CS 1555

Lecture 2

**Introduction**

Data abstraction

- Data model: collection of high-level data description constructs that hide low-level storage details

- Relational model/object-relational model (most widely used)

- Main construct is a relation: table of records

- Every relation has a schema: relation name, names of fields, types of fields

- State: actual data at a given point in time

Database languages

- Data Definition Language (DDL): define schemas, define integrity constraints

- Data Manipulation Language (DML): ask questions (query), create/modify data

Levels of data abstraction in a DBMS

1. Conceptual schema (defined by DDL)

2. Physical schema (defined by storage definition language)

3. External schema (made up of views and defined by view definition language)

External schema – views

- Allow data access to be customized and authorized at the user level

- Defined in terms of data model, consists of a collection of views

- Guided by end-user requirements

- Views are computed as needed

- Multiple views of data allow each user/application to get different perspective of database

3 level architecture

- View level (ex: CS Majors)

- Logical level (ex: courses, students)

- Physical level: how tables are stored, how many bytes

Execution abstraction

- Transaction is a logical unit of work in DBMS, ex: execution of a program segment, logical grouping of query and update requests

ACID properties

- Atomicity: all operations in a transaction happen or none do

- Consistency preservation: satisfies integrity constraints on database at transaction’s boundaries

- Isolation: transactions are independent, same result whether transactions are executed concurrently or serially

- Durability: effects of completed transactions become permanent surviving any subsequent failures

SQL transactions

- Begin: each SQL statement should implicitly start a transaction unless one is active

- End: COMMIT [WORK];, END [WORK];, or ROLLBACK[WORK]

ACID in NoSQL databases

- ACID to BaSE: lose immediate consistency, gain data freshness & accuracy