Chapter: 1
Fundamentals of DBMS

By

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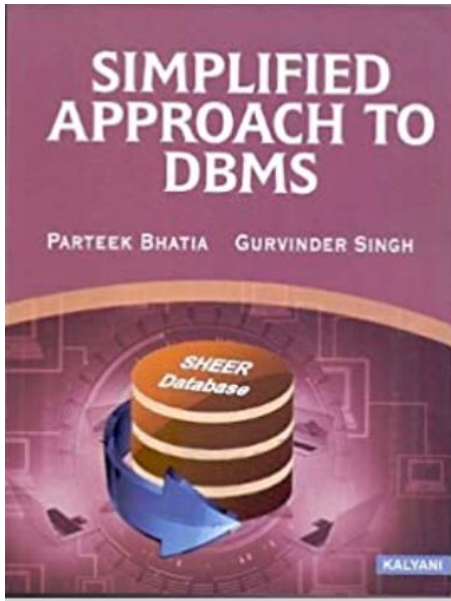
Patiala

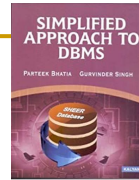


D **Data**

B **Base**

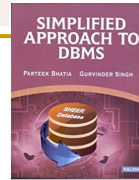
M **Management**

S **System**



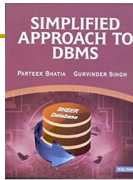
Understanding Data and Information

Data	Information
Data is raw facts and figures	Processed form of data
23 is data	Age 23 is information
Data cannot be used for decision making	Information is useful for decision making
Data is atomic.	Information is collection of data.



Database

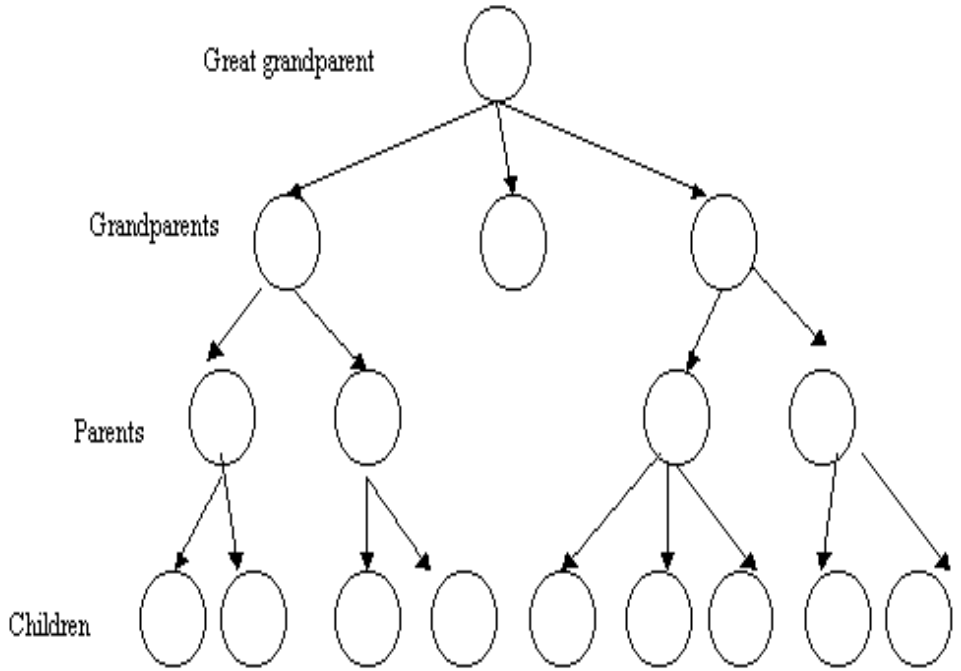
The related information when placed is an organized form makes a database.

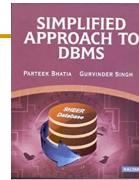


Ways to Organize the Information

Conversion of Data to Information

- Tree Data Structure





Ways to Organize the Information

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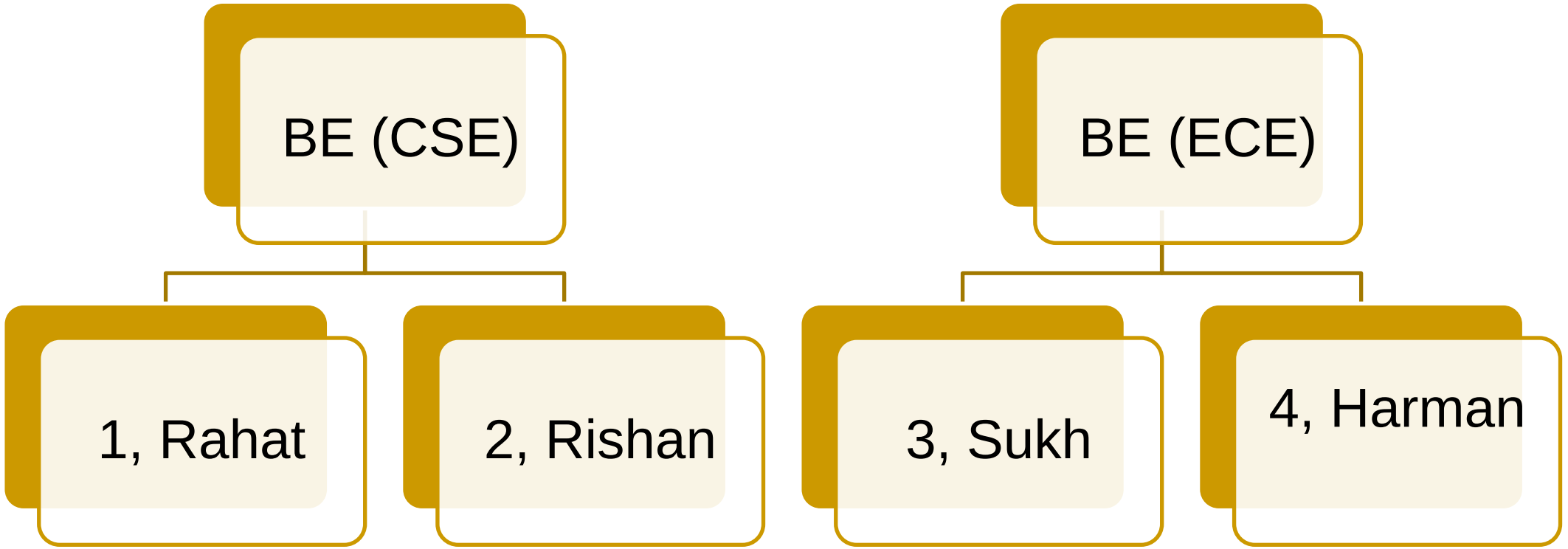
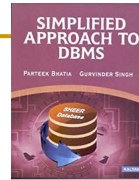
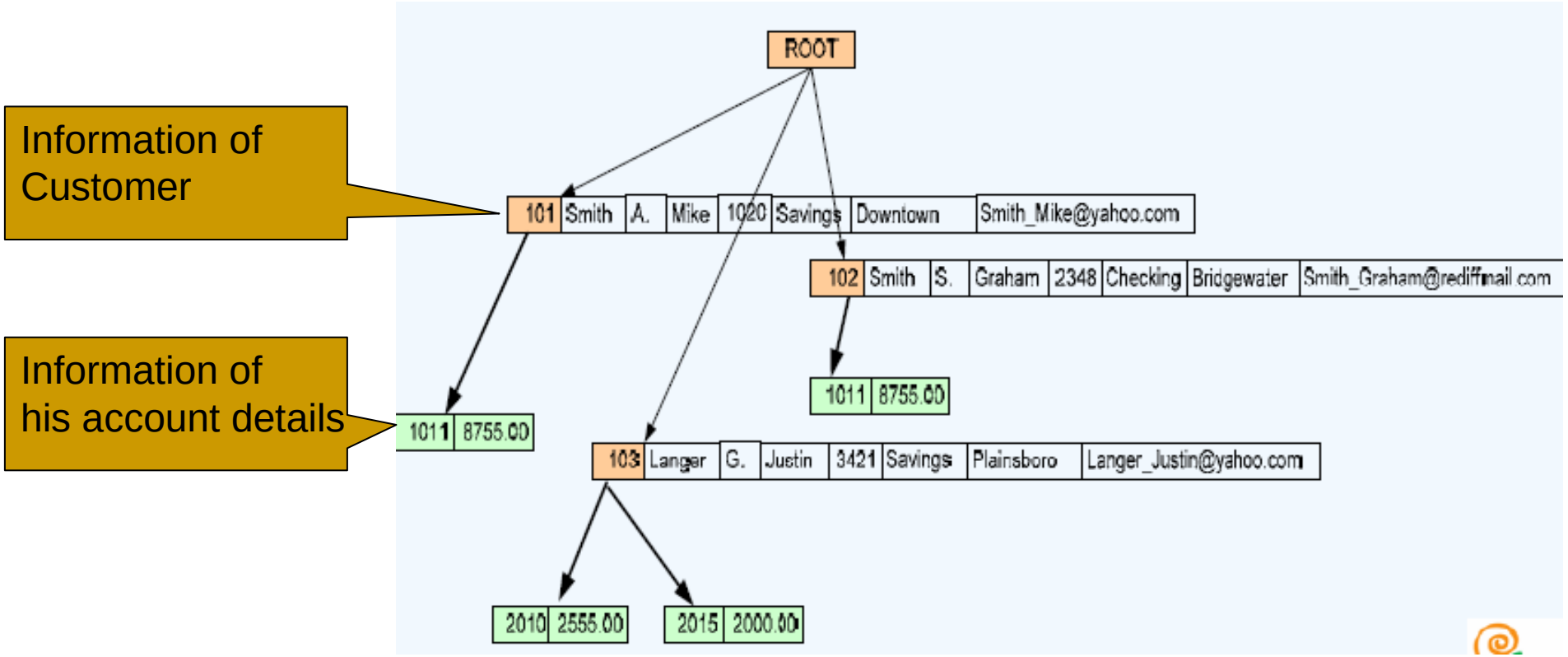




