

# DATA BASES MODELS AND MER

## DataBase Foundations

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# Outline

1 Databases Types

2 Entity-Relation Model (MER)



# Outline

1 Databases Types

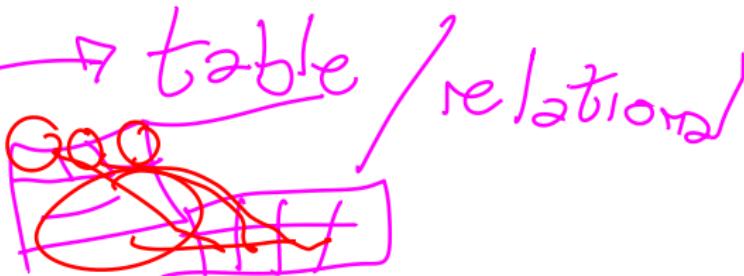
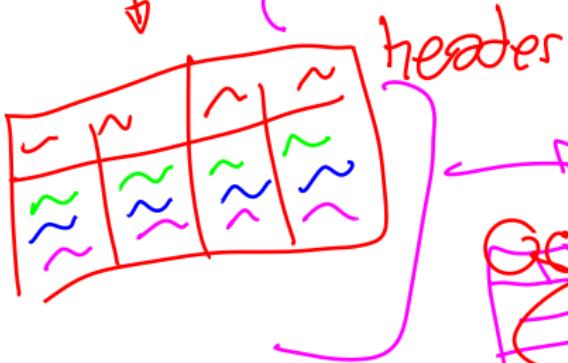
2 Entity-Relation Model (MER)



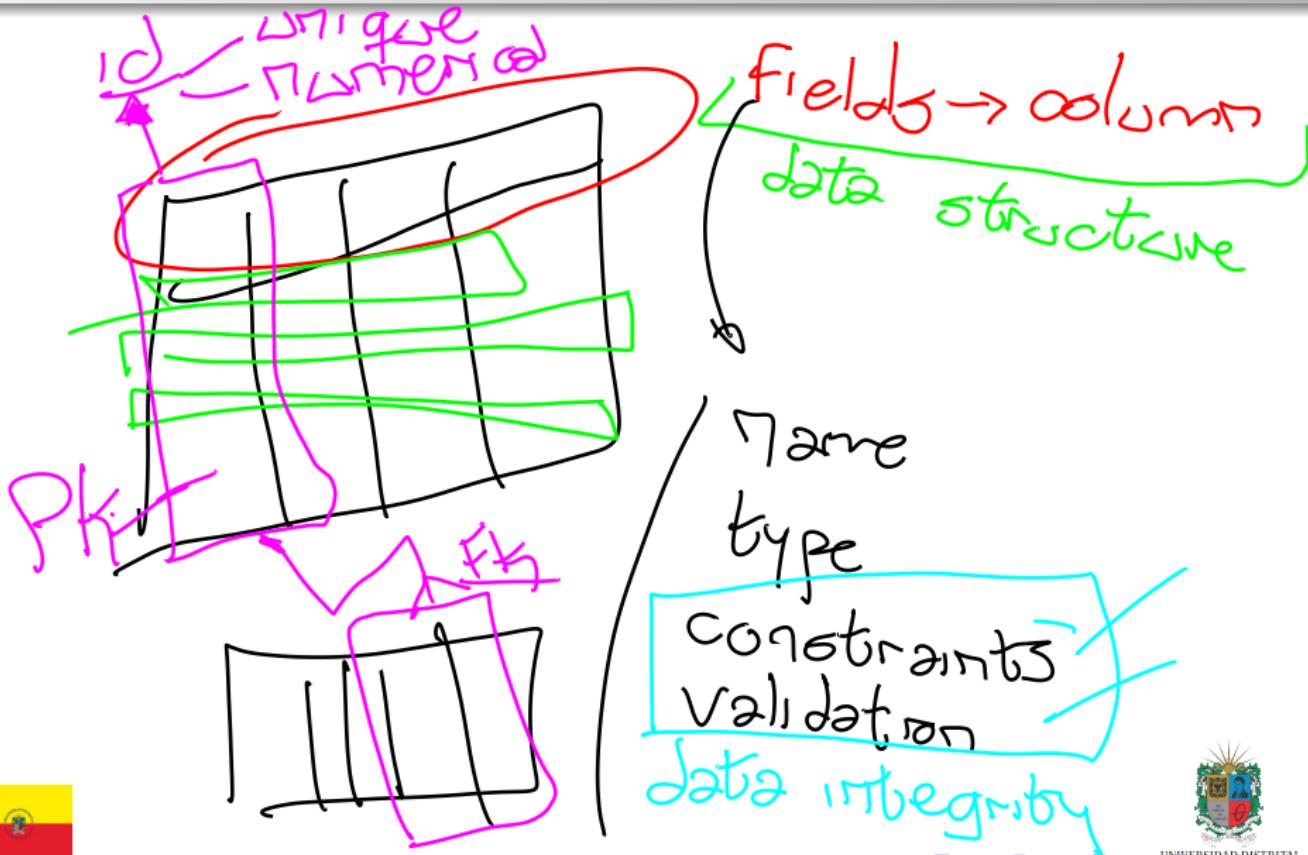
# Relational DataBases, I - Structured Data

