Grouping, E/R, and updates

CSE 444 section, July 1, 2010

Today

- Practice with grouping and aggregation
- Database design with E/R diagrams
- Modifying the database

Document index database

Author (aid, name)

Auth_Doc (aid, did)

Document (did, title)

Doc_Word (did, word)

Word (word)

Underlined = key (unique identifier for a tuple)

Find authors who wrote ≥ 20 docs

Find authors who wrote ≥ 20 docs

This could work:

SELECT name

FROM Author a

WHERE 20 <= (**SELECT** COUNT(*) **FROM** Auth_Doc ad **WHERE** ad.aid = a.aid)

Find authors who wrote ≥ 20 docs

Use grouping to eliminate the subquery:

```
SELECT name
FROM Author a, Auth_Doc ad
WHERE a.aid = ad.aid
GROUP BY a.aid, a.name
HAVING COUNT(*) >= 20
```

Find authors who wrote ≥ 20 docs

Use grouping to eliminate the subquery:

```
SELECT name
FROM Author a, Auth_Doc ad
WHERE a.aid = ad.aid
GROUP BY a.aid, a.name
HAVING COUNT(*) >= 20
```

One row per (a.aid, a.name) pair

Find authors who wrote ≥ 20 docs

Use grouping to eliminate the subquery:

```
SELECT name
FROM Author a, Auth_Doc ad
WHERE a.aid = ad.aid
GROUP BY a.aid, a.name
HAVING COUNT(*) >= 20
```

← Only groups that combine ≥ 20 tuples will match

Find authors who wrote ≥ 20 docs

Use grouping to eliminate the subquery:

```
SELECT name
FROM Author a, Auth_Doc ad
WHERE a.aid = ad.aid
GROUP BY a.aid, a.name
HAVING COUNT(*) >= 20
```

If aid is the key, why group by name?

If we deleted a.name…

ERROR: Column 'name' is invalid in the select list because it is not contained in either an aggregate function or the GROUP BY clause.

Finding literate authors

How can we find authors who use more than 10,000 distinct words?

Authors who use > 10,000 words

```
SELECT name
FROM Author a, Auth_Doc ad,
        Doc_Words dw
WHERE a.aid = ad.aid AND ad.did = dw.did
GROUP BY a.aid, a.name
HAVING COUNT(DISTINCT word) > 10000
```

Authors who use > 10,000 words

SELECT name

FROM Author a, Auth_Doc ad,

Doc_Words dw

WHERE a.aid = ad.aid AND ad.did = dw.did

GROUP BY a.aid, a.name

HAVING COUNT(DISTINCT word) > 10000

→ What does DISTINCT mean within COUNT?

More examples

- For each author, give the total number of words in all documents he has (co-)written.
- For each author, give the average length in words of his documents.
- Give the author with the longest average documents.

Total word count by author

```
SELECT name, COUNT(*) AS total
FROM Author a, Auth_Doc ad, Doc_Words dw
WHERE a.aid = ad.aid AND ad.did = dw.did
GROUP BY a.aid, a.name
```

Average word count by author

```
SELECT name, COUNT(*) / COUNT(DISTINCT did)
    AS avg_word_count
FROM Author a, Auth_Doc ad, Doc_Words dw
WHERE a.aid = ad.aid AND ad.did = dw.did
GROUP BY a.aid, a.name
```

Wordiest-on-average author

```
SELECT name, COUNT(*) / COUNT(DISTINCT did)
    AS avg_word_count
FROM Author a, Auth_Doc ad, Doc_Words dw
WHERE a.aid = ad.aid AND ad.did = dw.did
GROUP BY a.aid, a.name
ORDER BY avg_word_count DESC
LIMIT 1
```

Try these at home

- All words used by at least 10 authors
- The most frequently used word
- The longest document
- Authors of the longest document

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Why use E/R diagrams?

