Source

Welcome to Week 12 Lecture 1!

Data Science in Python & Machine Learning

Neural Network Review

Breakout!

Your group will contribute to a review of neural networks

Each group will contribute a different part.

1. Forward Propagation
2. Backward Propagation
3. Regression in neural networks
4. Binary classification in neural networks

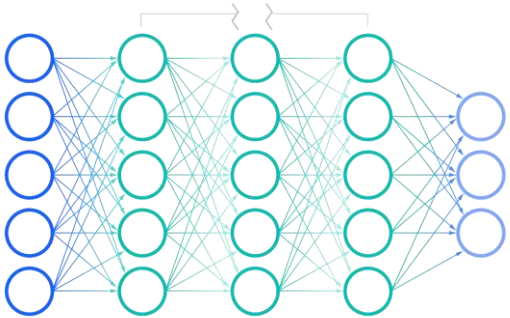


Image Source

Choose a reporter to type your answers into:

This Padlet!

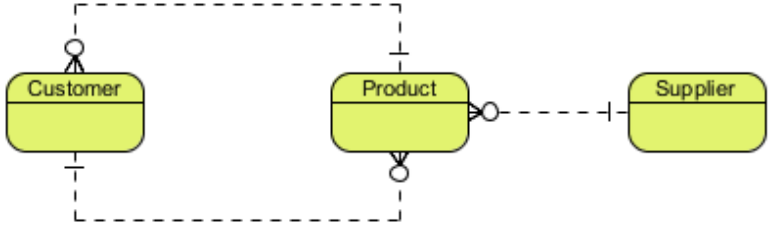
You have 5 minutes!

Learning Objectives

After this lesson you should be able to:

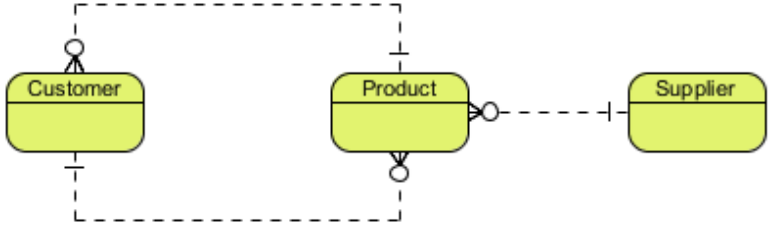
- Describe a relational database and how is it organized
- Explain ‘keys’ and what they are used for
- Use SQL to retrieve specific data from a relational SQL database.

Benefits of a Relational Database.



- Contains multiple tables
- Tables are related to each other in well defined ways.

Benefits of a Relational Database.



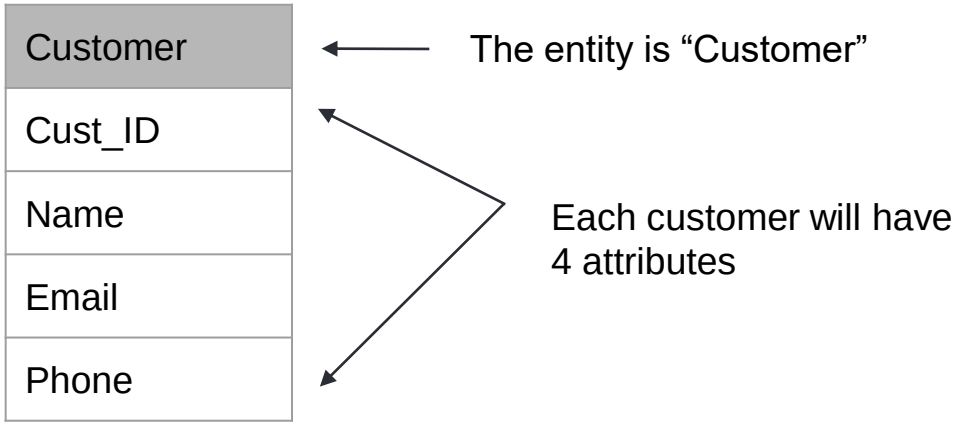
- Works well with highly structured data
- Reduces redundancy in data and promotes consistent data entry.
- Data can be efficiently accessed, retrieving only the data desired.