→ all rows same format

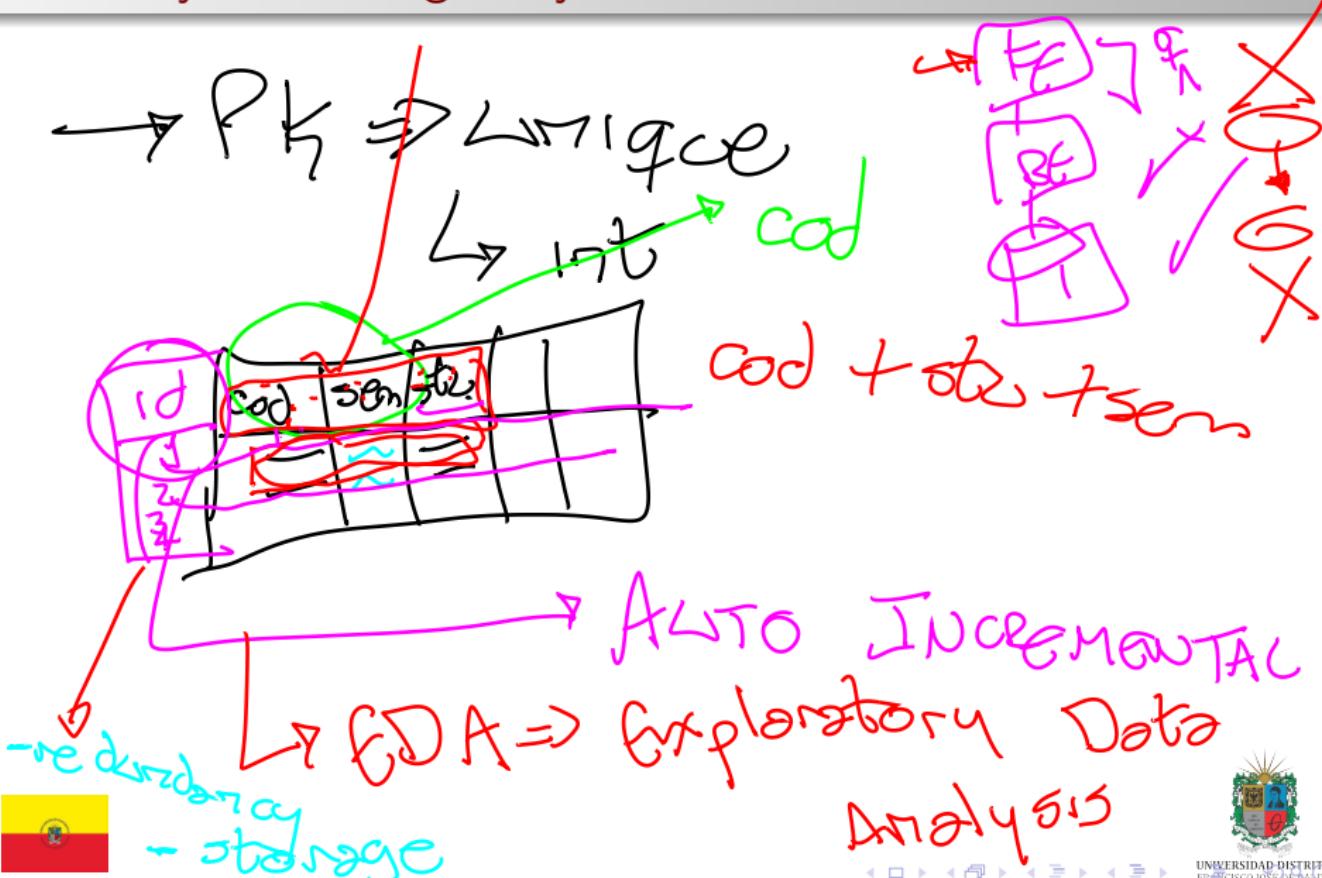
\* list      \* trees      \* hash      \* graph  
 semi-struct