E/R basics

- Concepts and symbols
  - Entity vs. entity set
  - Attributes
  - Relationship
  - Arrows
- ISA
  - Difference from OOP in C++/Java

From English to E/R diagrams

- Each project is managed by one professor (principal investigator)
- A professor can manage multiple projects

Example courtesy: Database Management Systems, 3rd E, R. Ramakrishnan and J. Gehrke

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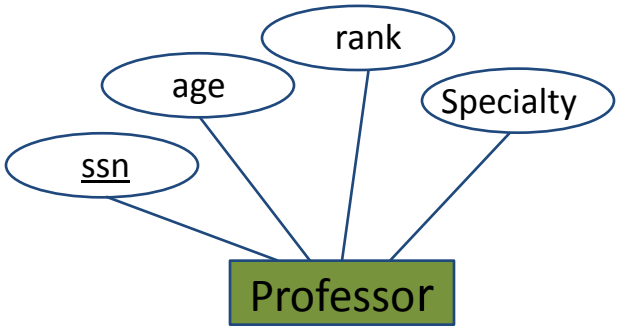

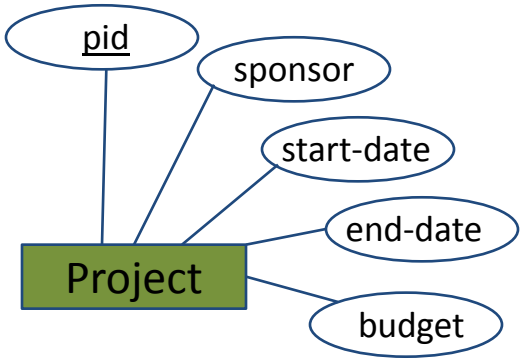

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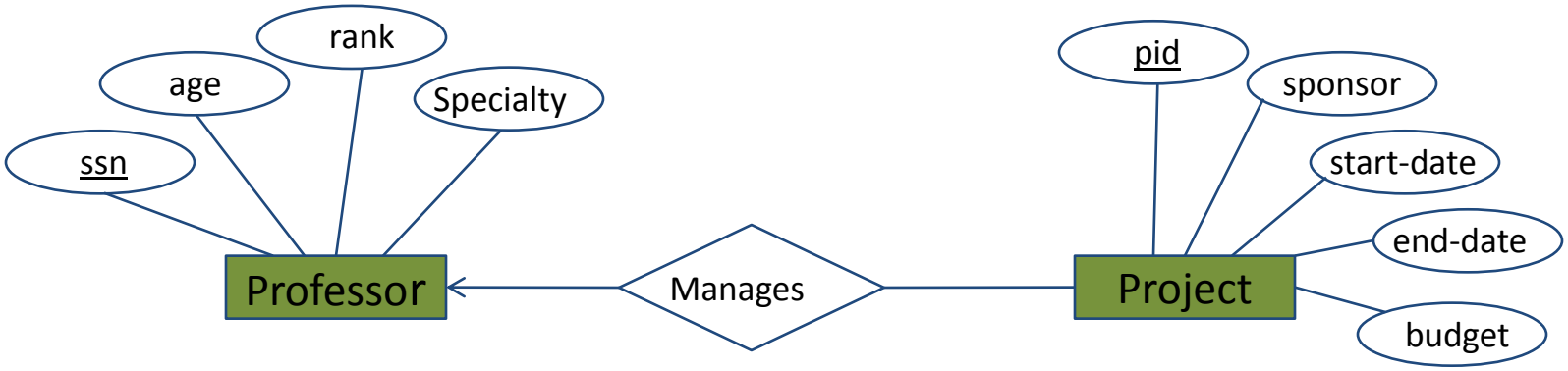

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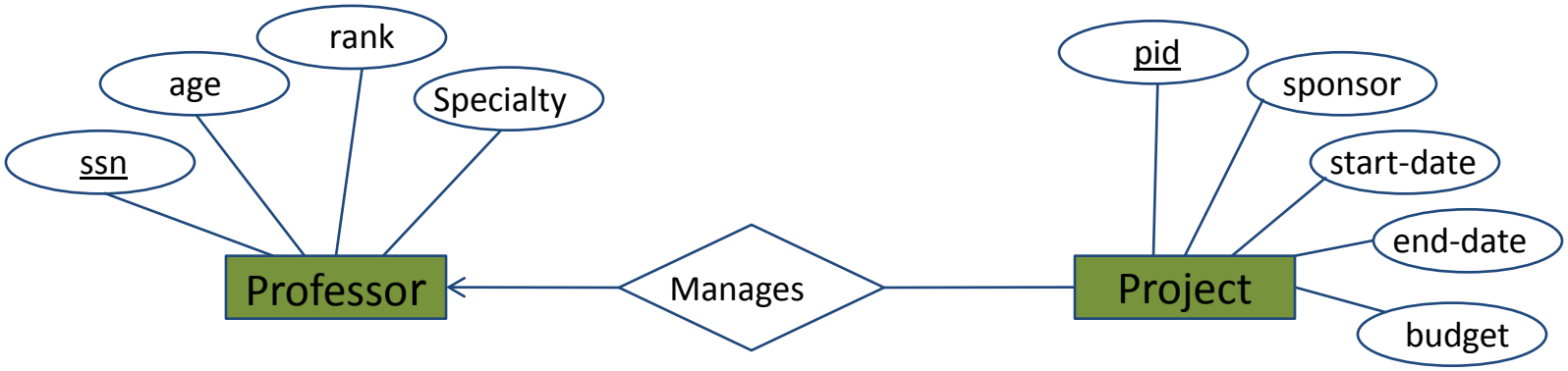
From English to E/R diagrams

