NYU Tandon School of Engineering
CS-UY 3083-B Spring 2025
Professor Salim Arfaoui

Assignment 02: DB Fine-tuning (FD, Normalization)

Due: 11:59pm, Sunday, Feb 16, 2025

No late submissions will be accepted.

This assignment covers the following topics:

- **Functional Dependency,**
- **Normalization,**

Submission instructions

- You should submit your homework on Gradescope.
- For this assignment you should turn in **2 separate** pdf files.
  - **`Part1.pdf`**
  - **`Part2.pdf`**

- The PDF files should contain a header comment block as follows:

```
"""
Author: [Your name here]
Assignment: HW2
Date due: February 16, 11:59pm
I pledge that I have completed this assignment without collaborating
with anyone else, in conformance with the NYU School of Engineering
Policies and Procedures on Academic Misconduct.
"""
```

Part1: Functional Dependency: (50 pts)

1) Problem1:

Consider a relation:

`Students(StudentID, Name, Major, Year, Advisor)`

- **StudentID:** unique identifier for each student
- **Name:** name of the student
- **Major:** major field of study
- **Year:** year of study (e.g., Freshman, Sophomore)
- **Advisor:** academic advisor for the student

Let the set of FDs for Students be:
`FDs = {StudentID→Name;  Major→Advisor; (StudentID, Major)→Year}`

A. Compute the attribute closures for the attributes `StudentID` and `Name`.
B. Compute F+.
C. List all candidate keys for the relation.

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2) Problem 2:

Consider a relation:

`Courses(CourseID, CourseName, Instructor, Credits, Semester)`

- **CourseID:** unique identifier for each course
- **CourseName:** name of the course
- **Instructor:** instructor teaching the course
- **Credits:** number of credits for the course
- **Semester:** semester when the course is offered

Let the set of FDs for Courses be:
```
FDs = {CourseID→CourseName;  Instructor→(CourseID, Credits);
            CourseName→Instructor;  (CourseID, Semester)→Credits}
```

A. Compute F+.
B. List all candidate keys for the relation.

Part2: Normalization:(50 pts)

Given the relation:
Book_Library(ISBN, Title, AuthorID, AuthorName, Publisher, PublisherAddress),

and the set of FDs:

FDs = { ISBN→Title; ISBN→AuthorID; AuthorID→AuthorName;
Publisher→PublisherAddress; ISBN→Publisher }

Does the Book_Library table satisfy 3NF requirements? If not, Show the database in 3rd NF (use schema statements or tables format). Make sure to show your work.

Hers is some sample data for your reference:

Book_Library Table

ISBN	Title	AuthorID	AuthorName	Publisher	PublisherAddress
978-1-234	Introduction to AI	A001	John Smith	TechPress	100 Tech Lane
978-1-235	Database Systems	A002	Jane Doe	DataBooks	200 Data St.
978-1-234	Introduction to AI	A001	John Smith	TechPress	100 Tech Lane
978-1-236	Web Development	A003	Emily Johnson	CodePublisher	300 Code Ave.
978-1-237	Machine Learning	A001	John Smith	TechPress	100 Tech Lane
978-1-238	Networking Basics	A004	Michael Brown	NetworkPub	400 Network Blvd.
978-1-239	Cybersecurity 101	A005	Sarah Wilson	SecureBooks	500 Secure St.
…	…	…	…	…	…

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