

CSE 414 Database Systems

Section 7: Database Design

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CONTEXT-SPECIFIC (DTD-BASED) MAPPING

```
<!DOCTYPE bib [  
  <!ELEMENT bib (book* )>  
  <!ELEMENT book (title, (author+ | editor+ ), publisher?, price )>  
  <!ATTLIST book  year CDATA  #REQUIRED >  
  <!ELEMENT author (last, first )>  
  <!ELEMENT editor (last, first, affiliation )>  
  <!ELEMENT title (#PCDATA )>  
  <!ELEMENT last (#PCDATA )>  
  <!ELEMENT first (#PCDATA )>  
  <!ELEMENT affiliation (#PCDATA )>  
  <!ELEMENT publisher (#PCDATA )>  
  <!ELEMENT price (#PCDATA )>  
>
```

(Recall) Entity / Relationship Diagrams

- Entity set = a class
 - An entity = an object
- Attribute
- Relationship



What Kinds of Entities?

```
<!DOCTYPE bib [
```

```
<!ELEMENT bib (book* )>
```

```
<!ELEMENT book (title, (author+ | editor+ ), publisher?, price )>
```

```
<!ATTLIST book year CDATA #REQUIRED >
```

```
<!ELEMENT author (last, first )>
```

```
<!ELEMENT editor (last, first, affiliation )>
```

```
<!ELEMENT title (#PCDATA )>
```

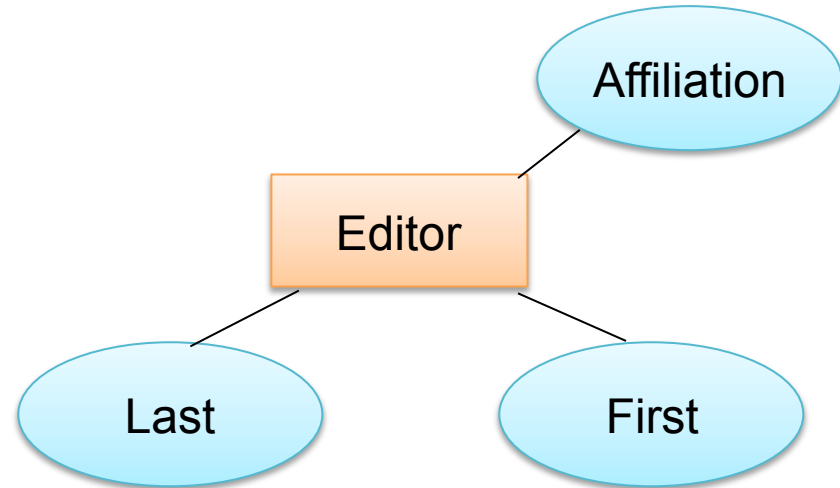
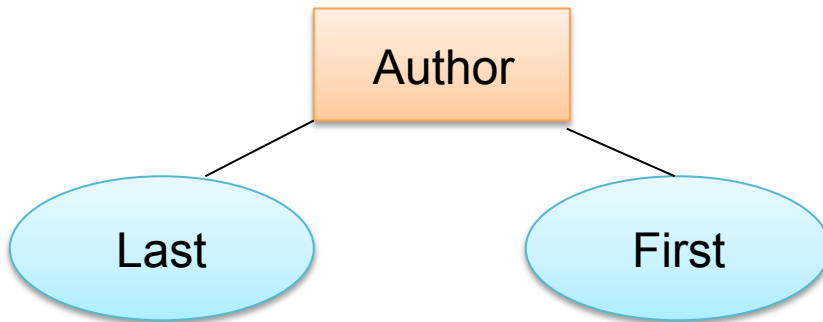
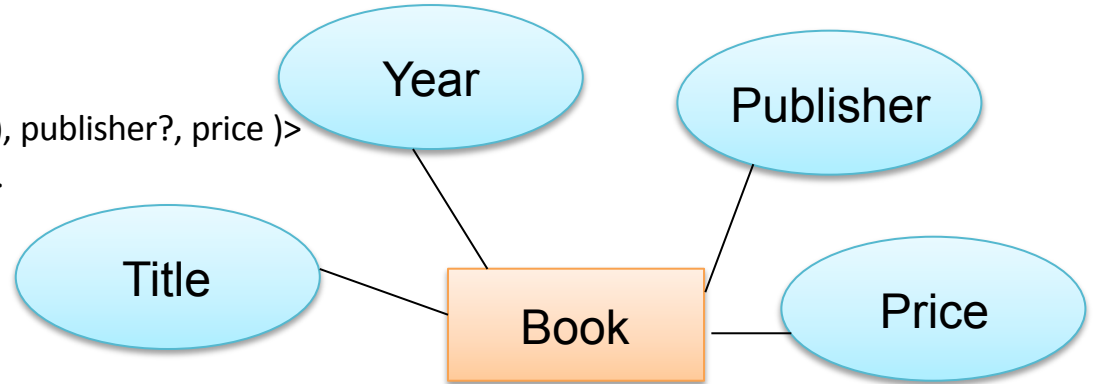
```
<!ELEMENT last (#PCDATA )>
```

```
<!ELEMENT first (#PCDATA )>
```

```
<!ELEMENT affiliation (#PCDATA )>
```

