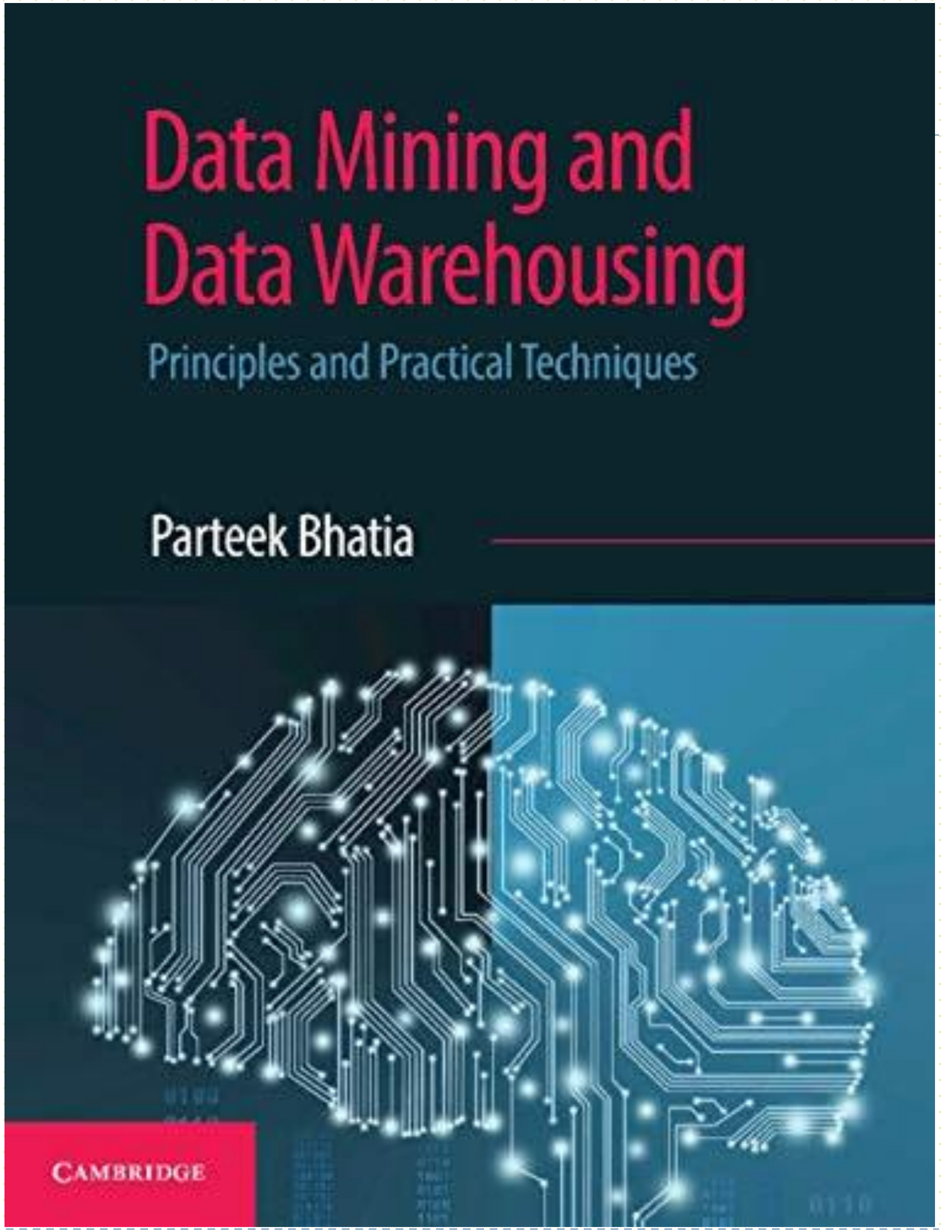
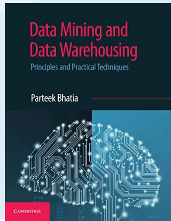
Chapter 4
Data Preprocessing



CHAPTER OBJECTIVES

1. To understand the need for data preprocessing.
2. To identify different phases of data preprocessing such as data cleaning, data integration,
3. Data transformation and data reduction



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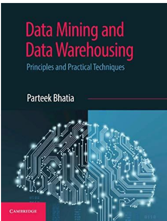
Need for Data Processing

- Data preprocessing is a data mining technique that involves transformation of raw data into an understandable format, because real world data can often be incomplete, inconsistent or even erroneous in nature.
- Data preprocessing resolves such issues. Data preprocessing ensures that further data mining process are free from errors. It is a prerequisite preparation for data mining, it prepares raw data for the core processes.



