

Special Types of FDs

- We need to understand some special types of Functional Dependencies for normalization:
 - Full / Partial FDs
 - Transitive FDs.



Full / Partial FDs

- In one relation, if a set of attributes $A: (a_1, a_2, \dots, a_n)$ determines attribute B :
 - $A: (a_1, a_2, \dots, a_n) \rightarrow B$
 - If there is **no proper** subset of A also determines B , then $A: (a_1, a_2, \dots, a_n) \rightarrow B$ is a Full functional dependency. It is **full** because we need **all** attributes in A to determine B .
 - If there is a proper subset of A determines B , then $A: (a_1, a_2, \dots, a_n) \rightarrow B$ is a Partial functional dependency.
 - To achieve Full FD, we need to minimize A by removing unnecessary attributes.



Example

EmpID	FirstName	LastName	DoB	Position	Department	StoreID
#20399	John	Ford	1998/2/12	Manager	HR	#1506
#30123	Anne	Brand	2001/3/12	Intern	Marketing	#1546
#12524	David	Biden	2000/2/20	Assistant	Sales	#1524
#14517	William	Potter	2001/9/12	Senior Manager	HR	#1506
#15214	Mary	Alexander	2001/9/12	Assistant	IT	#1524
#11032	Rose	Smith	1999/1/21	Intern	IT	#1503
#02012	Julie	Smith	1977/12/1	Senior Manager	IT	#1503
#78123	Angela	White	1967/4/4	Senior Manager	HR	#1546
#21342	John	Ford	1983/11/11	Manager	IT	#1546

- EmpID + FirstName + LastName → DoB, is it a Full or Partial FD?
- EmpID + FirstName → DoB, is it a Full or Partial FD?
- EmpID → DoB, is it a Full or Partial FD?
 - Hint: If $A \rightarrow B$, and A has only one attribute, then it must be full FD.

Example

- Relation R (A, B, C, D, E, F, G) has following FDs:
 - FD1: A, B, C \rightarrow D, E, F, G
 - FD2: A \rightarrow D
 - FD3: B, C \rightarrow E
 - FD4: F \rightarrow G
- FD1 is Full or Partial FD?
- FD3 is Full or Partial FD?



Transitive FDs

- In one relation, if an attribute A determines attribute B , and B determines attribute C (C is not A):
 - FD1: $A \rightarrow B$
 - FD2: $B \rightarrow C$
 - We can have $A \rightarrow C$ because the FD1 and FD2 form a Transitive Functional Dependency.



Example

- Relation R (A, B, C, D, E, F, G) has following FDs:
 - FD1: A, B, C \rightarrow D, E, F, G
 - FD2: A \rightarrow D
 - FD3: B, C \rightarrow E
 - FD4: F \rightarrow G
- Are there any Transitive Functional Dependencies?



Identifying FDs

- It is simple if attributes and their relationships are well understood.
- The best case is all information is provided.
- Otherwise, use your common sense.



Practice

- Let's do more practice in Lab2.