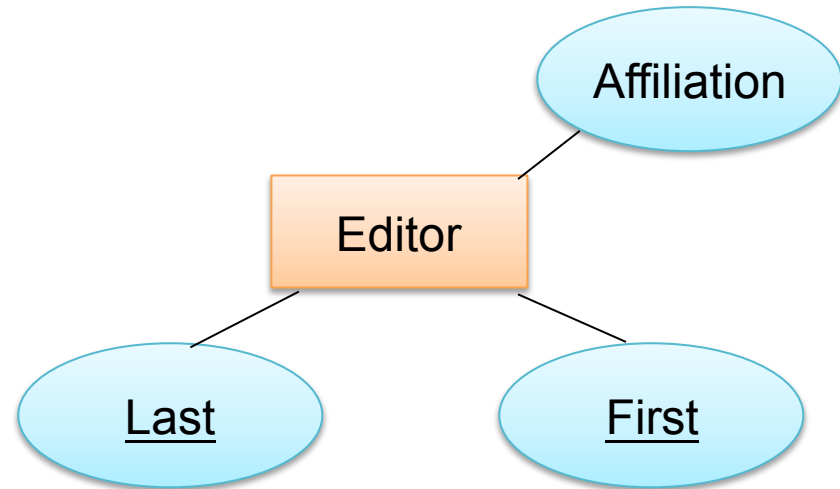
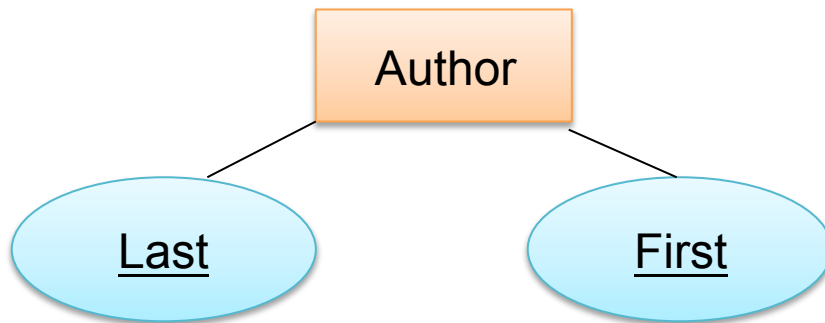
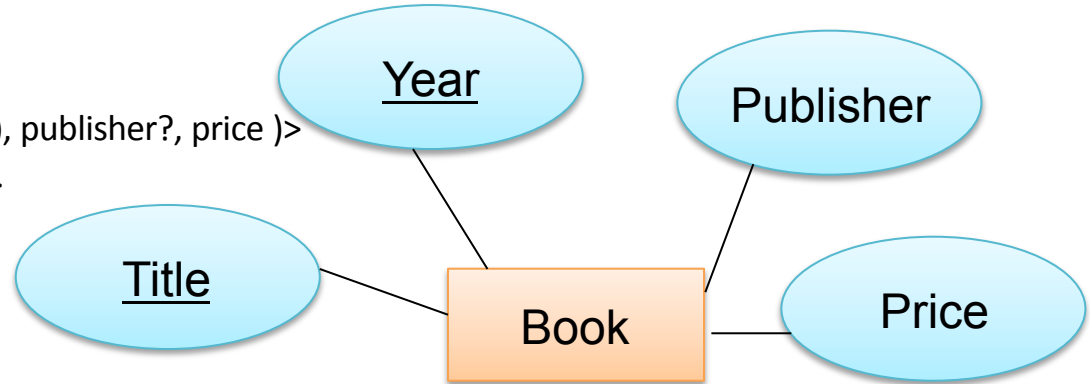
```
<!ELEMENT publisher (#PCDATA )>
```

```
<!ELEMENT price (#PCDATA )>
```