Data Pre-processing example

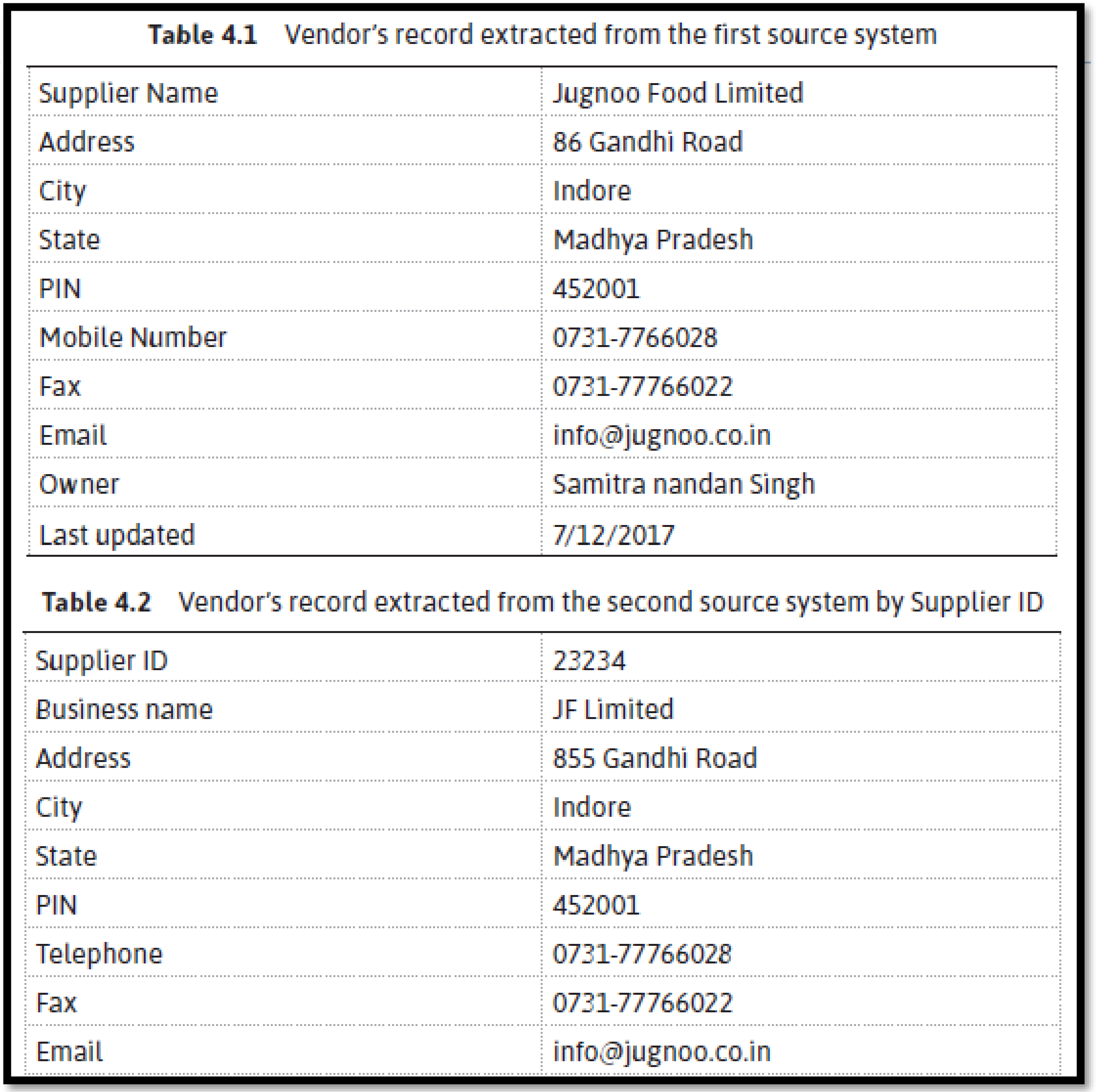


Table 4.1 Vendor's record extracted from the first source system

Supplier Name	Jugnoo Food Limited
Address	86 Gandhi Road
City	Indore
State	Madhya Pradesh
PIN	452001
Mobile Number	0731-7766028
Fax	0731-77766022
Email	info@jugnoo.co.in
Owner	Samitra nandan Singh
Last updated	7/12/2017

Table 4.2 Vendor's record extracted from the second source system by Supplier ID

Supplier ID	23234
Business name	JF Limited
Address	855 Gandhi Road
City	Indore
State	Madhya Pradesh
PIN	452001
Telephone	0731-77766028
Fax	0731-77766022
Email	info@jugnoo.co.in

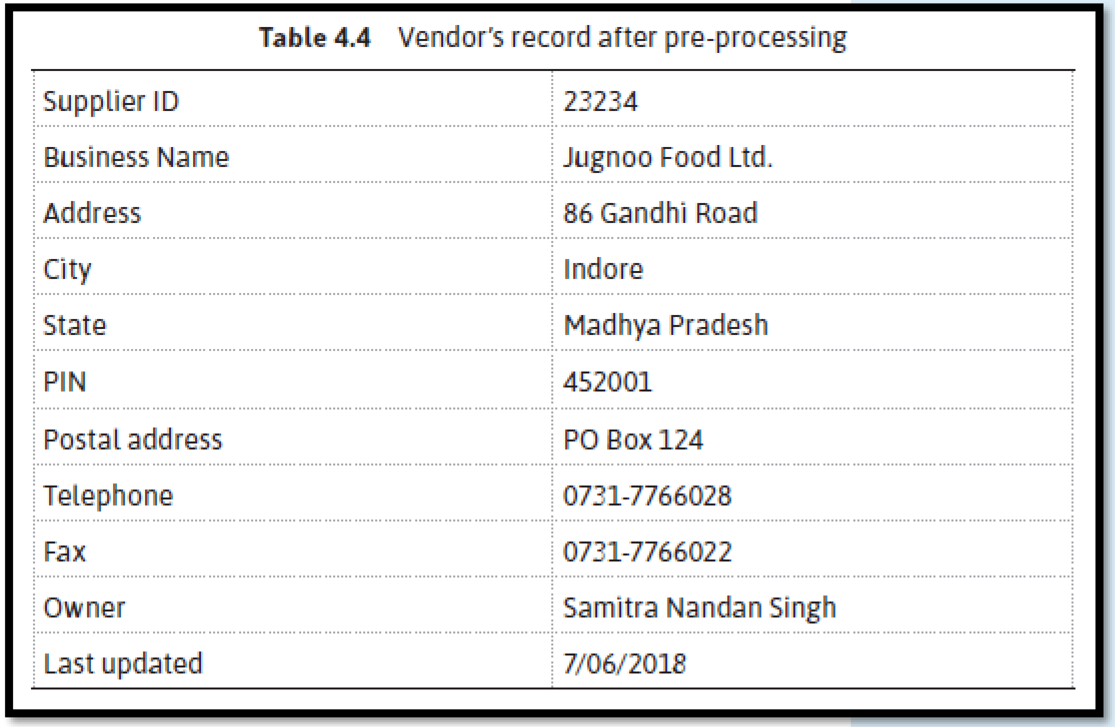
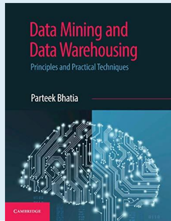
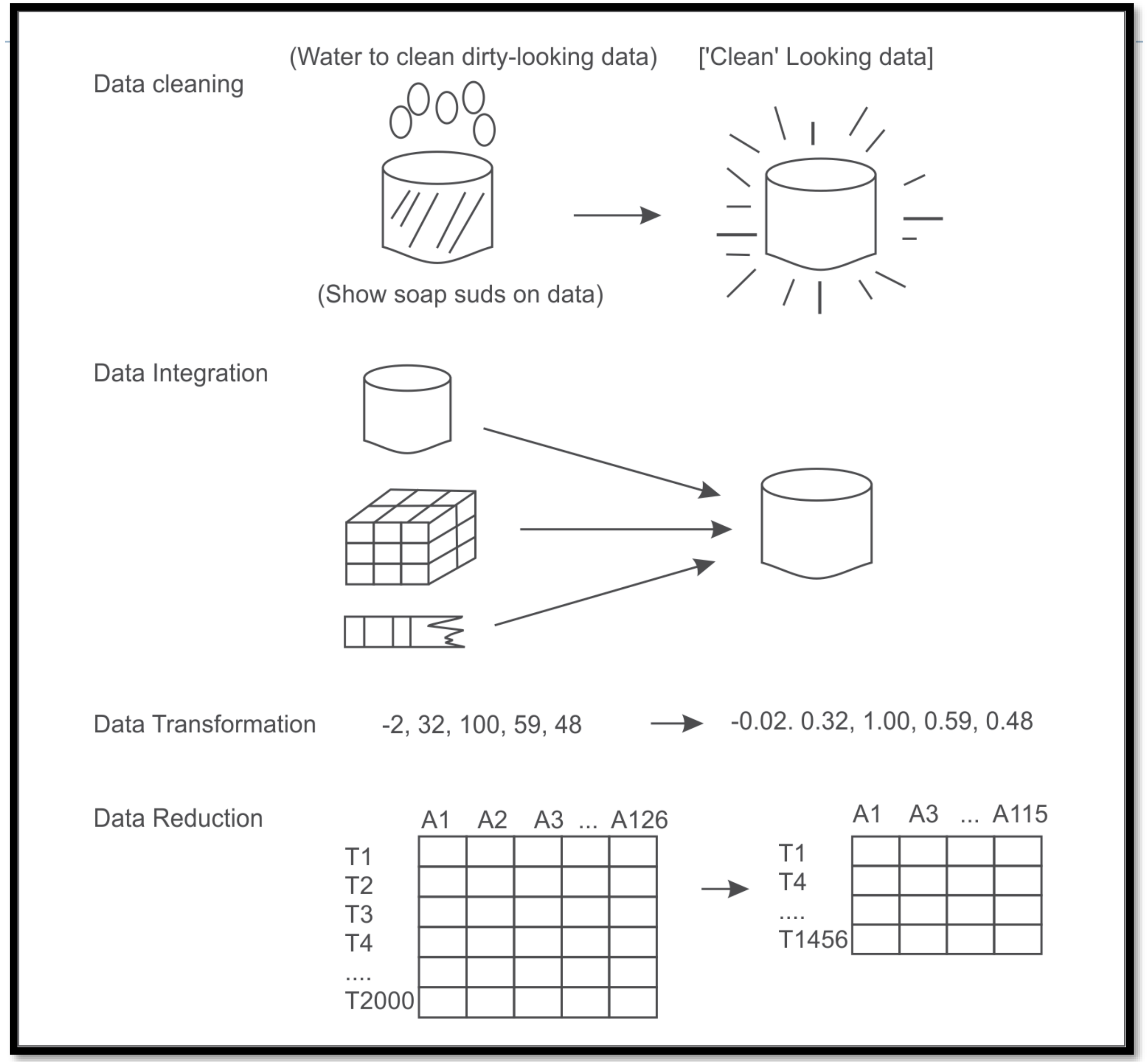