Ways to Organize the Information

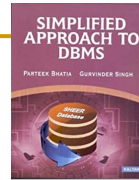
Conversion of Data to Information

- Tree Data Structure: Information of Customers and their Account details



Ways to Convert Data to Information

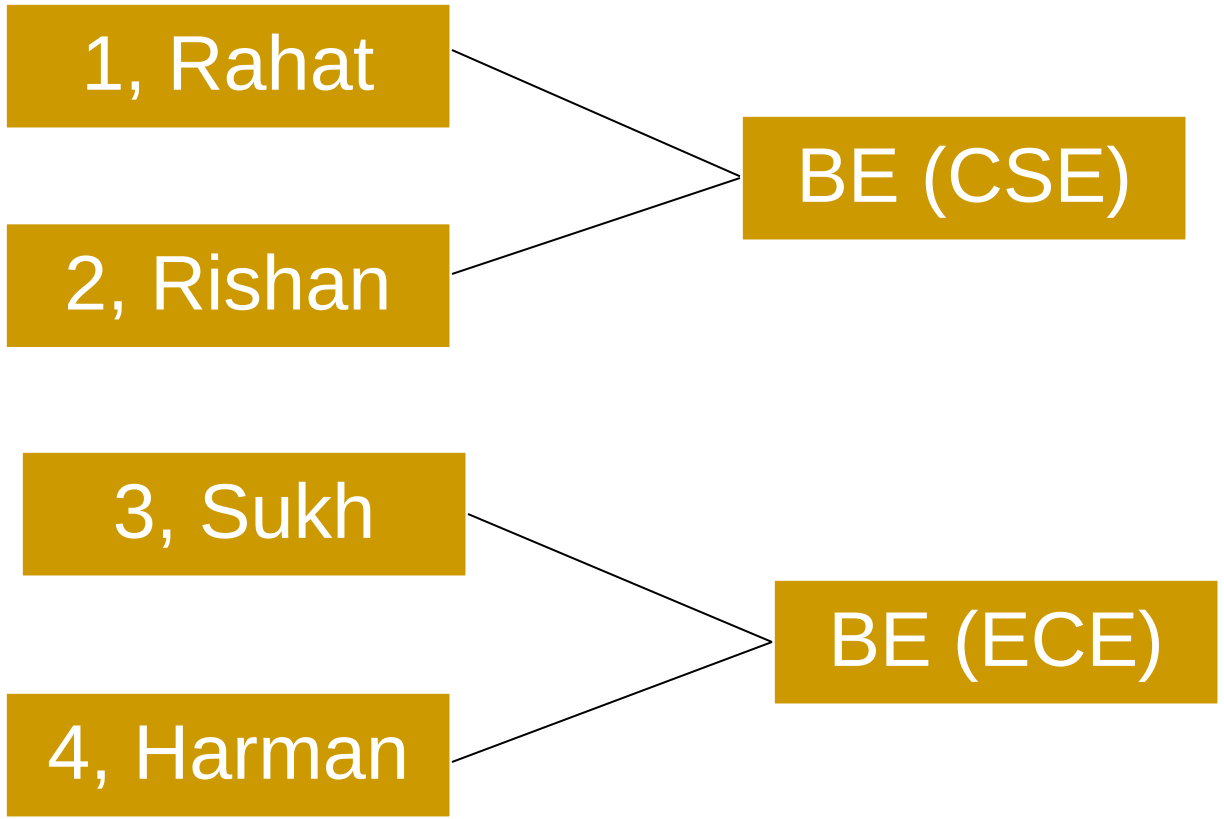
- Data Structure
  - Tree
- Data Model
  - Hierarchical Model

