

# The Relational Model

CISC437/637, Lecture #4

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## Relational Model

- The relational model is the most widely used in modern DBMS
  - IBM's DB2, Informix, Oracle, Sybase, Microsoft Access and SQL Server, MySQL, PostgreSQL
- Introduced by Edgar Codd in 1970
- Differences from ER model:
  - Only one structure (relations) rather than two (entities and relationships)
  - Logical rather than conceptual
  - Based on mathematical framework that formally describes queries of relations

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## Relations

- **Relations** are the main construct in the relational model
- Two components:
  - **Relation instance** is a table with rows and columns
  - A **relation schema** describes the columns of the table

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## Relation Schema

- The schema defines a relation in terms of:
  - The relation name
  - The name of each column (or field)
  - The domain of each field
- Example:
  - `Students(sid: integer, name: string, login: string, age: integer, gpa: real)`

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## Relation Instance

- An **instance** of a relation is a set of records or tuples
  - Each record has the same fields as defined in the schema
  - Relation instance = relation table
- Every record in a table is unique
  - No two records can have every field value equivalent
- Strictly speaking, no ordering on records or fields
  - In practice, ordering fields is often useful

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## Domain Constraints

- The domains of the fields specify conditions that a relation must satisfy
  - A record is valid only if its values are in the specified domains (or NULL)
- More formally:
  - $R(f_1:D_1, \dots, f_n:D_n)$  is a relation schema
  - $D_i$  is a name for a set of values  $Dom_i$
  - $\{ \langle f_1:d_1, \dots, f_n:d_n \rangle \mid d_1 \in Dom_1, \dots, d_n \in Dom_n \}$  is a valid relation instance of  $R$
  - Any record  $\langle f_1:d_1, \dots, f_n:d_n \rangle$  for which there is some  $i$  such that  $d_i \notin Dom_i$  is invalid

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