Table 4.4 Vendor's record after pre-processing

Supplier ID	23234
Business Name	Jugnoo Food Ltd.
Address	86 Gandhi Road
City	Indore
State	Madhya Pradesh
PIN	452001
Postal address	PO Box 124
Telephone	0731-7766028
Fax	0731-7766022
Owner	Samitra Nandan Singh
Last updated	7/06/2018



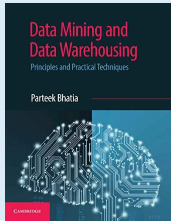
Data Pre-processing Methods



Raw data is highly vulnerable to missing values, noise and inconsistency and the quality of data affects the data mining results.

The various stages in which data preprocessing is performed:

1. Data Cleaning
2. Data Integration
3. Data Transformation
4. Data Reduction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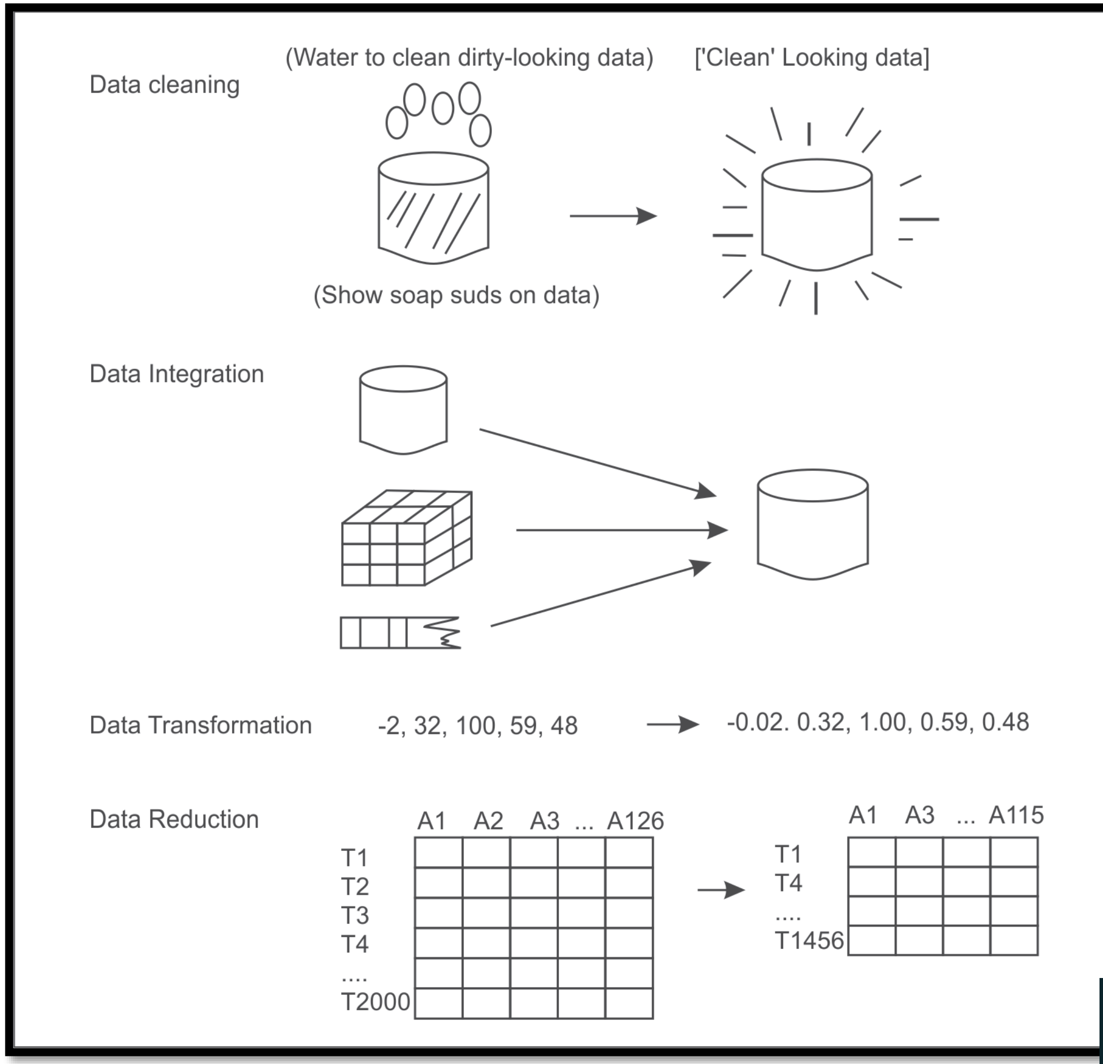
Data Pre-processing Methods

Data Cleaning

- Raw data or noisy data goes through the process of cleansing first. In Data cleansing missing values are filled, noisy data is smoothened, inconsistencies are resolved, outliers are identified and removed in order to clean the data.