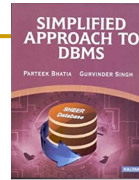


Ways to Organize the Information

Conversion of Data to Information

- Graph Data Structure

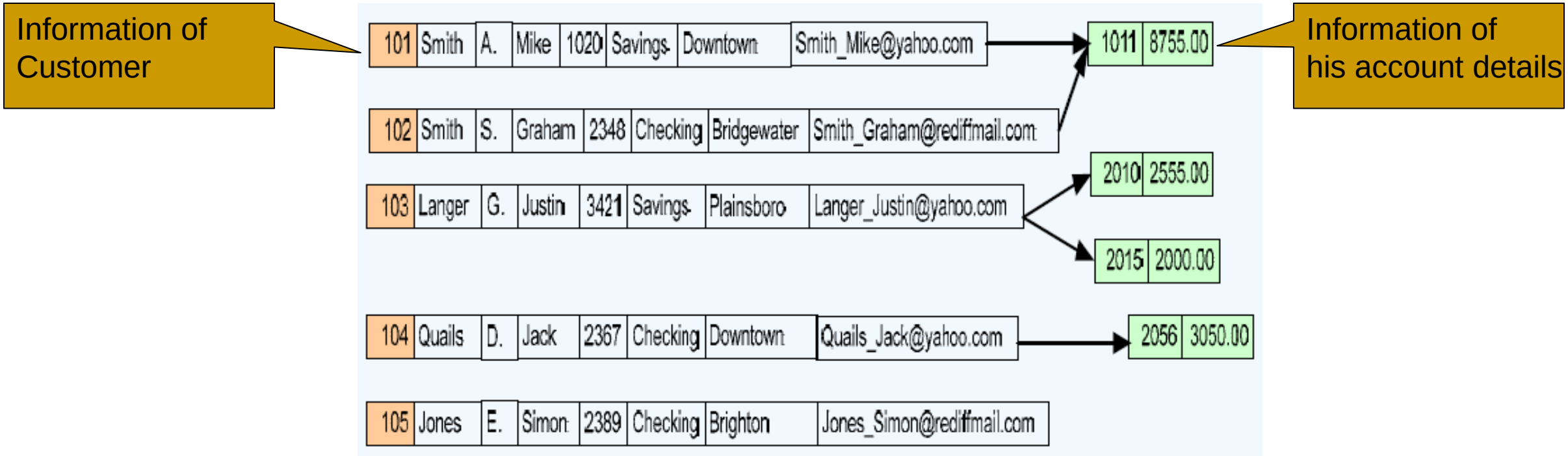




Ways to Organize the Information

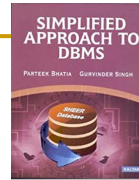
Conversion of Data to Information

- Graph Data Structure: Information of Customers and their Account details



Ways to Convert Data to Information

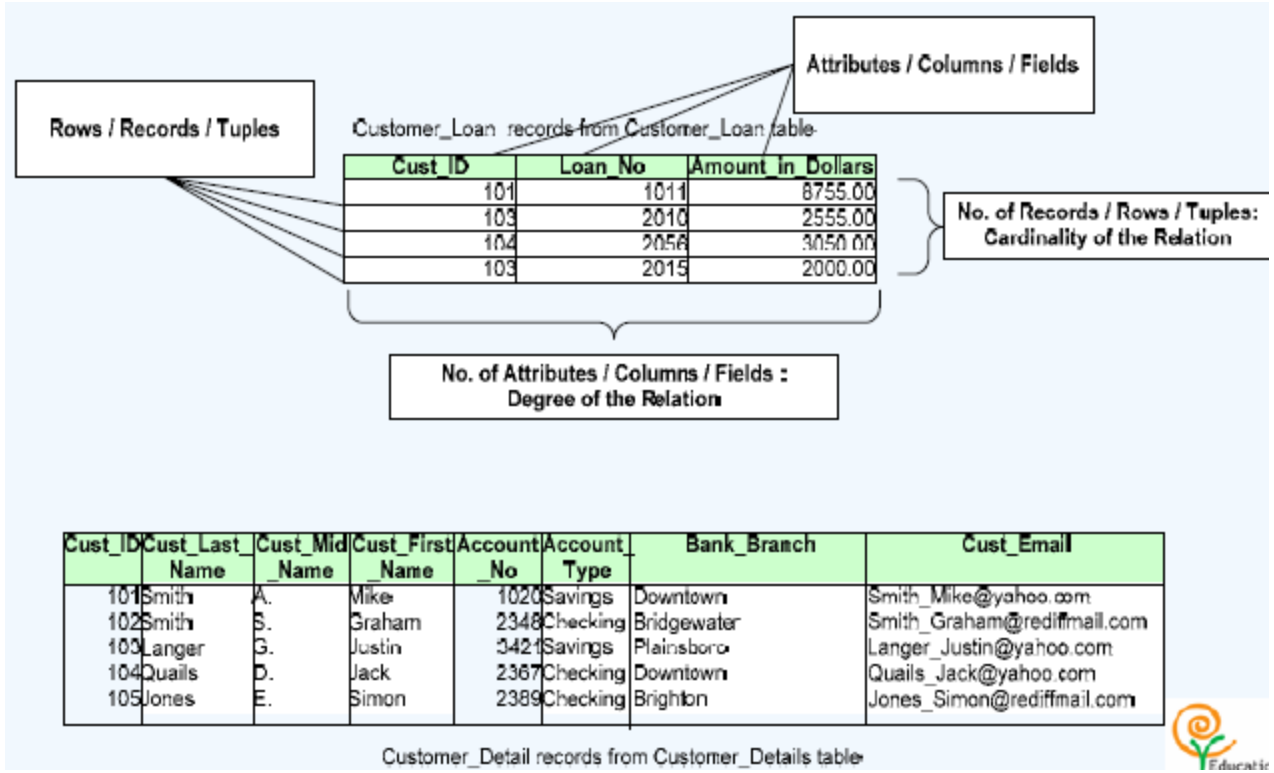
- Data Structure
  - Graph
- Model
  - Network Model



Ways to Organize the Information

Conversion of Data to Information

- Arrays Data Structure: Information of Customers and their Account details

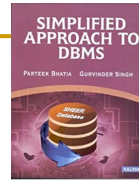


Ways to Organize the Information

Conversion of Data to Information

- Arrays Data Structure

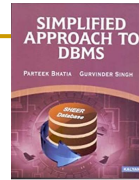
Rno	Name	Class
1	Rahat	BE(CSE)
2	Rishan	BE(CSE)
3	Sukh	BE(ECE)
4	Harman	BE(ECE)



Ways to Organize the Information

Conversion of Data to Information

- Data Structure
  - Array/Table
- Model
  - Relational Model



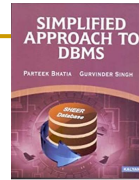
Ways to Organize the Information

Conversion of Data to Information

- Three Data Models
  - Hierarchical Data Model: Based on tree data structure
  - Network Data Model: Based on graph data structure
  - Relational Data Model: Based on Arrays/tables

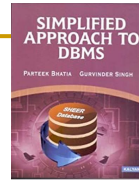
Relational Data Model is simple and easy to use.

Thus, out of all data models Relational Data model is commonly used. And popular software like Oracle, MySQL, MS Access are based on this model.



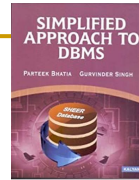
DBMS: Management

- It is management of information.
- We can perform Insert, Update, Delete and Retrieve operations over database.



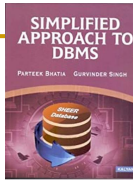
Operations on Databases

- To add new information (e.g. to add the address of a new friend in your address book)
- To view or retrieve the stored information (e.g. you have to find the address of one of your old friends)
- To modify or edit the existing information (e.g. your friend has shifted to a new place so his address would get changed)
- To remove or delete the unwanted information (e.g. your friend has changed his/her mobile number, so his/her mobile number would have to be removed from list)
- Arranging the information in a desired order etc.



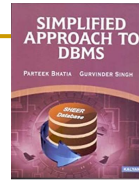
DBMS: System

- A system or software which manage the database on a computer.



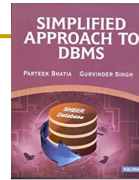
DBMS

- A software responsible to manage database, i.e., a software responsible to manage insert, update, delete and retrieve operations over database in a computer is known as Database Management System or DBMS.
- Examples: Oracle, MySQL, Sybase, SQL Server, FoxPro etc.



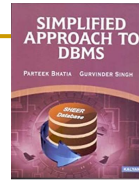
Maintaining Database on Computers

- There are two approaches
  - Traditional File Based Approach
  - Centralized DBMS approach