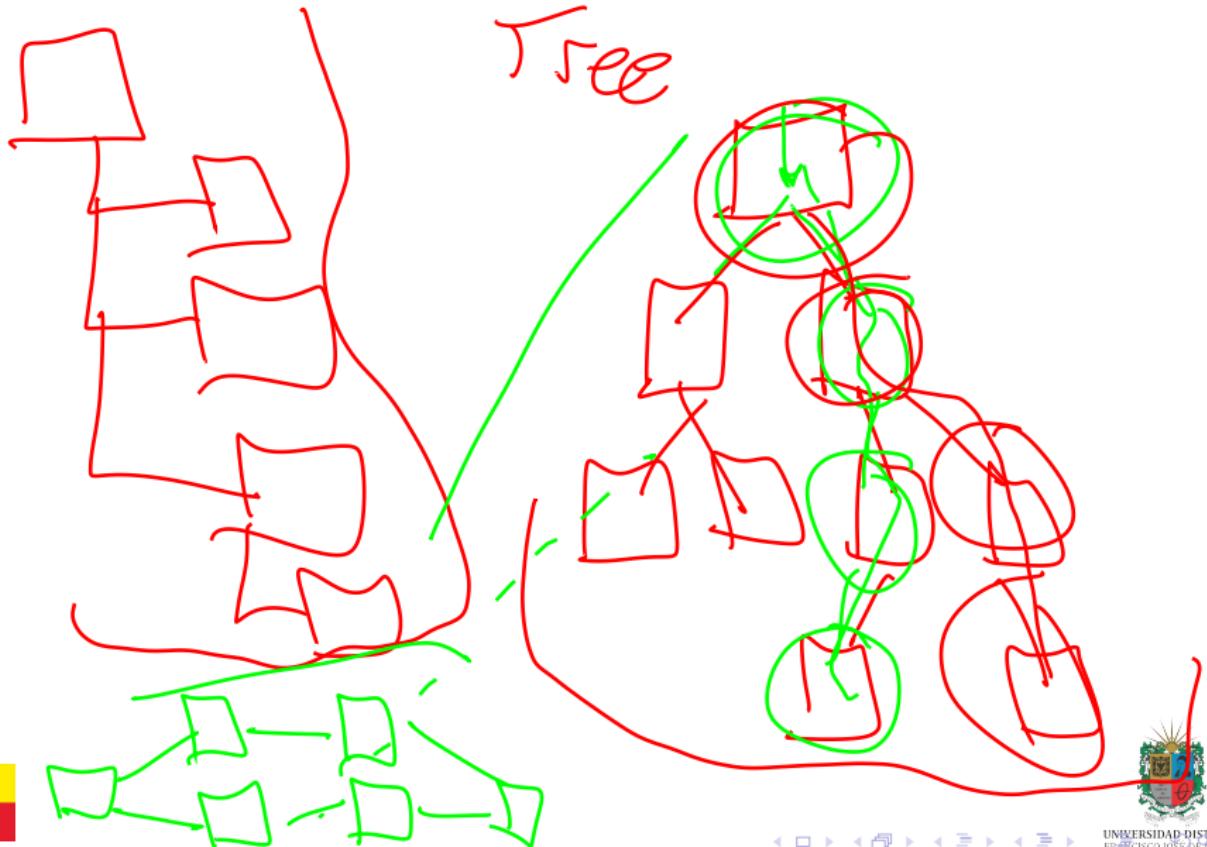
# Relational DataBases II - Tables & Keys