Data cleaning

(Water to clean dirty-looking data)

['Clean' Looking data]

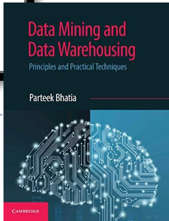
(Show soap suds on data)

Data Integration

Data Transformation

-2, 32, 100, 59, 48 → -0.02. 0.32, 1.00, 0.59, 0.48

Data Reduction



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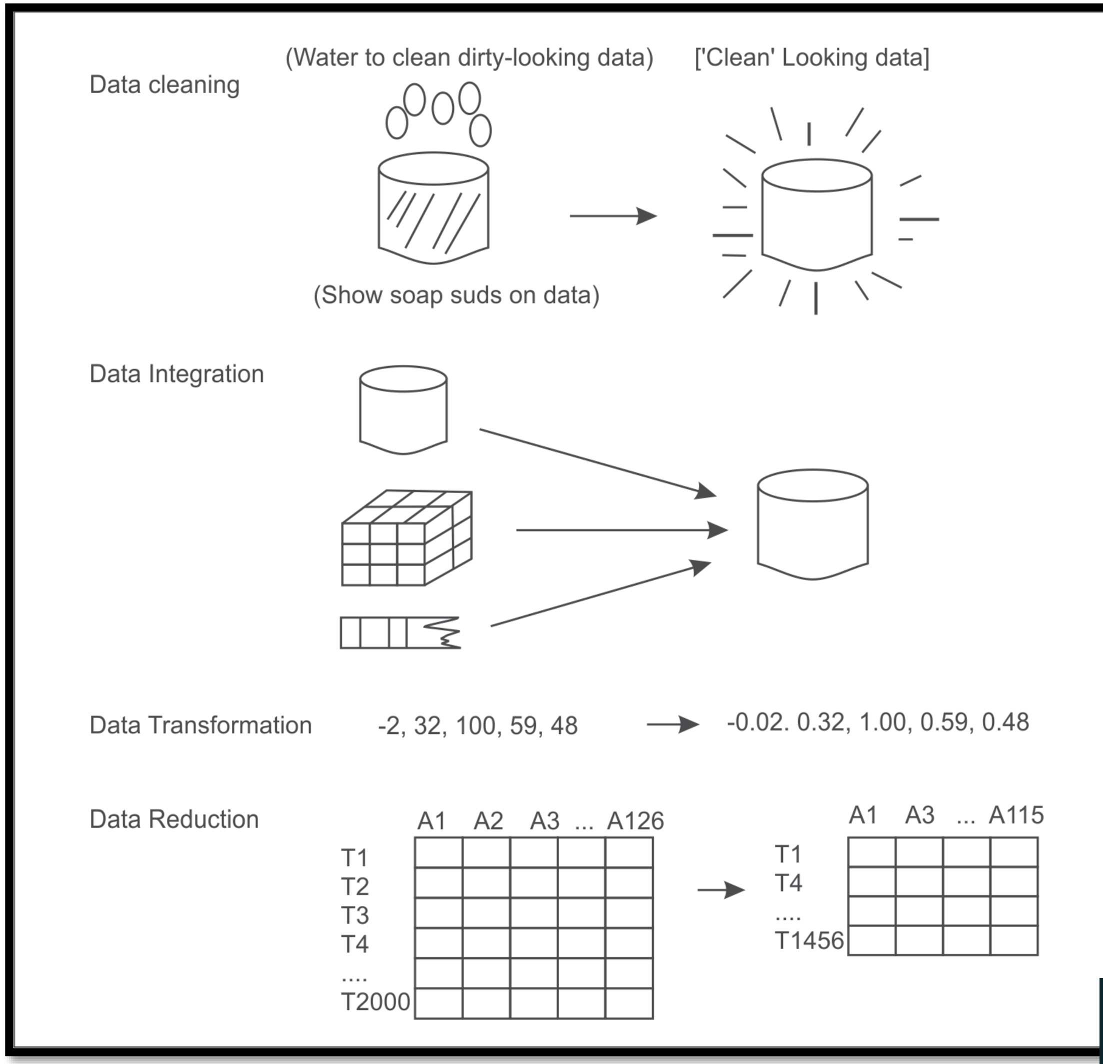
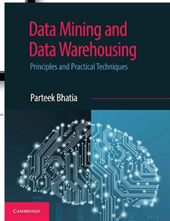
Data Pre-processing Methods

Operations Performed during Data Cleaning

- Handling of Missing Values
- Handling of Noisy Data
- Handling of Inconsistent data

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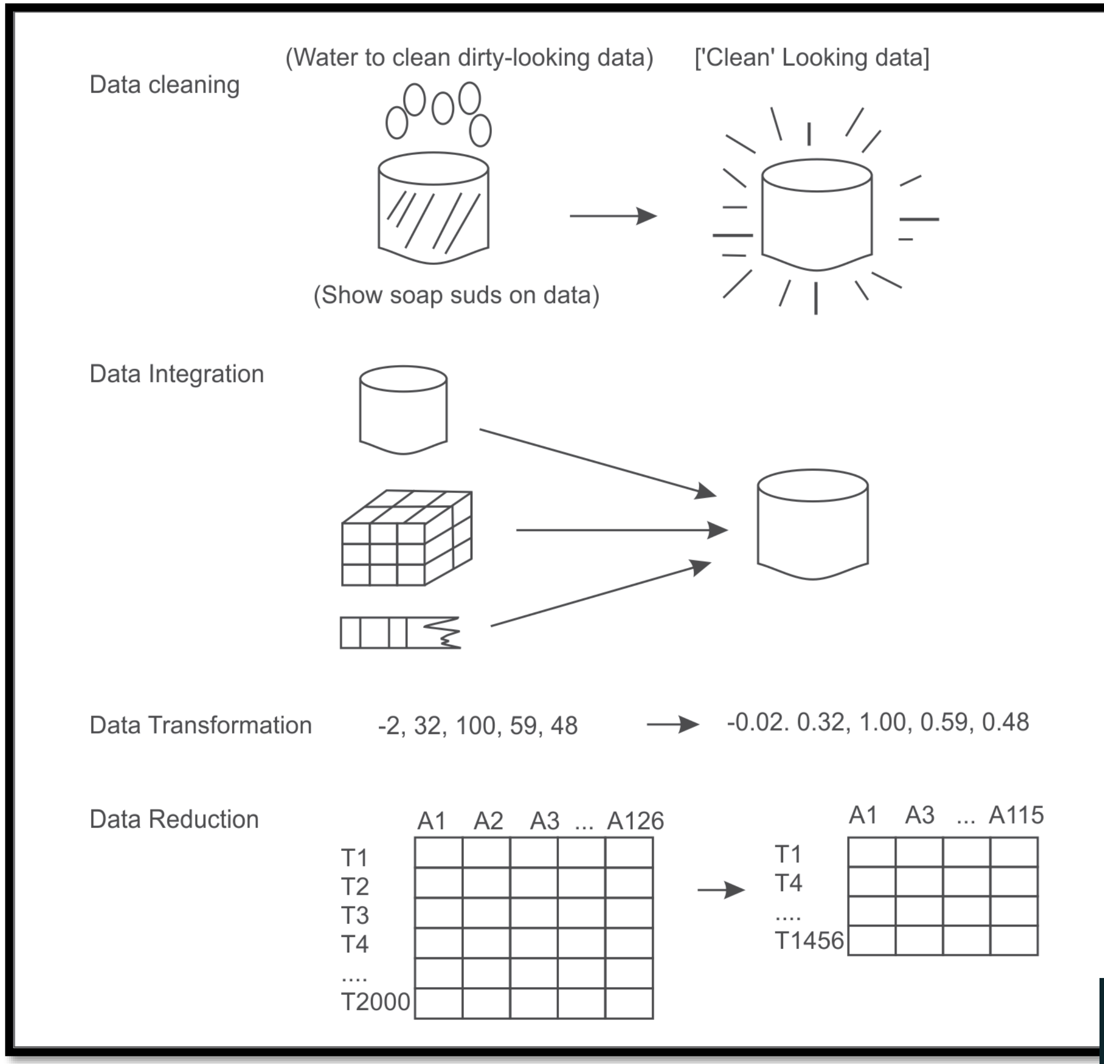
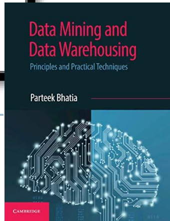
Data Pre-processing Methods

