CS 1555

Lecture 22

**Database System Design (continued)**

Normal Forms summary

- 1NF: every attribute has single atomic value

- 2NF: in 1NF and doesn’t have partial dependencies

- 3NF: in 2NF and doesn’t have transitive dependencies to attributes that are not part of a key

- Boyce-Codd NF: in 3NF and has no transitive dependencies

- 4NF: in BCNF and has no multivalue dependencies

Synthesis (bottom-up)

- Begin with attributes and combine them into related group using functional dependencies to develop a set of normalized relations

Design goals

- Goal: BCNF, lossless join, dependency preservation

- If we can’t achieve this, we accept one of

- Lack of dependency preservation

- Redundancy due to use of 3NF

Disadvantages of normal forms

- Not constructive

- Can only be applied after we have a schema

- Provides no conceptual design

- Can be applied only to relational schemas

**Conceptual Database Design & ER Model**

Entity-relationship model

- Two semantics primitives:

- Entities: objects with physical or conceptual existence

- Relationships: associations between 2+ entities

Attributes

- Entities are characterized by their attributes

- Relationships may also have attributes

Attribute classification

- Value: single, multi, derived, NULL

- Structure: simple (atomic), composite

Entity types

- All similar (same attributes) entities are grouped into sets, an entity type

- Entity type schema specifies common structure

- Type name

- Entity attributes

- Constraints on entities

Uniqueness or key constraint

- Entities are distinguished by using various keys

- Superkey: any attribute combination that uniquely identifies an entity

- In notation, primary key is underlined and alternate key is overlined

Relationship types

- Sets of relationships that are homogeneous in participating entities