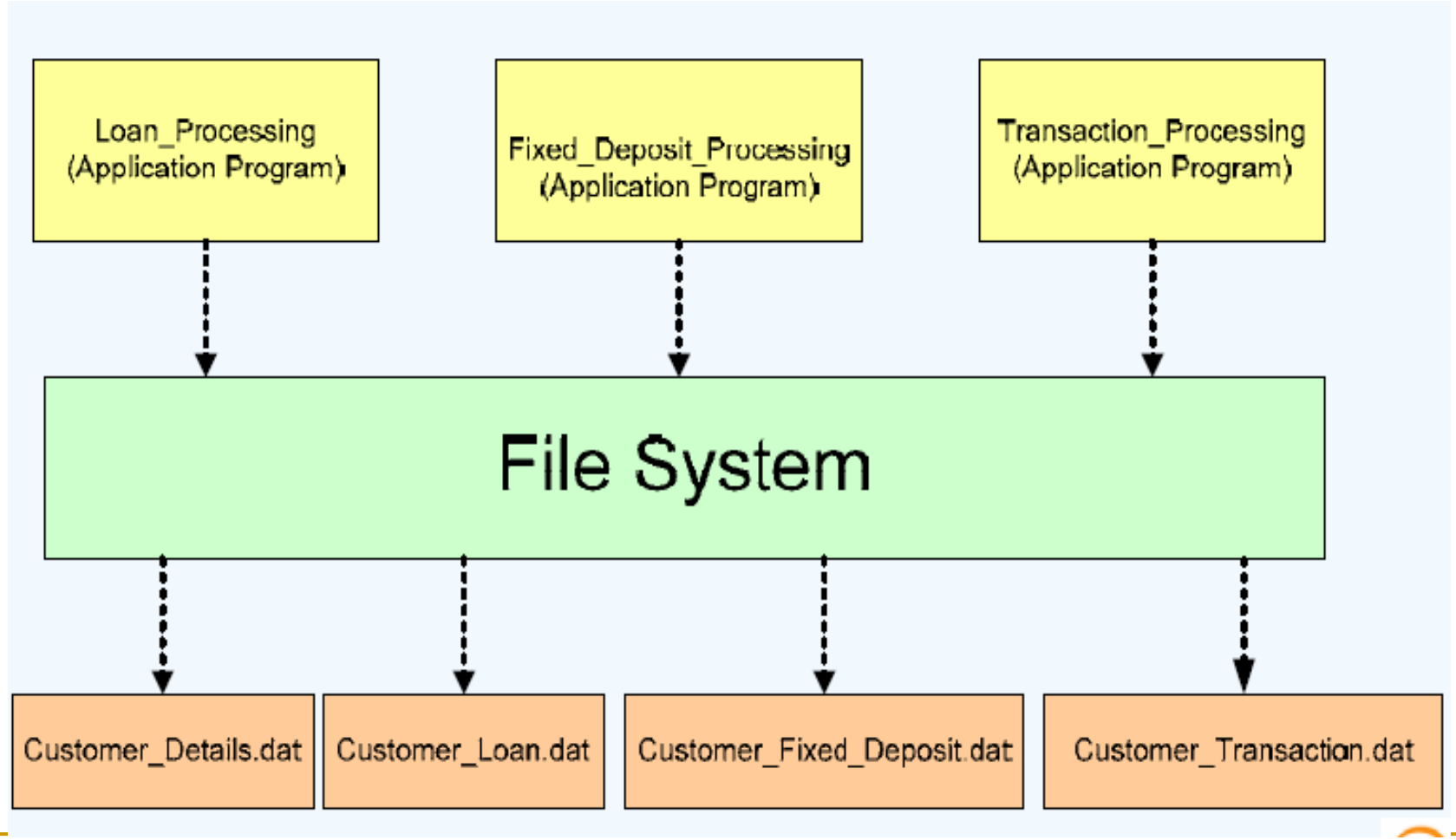


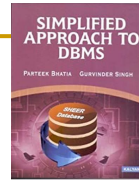
File Based Approach

- It is an early attempt to computerize the manual filing system. It is first implemented by using file handling utilities of COBOL (Common Business Oriented Language).
- Data is stored in flat files. For example: Text files, csv files
- Each file called a flat file, contained and processed information for one specific function.
- Now a days file Handling utilities of Programming languages like C, C++, Java etc. is used to implement it.



File Based Approach





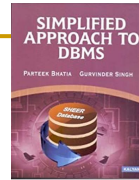
File Based Approach

Ways of storing data in files – customer data

4176	Aniruddha Sarkar	SBU1
4181	Manoj Saha	SBU1
4183	Moushumi Dharchoudhury	SBU1
4203	Suryanarayana D.V.S.S.	SBU1
4204	Vivek Rai	SBU1

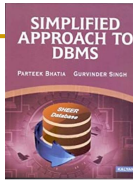
Predefined

```
4176  AniruddhaSarkar  SBU1
4181  ManojSaha  SBU1
4183  MoushumiDharchoudhury  SBU1
4203  SuryanarayanaD.V.S.  SBU1
4204  Vivek Rai     SBU1
```

Limitations of the File-Based Approach

- **Separated and Isolated Data**
- **Duplication of data**
- **Data Dependence**
- **Difficulty in representing data from the user's view**
- **Data Inflexibility**
- **Incompatible file formats**



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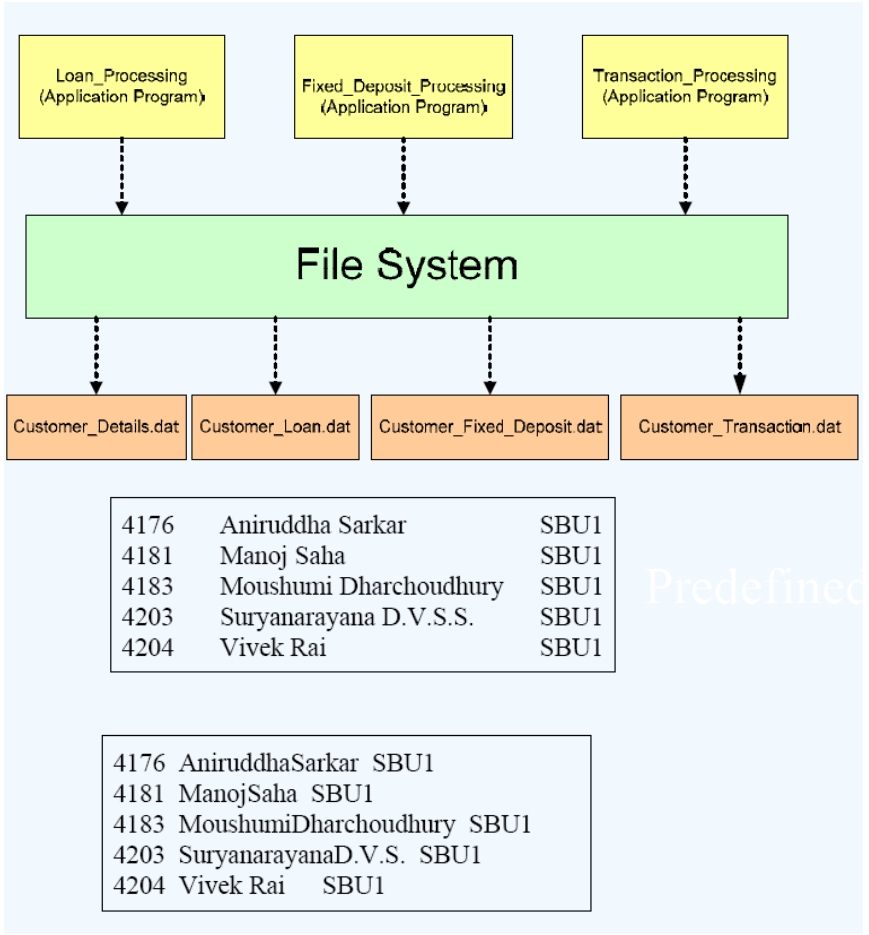
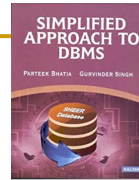
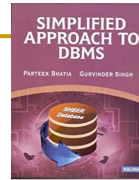