Data Integration

- One of the most necessary steps taken during the data analysis is Data Integration. Data integration is a method which combines data from plethora of sources (such as multiple databases, flat files or data cubes) into a unified data store.

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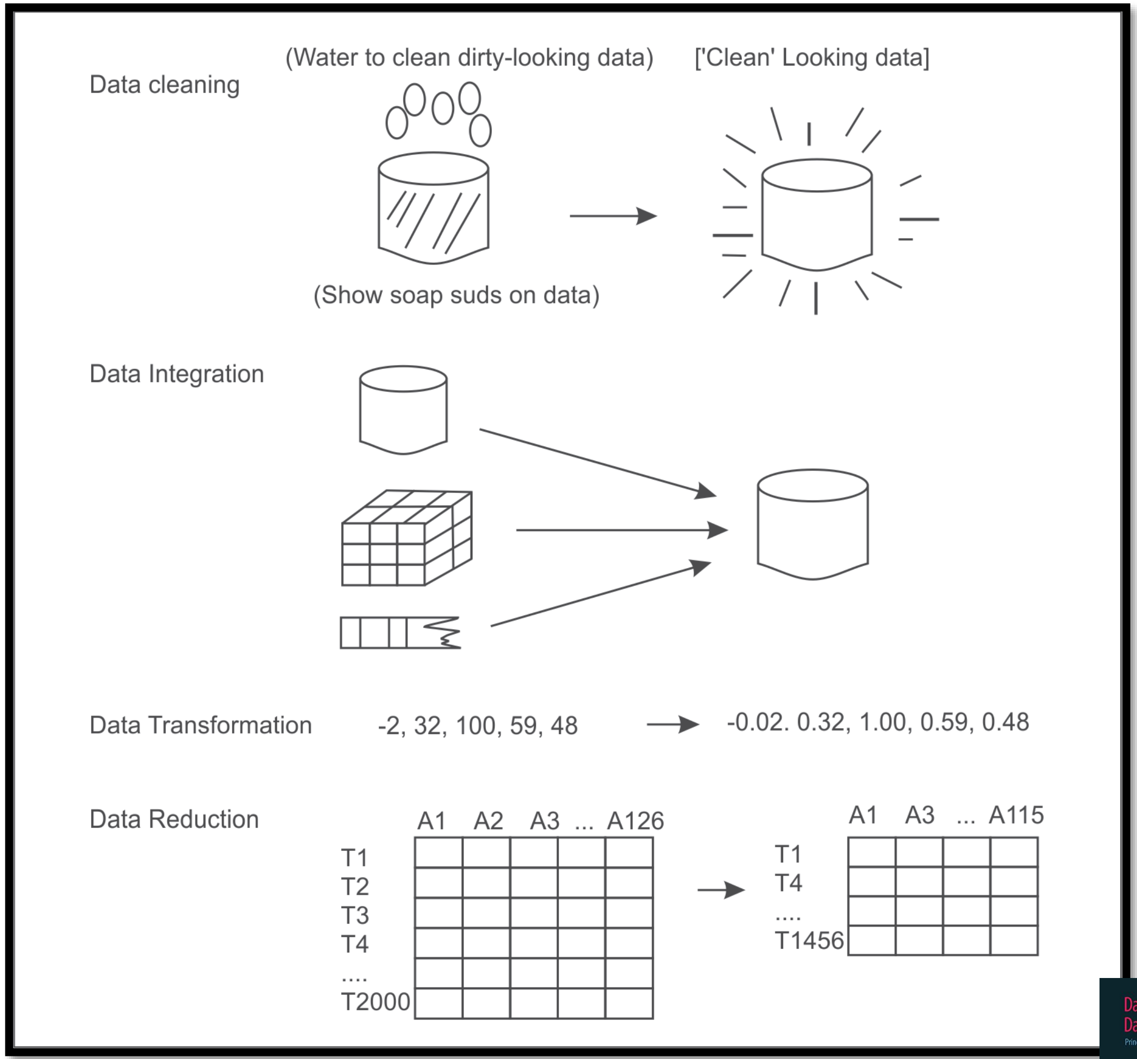
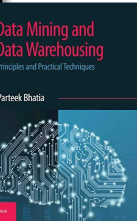
Data Pre-processing Methods

Data Transformation

- Sometimes, the value of one attribute may be small as compared to other attributes, then in this scenario, that attribute will not have much influence on mining of information, since the values of this attribute were smaller than other attributes and the variation within the attribute will also be small.
- Normalization and Standardization are most popular and widely used Data Transformation methods.