Primary Key in each Entity

```
<!DOCTYPE bib [  
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  <!ELEMENT author (last, first )>  
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  <!ELEMENT publisher (#PCDATA )>  
  <!ELEMENT price (#PCDATA )>  
>
```



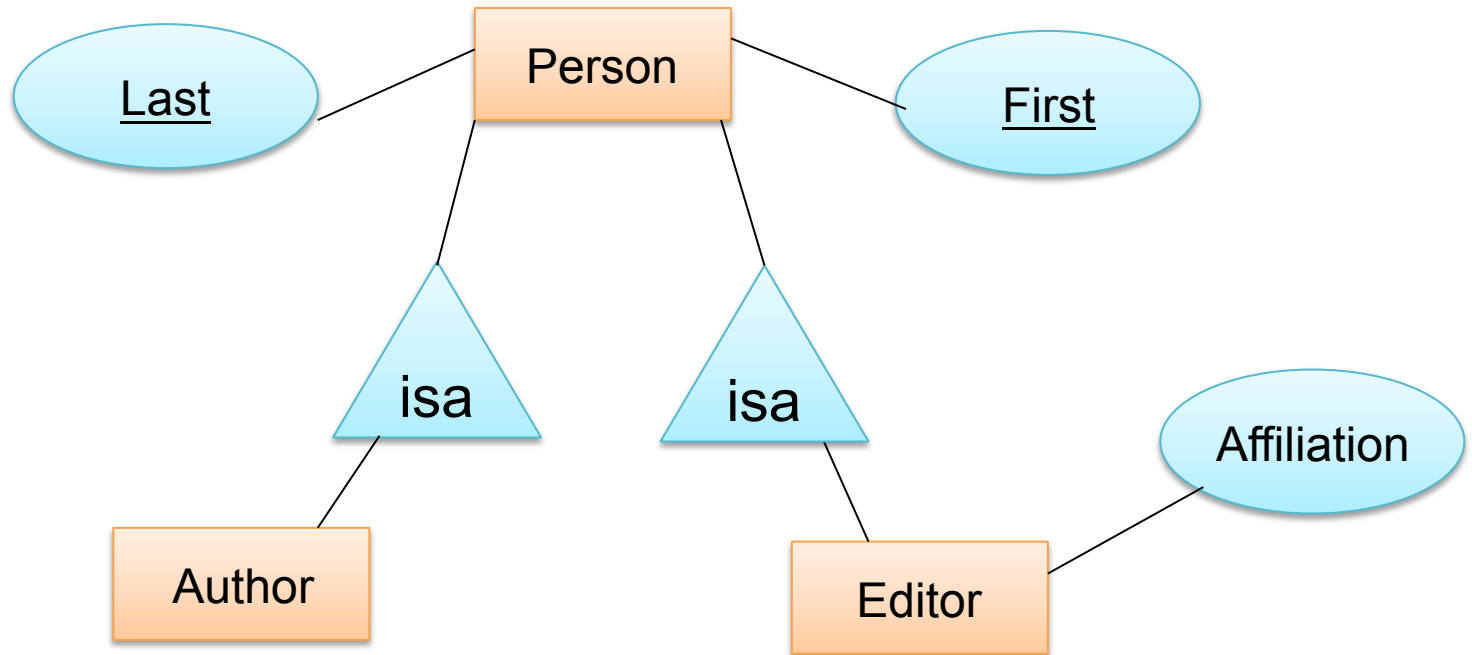
What's wrong with this model?