Entity Relationship Diagram (ERD)

An map of all tables and relationships between tables

- **Entity:** A ‘thing’. Could be:
  - It can be a person, thing, concept, or event.
  - Such as: Customers, Sales, Products, Locations…etc
- Each “entity” has its own table.
- Each table contains the attributes (like features) associated with the entity

Entity
Attribute
Attribute
Attribute



Different levels of ERD

Conceptual Data Model - big picture, shows key relationships, but no attributes

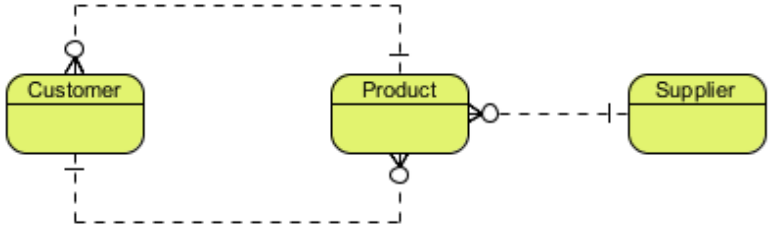


Image Source

Different levels of ERD

Logical Data Model - includes attributes

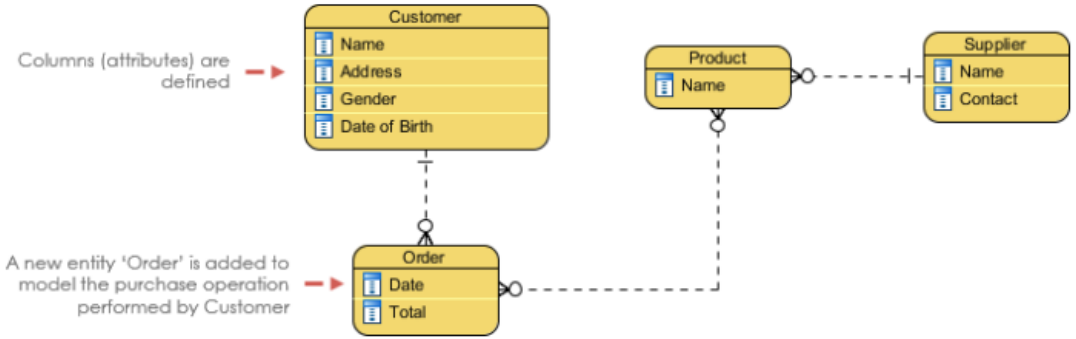


Image Source

Different levels of ERD

Physical Data Model - Includes data type and primary or foreign keys

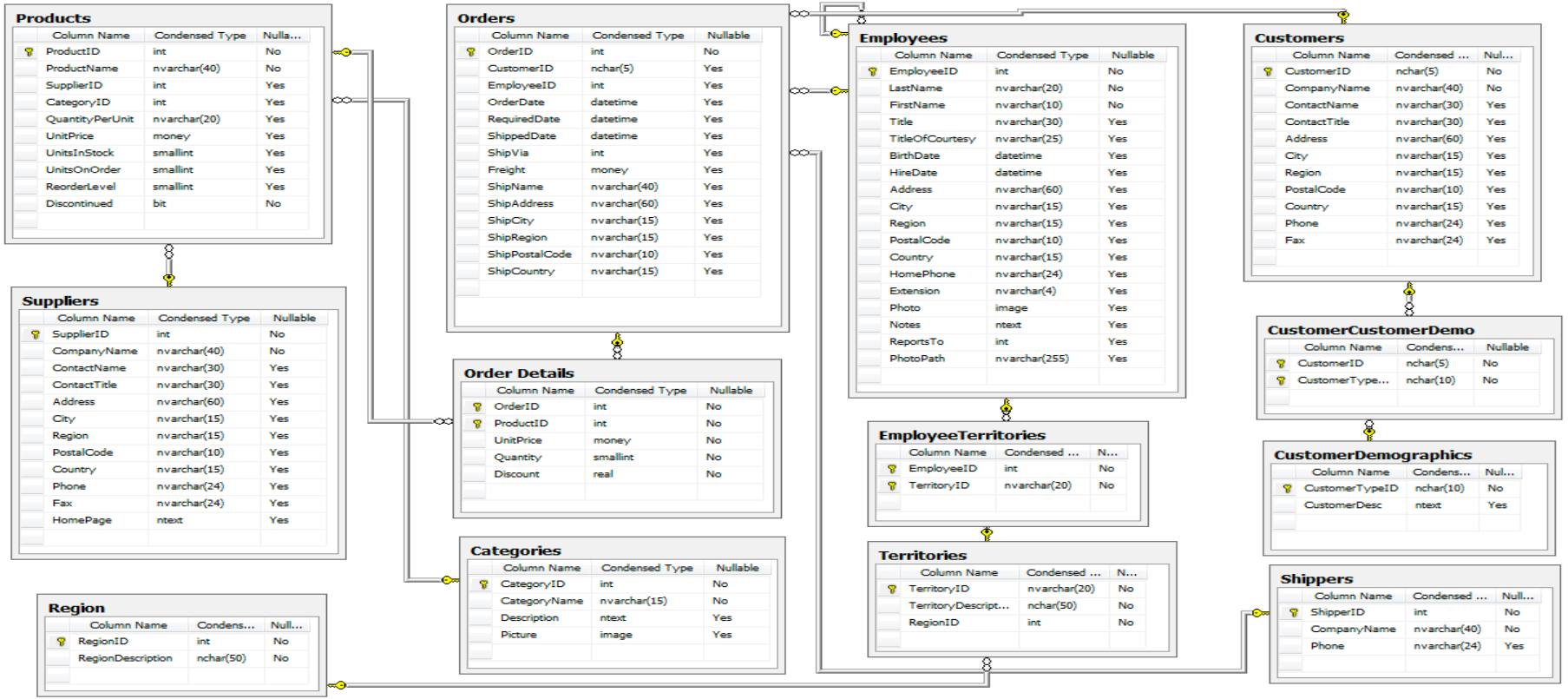


Image Source

Keys link one table to another

- Primary keys
  - Must be unique (like an ID number)
  - Must be present, no null values
  - Only one per table
- Foreign keys
  - A field in a table that references the primary key in another
  - Must match a primary key

Persons Table

Primary key of persons table

PersonID	LastName	FirstName	Age
1	Hansen	Ola	30
2	Svendson	Tove	23
3	Pettersen	Kari	20

Orders Table

OrderID	OrderNumber	PersonID
1	77895	3
2	44678	3
3	22456	2
4	24562	1

Foreign Key in Orders table referencing primary key in Persons table

Notice how every time an order is placed, we don't need to repeat all the customer info. We can just link to it with the foreign key.

Image from W3Schools

Cardinality

Cardinality is how many times an entity exist in relation to another entity

- One to one (1:1)
  - One record only associated with one record in another table
  - Example: Each Cust_ID in the Customers table can only be related to one entry in the Contact table