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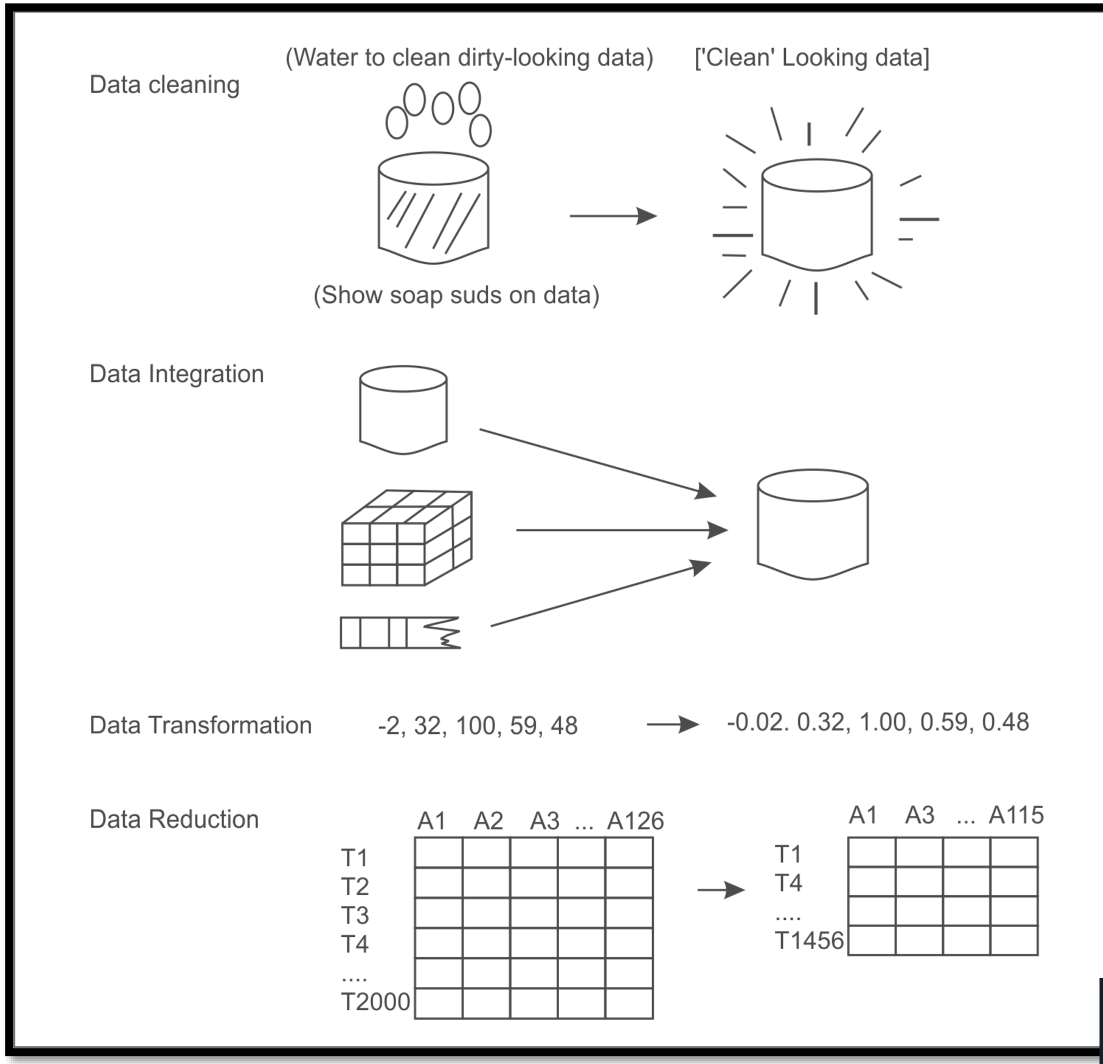
Data Pre-processing Methods

Data Reduction

- It is often seen that, when the complex data analysis and mining processes are carried out over humongous data sets, they cost a very long time, henceforth making the whole data mining or analysis process unsuitable (or not feasible). Data reduction techniques come for the rescue in such scenarios. Using data reduction techniques dataset could be represented in a reduced manner without actually compromising the integrity of original data.



Data cleaning

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Data Integration

Data Transformation

-2, 32, 100, 59, 48 → -0.02. 0.32, 1.00, 0.59, 0.48

Data Reduction

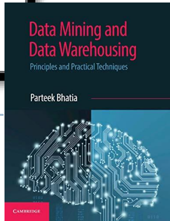
A1 A2 A3 ... A126

T1
T2
T3
T4
....
T2000

→

A1 A3 ... A115

T1
T4
....
T1456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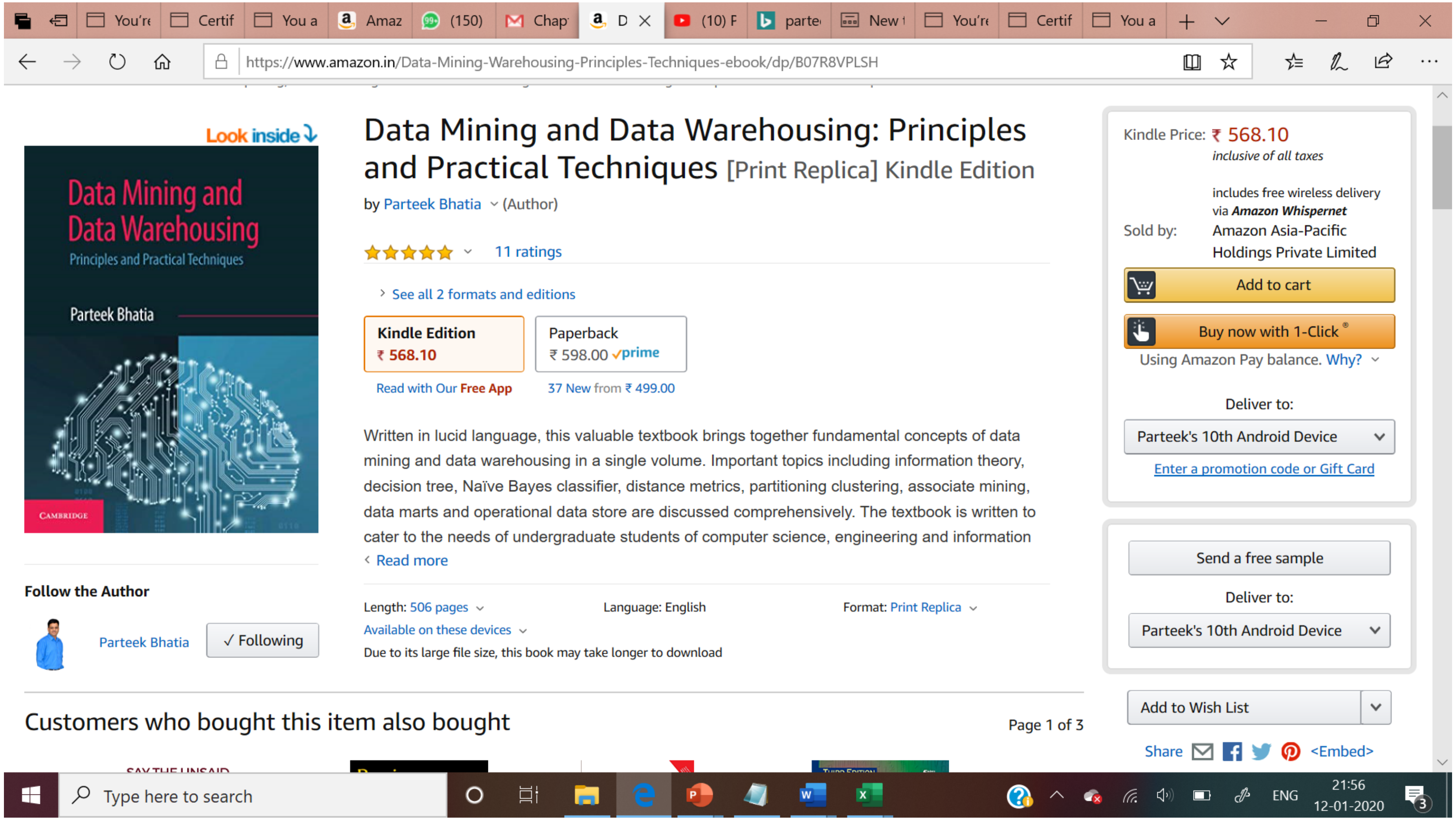

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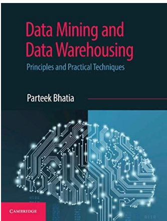