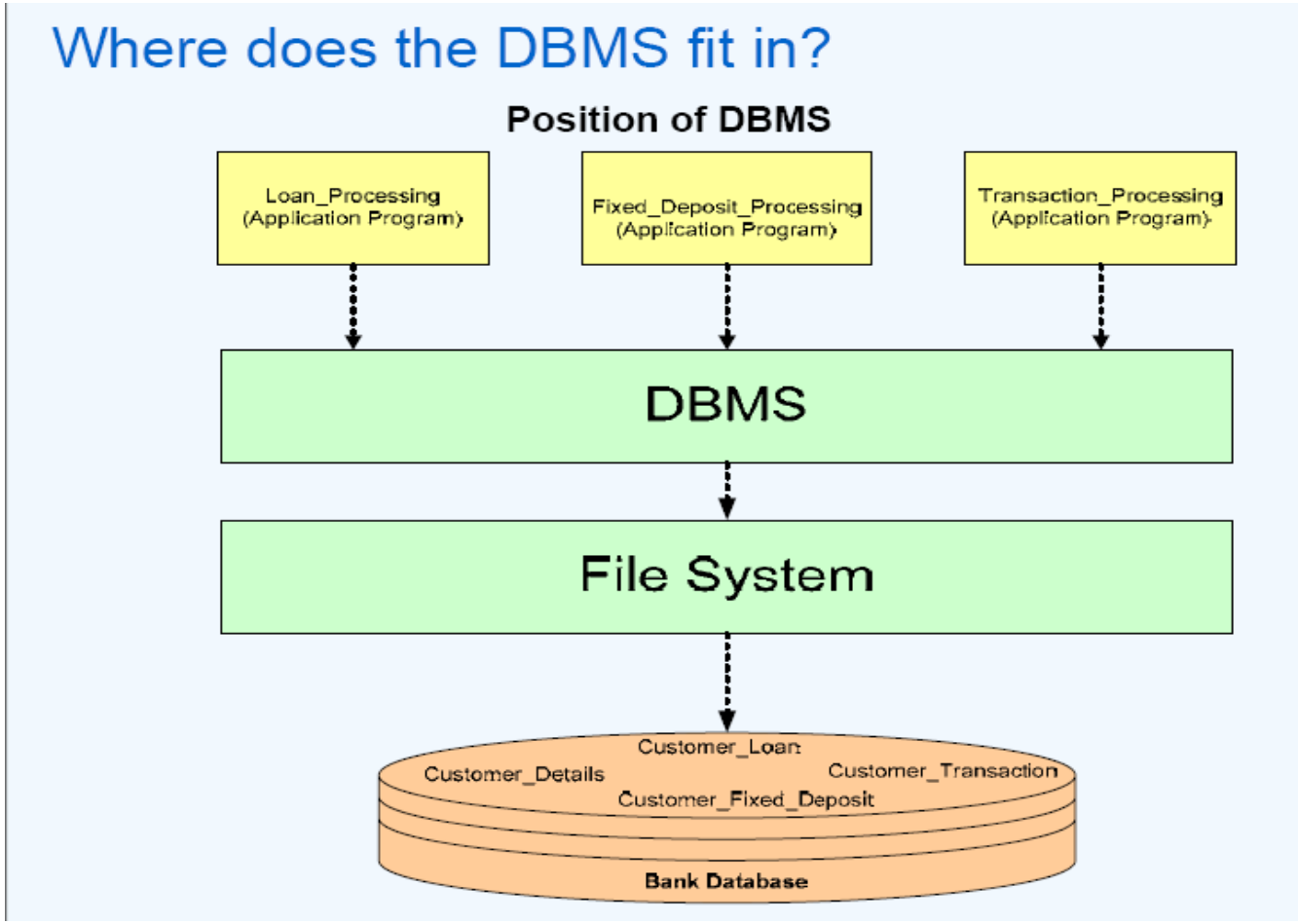


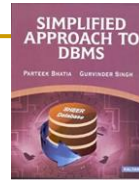
Database Approach

- The database is a single, large repository of data, which can be used simultaneously by many departments and users.



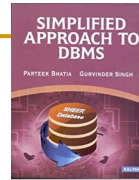
Database Approach





Example: File Based System

General Office	Library	Hostel	Account Office
Rollno	Rollno	Rollno	Rollno
Name	Name	Name	Name
Class	Class	Class	Class
Father_Name	Address	Father_Name	Address
Date_of_birth	Date_of_birth	Date_of_birth	Phone_No
Address	Phone_No	Address	Fee
Phone_No	No_of_books_issued	Phone_No	Installments
Previous_Record	Fine	Mess_Bill	Discount
Attendance	etc.	RoomNo	Balance
Marks		etc.	Total
etc.			etc.



Example: Database Approach

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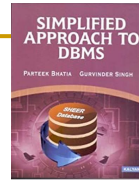
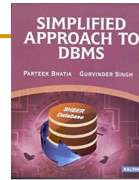
Rollno	Rollno	Rollno	Rollno
Name	No_of_books_issued	RoomNo	Fee
Class	Fine	Mess_Bill	Installments
Father_Name	etc.	etc.	Discount
Address			Balance
Phone_No			Total
Date_of_birth			etc.
Previous_Record			
Attendance			
Marks			
etc.			



Comparison of File Management System with Database Management System

File Management e.g. C++ or COBOL program	Database Management e.g. Oracle or Sybase
Small systems	Large systems
Relatively cheap	Relatively expensive
Few 'files	Many 'files'
Files are files	Files are tables
Simple structure	Complex structure
Redundant data	Reduced redundancy
Chances of inconsistency	Consistent
Isolated data	Data can be shared
Little preliminary design	Vast preliminary design
Integrity left to application programmer	Rigorous inbuilt integrity checking
No security	Rigorous security
Simple, primitive backup/recovery	Complex & sophisticated backup/recovery
Often single user	Multiple users



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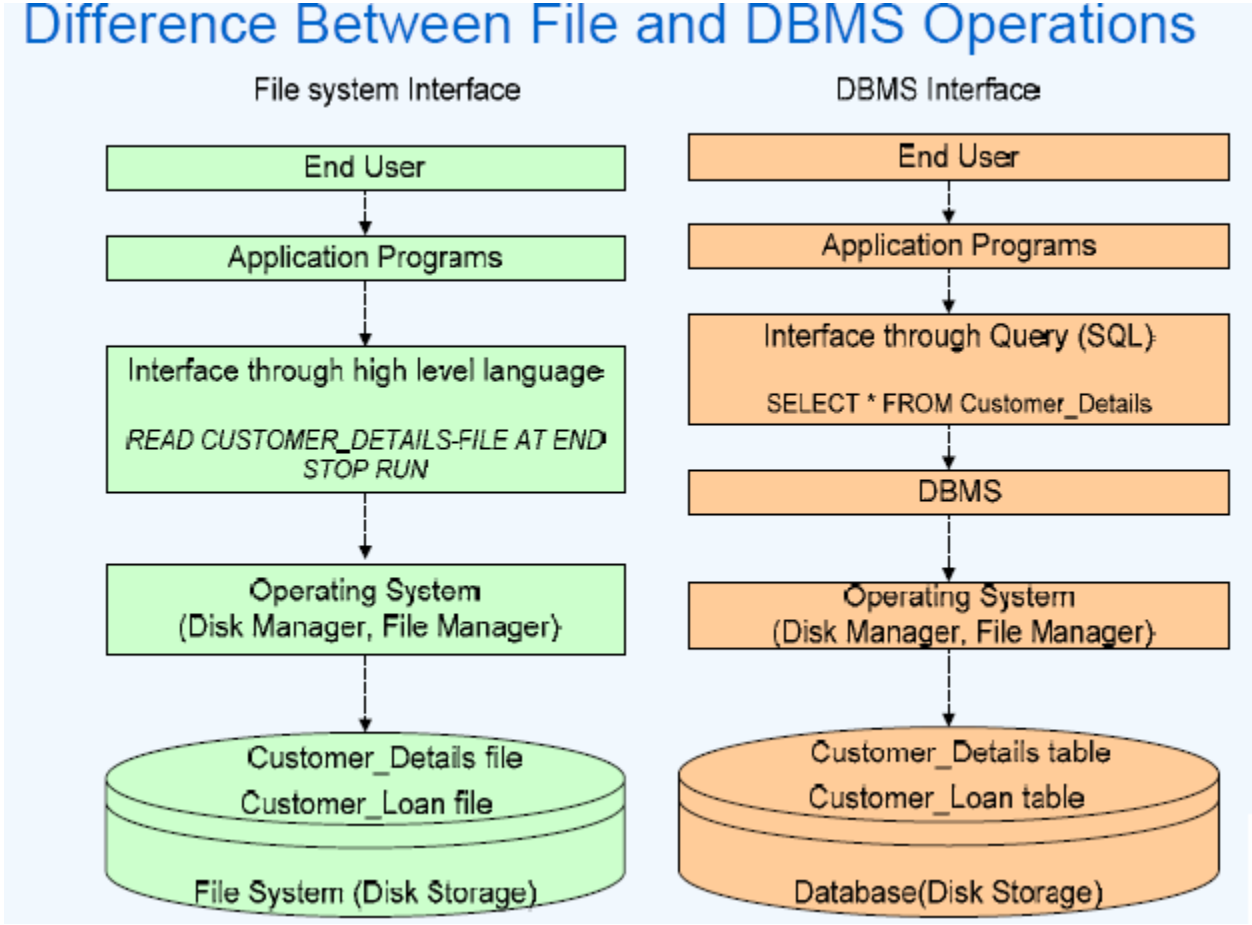
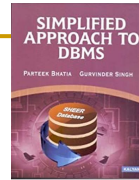
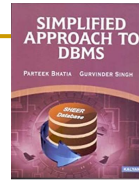




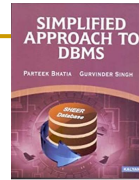
Advantages of DBMS

- **Controlling Redundancy**



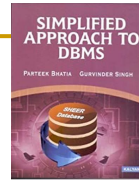
Integrity can be enforced

- Integrity of data means that data in database is always accurate, such that incorrect information cannot be stored in database.



