SQL Data Types

- INT, FLOAT, DECIMAL - VARCHAR(n) - DATE, TIME, TIMESTAMP

- CREATE DOMAIN d as CHAR(9);
- CREATE TABLE t
  (FNAME VARCHAR(15) ...,
  PRIMARY KEY (SSN),
  FOREIGN KEY (DNO) REFERENCES DEPARTMENT(DNUMBER)
  CONSTRAINT empPK
  PRIMARY KEY (SSN));
- DROP SCHEMA schema_name [CASCADE] - DROP TABLE table-name [CASCADE]

Queries

- SELECT attr1, attr2, ...
  FROM table1, table2, ...
  WHERE conditions
- Tricks: EMPLOYEE as E, E.FNAME, UNION/INTERSECT 2 QUERIES

- ORDER BY attr DESC, attr2 ASC

- JOINS:
  FROM (EMPLOYEE JOIN DEPT ON DNUM=DNO)
  NATURAL JOIN ← Must rename

NESTED QUERIES

- WHERE SALARY > ALL (... QUERY ...)
  >, <, =, <> → ← ANY, ALL, SOME
  "=ANY" == "IN"
- EXISTS Keyword
  At least one tuple → TRUE
  Zero tuples → FALSE
- GROUP BY SSN, FNAME
- HAVING COUNT(*) ← Agg. Function in condition
  COUNT, SUM, MIN, MAX, AVG

1. FROM
2. WHERE
3. GROUP BY
4. HAVING
5. SELECT
6. ORDER BY

TRIGGERS

- ON event IF condition THEN action
  event: INS, UPD, DEL
  condition: WHERE syntax
  action: DEL, INS, UPD

Row-level vs Stmt-level (Ins., Up., Del.)

- Keywords: NEW and OLD.

Functional Dependencies

$F = \{A \to B, BC \to E, ED \to A\}$

- Compute closure $AC^+ = ACBE$.
- Is $E \in AC^+$? Yes
- Is AC a key of R?
  $AC^+ = ACBE \neq R \Rightarrow$ Not a superkey
- Is BCDE a key of R?
  $BCDE^+ = ABCDE = R$ ✓ $\Rightarrow$ Superkey ✓
  $\Rightarrow$ Check one-level deep subsets
  $BCD^+ = R$ ✓ $CDE^+ \neq R$ $BDE^+ \neq R$
  $\therefore$ BCDE is a superkey but not minimal $\Rightarrow$ Not a key.

- Find a key

Order EDCBA (backwards)

K = ABCDE

ABCDE Try to remove E.
$ABCD^+ = ABCDE = R \Rightarrow$ you're good to rm E. ①

ABCD Try to remove D
$ABC^+ = ABCE \neq R \Rightarrow$ Cannot rm D. ✗

Try to remove C ✗

Try to remove B ✓
$ACD^+ = ABCDE = R \Rightarrow$ Good to remove B

ACD
Try to rm A
$CD^+ = CD \neq R$

RM C
$AD^+ = ABD \neq R$

RM D
$AC^+ = ACBE \neq R$

Done. ACD a key of R.

Compute ALL Keys of R.

① Start with CD, not showing up on RHS

$F = \{A \to B, BC \to E, ED \to A\}$

Can't use B, E, A.

Use CD

CD
CDE CDB ① CDA ②
~~CDAB~~ ~~CDAE~~ ~~CDBE~~
~~CDABE~~

② Get all supersets.

③ Find closure. If superkey, delete all supersets

- Is R in BCNF
  $A^+ = AB \neq R$ $\therefore A \to B$ violates BCNF
  $\therefore$ R is not BCNF
- What are the prime attributes of R?
  PA = Attributes that appear in some key
- Is R in 3NF?
  If all attributes are prime attributes
  All LHS superkey
  OR
  All RHS PA
  Yes since B, E, A

Normal Forms

- 3NF if for every $X \to Y$ in F either
  a) Every LHS is a superkey
  b) Every RHS is a prime attribute
- BCNF if for every $X \to Y$ in F
  a) Every LHS is a superkey.

Decomposition

$D = \{ABC, ADE\} = \{R_1, R_2\}$ **Is D Lossless Join?**

Check: If $(R_1 \cap R_2) \to (R_1 - R_2)$ in $(R_1 \cap R_2)^+$
If " $\to (R_2 - R_1)$ "

$$bfr = \left\lfloor \frac{\text{Block Record Size in B}}{\text{Record Size in B}} \right\rfloor$$

R

A	B	C	D	E
a_1	b_1	c	d_1	e_1
a_2	b_2	c	d_2	e_2

π_{ABC}

A	B	C
a_1	b_1	c
a_2	b_2	c

π_{CDE}

C	D	E
c	d_1	e_1
c	d_2	e_2

$\pi_{ABC}(R) \bowtie \pi_{CDE}(R) \neq R$

A	B	C	D	E
a_1	b_1	c	d_1	e_1
a_1	b_1	c	d_2	e_2
a_2	b_2	c	d_1	e_1
a_2	b_2	c	d_2	e_2

We lose the original structure of R.