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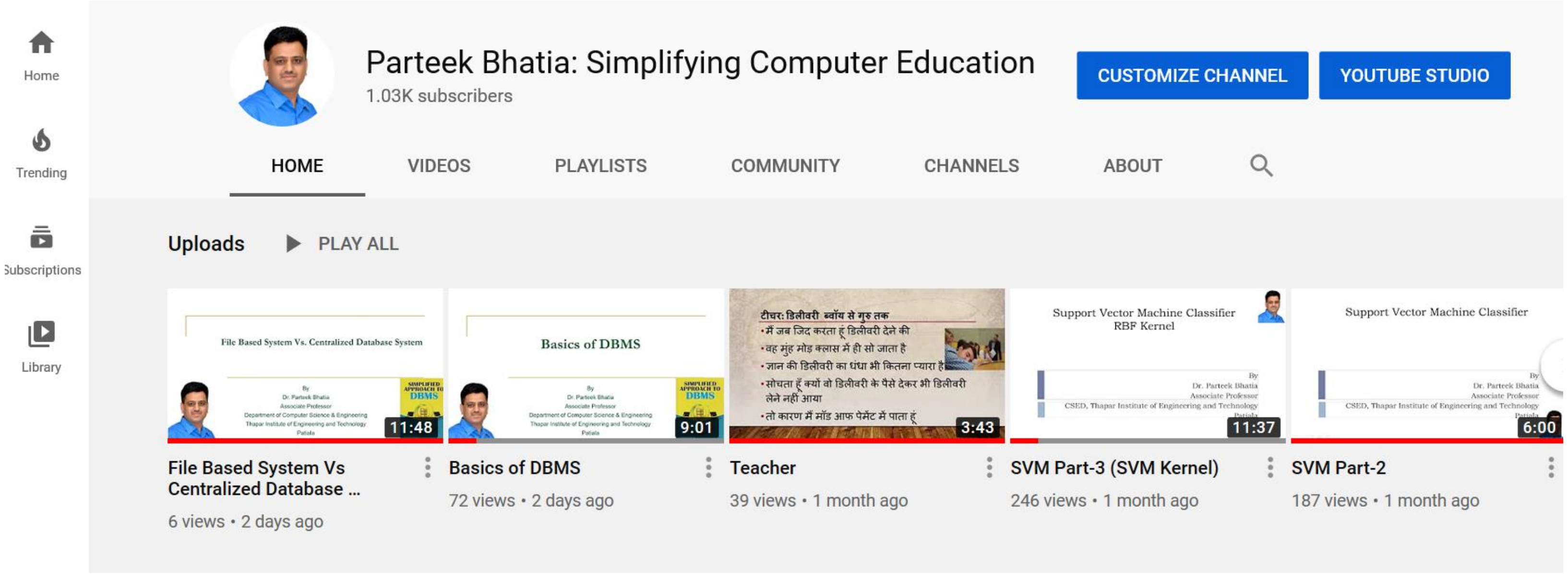

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ABOUT THE INSTRUCTOR

Dr. Parteek Bhatia is Associate Professor in the Department of Computer Science and Engineering at Thapar Institute of Engineering and Technology, Patiala. He has more than 18 years of academic experience.He has authored several books in various areas of computer science. His book - Simplified approach to DBMS is one of the bestseller. Currently, he is working on plethora of Projects which are funded by Department of Science and Technology, CSIR and other funding agencies of India.

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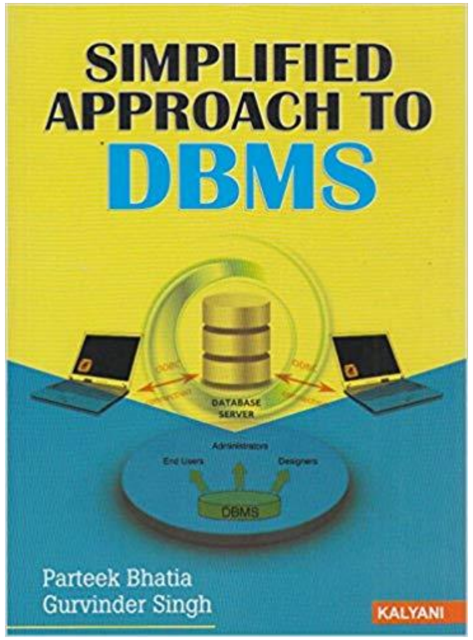