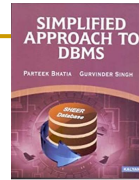
Inconsistency can be avoided

- Data of same entity should be same at all the places.
- Duplication of data may results in to inconsistency as the two entries regarding the same data may not agree. At such times the data is said to be inconsistent.



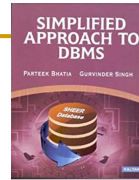
Other Advantages

- Data can be shared
- Providing Backup and Recovery
- Standards can be enforced
- Restricting unauthorized access
- Solving enterprise requirement than individual requirement



Disadvantages of DBMS

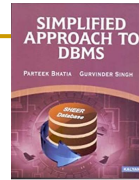
- Complexity
- Size
- Performance
- Higher impact of a failure
- Cost of DBMS
- Additional Hardware costs
- Cost of Conversion



When not to Use a DBMS

The overhead costs of using a DBMS are due to the following:

- High initial investment in hardware, software, and training
- Overhead for providing security, concurrency control, recovery, and integrity functions.
- Additional problems may arise if the database designers and DBA do not properly design the database or if the database systems applications are not implemented properly.



Components of DBMS

- Hardware
- Software
- Data
- Users
- Procedures

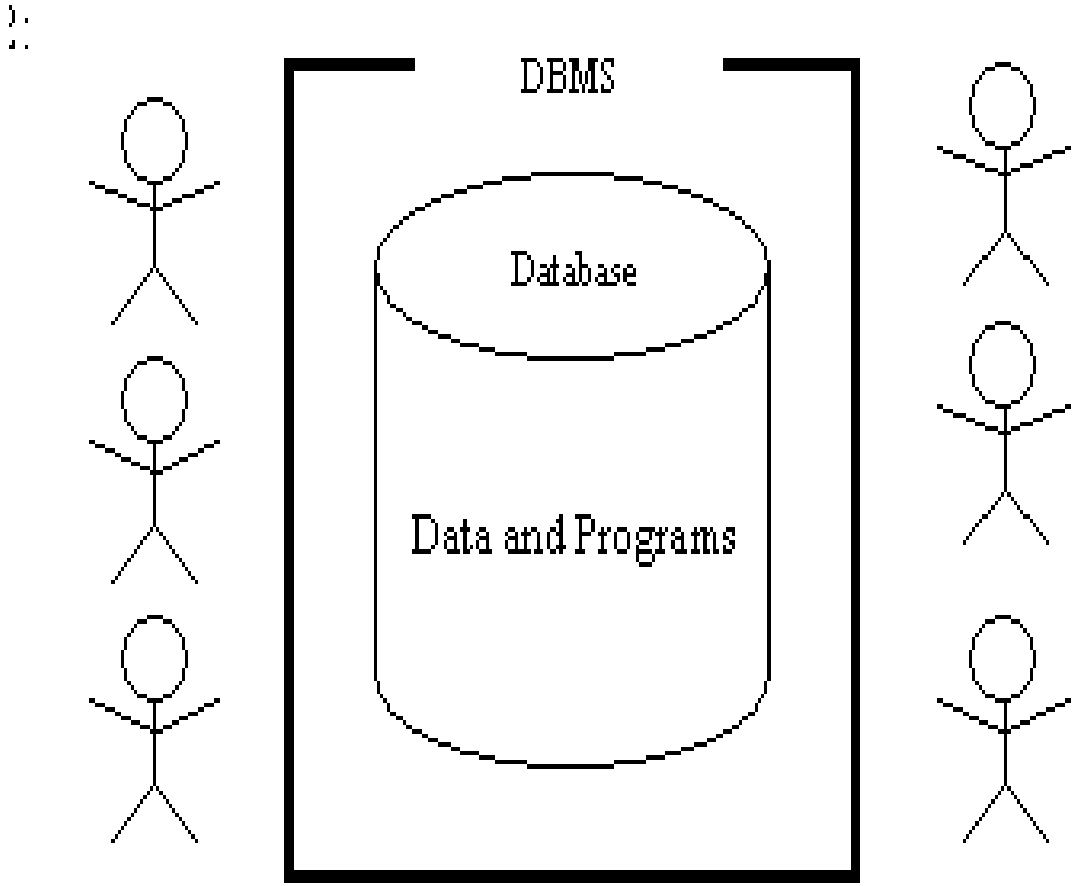
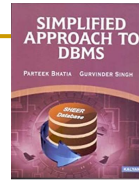
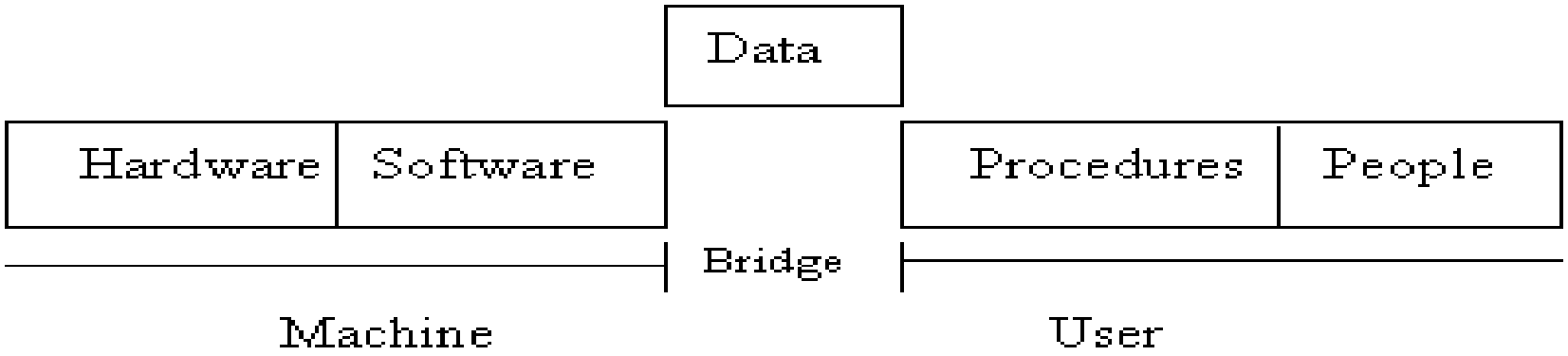
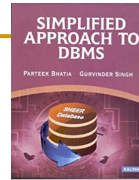


Figure 1.1



Components of DBMS





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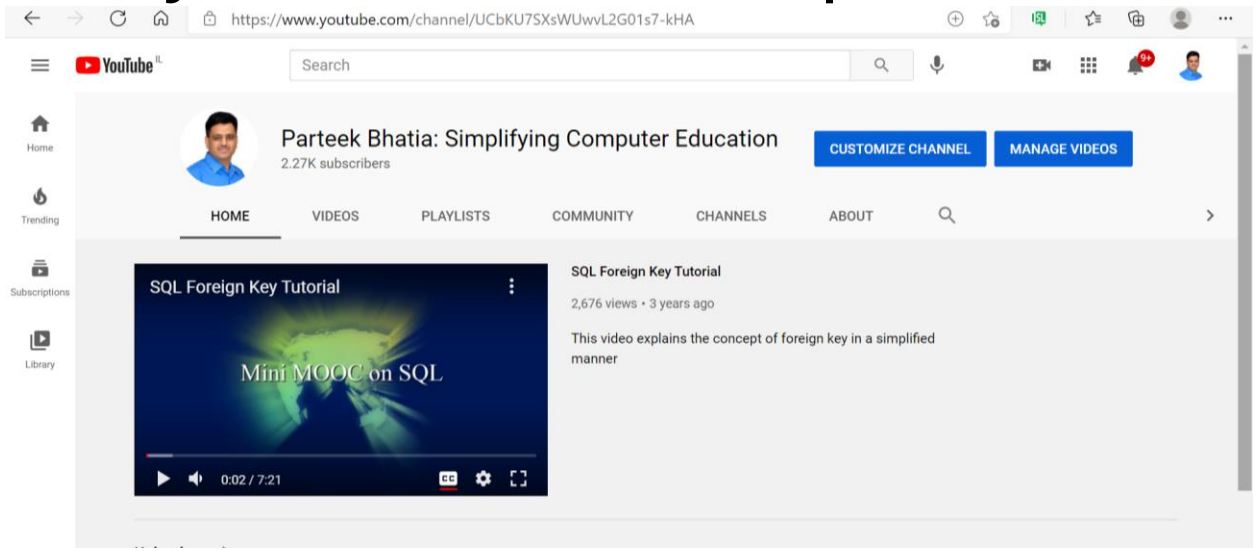

