

# Databases

## Computer Security and Networks

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- Databases store large amount of data and make it possible to operate on them efficiently
- Most common type based on sets and relations.
- Terminology used:
  - Have sets of values and relations between them. Such sets are called *domains*.
  - *Attribute names* (or *attributes*) are a function from values to domains
  - *Relational schema* is finite set of attribute names
  - *Relation*: a mathematical relation between domains
  - *tuple* : element of a relation



- *Superkey* a set of attributes which can always be used to differentiate one tuple from another (within a relation)
- *Key* a minimal superkey
- *Primary key* a special key, often an integer which incremented for each new entry
- *Foreign key* an attribute of the relation which is a key for another relation



Give an example.



- Data stored and administered using a database management system (eg postgres, MySQL)
- Have separate language for querying and operating on data called *SQL*. Main concepts of SQL:
  - *Tables* represent relations. Columns are attribute names, rows are elements of the relation.
  - Can specify primary and foreign keys explicitly

# Basic SQL operations

- *SELECT* displays certain rows of tables
- *INSERT* inserts row into a table
- *UPDATE* updates rows of a table
- *DELETE* deletes rows of a table
- *CREATE DATABASE* creates new database
- *DROP DATABASE* deletes whole database (!)
- *CREATE TABLE* adds table to database
- *DROP TABLE* drops table of a database
- *ALTER TABLE* changes properties of a table



- Database design usually captured by Entity-Relationship diagram
- These can be easily mapped to database schema
- Components of ER diagrams:
  - *Oval* - attributes
  - *Rectangle* - entity set
  - *Diamond* - relation set
  - *Lines* - showing links, and kind of relationship (one-to-one, one-to-many, many-to-many)

# Example of ER-diagram

