Functional Dependency

Bachelor of Information Systems

INTRODUCTION TO
DATABASE AND INFORMATION SYSTEM

Learning Objective(s)

This material should address the following question(s).

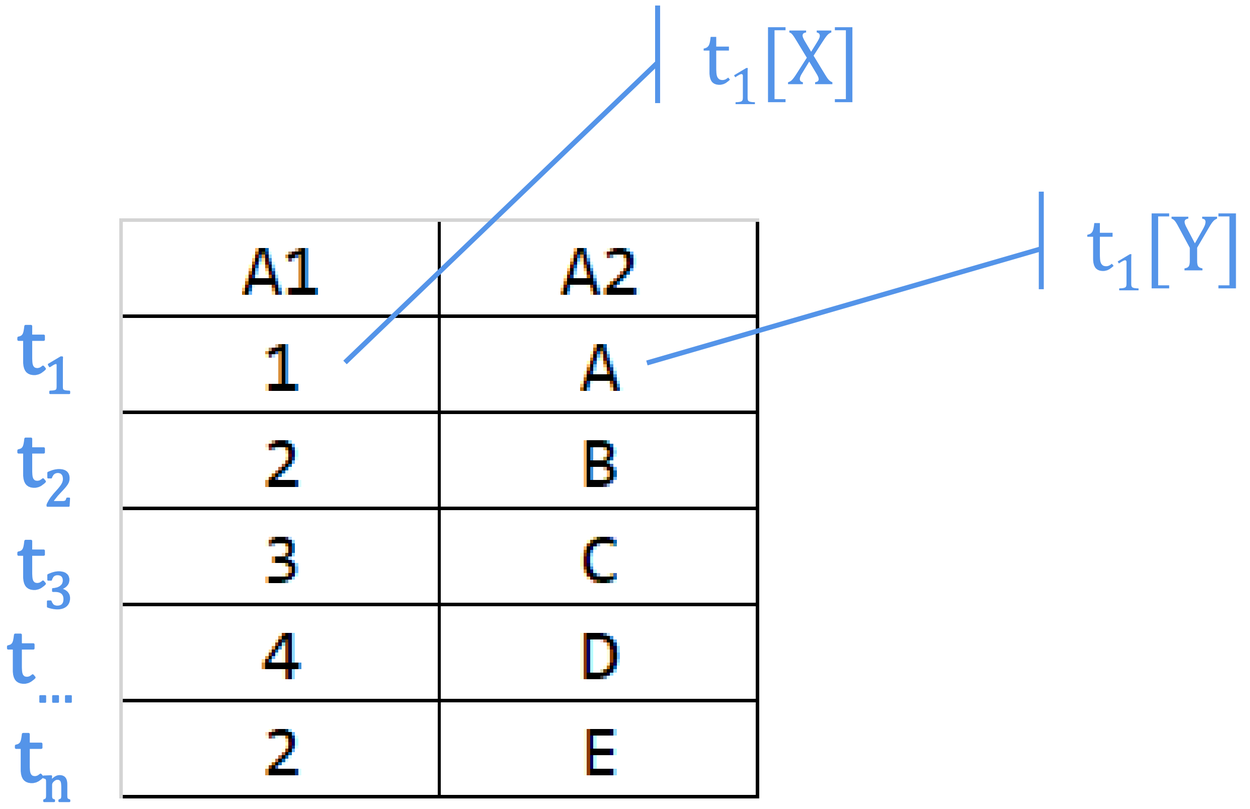
- What is functional dependency?
- How to identify functional dependencies in a relation?