# Primary and Foreign Keys



# Semi-Structured Data

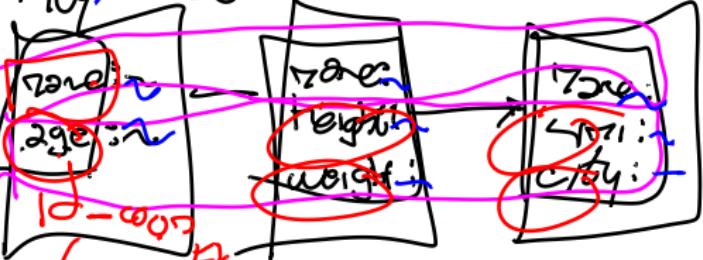


## Document-Based NoSQL

MongoDB

→ Collection

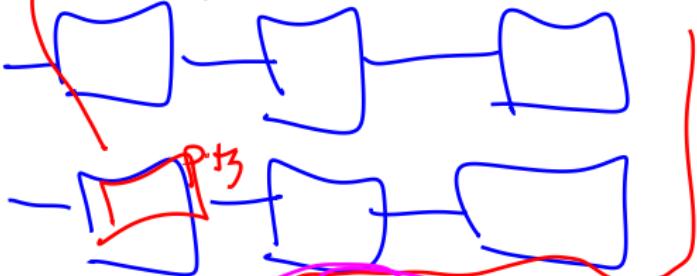
key:value



→ person

→ pet

→ cars



33

storage

redundancy

storage

No SQL

G1

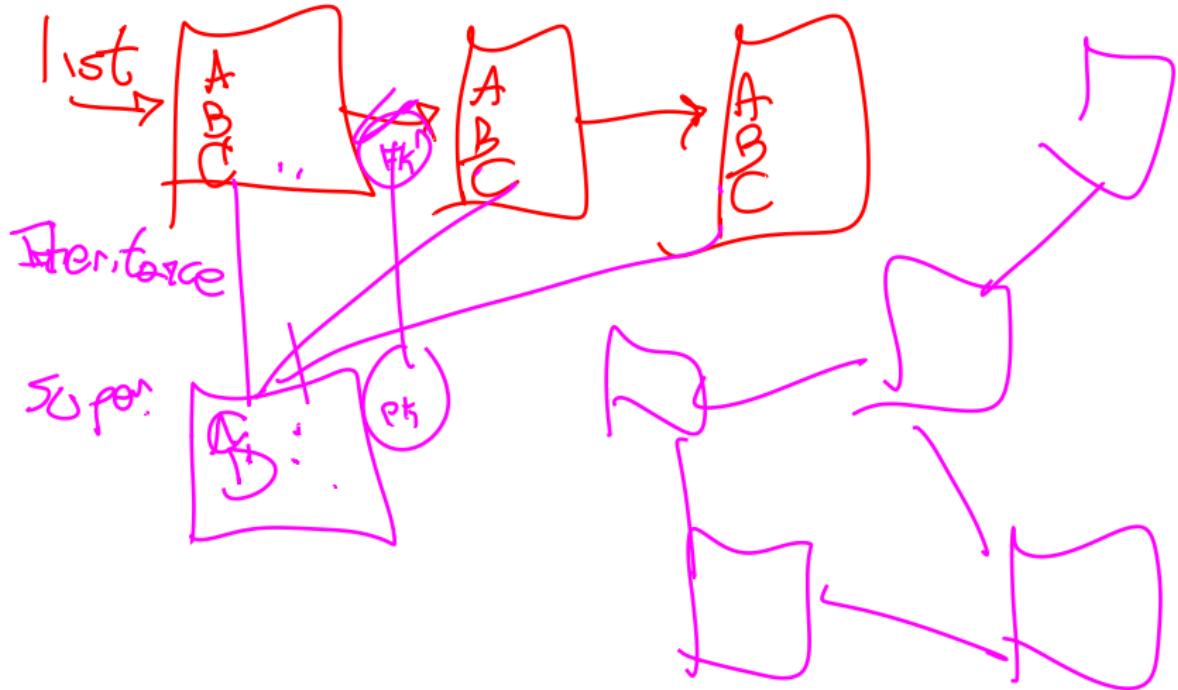
G2

G3

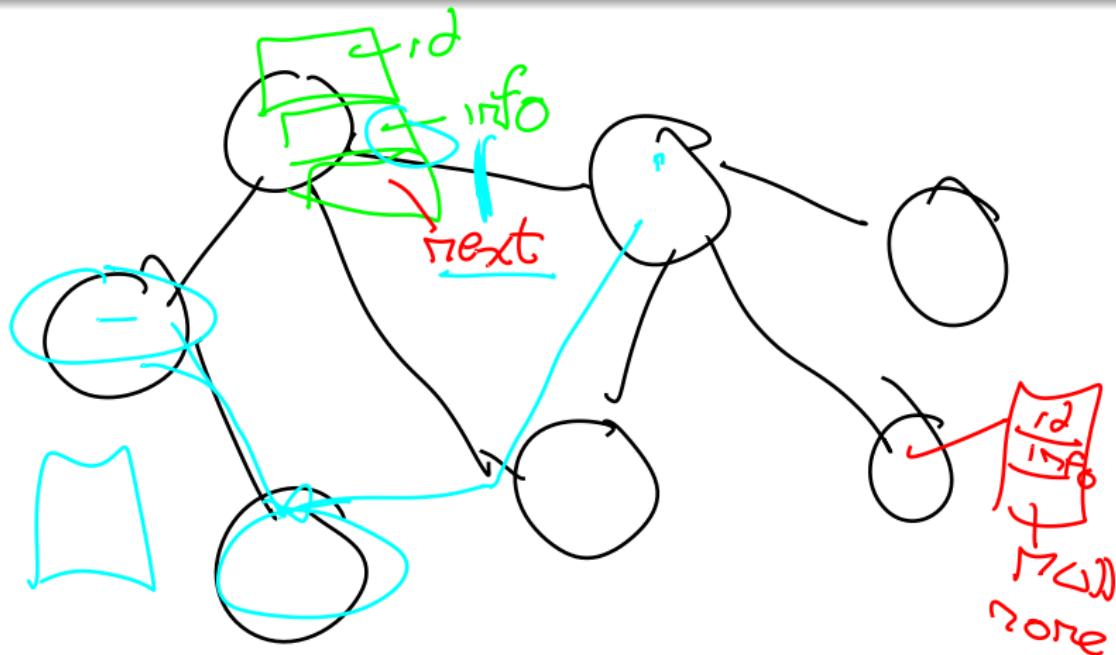
G4



# Object-Oriented NoSQL



# Graph-Based NoSQL



# Outline

1 Databases Types

2 Entity-Relation Model (MER)



# Basic Concepts

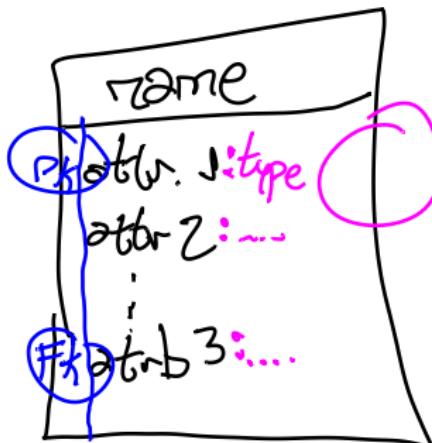
Entity  $\Rightarrow$  Table

Relationships

Attr, better  $\Rightarrow$  columns

$\begin{cases} \text{1-to-1} \\ \text{1-to-many} \\ \text{many-to-many} \end{cases}$

