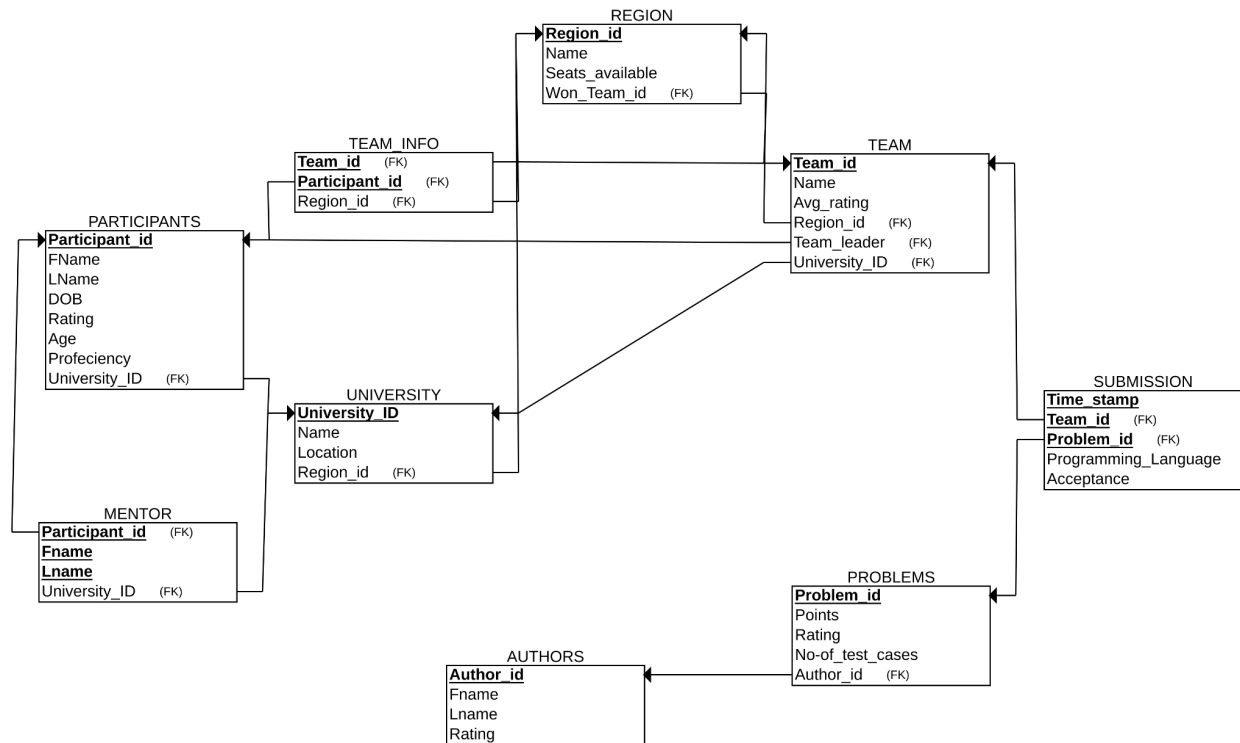# DNA Project Phase 3

Following 7 step algorithm for ER-Relational mapping is used:

- **Mapping Regular Entity Types to Tables:** This step involves identifying regular entities in the ER diagram and transforming each entity into a table in the relational model. Each table should include attributes as columns, with a primary key chosen to uniquely identify each record.

- **Mapping Weak Entity Types:** Weak entities lack a unique identifier without their parent entity. Create tables for weak entities, incorporating their attributes and establishing foreign key relationships referencing their identifying strong entities. The combination of the weak entity's partial key and the strong entity's primary key forms a composite key for the weak entity table.

- **Mapping Binary 1:1 Relationship Types:** For one-to-one relationships, merge the attributes of the related entities into a single table or create separate tables for each entity with a foreign key referencing the other entity's primary key.

- **Mapping Binary 1:N Relationship Types:** Represent one-to-many relationships by including a foreign key in the "N" side entity's table, referencing the primary key of the "1" side entity.

- **Mapping Binary M:N Relationship Types:** For many-to-many relationships, introduce an associative table with foreign keys referencing the related entities. This table resolves the M:N relationship into two 1:N relationships.

- **Mapping Multivalued Attributes:** Handle multivalued attributes by creating separate tables for them and establishing relationships to the main entity's table. Each row in the multivalued attribute table corresponds to a single value of the multivalued attribute for a specific entity.

- **Mapping N-ary Relationship Types:** N-ary relationships involving more than two entities can be represented using composite tables or associative entities. These tables hold foreign keys referencing the related entities involved in the relationship, with additional attributes specific to the relationship itself.

