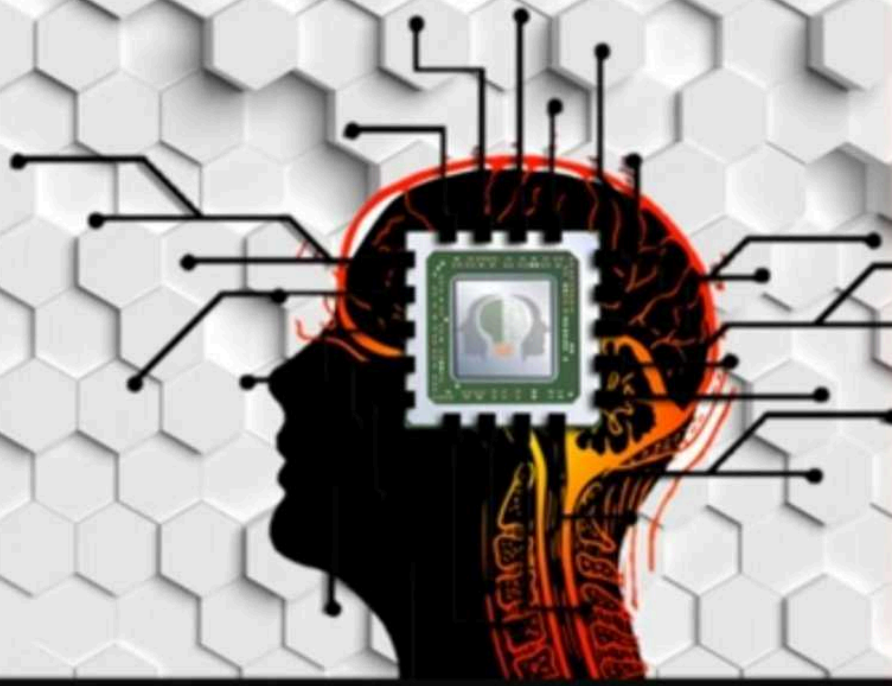
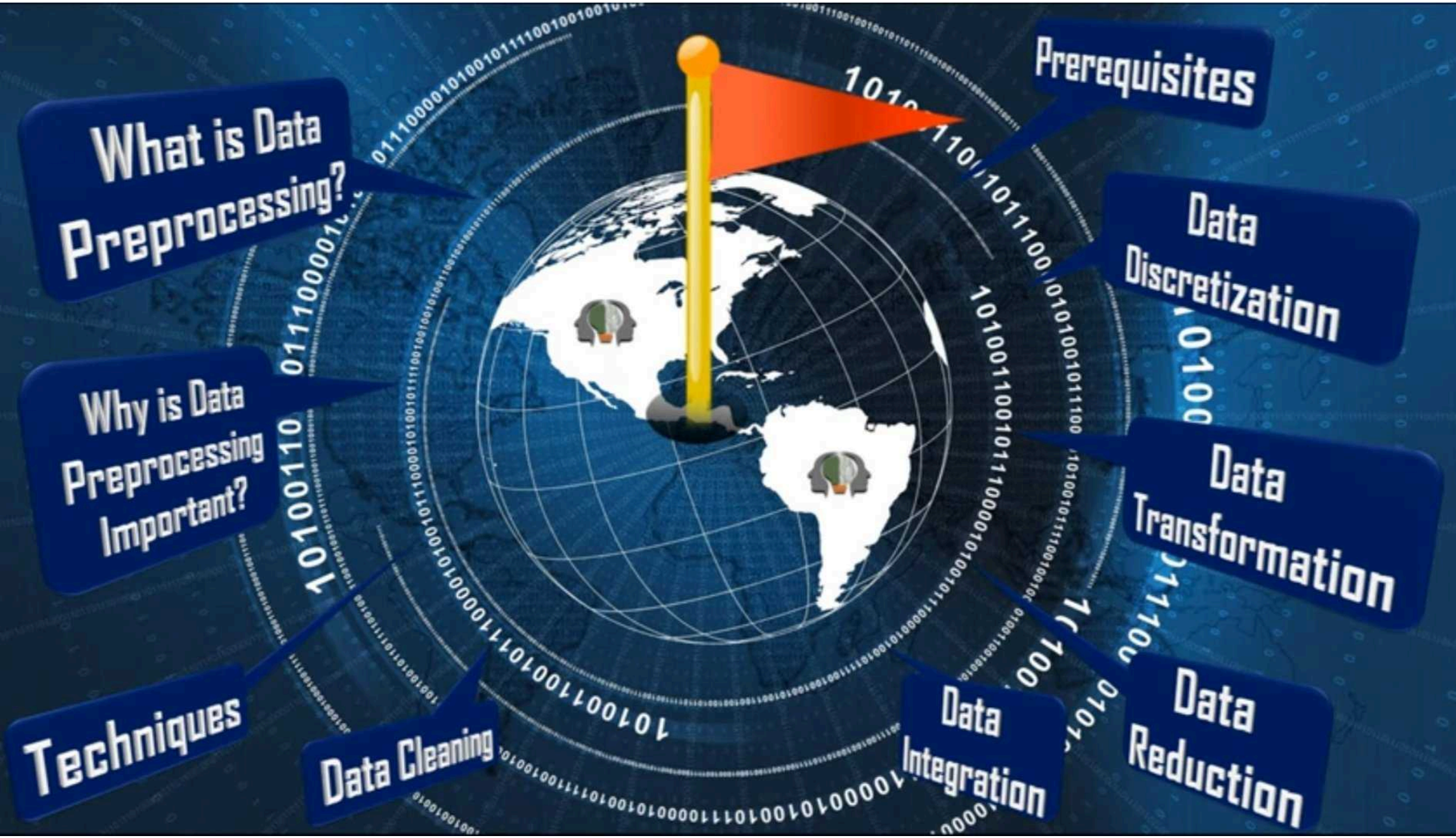
Data Preprocessing & Feature Engineering Tutorial