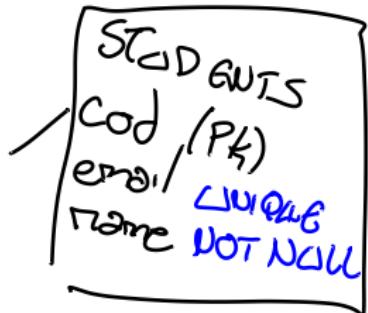
many-to-many



Constraints

① Unique

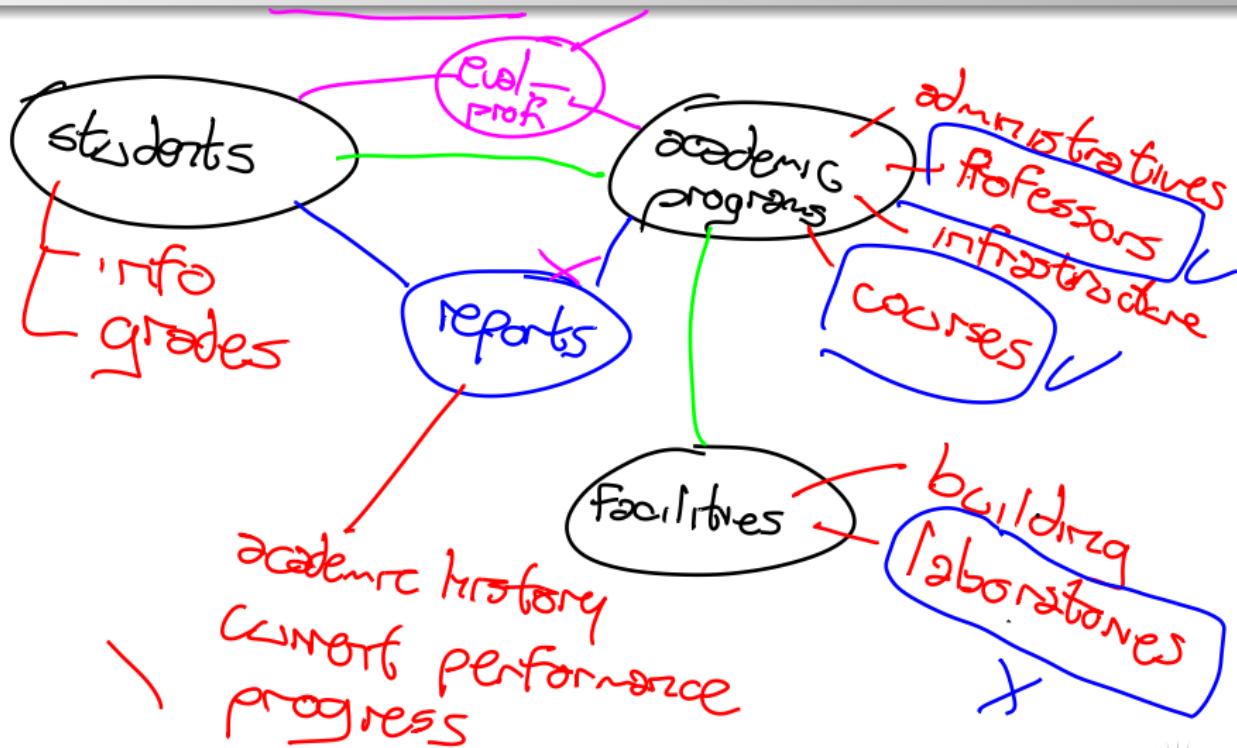
② Not null  
\*mandatory



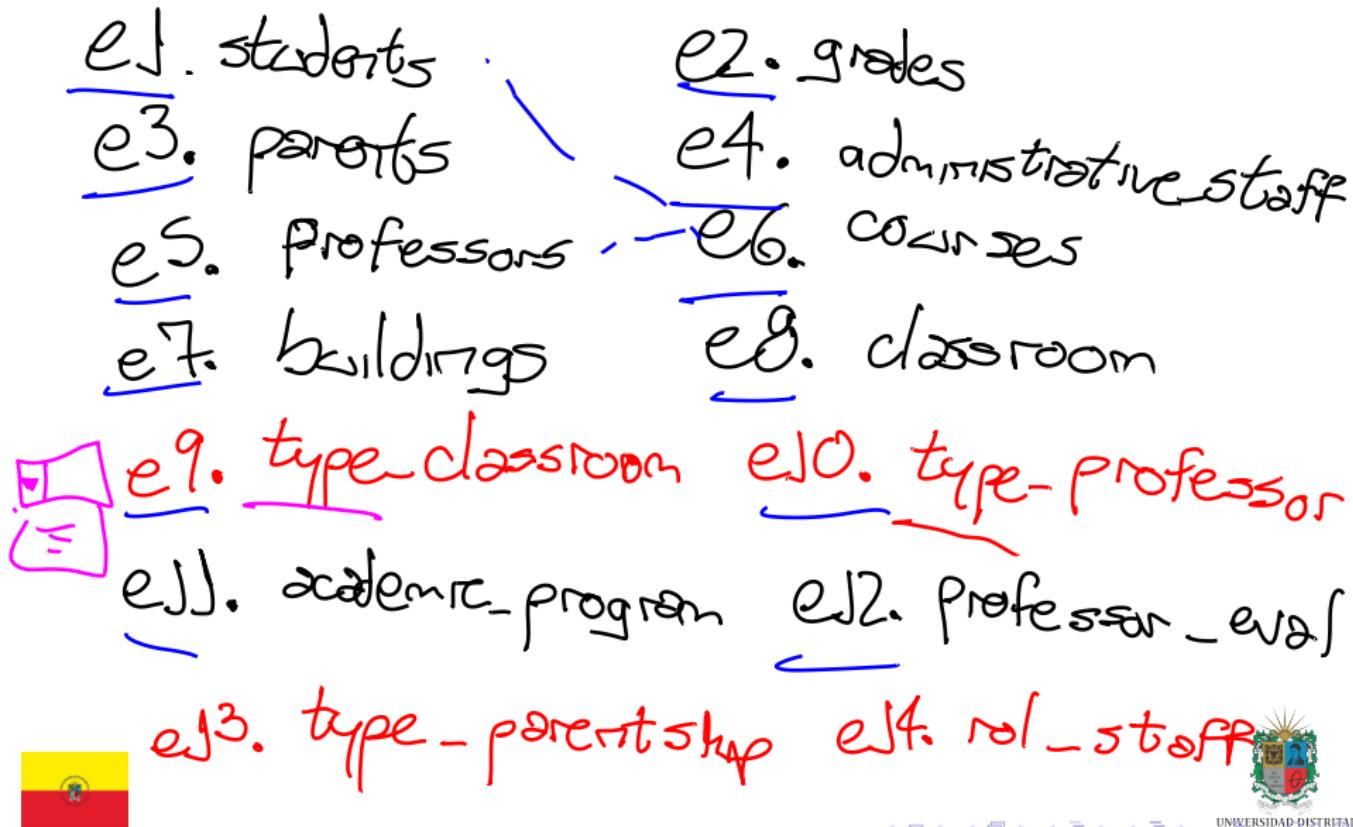
ENLIGATE (op1, op2 -)



