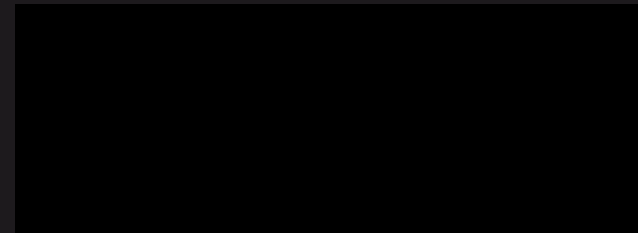


# FUNCTION DEPENDENCY AND TYPES & EXAMPLE



# DEFINATION

- Functional dependency is a relationship that exists when one attribute uniquely determines another attribute. If R is a relation with attributes X and Y, a functional dependency between the attributes is represented as  $X \rightarrow Y$ , which specifies Y is functionally dependent on X.
  - The attributes of a table is said to be dependent on each other when an attribute of a table uniquely identifies another attribute of the same table.
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- For example:
  - Suppose we have a student table with attributes: **Stu\_Id**, **Stu\_Name**, **Stu\_Age**.
  - Here **Stu\_Id** attribute uniquely identifies the **Stu\_Name** attribute of student table because if we know the student id we can tell the student name associated with it.
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Functional dependency and can be written as :

**Stu\_Id- $\geq$ Stu\_Name\_**

we can say **Stu\_Name** is functionally dependent on **Stu\_Id**.

**Formally:**

If column A of a table uniquely identifies the column B of same table then it can be represented as  $A \rightarrow B$  (Attribute B is functionally dependent on attribute A)

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# Types of Functional Dependencies

- Trivial functional dependency
  - Non-trivial functional dependency
  - Multivalued dependency
  - Transitive dependency
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# Trivial functional dependency

- The dependency of an attribute on a set of attributes is known as trivial functional dependency if the set of attributes includes that attribute.

Symbolically:

- $A \rightarrow B$  is trivial functional dependency if  $B$  is a subset of  $A$ .
  - The following dependencies are also trivial:  $A \rightarrow A$  &  $B \rightarrow B$
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- For example:

Consider a table with two columns **Student\_id** and **Student\_Name**.

$\{\text{Student\_Id}, \text{Student\_Name}\} \rightarrow \text{Student\_Id}$  is a trivial functional dependency as **Student\_Id** is a subset of  $\{\text{Student\_Id}, \text{Student\_Name}\}$ .

- Also,  $\text{Student\_Id} \rightarrow \text{Student\_Id}$  &  $\text{Student\_Name} \rightarrow \text{Student\_Name}$  are trivial dependencies too.
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# Non-trivial functional dependency

- If a functional dependency  $X \rightarrow Y$  holds true where  $Y$  is not a subset of  $X$  then this dependency is called non trivial Functional dependency.
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## Example :

An employee table with three attributes: **emp\_id**, **emp\_name**, **emp\_address**.

The following functional dependencies are non-trivial:

**emp\_id** -> **emp\_name** (**emp\_name** is not a subset of **emp\_id**)

**emp\_id** -> **emp\_address** (**emp\_address** is not a subset of **emp\_id**)

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- On the other hand, the following dependencies are trivial:

$\{\text{emp\_id}, \text{emp\_name}\} \rightarrow \text{emp\_name}$  [ $\text{emp\_name}$  is a subset of  $\{\text{emp\_id}, \text{emp\_name}\}$ ]

## Completely non trivial FD:

If a Functional dependency  $X \rightarrow Y$  holds true where  $X \cap Y$  is **Null** then this dependency is said to be completely **non trivial function dependency**.

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# Multivalued dependency

- Multivalued dependency occurs when there are more than one independent multivalued attributes in a table.
  - a **multivalued dependency** is a full constraint between two sets of attributes in a relation. In contrast to the functional **dependency**, the **multivalued dependency** requires that certain tuples be present in a relation.
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- Consider a bike manufacture company, which produces two colors (Black and white) in each model every year.

bike_model	manuf_year	color
M1001	2007	Black
M1001	2007	Red
M2012	2008	Black
M2012	2008	Red
M2222	2009	Black
M2222	2009	Red

- Here columns **manuf\_year** and **color** are **independent** of each other and **dependent** on **bike\_model**. In this case these two columns are said to be **multivalued dependent** on **bike\_model**.

These dependencies can be represented like this:

- $\text{bike\_model} \twoheadrightarrow \text{manuf\_year}$
  - $\text{bike\_model} \twoheadrightarrow \text{color}$
-

# Transitive dependency

A functional dependency is said to be transitive if it is indirectly formed by two functional dependencies.

$X \rightarrow Z$  is a transitive dependency if the following three functional dependencies hold true:

$X \rightarrow Y$

$Y$  does not  $\rightarrow X$

$Y \rightarrow Z$

A transitive dependency can only occur in a relation of three or more attributes. This dependency helps us normalizing the database in 3NF (3<sup>rd</sup> Normal Form).

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- Example :-

Book	Author	Author_age
Game of Thrones	George R. R. Martin	66
Harry Potter	J. K. Rowling	49
Dying of the Light	George R. R. Martin	66

- $\{\text{Book}\} \rightarrow \{\text{Author}\}$  (if we know the book, we know the author name)
  - $\{\text{Author}\}$  does not  $\rightarrow \{\text{Book}\}$
  - $\{\text{Author}\} \rightarrow \{\text{Author\_age}\}$
  - Therefore as per the rule of **transitive dependency**:
  - $\{\text{Book}\} \rightarrow \{\text{Author\_age}\}$  should hold, that makes sense because if we know the book name we can know the author's age.
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*THANK YOU*