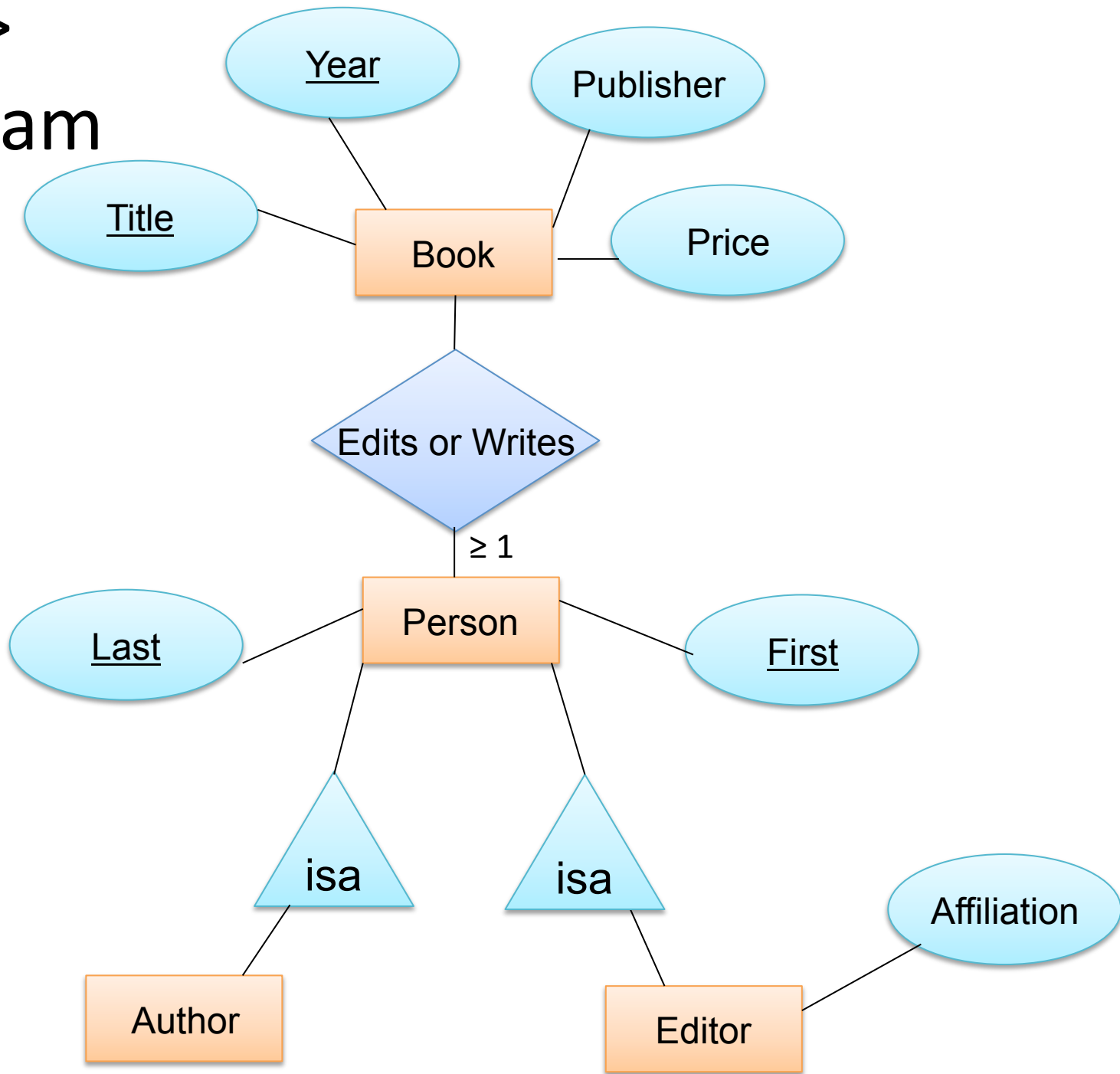
What's wrong with this model?