# Step 0. Define Components



# Step 1. Define Entities



## Step 2. Define Attributes per Entity

- e1.  $\Rightarrow$  cod, name, email, phone, address
- e2.  $\Rightarrow$  value, student, course, period
- e3.  $\Rightarrow$  id, name, student, type
- e4.  $\Rightarrow$  id, name, no
- e5.  $\Rightarrow$  id, name, email, academic\_program, bachelor
- e6.  $\Rightarrow$  cod, name, semester, academic\_program
- e7.  $\Rightarrow$  id, name, address, latitude, longitude
- e8.  $\Rightarrow$  number, building, type\_classroom
- e9.  $\Rightarrow$  id, name, description
- e10.  $\Rightarrow$  id, name, description
- e11.  $\Rightarrow$  street, name, coordinator, department



### Step 3 Define Relationships

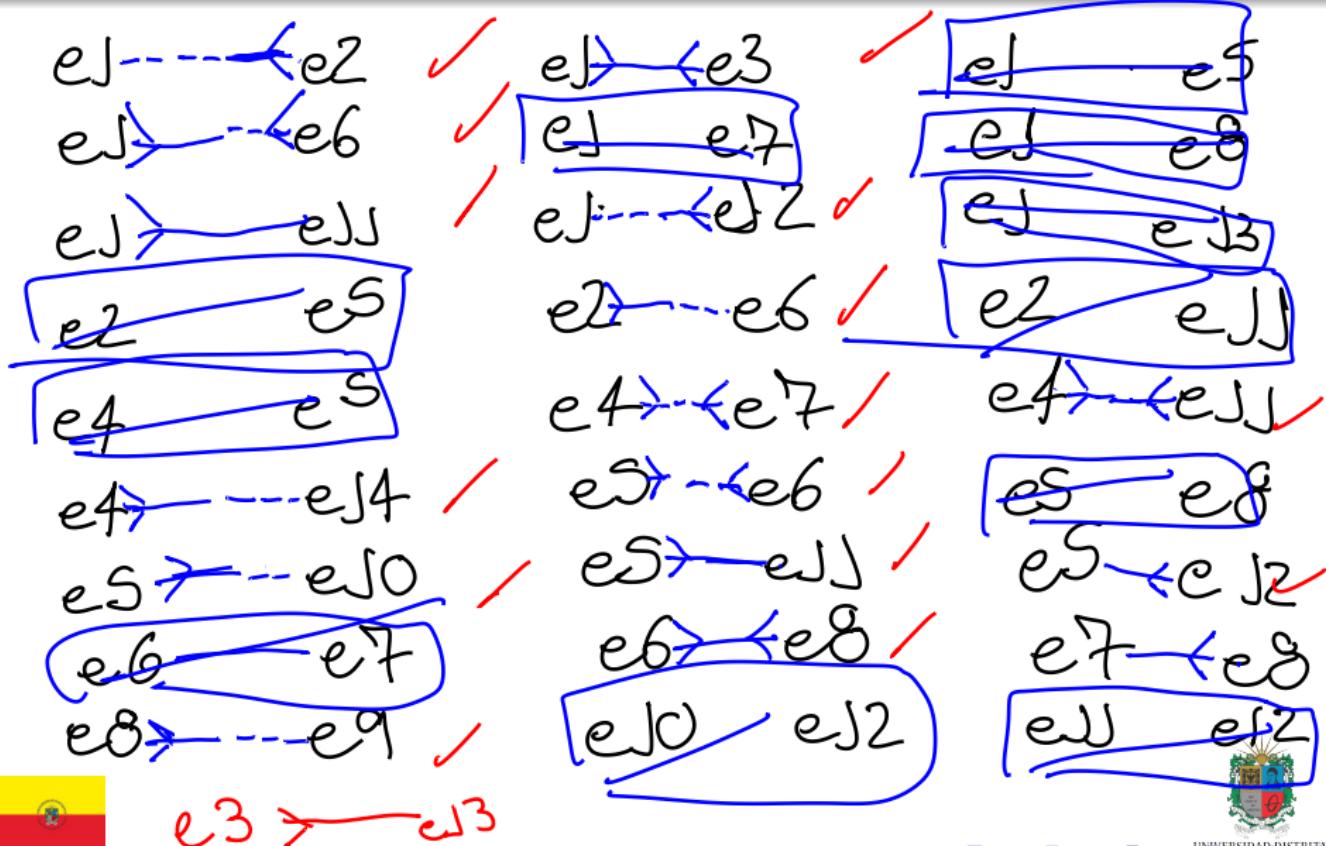
	e1	e2	c3	e4	e5	e6	e7	e8	e9	e10	e11	e12	e13	e14
e1		/	/											
e2														
e3														
e4														
e5														
e6														
e7														
e8														
e9														
e10														
e11														
e12														
e13														
e14														