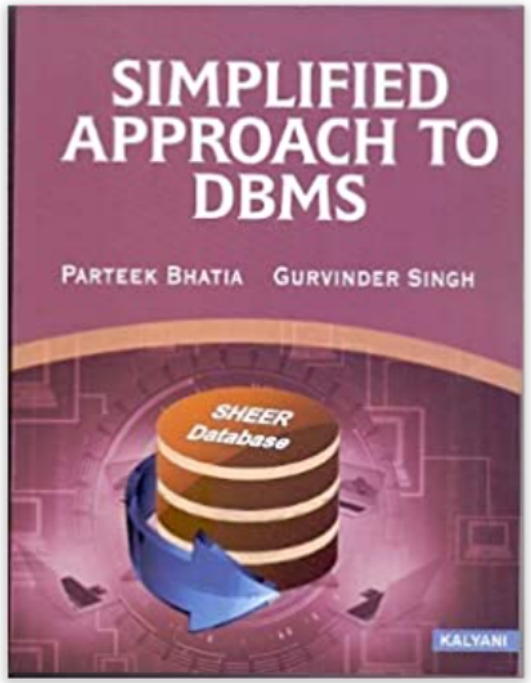

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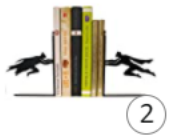

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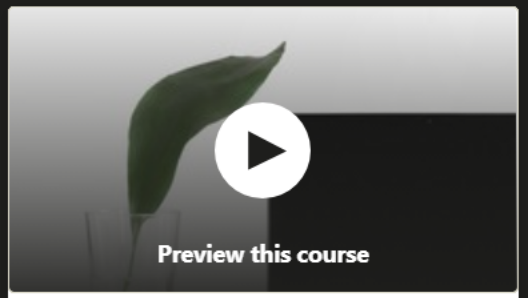

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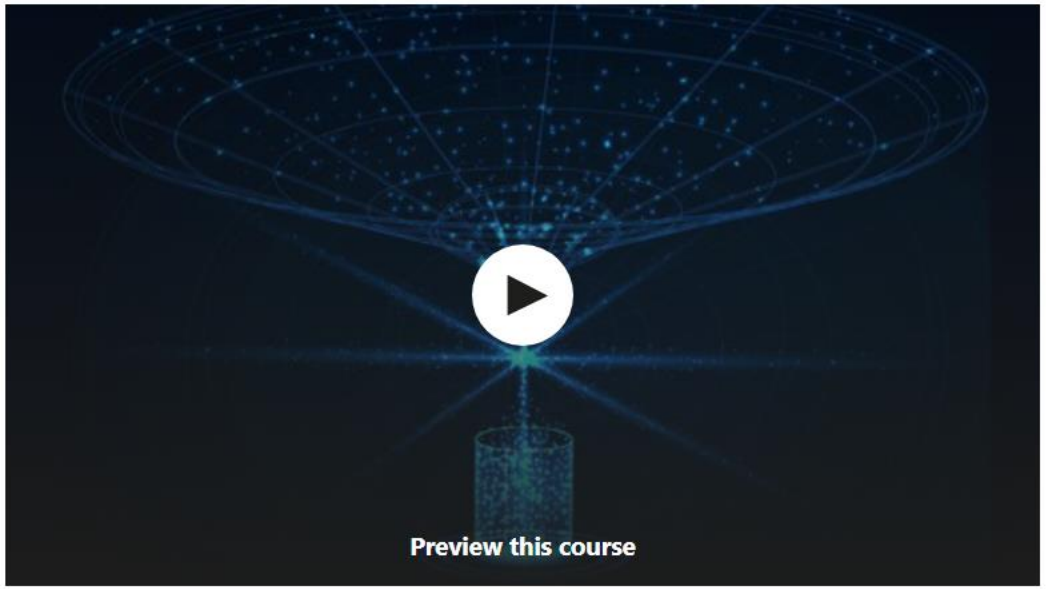

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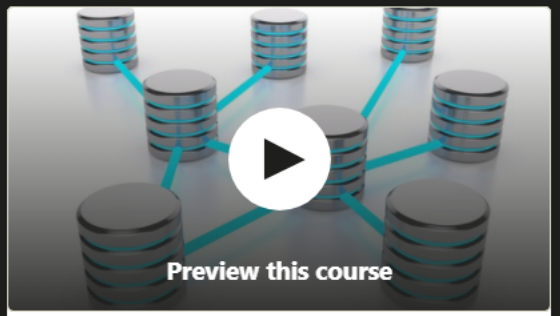

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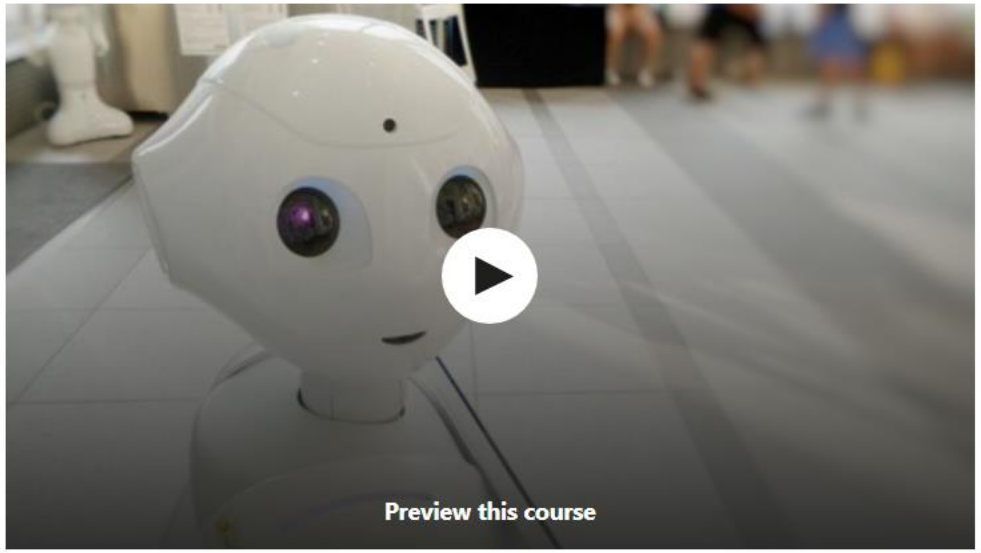

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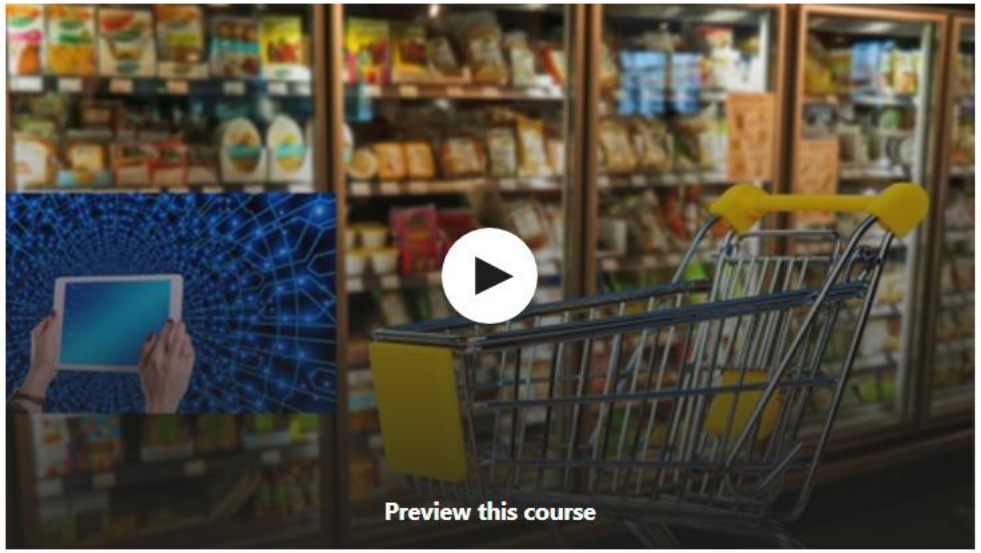

