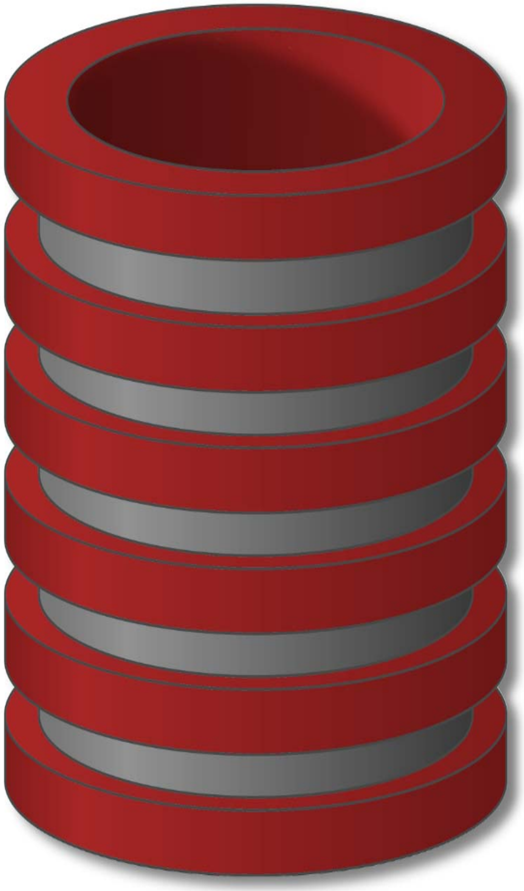

Relational Databases

Relational Algebra

Set operators, renaming, grouping and aggregate operations

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Relational Algebra

Relational algebra query (expression) on set of relations produces relation as a result

College(cName,state,enrollment)

Student(sID,sName,GPA,sizeHS)

Apply(sID,cName,major,decision)

College

cName	state	enr

Student

sID	sName	GPA	HS

Apply

sID	cName	major	dec

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Union operator

List of college and student names (contrived example)

College

cName	state	enr

Student

sID	sName	GPA	HS

Apply

sID	cName	major	dec

Rename operator (2 forms)

1.

2.

College

cName	state	enr

Student

sID	sName	GPA	HS

Apply

sID	cName	major	dec

Rename operator

To unify schemas for set operators

List of college and student names

College

cName	state	enr

Student

sID	sName	GPA	HS

Apply

sID	cName	major	dec

Rename operator

For disambiguation in "self-joins"

Pairs of colleges in same state

College

cName	state	enr

Student

sID	sName	GPA	HS

Apply

sID	cName	major	dec

Difference operator

IDs of students who didn't apply anywhere

IDs and names of students who didn't apply anywhere

College

cName	state	enr

Student

sID	sName	GPA	HS

Apply

sID	cName	major	dec

Intersection operator

Names that are both a college name and a student name

College

cName	state	enr

Student

sID	sName	GPA	HS

Apply

sID	cName	major	dec

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Intersection doesn’t add expressive power (1)

College

cName	state	enr

Student

sID	sName	GPA	HS

Apply

sID	cName	major	dec

Intersection doesn’t add expressive power (2)

College

cName	state	enr

Student

sID	sName	GPA	HS

Apply

sID	cName	major	dec

Practice Exercises

Grouping and Aggregate Operators

Grouping allows us to look at properties of “groups” of rows, the aggregate operators (sum, count, count-distinct, max, min, avg) then allow us to apply simple functions to groups

How many NC colleges are in the College table

Which student from a high school with more than 1000 students had the lowest GPA and their name

College

cName	state	enr

Student

sID	sName	GPA	HS

Apply

sID	cName	major	dec

Grouping and Aggregate Operators

Grouping can be based on equality on one or more columns; written on the left side of the script G.

College enrollment broken down by state.

The average GPA of applicants by school.

College

cName	state	enr

Student

sID	sName	GPA	HS

Apply

sID	cName	major	dec

Grouping and Aggregate Operators

Considering only those students who were accepted, which college in NC had the highest average applicant GPA.

College

cName	state	enr

Student

sID	sName	GPA	HS

Apply

sID	cName	major	dec

SQL in a Nutshell

SQL

College

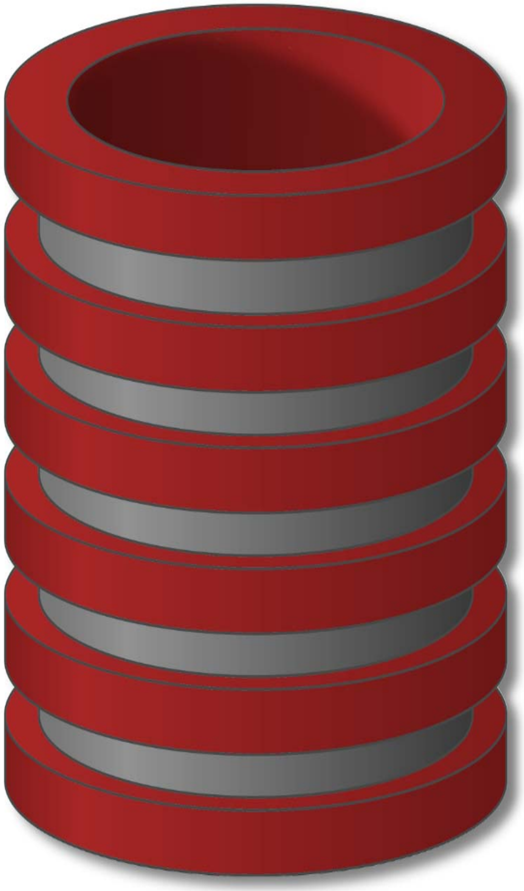
cName	state	enr

Student

sID	sName	GPA	HS

Apply

sID	cName	major	dec



SQL

Mini-Introduction

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SQL: Intro

- "S.Q.L." or "sequel"
- Supported by all major commercial database systems
- Standardized – many new features over time
- Interactive via GUI or prompt, or embedded in programs
- Based on relational algebra
- A declarative language

SQL: Intro

Data Definition Language (DDL)

Data Manipulation Language (DML)

Other aspects:

indexes, constraints, views, triggers, transactions, authorization, …

The Basic SELECT Statement

Select $A_1, A_2, \ldots, A_n$

From $R_1, R_2, \ldots, R_m$

Where condition