The diagram shows a grid of relationships between entities e1 through e14. Handwritten annotations include red checkmarks and X's, blue circles with X's, and black scribbles. Key observations include:

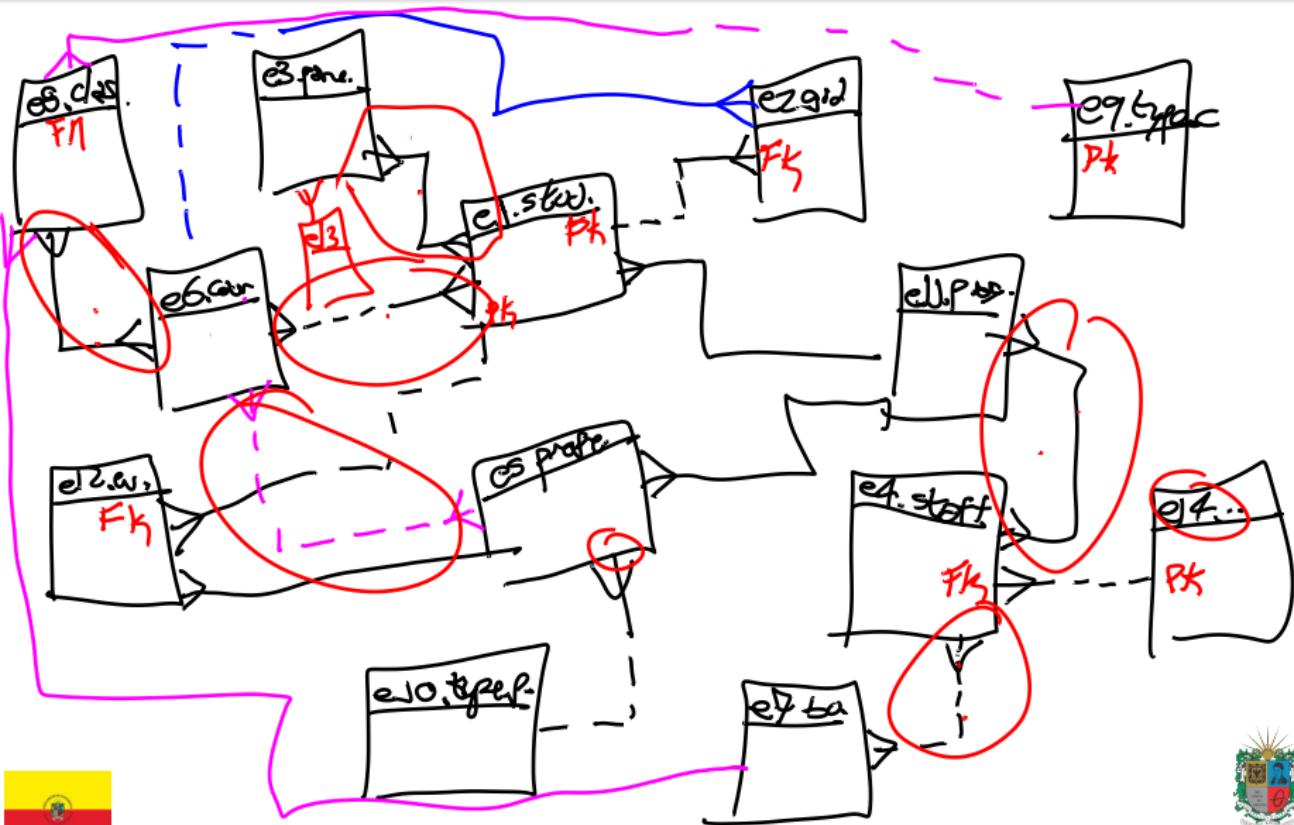
- Relationships between e1 and e2, e1 and e3, e1 and e4, e1 and e5, e1 and e6, e1 and e7, e1 and e8, e1 and e9, e1 and e10, e1 and e11, e1 and e12, e1 and e13, and e1 and e14 are marked.
- Relationships between e2 and e3, e2 and e4, e2 and e5, e2 and e6, e2 and e7, e2 and e8, e2 and e9, e2 and e10, e2 and e11, e2 and e12, e2 and e13, and e2 and e14 are marked.
- Relationships between e3 and e4, e3 and e5, e3 and e6, e3 and e7, e3 and e8, e3 and e9, e3 and e10, e3 and e11, e3 and e12, e3 and e13, and e3 and e14 are marked.
- Relationships between e4 and e5, e4 and e6, e4 and e7, e4 and e8, e4 and e9, e4 and e10, e4 and e11, e4 and e12, e4 and e13, and e4 and e14 are marked.
- Relationships between e5 and e6, e5 and e7, e5 and e8, e5 and e9, e5 and e10, e5 and e11, e5 and e12, e5 and e13, and e5 and e14 are marked.
- Relationships between e6 and e7, e6 and e8, e6 and e9, e6 and e10, e6 and e11, e6 and e12, e6 and e13, and e6 and e14 are marked.
- Relationships between e7 and e8, e7 and e9, e7 and e10, e7 and e11, e7 and e12, e7 and e13, and e7 and e14 are marked.
- Relationships between e8 and e9, e8 and e10, e8 and e11, e8 and e12, e8 and e13, and e8 and e14 are marked.
- Relationships between e9 and e10, e9 and e11, e9 and e12, e9 and e13, and e9 and e14 are marked.
- Relationships between e10 and e11, e10 and e12, e10 and e13, and e10 and e14 are marked.
- Relationships between e11 and e12, e11 and e13, and e11 and e14 are marked.
- Relationships between e12 and e13, and e12 and e14 are marked.
- Relationships between e13 and e14 are marked.
- Relationships between e1 and e2, e1 and e3, e1 and e4, e1 and e5, e1 and e6, e1 and e7, e1 and e8, e1 and e9, e1 and e10, e1 and e11, e1 and e12, e1 and e13, and e1 and e14 are circled with blue circles containing X's.
- Relationships between e2 and e3, e2 and e4, e2 and e5, e2 and e6, e2 and e7, e2 and e8, e2 and e9, e2 and e10, e2 and e11, e2 and e12, e2 and e13, and e2 and e14 are circled with blue circles containing X's.
- Relationships between e3 and e4, e3 and e5, e3 and e6, e3 and e7, e3 and e8, e3 and e9, e3 and e10, e3 and e11, e3 and e12, e3 and e13, and e3 and e14 are circled with blue circles containing X's.
- Relationships between e4 and e5, e4 and e6, e4 and e7, e4 and e8, e4 and e9, e4 and e10, e4 and e11, e4 and e12, e4 and e13, and e4 and e14 are circled with blue circles containing X's.
- Relationships between e5 and e6, e5 and e7, e5 and e8, e5 and e9, e5 and e10, e5 and e11, e5 and e12, e5 and e13, and e5 and e14 are circled with blue circles containing X's.
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- Relationships between e9 and e10, e9 and e11, e9 and e12, e9 and e13, and e9 and e14 are circled with blue circles containing X's.
- Relationships between e10 and e11, e10 and e12, e10 and e13, and e10 and e14 are circled with blue circles containing X's.
- Relationships between e11 and e12, e11 and e13, and e11 and e14 are circled with blue circles containing X's.
- Relationships between e12 and e13, and e12 and e14 are circled with blue circles containing X's.
- Relationships between e13 and e14 are circled with blue circles containing X's.



