

# CSC343 Worksheet 12 Solution

June 30, 2020

1.
  - Keys
    - {id of molecule}
    - {x position, y position, z position}
  - Functional Dependencies
    - 1. id of molecule  $\rightarrow$  x position, y position, z position, x velocity, y velocity, z velocity
    - 2. x position, y position, z position  $\rightarrow$  id of molecule, x velocity, y velocity, z velocity

## Notes:

- Function Dependencies
  - *Functional Dependency* is a relationship between two attributes typically between the key and other non-key attributes within a table.

### Example:

SIN  $\rightarrow$  Name, Address, Birthdate

### Example 2:

ISBN  $\rightarrow$  Title

- Key of Relations
  - One or more attributes  $\{A_1, A_2, \dots, A_n\}$  is a key for a relation R if
    1. Those attributes functionally determine all other attributes of the relation
    2. No proper subset of  $\{A_1, A_2, \dots, A_n\}$  functionally determines all other attributes of R

### Example:

Given relation

$R = \text{Movies1}(\text{title, year, length, genre, studioName, starName})$

- i. {title, year, starName } form a key for the relation **Movies1**

- ii.  $\{ \text{year}, \text{starName} \}$  is not a key. Same star can be in multiple movies per year
- Superkeys
  - \* Means a set of attributes that contains a key
  - \* Don't need to be minimal

**Example:**

Given relation

$R = \text{Movies1}(\text{title}, \text{year}, \text{length}, \text{genre}, \text{studioName}, \text{starName})$

- $\{ \text{title}, \text{year}, \text{starName} \}$  is a key and superkey
- $\{ \text{title}, \text{year}, \text{starName}, \text{title}, \text{year}, \text{length} \}$  is a superkey

**References:**

1) OpenTextBC, Chapter 11 Functional Dependencies, link

2. a) **Notes:**

- The Splitting / Combining Rule
  - Combining Rule
    - \*  $A_1, A_2, \dots, A_n \rightarrow B_i$  for  $i = 1, 2, \dots, m$
    - to
    - $A_1, A_2, \dots, A_n \rightarrow B_1, B_2, \dots, B_m$

**Example:**

Given

$\text{title year} \rightarrow \text{length}$   
 $\text{title year} \rightarrow \text{genre}$   
 $\text{title year} \rightarrow \text{studioName}$

it's combined form is

$\text{title year} \rightarrow \text{length genre studioName}$

- Splitting Rule
  - \*
  - \*  $A_1, A_2, \dots, A_n \rightarrow B_1, B_2, \dots, B_m$
  - to
  - $A_1, A_2, \dots, A_n \rightarrow B_i$  for  $i = 1, 2, \dots, m$

**Example:**

Given

title year  $\rightarrow$  length

It's splitted form is

title  $\rightarrow$  length

year  $\rightarrow$  length

- Trivial Functional Dependencies

- A functional dependency  $FD : X \rightarrow Y$  is **trivial** if  $Y$  is a subset of  $X$

**Exmample:**

title year  $\rightarrow$  title

**Example 2:**

title  $\rightarrow$  title

- Non-trivial Functional Dependencies

- is a case where some but not all of the attributes on the R.H.S of an FD are also on L.H.S

**Example:**

title year  $\rightarrow$  title movieLength

- Can be simplified using **trivial-dependency rule**
  - \* The  $FD A_1A_2 \cdots A_n \rightarrow B_1B_2 \cdots B_m$  is equivalent to  $A_1A_2 \cdots A_n \rightarrow C_1C_2 \cdots C_k$

where  $C$ 's are all those  $B$ 's that are not in  $A$ 's.

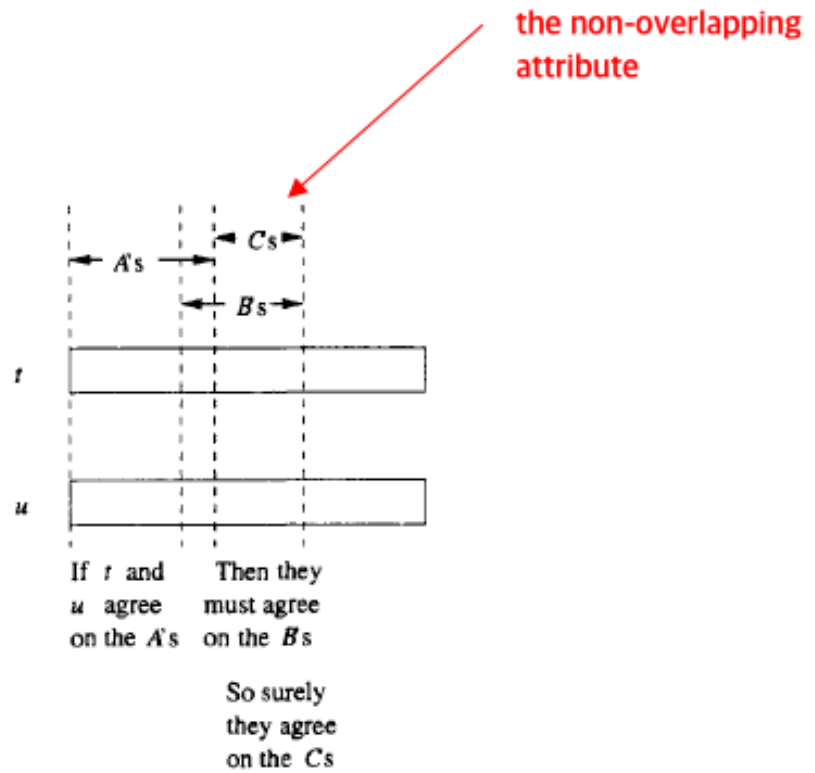


Figure 3.3: The trivial-dependency rule

- Computing the Closure of Attributes

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