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Dimensionality Reduction in Machine Learning

1. **Introduction to Dimensionality Reduction**
    - What is Dimensionality Reduction?
    - Why is Dimensionality Reduction required?
    - Common Dimensionality Reduction Techniques

2. **Curse of Dimensionality**
    - Risk of Overfitting
    - Strength and Relationship between two variables
        i. Spearman Correlation (Assume linear relation between variable)
        ii. Pearson Correlation

3. Collinearity & Multi Collinearity

- Definition, Why is it a problem ?
- Technique to check collinearity : VIF

4. Variation Inflation Factor (VIF)

- Detect Multicollinearity in the dataset

5. Feature Selection Techniques

- Missing Value Ratio
- Missing Value Ratio Implementation
- Low Variance Filter
- Low Variance Filter Implementation

6. FEATURE SELECTION I - Selecting for Feature Information

- The curse of dimensionality
- Train - test split
- Fitting and testing the model

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7. FEATURE SELECTION II - Selecting for Model Accuracy

- Selecting features for model performance
- Building a diabetes classifier
- Manual Recursive Feature Elimination

8. Factor Based Feature Extraction Techniques

- Introduction to the Module
- Factor Analysis

9. Dimensionality Reduction Overview

- Problem of Multicollinearity, lead to Overfitting
- Dimensionality reduction reduces dimension and not lose any information
- Definition, Type of Dimensionality Reduction Technique
    i. PCA
    ii. Factor Analysis
    iii. LDA
    iv. T-sne

10. FEATURE EXTRACTION

- Manual feature extraction I
- Manual feature extraction II
- Principal component intuition
- Principal component analysis

11. Projection Based Feature Extraction Techniques

- Understanding Projection
- ISOMAP
- t- Distributed Stochastic Neighbor Embedding (t-SNE)

- UMAP

12. LDA

- Linear Discriminant Analysis
- Used for Supervised Classification problem
- Steps by steps to solve LDA

13. PCA

- Principal Component Analysis
- Used for Unsupervised Learning problem
- Example of PCA in depth

14. Eigen Value and Eigen Vector

- Definition and Example
- Steps by steps to solve PCA

15. Dimensionality Reduction Assumptions

- Assumption of Each Dimensionality Reduction Algorithm

16. Factor Analysis

- Definition, Steps and Example
- Steps by steps to solve Factor Analysis