Introduction of Data Preprocessing - Techniques



Machine Learning & Data Science: Hands-on Python Course in Hindi


What is Data Preprocessing?
Why is Data Preprocessing Important?
Techniques
Data Cleaning
Data Integration
Data Reduction
Data Transformation
Data Discretization
Prerequisites

What is Data Preprocessing?

- Data
  - Text
  - Image
  - Video
  - Audio

- Data Preprocessing is a process to convert raw data into meaningful data using different techniques.

Why is Data Preprocessing Important?

- **Data in the real world is dirty**
  - Incomplete
  - Noisy
  - Inconsistent
  - Duplicate
- **Data Quality Elements**
  - Accuracy
  - Completeness
  - Consistency
  - Believability
  - Interpretability
- **Machine Learning algorithm follow the rule *(learn like Kids)***
  - GIGO – Garbage In Garbage Out

Steps/Technique in Data Preprocessing

- **Major steps in Data Preprocessing**
  - **Data Cleaning**
  - **Data Integration**
  - **Data Reduction**
  - **Data Transformation**
  - **Data Discretization**

What is Data Cleaning?

- **Data Cleaning means fill in missing values, smooth out noise while identifying outliers, and correct inconsistencies in the data.**

CO2 emissions (metric tons per capita)

Country Name	2000	2001	2002
United States	20.17875	19.63651	NAN
United Kingdom	9.199549	9.233175	8.904123
India	0.97987	NAN	0.967381
China	2.696862	2.742121	3.007083
Russian Federation	NAN	10.6696	10.7159
Australia	17.20061	16.73337	17.37045

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What is Data Integration?

- **Data Integration** is a technique to merges data from multiple sources into a coherent data store, such as a data warehouse.

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What is Data Reduction?

- **Data Reduction** is a technique use to reduce the data size by aggregating, eliminating redundant features, or clustering, for instance.

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What is Data Transformation?

- **Data Transformation means data are transformed or consolidated into forms appropriate for ML model training, such as normalization, may be applied where data are scaled to fall within a smaller range like 0.0 to 1.0.**
  - **Aggregation**
  - **Feature type conversion:**
  - **Normalization**
  - **Attribute/feature construction**

What is Data Discretization?

- **Data Discretization technique transforms numeric data by mapping values to interval or concept labels.**
- **It can be used to reduce the number of values for a given continuous attribute by dividing the range of the attribute into intervals.**
- **Discretization techniques include -**
  - **Binning**
  - **Histogram analysis**
  - **Cluster analysis**
  - **Decision-tree analysis**
  - **Correlation analysis**

Ex-

Age: 1,2,3,4,5,6,7,8,9

Output>>>

Age: 1-3, 4-6, 7-9

Prerequisites for Data Preprocessing

- **Python Libraries**
  - NumPy
  - Pandas
  - Matplotlib
  - Seaborn
  - Scikit Learn
- **Mathematics**
  - Statistics
  - Probability
  - Calculus
  - Linear Algebra

- **Software**
  - Anaconda
    - Jupyter Notebook & Spyder
- **Learning Platform**
  - www.YouTube.com/IndianAIProduction