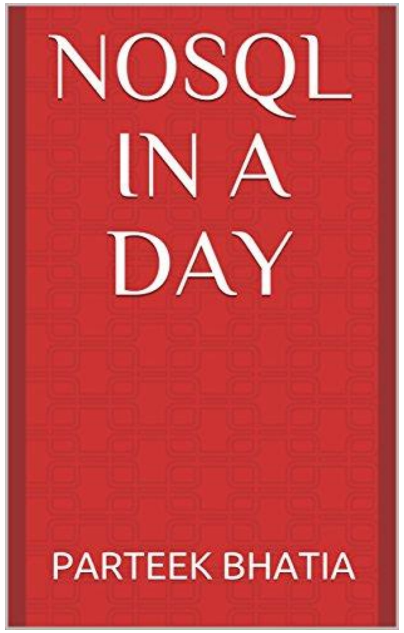

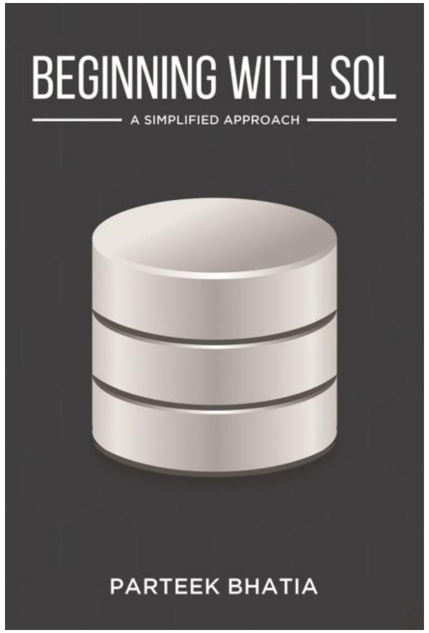

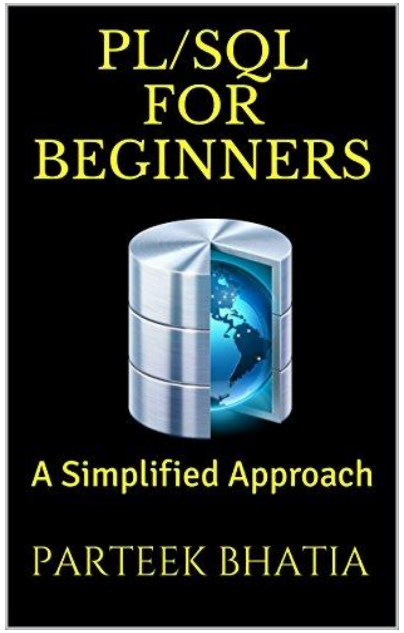

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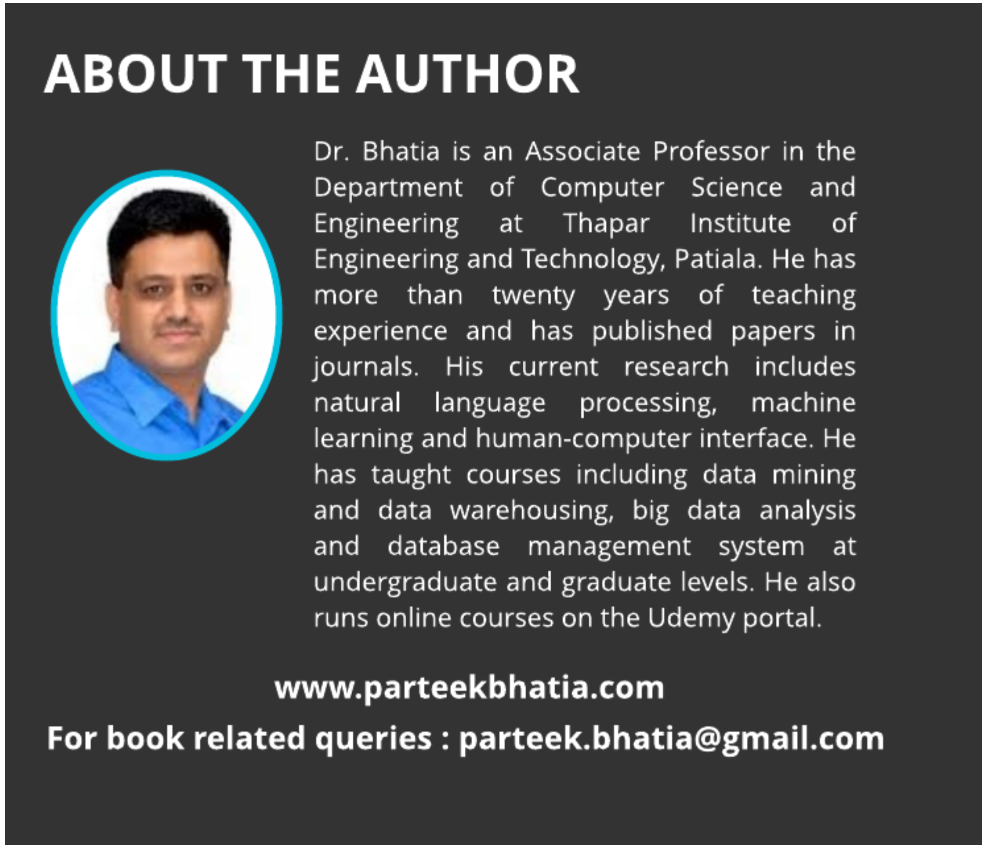

ABOUT THE AUTHOR

Dr. Bhatia is an Associate Professor in the Department of Computer Science and Engineering at Thapar Institute of Engineering and Technology, Patiala. He has more than twenty years of teaching experience and has published papers in journals. His current research includes natural language processing, machine learning and human-computer interface. He has taught courses including data mining and data warehousing, big data analysis and database management system at undergraduate and graduate levels. He also runs online courses on the Udemy portal.

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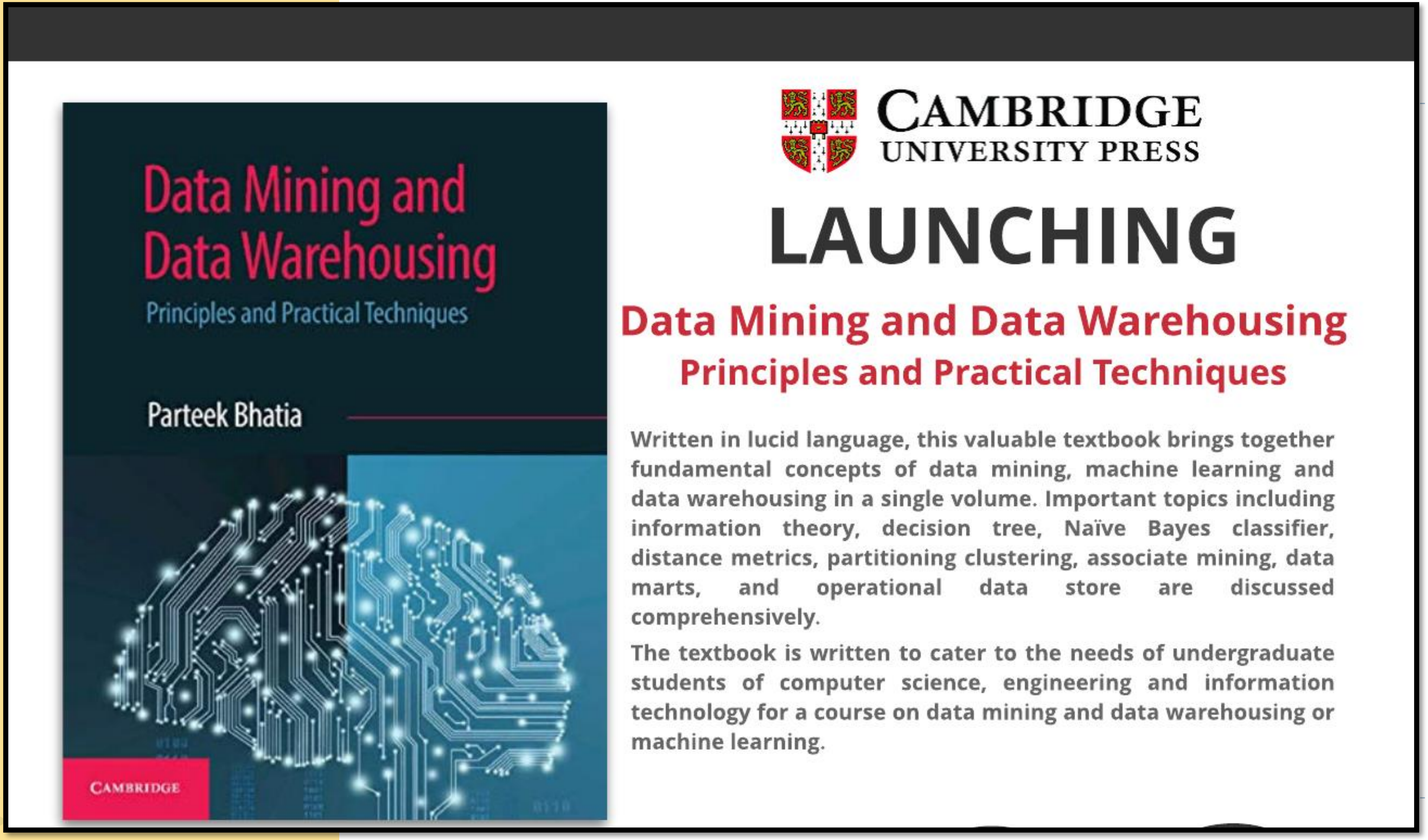

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