

## Databases HW1

Kevin Chen, EECS 339, PS1 Submission.

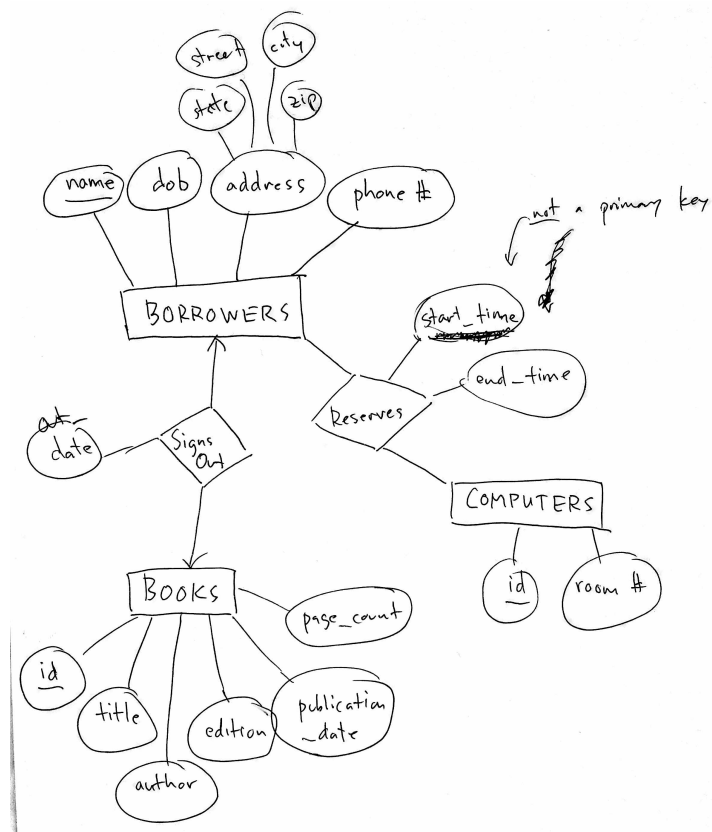
### 1. List entity sets and relationships; which sets need a primary key?

**Entity Sets:** Books, Borrowers, Computers.

Books require an additional attribute for their primary key, since the rest of the information would be identical for multiple copies of a book, and the library might have more than one copy of a book.

Computers already have a primary-key-like identifier.

### 2. E-R Diagram.



### 3. Translate E/R Diagram into a set of relations.

---

Primary keys are underlined. Foreign keys are *italicized*.

Entity Sets:

- Borrowers(name, dob, phone, street, city, state, zip, out\_date, *bookid*)
- Books(bookid, title, author, edition, publication\_date, page\_count)
- Computers(computerid, room\_number)
- Reserves(*name*, *computerid*, start\_time, end\_time)

### 4. Design constraints.

---

- Borrowers cannot sign out more than one book at a time.
- There cannot be more than 3 computer reservations for one borrower that are active (in the future).
- Books may not be signed out for longer than 14 days
- Reservation times for the same computer cannot overlap (e.g. cannot have a start\_time between any other start and end times for different computers)
- Reservations must have a start time, end time, and computer id.

Add some other constraints to ensure that each entity entered into an entity set has all of the fields formatted properly.

### 5. Develop a custom E-R diagram.

---

Topic: Research Lab.

- Labs has undergraduates, graduate students, and professors.
- Both undergraduates and graduate students have names, majors, and years.
- Graduate students also have thesis topics, while undergraduates have dorms.
- Professors have names and PhD degrees.
- Each undergraduate works on at most one project.
- Graduate students and professors may work on as many projects as they want.
- Multiple people work on the same project, but at most one professor can work on a project.
- Projects have a topic and tentative conference.
- Professors mentor multiple graduate students and undergraduates. Students can have multiple mentors.