# Step 4 Define Relationships Types



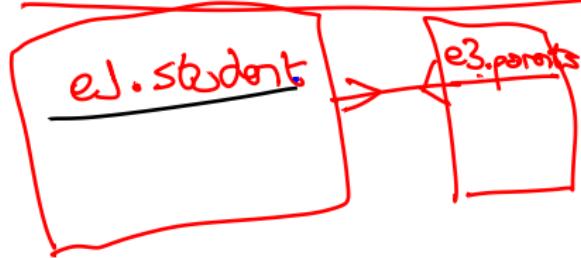
# Step 5 First Entity-Relationship Draw



# Step 7. First Split Many-to-Many Relationships

$e_1 \Rightarrow FK\_Program$   
 $e_4 \Rightarrow FK\_rel\_staff$   
 $e_8 \Rightarrow FK\_type\_classroom$   
 $\quad FK\_building$   
 $e_3 \Rightarrow FK\_type\_parent$

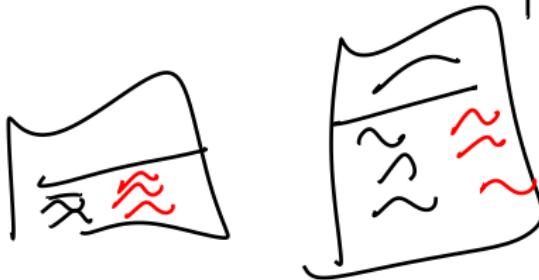
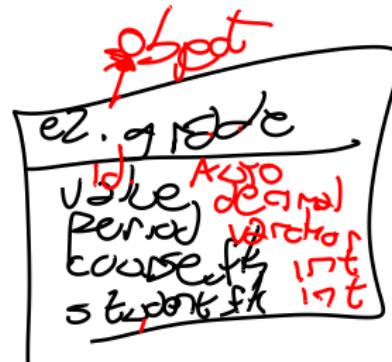
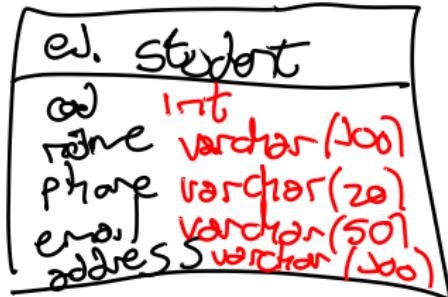
$e_2 \Rightarrow FK\_student$   
 $e_5 \Rightarrow FK\_type\_professor$   
 $\quad FK\_program$   
 $e_7 \Rightarrow FK\_student$   
 $\quad FK\_professors$



# Step 8. Second Entity-Relationship Draw



# Step 9. Get Data-Structure E-R M



# Step 10. Define Constraints and Properties of Data

e.g. student	
col	int PK
name	varchar NOT NULL
address	varchar
age	decimal > 0
email	varchar UNIQUE



# Outline

1 Databases Types

2 Entity-Relation Model (MER)



# Thanks!

# Questions?



Repo: [github.com/engandres/ud-public/courses/databases-foundations](https://github.com/engandres/ud-public/courses/databases-foundations)

