x}{\partial a_i}$$

$$\left(\frac{\partial \mathbf{a}}{\partial \mathbf{b}}\right)_{ij} = \frac{\partial a_i}{\partial b_j}.$$

Principal Component Analysis

- First M eigenvectors of data covariance matrix

$$S = \frac{1}{N}\sum_{n=1}^{N}(\mathbf{x}_n - \bar{\mathbf{x}})(\mathbf{x}_n - \bar{\mathbf{x}})^T$$

- Residual error from PCA

$$J = \sum_{i=M+1}^{D} \lambda_i$$

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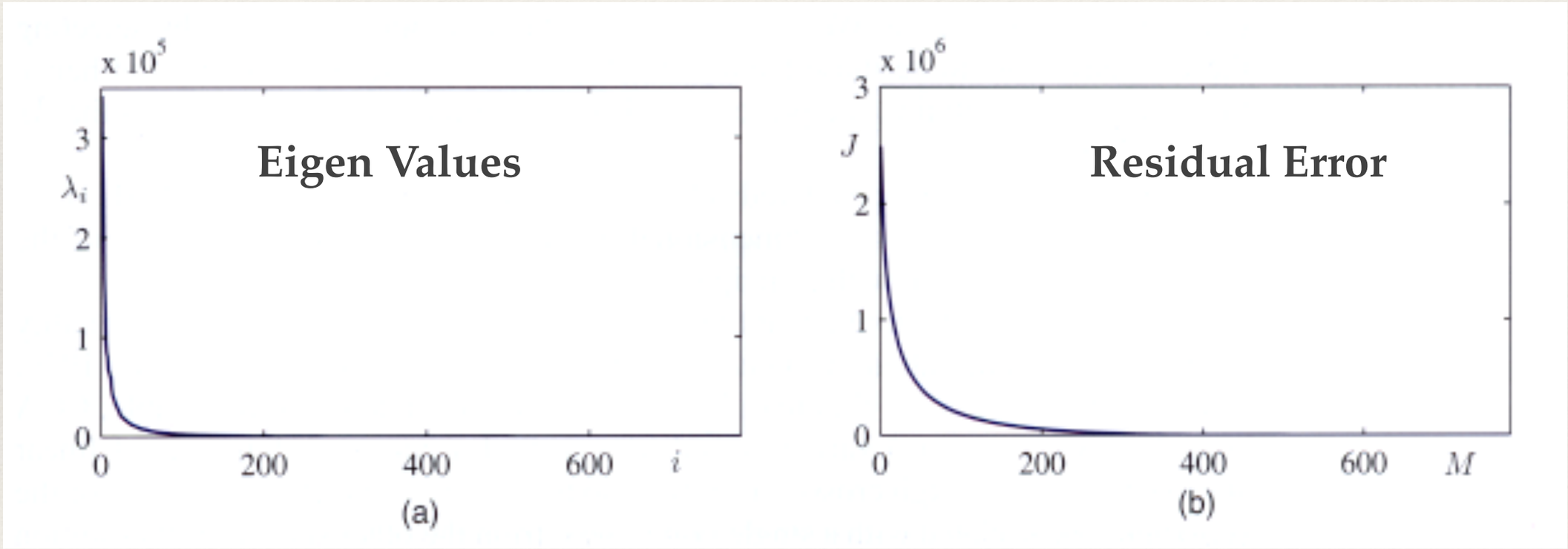
PCA