- In the DTD, a book can have authors, or editors, but not both.
- Perhaps, we can we combine Author and Editor.
 - Define an entity set Person with attributes last and first.
 - Add is-a relationship such that Author is-a Person, and Editor is-a Person.

Modeling UnionTypes With Subclasses



XML -> E/R Diagram



E/R Diagram -> Relation

```
CREATE TABLE Book(  
    title CHAR(30),  
    year INT,  
    publisher CHAR(30),  
    price FLOAT,  
    PRIMARY KEY (title, year)  
)
```

```
CREATE TABLE EditsOrWrites(  
    first CHAR(20),  
    last CHAR(20),  
    title CHAR(30),  
    year INT,  
    PRIMARY KEY (first, last, title, year),  
    FOREIGN KEY (first, last)  
        REFERENCES Person,  
    FOREIGN KEY (title, year)  
        REFERENCES Book  
)
```

```
CREATE TABLE Person(  
    first CHAR(20),  
    last CHAR(20),  
    PRIMARY KEY (first, last)  
)
```

```
CREATE TABLE Author(  
    first CHAR(20),  
    last CHAR(20),  
    PRIMARY KEY (first, last),  
    FOREIGN KEY (first, last)  
        REFERENCES Person  
)
```

```
CREATE TABLE Editor(  
    first CHAR(20),  
    last CHAR(20),  
    affiliation CHAR(20),  
    PRIMARY KEY (first, last),  
    FOREIGN KEY (first, last)  
        REFERENCES Person  
)
```

XPath to SQL (1)

- XPath = /bib/book[author[last="Ullman"]
[first="Jeff"]] (ignoring editor)
- SQL = ?

XPath to SQL (1)

- XPath = /bib/book[author[last="Ullman"]
[first="Jeff"]]
- SQL =

SELECT b.*

FROM Book b, EditsOrWrites w

WHERE b.title = w.title

AND b.year = w.year

AND w.last = 'Ullman'

AND w.first = 'Jeff';



This does not
return the names
of the authors!

```
<!DOCTYPE bib [  
  <!ELEMENT bib (book* )>  
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  <!ELEMENT first (#PCDATA )>  
  <!ELEMENT affiliation (#PCDATA )>  
  <!ELEMENT publisher (#PCDATA )>  
  <!ELEMENT price (#PCDATA )>  
>
```

XPath to SQL (1)

- XPath = /bib/book[author[last="Ullman"]
[first="Jeff"]]

- SQL =

SELECT b.*, w2.*

FROM Book b, EditsOrWrites w1, EditsOrWrites w2

WHERE b.title = w1.title AND b.year = w1.year

AND b.title = w2.title AND b.year = w2.year

AND w1.last = 'Ullman' AND w1.first = 'Jeff';

XPath to SQL (2)

- XPath = /bib/book[author/last="Ullman"][author/first="Jeff"]
- SQL = ?

XPath to SQL (2)

- XPath = /bib/book[author/last="Ullman"][author/first="Jeff"]

- SQL =

SELECT b.*, w.*

FROM Book b, EditsOrWrites w,

EditsOrWrites jeff, EditsOrWrites ullman

WHERE b.title = w.title AND b.year = w.year

AND b.title = jeff.title AND b.year = jeff.year

AND b.title = ullman.title AND b.year = ullman.year

AND ullman.last = 'Ullman' AND jeff.first = 'Jeff';

Questions?