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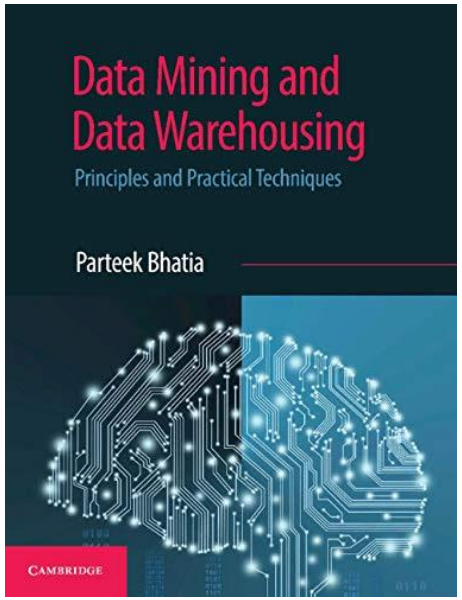

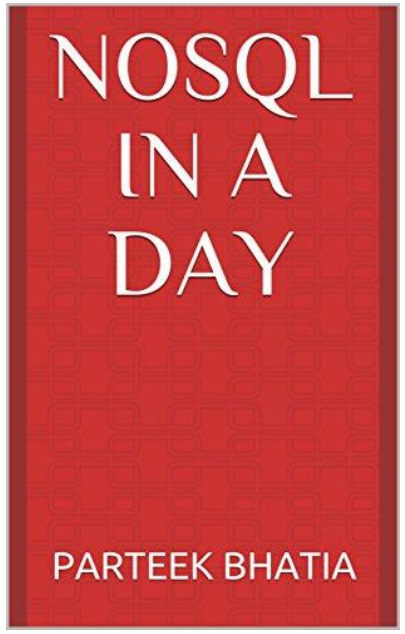

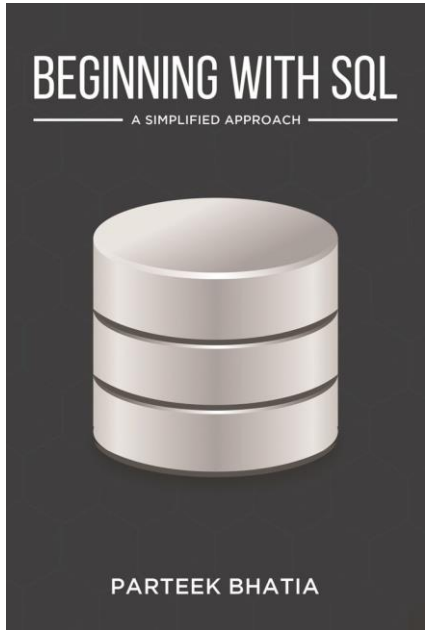

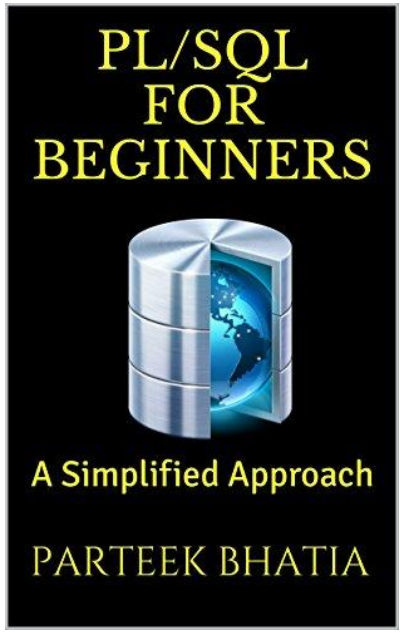

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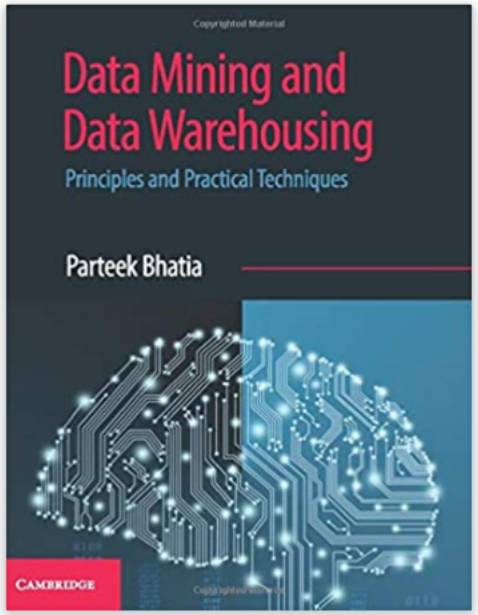

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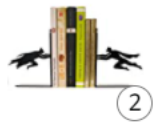

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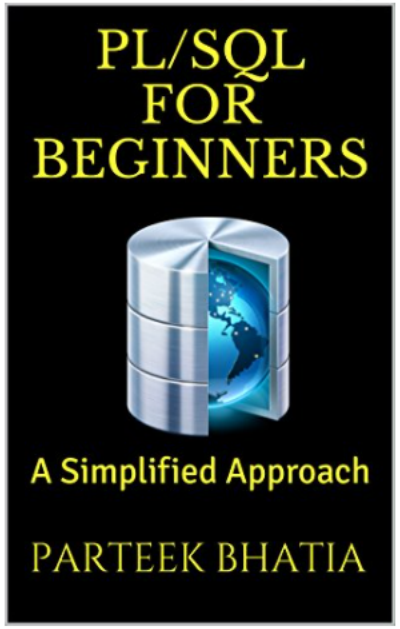

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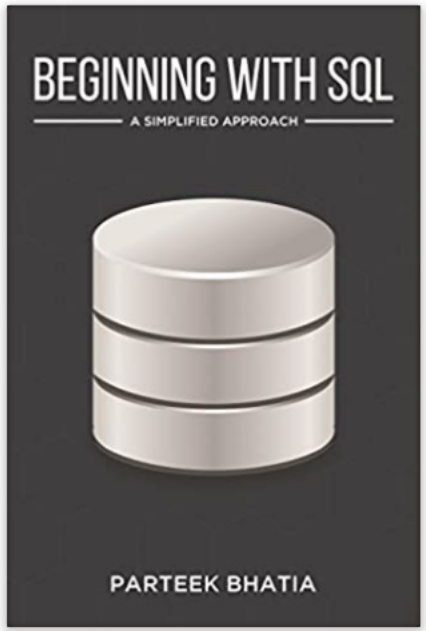

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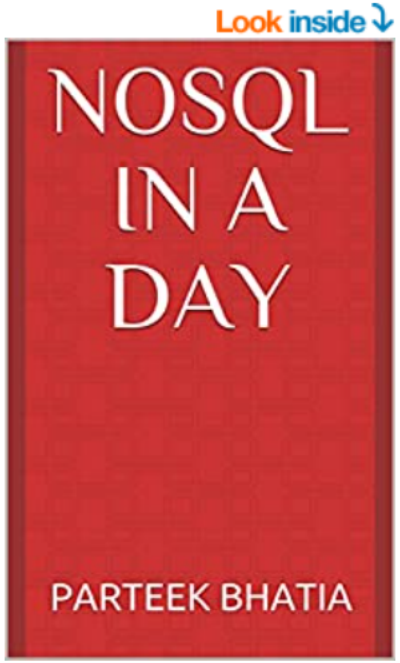

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