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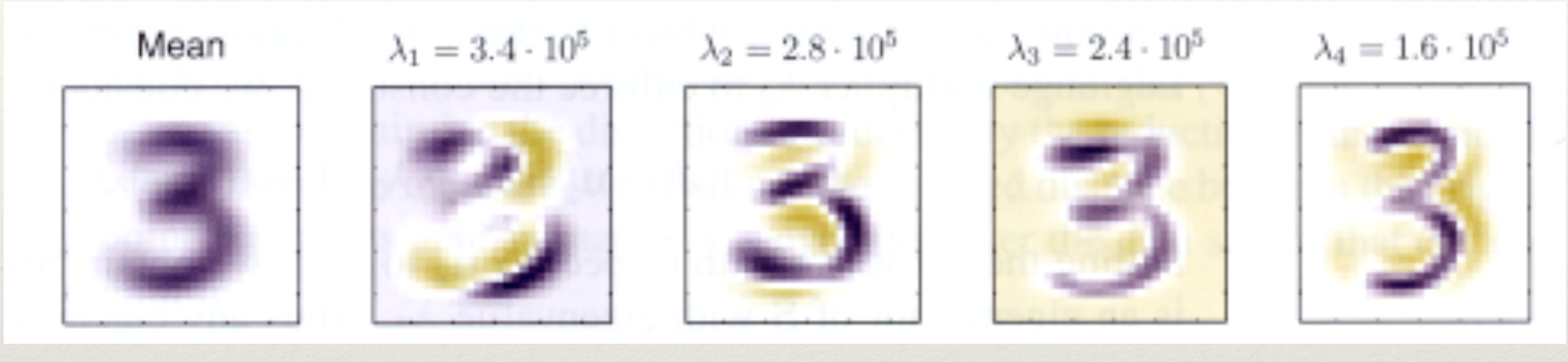
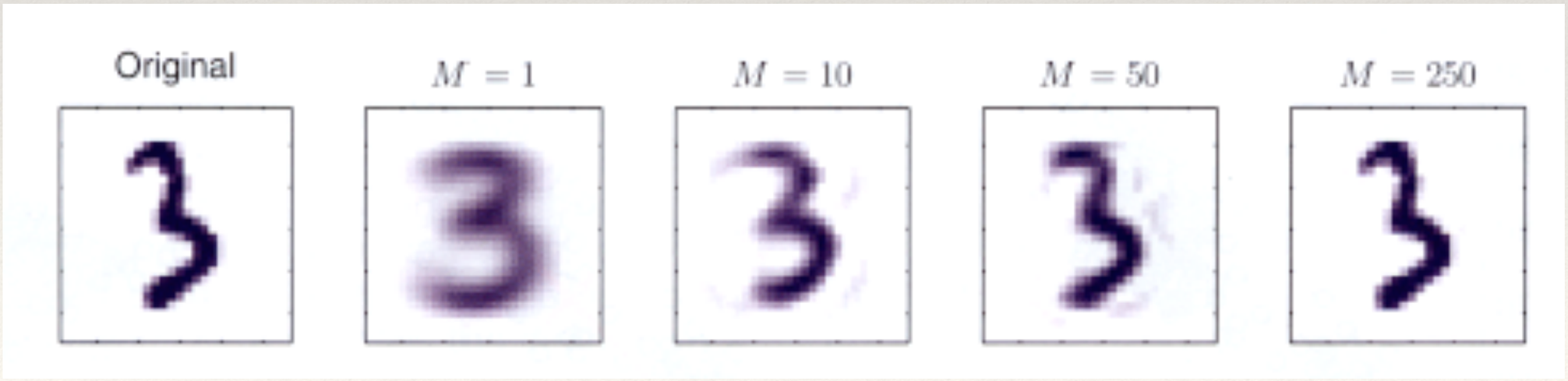
PCA - Reconstruction

Eigenvectors



PCA - Reconstruction



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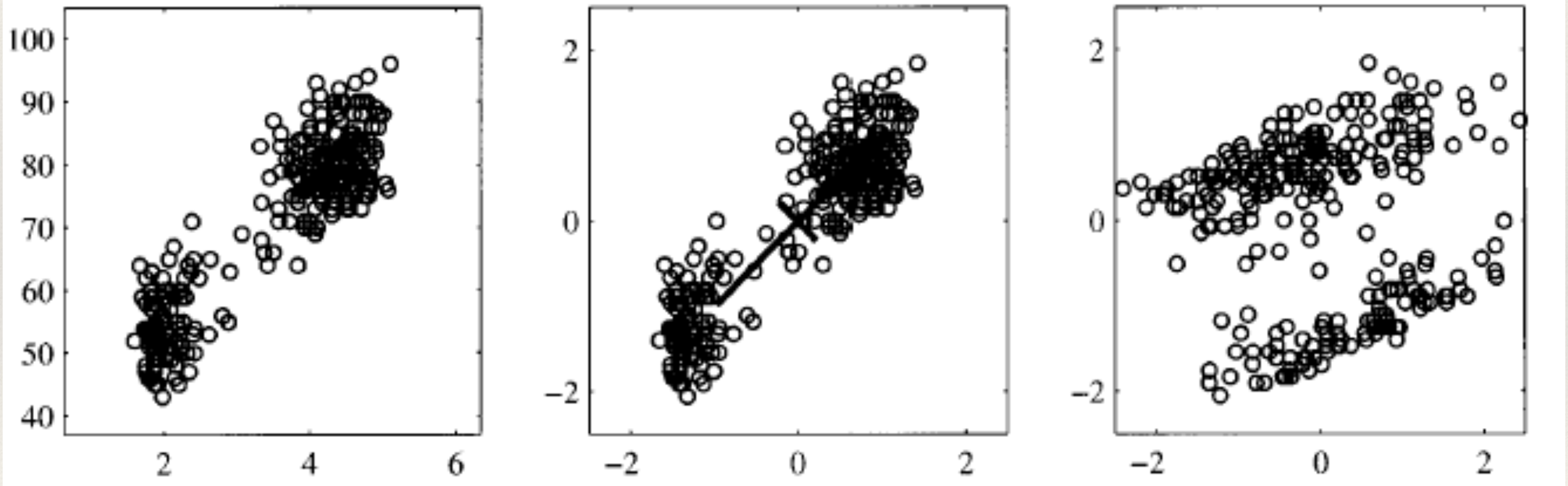
Whitening the Data

Original Data **Standardized Data** **Whitened data**



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