Insert

- **Insert Tuple**
  - Insert a single tuple with implicit or explicit attribute assignment

  ```
  INSERT INTO Students (SID, Lname, Fname, MTime, DoB)
      VALUES (7,'Boehm','Matthias','2002-10-01','1982-06-25');
  ```

  - Insert attribute key-value pairs to use auto increment, defaults, NULLs, etc

  ```
  INSERT INTO Students (Lname, Fname, DoB)          SERIAL SID,
      VALUES ('Boehm','Matthias','1982-06-25'),   DEFAULT MTime
              (...), (...);
  ```

- **Insert Table**
  - **Redirect query result into INSERT** (append semantics)

  ```
  INSERT INTO Students
      SELECT * FROM NewStudents;
  ```

  Analogy Linux redirect (append):
  ```
  cat NewStudents.txt >> Students.txt
  ```

Update and Delete

- **Update Tuple/Table**
  - Set-oriented update of attributes
  - Update single tuple via predicate on **primary key**

  ```
  UPDATE Students
      SET MTime = '2002-10-02'
      WHERE LName = 'Boehm';
  ```

- **Delete Tuple/Table**
  - Set-oriented delete of tuples
  - Delete single tuple via predicate on **primary key**

  ```
  DELETE FROM Students
      WHERE extract(year
          FROM mtime) < 2010;
  ```

- **Note: Time travel and multi-version concurrency control**
  - Deleted tuples might be just **marked as inactive**
  - See lecture 09 Transaction Processing and Concurrency

Select Template

- **Basic Query Template**
  - Select-From-Where
  - Grouping and Aggregation
  - Having and ordering
  - Duplicate elimination

  ```
  SELECT [DISTINCT] <column_list>
      FROM [<table_list> |
        <table1> [RIGHT | LEFT | FULL] JOIN
        <table2> ON <condition>]
      [WHERE <predicate>]
      [GROUP BY <column_list>]
        [HAVING <grouping predicate>]
      [ORDER BY <column_list> [ASC | DESC]]
  ```

Distinct

Distinct and All

- **Distinct and all** alternatives
- Projection w/ **bag semantics** by default

```
SELECT DISTINCT
    FROM Students
```

Sorting

Sorting

- Convert a **bag** into a **sorted list** of tuples; order lost if used in other ops
- Single order: (Lname, Fname) **DESC**
- Evaluated last in a query tree

```
SELECT * FROM
    ORDER BY Ln
              Fn
```

Set Operations

Set Operations

- See **04 Relational Algebra and Calculus**
  → UNION, INTERSECT, EXCEPT
- Set operations **set semantics** by default
  → DISTINCT (set) vs ALL (bag)

```
(SELECT Firstnam
FROM Participant
   UNION DISTINCT
(SELECT Firstnam
FROM Participant
```

[[SQL]]