

Project 1: ChessDB

CMPE 321, Introduction to Database Systems, Spring 2025

Due: March 21, 2025, 23:59

1 Introduction

Chess is more than just a game—it is a battlefield of minds, a test of strategy, logic, and foresight. From the quiet halls of local clubs to the grand stages of world championships, chess has captivated players for centuries. The ever-growing competitive landscape of the sport, managed by the International Chess Federation (FIDE), requires meticulous organization and precision.

Managing a chess tournament is not simply about arranging matches; it involves tracking player ratings, ensuring fair play, assigning qualified arbiters, scheduling games without conflicts, and maintaining the integrity of the competition. As chess tournaments expand in scale and complexity, an efficient and well-structured database system becomes essential for seamless operations.

As a database architect, your task is to design **ChessDB**, a comprehensive database management system for chess tournaments. Your database will handle key components such as player records, tournament formats, match schedules, and rating updates.

Are you ready to build the foundation for the next generation of chess tournaments? Let's begin.

2 Project Description

This project involves designing a database system to manage FIDE chess tournaments. The system will store and organize data on players, coaches, arbiters, matches, and sponsorships, ensuring smooth tournament operations. You will begin with a detailed description of the content. Then you will need to systematically go through parts of the standard database design process as you learned about in class, including conceptual and logical design. Our database should contain the following information:

1. **User** includes the following attributes; *username*, *password*, *name*, *sur-name*, *nationality*. Each user has a unique username. Also each user is either a player or a coach or an arbiter (i.e., jury). Each user **must have only one *nationality***. That is, dual citizenship is not allowed.

- (a) **Players** additionally have attributes of *date_of_birth*, *elo_rating*, *fide_ID*, *title* (e.g., Grandmaster (GM), International Master (IM), FIDE Master (FM) etc.) and *team_list*.
A player must be registered with at least one team. A player can be registered in different teams, but cannot participate in matches where there are time conflicts. There are no age restrictions for teams. A player must have a valid ELO rating, which must be an integer greater than 1000.
- (b) **Coaches** additionally have *specialty* and *certification* information.
Each coach must have **at least one** *specialty* representing specific areas of expertise (e.g., tactical play, opening theory and endgame strategies etc.); a coach can have multiple specialties.
certification refers to the official qualifications (e.g., FIDE Trainer (FT), FIDE Instructor (FI), National Trainer (NT) etc.) that the coach has obtained. Similar to specialties, a coach can hold multiple certifications, and they must have **at least one** *certification*.
Being in an agreement with more than one team at the same time is not possible for coaches. In addition, each team **must** be directed by a unique coach.
- (c) **Arbiters** additionally have *certification* and *experience_level* information. They rate matches. Each match is assigned an arbiter, who can rate the match only once. Arbiters can only rate matches they are assigned to and cannot modify their ratings afterward.
certification represents the official qualifications an arbiter has obtained such as FIDE Arbiter (FA), International Arbiter (IA), National Arbiter (NA), etc. An arbiter can hold multiple certifications, and they must have **at least one** *certification*.
experience_level of an arbiter refers to the arbiter's category (beginner, intermediate or advanced).
2. **Title** includes the following attributes: *title_ID*, *title_name*.
title_ID must be unique.
3. **Team** includes the following attributes: *team_ID*, *team_name*, *coach_username*, *contract_start*, *contract_finish*, *sponsor_ID*.
team_ID must be unique, and each *sponsor_ID* is associated with a unique *sponsor_name*. Each team is led by a single coach. *contract_start* and *contract_finish* define the duration of coach-team agreements. A coach cannot manage multiple teams simultaneously. Each team has an agreement with only one sponsor, but a sponsor can have agreements with multiple teams.
4. **Match** includes the following attributes: *match_ID*, *tournament_ID*, *hall_ID*, *table_ID*, *white_player_team*, *white_player*, *black_player_team*, *black_player*, *result*, *time_slot*, *date*, *assigned_arbiter_username*, *rating*.
The *match_ID* must be unique. Each match must have exactly one *white_player* and exactly one *black_player*. The *result* of a match is stored as white_wins, black_wins, or draw. *rating* stores the arbiter's evaluation of the match's adherence to the rules and regulations of chess. It is an integer between 1 and 10,

with 10 being the highest (best) rating.

5. **Tournament** includes the following attributes: ***tournament_ID***, ***tournament_name***, ***start_date***, ***end_date***, ***hall_ID***, ***format*** (e.g., Swiss, Round Robin etc.), ***chief_arbiter***. A tournament must include at least one match, but can have multiple matches as well. Each unique ***match_ID*** belongs to exactly one tournament. Every tournament must be held in at least one hall but can take place in multiple halls. Tournaments must adhere to the following official chess regulations.

