IT360 – Applied Database Systems

Normalization

Modification Anomalies

- Update anomaly
- Delete anomaly
- Insert anomaly

Kroenke, Database Processing
Functional Dependencies

Class Exercise

<table>
<thead>
<tr>
<th>ID</th>
<th>Name</th>
<th>University</th>
<th>MainCampus</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>John Smith</td>
<td>Cornell</td>
<td>Ithaca</td>
</tr>
<tr>
<td>2</td>
<td>John Smith</td>
<td>MIT</td>
<td>Boston</td>
</tr>
<tr>
<td>3</td>
<td>Matt Johnson</td>
<td>Ithaca College</td>
<td>Ithaca</td>
</tr>
<tr>
<td>4</td>
<td>Chris Brown</td>
<td>USNA</td>
<td>Annapolis</td>
</tr>
<tr>
<td>5</td>
<td>Jane Doe</td>
<td>Cornell</td>
<td>Ithaca</td>
</tr>
<tr>
<td>6</td>
<td>Ric Crabbe</td>
<td>USNA</td>
<td>Annapolis</td>
</tr>
</tbody>
</table>

- Do these FDs hold? Why?
  - ID → University
  - Name → ID
  - University → MainCampus
  - MainCampus → Name

- Example of deletion anomaly?
- Example of insertion anomaly?
- Example of update anomaly?
Normal Forms

- 1st
- 3rd
- BCNF

Normalization

- Put all relations into Boyce-Codd Normal Form (BCNF):
Normalize or Not?

Customer(CustID, Name, City, State, Zip)
- Assuming that city and state determine zip code, is Customers table in BCNF?
- If Customers table is not in BCNF, would you or would you not normalize it to BCNF? Give one reason for the choice you make

Class Exercise
- R(A, B, C, D, E, F)
  - A \rightarrow (B,C,D,E,F)
  - B \rightarrow C
  - (D,E) \rightarrow F
- Is A a key? Why?
- Is R in BCNF? Why?
- If R not in BCNF, decompose to BCNF