- Each project is **worked on** by one or more professors
- Professors can **work on** multiple projects



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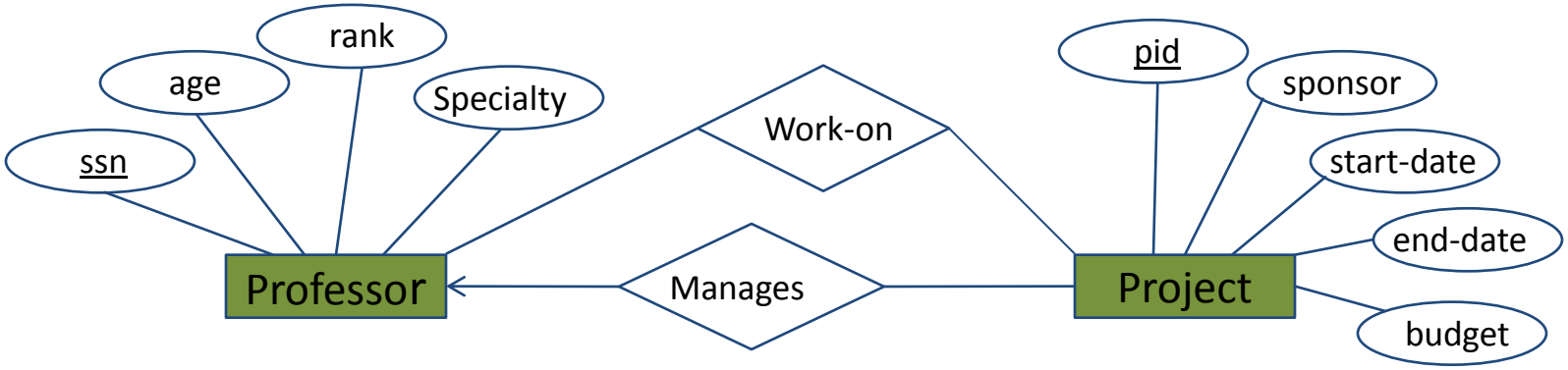

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Modifying the database

Three kinds of modifications in SQL:

- insertions
- updates
- deletions

Sometimes they are all called “updates”

Insertions

General form:

INSERT INTO R(A1,…., An) **VALUES** (v1,…., vn)

Insertions

Product (<u>name</u>, listPrice, category)
Purchase (buyer, seller, product, price)

Example: Insert a new purchase to the database:

```
INSERT INTO Purchase (buyer, seller, product, price)
       VALUES ('Joe', 'Fred', 'wakeup-clock-espresso-machine',
                      199.99)
```

Missing attributes → NULL.
May drop attribute names if you give them in order.

Inserting results of a query

```
INSERT   INTO   Product (name)

    SELECT  DISTINCT  Purchase.product
    FROM      Purchase
    WHERE   Purchase.date > "10/26/01";
```

The query replaces the VALUES keyword.
Here we insert *many* tuples into Product

Updates

Example:

```
UPDATE   Product
SET    price = price/2
WHERE  Product.name  IN
                (SELECT product
                  FROM    Purchase
                  WHERE  Date ='Oct, 25, 1999');
```

WHERE works the same as in a query (SELECT).
It chooses the tuples whose values are to be updated

Deletions

Similar to UPDATE but without the SET clause:

```
DELETE   FROM   Purchase

WHERE    seller = 'Joe'   AND
                product = 'Brooklyn Bridge'
```

Always specify a WHERE clause (in fact, write it first!)
Otherwise, *every tuple* will be deleted!