After mapping ER to Relational model(Initial Phase):

REGION
| Region_id |
| Name |
| Seats_available |
| Won_Team_id   (FK) |

TEAM_INFO
| Team_id   (FK) |
| Participant_id   (FK) |
| Region_id   (FK) |

TEAM
| Team_id |
| Name |
| Avg_rating |
| Region_id   (FK) |
| Team_leader   (FK) |
| University_ID   (FK) |

PARTICIPANTS
| Participant_id |
| FName |
| LName |
| DOB |
| Rating |
| Age |
| Profeciency |
| University_ID   (FK) |

UNIVERSITY
| University_ID |
| Name |
| Location |
| Region_id   (FK) |

SUBMISSION
| Time_stamp |
| Team_id   (FK) |
| Problem_id   (FK) |
| Programming_Language |
| Acceptance |

MENTOR
| Participant_id   (FK) |
| Fname |
| Lname |
| University_ID   (FK) |

PROBLEMS
| Problem_id |
| Points |
| Rating |
| No-of_test_cases |
| Author_id   (FK) |

AUTHORS
| Author_id |
| Fname |
| Lname |
| Rating |

We converted the ER diagram to above relational model using the above 7 steps.

Created tables for all the strong entities and weak entities.

Added new tables like "TEAM_INFO" table which is a relation between PARTICIPANTS and TEAMS to show the relations between the entities in the ER diagram.
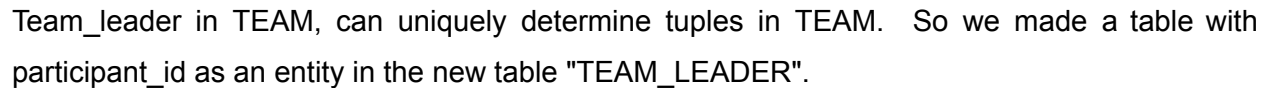
For showing some relations, added the foreign key constraints like in SUBMISSION table which is an entity in the ER diagram, added the Team_id and Problem_id as foreign keys.

Relational model after conversion to 1NF:
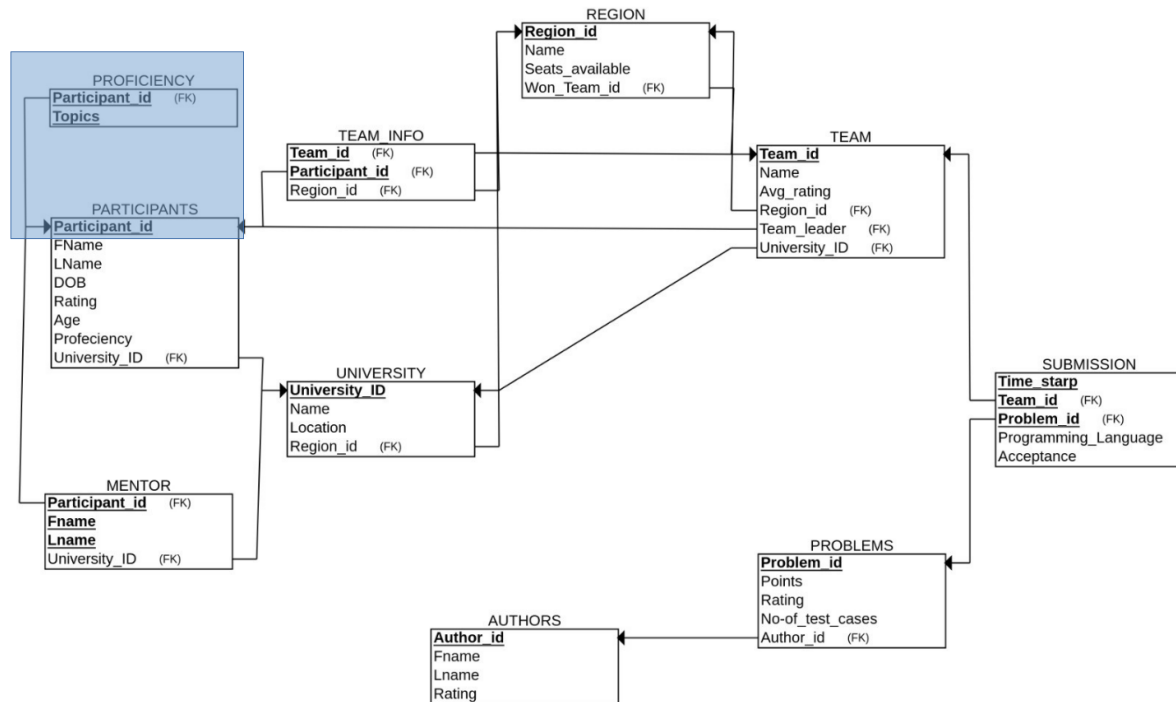
There was a multi-valued attribute "Proficiency" in PARTICIPANTS. To convert the model to 1NF, we have added the table named PROFICIENCY which has Participant_id as foreign key.

Relational model after conversion 2NF and 3NF PHASE:

Team_leader in TEAM, can uniquely determine tuples in TEAM. So we made a table with participant_id as an entity in the new table "TEAM_LEADER".

In TEAM_INFO, we have removed the Team_id from the primary key since there was partial dependency.

In MENTOR, we removed the Lname, Fname as primary key to avoid partial dependency.

After converting the relational model to 2 NF it is already in 3 NF also because there are no transitive dependencies.

(ABOVE FINAL RELATIONAL MODEL IS ALSO UPLOADED IN FORM OF PDF FOR MORE CLARITY)