- One to many (1:M)
  - One record can be associated with more than one record in another table
  - Example: Each Cust_ID can be associated with multiple orders

- Many to many (M:M)
  - Multiple records on both tables can be associated multiple records on the other table.
  - Requires an additional connector table
  - Example: One order can include multiple products and one product can be ordered multiple times.

Check out this link at Database Star for examples of various notation methods for representing cardinality and different types of ERDs.

How to Display a Table from a SQL Database

SQL is a ‘Query’ language that allows users to retrieve, add, or manipulate data on a SQL server.

SELECT - select the data from the database and display the result based on the condition

- ```
  SELECT *
  FROM table_name;
  ```
  - Select all the columns from the table_name and display

- ```
  SELECT col1, col2, …
  FROM table_name;
  ```
  - Select col1, col2, … from the table_name and display

Knowledge Check: Relational Database Poll

How can you retrieve data from multiple tables in one query?

Resources

- SQL CheatSheet
- SQL Island
  - Change language to ‘English’
- SQLZoo
  - SQL practice and a great tutorial
  - Will be required in Stack 4

Code-along Example

Announcements

- ALL assignments due Friday, 9am.
  - Including all resubmits Weeks 1-3

- Presentations on Thursday!

Presentations:

1. Non-technical:
    a. No technical jargon,
    b. Graphs interpretable by anyone
    c. Only what you would have understood before starting this program

2. 5 minutes: Hard stop!

3. Examples:

    a. Stroke Prediction

Daily Schedule

Complete your Environment Setup Assignment!

Code-along Solutions