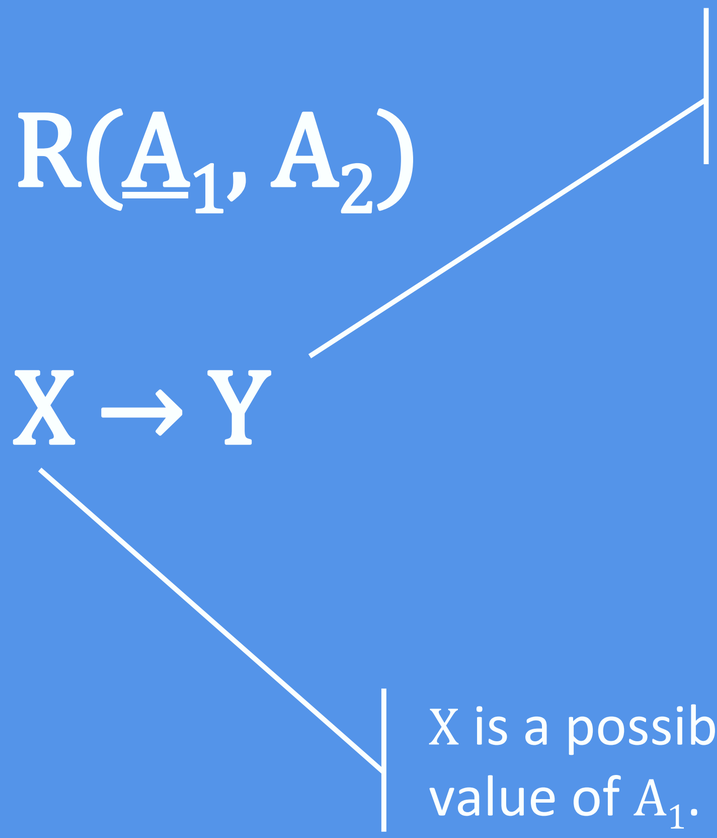
Functional dependency

It is a condition where value (X) of an attribute (A_1) determines value (Y) of another attribute (A_2) in R.

Functional dependency

FD is used to find out the strongest attribute(s) in the relation (candidate key) and the most irrelevant ones.


$t_1[X]$
$t_1[Y]$
A1
A2
t_1
1
A
t_2
2
B
t_3
3
C
$t_{...}$
4
D
t_n
2
E



X determines Y; or
Y is **functionally dependent** to X.
Functional dependency is denoted by an → or f.d.

$$\mathbf{R(\underline{A}_1, A_2)}$$

$$\mathbf{X \rightarrow Y}$$

How to check functional dependency?
Say, will f.d. $A_1 \rightarrow A_2$ hold?

If $t_i[X] = tj[X]$ *then*
$t_i[Y] = tj[Y]$

Will the following functional dependencies hold?

Relation $\mathbf{R}$

	A1	A2
t_1	1	A
t_2	2	B
t_3	3	C
$t_{...}$	4	D
t_n	2	E

$$\boldsymbol{A_1 \rightarrow A_2}$$

If $t_i[X] = tj[X]$ *then*
$t_i[Y] = tj[Y]$

Will the following functional dependencies hold?

Relation $\mathbf{R}$

	A1	A2
t_1	1	A
t_2	2	B
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$t_{...}$	4	D
t_n	2	E

$$A_1 \rightarrow A_2$$

If $t_i[X] = tj[X]$ *then* $t_i[Y] = tj[Y]$

No duplication, no need to check.

Duplication, need to check.

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Duplication, need to check.

Will the following functional dependencies hold?

Relation **R**

	A1	A2
t_1	1	A
t_2	2	B
t_3	3	C
$t_{...}$	4	D
t_n	2	E

$\boldsymbol{A_1 \rightarrow A_2}$

If $t_i[X] = tj[X]$ *then*
$t_i[Y] = tj[Y]$

If $t_2[2] = tn[2]$ *then*
$t_2[A] = tn[E]$ ***fails***.

The functional dependency **does not** hold.

Will the following functional dependencies hold?