- No two matches can overlap, both in terms of location and playing time.
- There are four time slots (e.g., 1,2,3,4) for each day.
- The duration of the match is closely related to the time slots. The time slot attribute determines the starting time of the match, and the end time is determined by the duration. A match has a fixed duration of 2 time slots. (For example, if a match starts at time slot 2 and has a duration of 2, then that specific table in the hall is reserved for that match during the following time slots: [2,3], a new match cannot start at the time_slot 2 or time_slot 3 in the same table in that hall).
- The ***time_slot*** attribute determines the starting time of the match. Only one match can be played at a given time slot, in a specific hall, and on a specific table. In other words, the ***time_slot***, ***hall_ID***, and ***table_ID*** of two matches can not be the same.
- Each ***hall_ID*** corresponds to a physical location. Hence, ***hall_name***, ***hall_country***, ***hall_capacity*** (number of tables in the hall) depend solely on the ***hall_ID***.
- Each ***table_ID*** corresponds to a specific table within a hall. A table is uniquely assigned to a hall, and matches take place at specific tables within a hall.
- An arbiter can rate the same match only once.
- Each match will be rated by an arbiter assigned to that match.
- An arbiter cannot be assigned to two matches with time conflicts.
- Each tournament **must have exactly one** ***chief_arbiter***.
- Tournaments follow a **league format**, where teams compete against each other in multiple matches.
- Teams are the participants of the tournament.
- Each match is played between two teams.
- For each match, each team must select one available player to represent them.
- A player cannot play in two matches with time conflicts.

- Two players from the same team cannot compete against each other in a match.
- A player cannot participate in a tournament unless their team is registered for that tournament.
- The team with the most match wins at the end of the tournament is declared the winner.

Please do not make any assumptions, apply only the given constraints in your database design.

2.1 Part 1: Conceptual Database Design

Your task in Part 1 is to perform the Conceptual Database Design (or ER Design) – draw ER diagrams to capture all the information, following the approach described in the lectures. While there are many ER model variants, for this project, we expect you to use the ER notation from the textbook and lectures.

To receive full points for this part, you need to identify all the entity sets and relationship sets in a reasonable way. We expect there to be multiple correct solutions since the ER design is subjective. Your goal should be to capture the given information and constraints reasonably. You can use underscores, spaces, numbers, uppercase, or lowercase letters to construct the names of the entity sets, relationship sets, and attributes that you will be using in your ER diagram. It is required to use the features of ER modeling that you have learned in the lectures, including participation constraints, key constraints, weak entities, class hierarchy, and aggregation whenever necessary.

You must use computer-based / online drawing tools such as Lucidchart and diagrams.net. Handcrafted diagrams will not be accepted.

Include a discussion at the end of the report for this part, indicating the constraints that you were unable to represent in your ER design.

2.2 Part 2: Logical Database Design: Mapping ER Design to the Relational Model

For the second part of the project, your task is to convert the ER diagrams into relational tables, based on the set of simple rules as described in the textbook and in the lectures. You are required to write SQL DDL statements that create the relational tables of your database. You should specify all the integrity constraints such as primary key, foreign key, Unique, and NOT NULL. Please also define the general constraints using the CHECK construct.

Include a discussion at the end of the report for this part, indicating the constraints that you were unable to represent in your relational design.

Note: For this part, you must use MySQL Server, others are not allowed.

3 Submission

This project must be completed and submitted in teams of two people. Each team must submit one joint submission.

You are required to submit reports for **Part 1 and Part 2** in PDF format. Additionally, both team members must include their **Individual Contribution Reports** inside the same ZIP file.

Each group should submit exactly one ZIP file.

File Naming and Structure:

- The ZIP file must be named as: **GroupXX.zip** (where **XX** is your group number)
- The following files must be placed **directly inside the ZIP file** (without extra folders):
 - **part1.pdf** (Conceptual Database Design Report)
 - **part2.pdf** (Logical Database Design Report)
 - **Student1ID_Contribution.pdf** (Individual Contribution Report for Student 1)
 - **Student2ID_Contribution.pdf** (Individual Contribution Report for Student 2)

Final Folder Structure (Inside the ZIP):

```
GroupXX.zip
  part1.pdf
  part2.pdf
  123456_Contribution.pdf  (Student 1's Report)
  789012_Contribution.pdf  (Student 2's Report)
```

3.1 Individual Contribution Report Guidelines

Each student must prepare an **Individual Contribution Report** and include it in the group ZIP file. The report must be in **PDF format**, named as:

StudentID_Contribution.pdf
(e.g., 123456_Contribution.pdf)

What to Include:

- **Personal Information:** Name, Student ID, Group Number.
- **Tasks & Contributions:** Briefly describe what you worked on (ER diagram, SQL queries, documentation, debugging, etc.).
- **Collaboration & Challenges:** How the team worked together, any difficulties, and how they were resolved.
- **Self-Assessment:** Reflection on your role, skills learned, and areas for improvement.

Formatting:

- **Length:** 1 page (max 2 pages)
- **Font & Size:** Times New Roman, 12pt, 1.5 spacing
- **File Format:** PDF

Important Notes:

- Each student must submit their own report within the ZIP file.

4 Late Submission Policy

We will accept late submissions, however;

- One day late (even one minute will be considered a day late) would mean -20 points penalty.
- Two days late (even one minute and a day will be considered two days late) would mean -50 points penalty.
- Moodle will close after two days. No other submission method will be accepted.

5 Academic Honesty

Please read carefully the academic honesty part of the syllabus as we give utmost importance to academic honesty.