Relation $\mathbf{R}$

	A1	A2
t_1	1	A
t_2	2	B
t_3	3	C
$t_{...}$	4	D
t_n	2	E

$$A_2 \rightarrow A_1$$

If $t_i[X] = tj[X]$ *then* $t_i[Y] = tj[Y]$

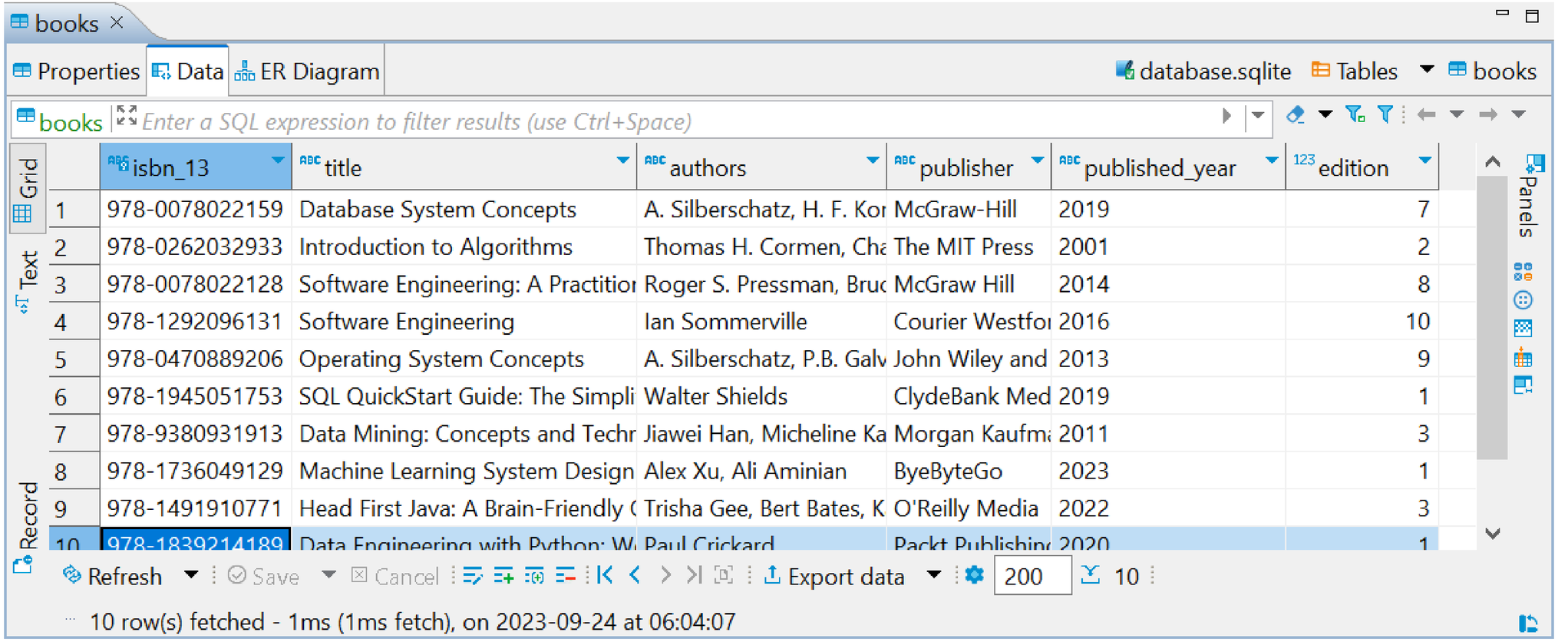
The short answer is **yes**!

$$R(\underline{A_1}, A_2, \ldots, A_n)$$

$$X, Y \rightarrow Z$$

It is possible to have a combination of multiple attributes to determine the value of another attribute.

For instance $X, Y \rightarrow Z$.
Where X and Y, together, determine Z.



books (<u>isbn_13</u>, title, authors, publisher, published_year, edition)

$isbn\_13 \rightarrow title?$

$publisher \rightarrow published\_year?$

Conclusion

- FD shows whether the value of an attribute(s) determines other’s.
- Representative dataset is important to check FD.

References

- R, Elmasri, et. al., Fundamentals of Database Systems.
- A. Silberschatz, et. al., Database System Concepts.
- R. K. Rainer, et. al., Introduction to Information Systems.
- G. M. Marakas et. al., Introduction to Information Systems: Essentials for The e-Business Enterprise.

Course

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