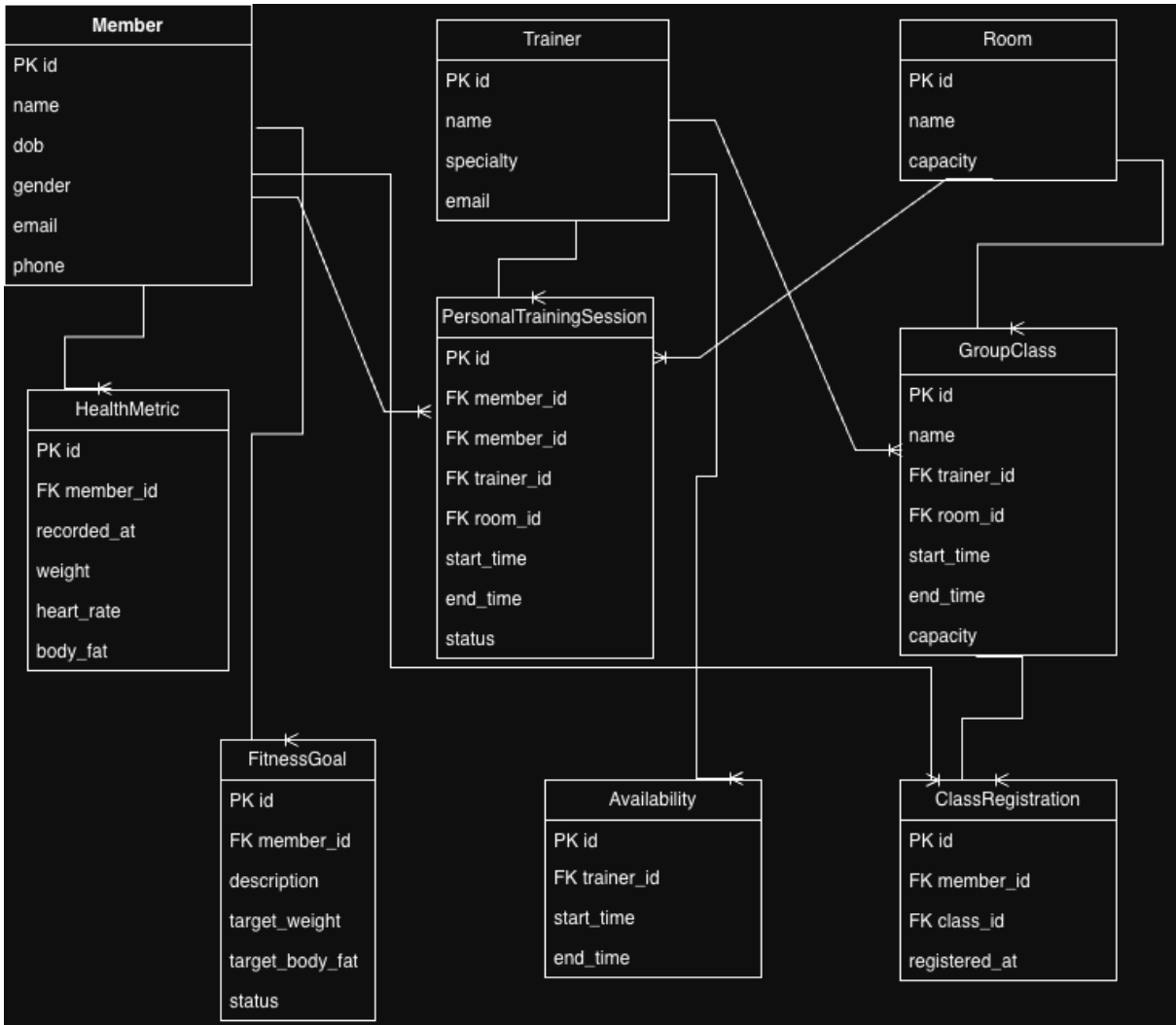# ER Diagram

Relational Mapping

The following relational schema was derived directly from the ERD and the ORM model implementation.

Each relation includes its primary key (PK) and foreign keys (FK).

1. Member

Attribute	Type	Key	Description
member_id	INT	PK	Unique member identifier
name	VARCHAR	-	Member full name

dob	DATE	-	Date of birth
gender	VARCHAR	-	Gender
email	VARCHAR	UNIQUE	Contact email
phone	VARCHAR	-	Phone number

2. HealthMetric

Attribute	Type	Key	Description
metric_id	INT	PK	Unique metric record
member_id	INT	FK (member.member_id)	Member the metric record belongs to
recorded_at	DATETIME	-	Timestamp
weight	FLOAT	-	Weight
heart_rate	INT	-	Heart Rate
body_fat	FLOAT	-	Body fat %

3. FitnessGoal

Attribute	Type	Key	Description
goal_id	INT	PK	Unique goal
member_id	INT	FK (member.member_id)	Owner of the goal
description	VARCHAR	-	Goal description
target_weight	FLOAT	-	Target weight
target_body_fat	FLOAT	-	Target body fat
status	VARCHAR	-	active/completed

4. Trainer

Attribute	Type	Key	Description
trainer_id	INT	PK	Unique trainer ID
name	VARCHAR	-	Trainer name
specialty	VARCHAR	-	Fitness specialty
email	VARCHAR	UNIQUE	Trainer email

5. Availability

Attribute	Type	Key	Description
availability_ID	INT	pk	Slot ID
trainer_ID	INT	FK (Trainer.trainer_id)	Trainer
start_time	DATETIME	-	Slot start
end_time	DATETIME	-	Slot end

6. Room

Attribute	Type	Key	Description
room_id	INT	PK	Room ID
name	VARCHAR	UNIQUE	Room name
capacity	INT	-	Max capacity

7. PersonalTrainingSession

Attribute	Type	Key	Description
session_id	INT	PK	Session ID
member_id	INT	FK (member.member_id)	Member
trainer_id	INT	FK	Trainer

Attribute	Type	Key	Description
		(trainer.trainer_id)	
room_id	INT	FK (room.room_id)	Room
start_time	DATETIME	-	Start
end_time	DATETIME	-	End
status	VARCHAR	-	Scheduled/cancelled/completed

8. GroupClass

Attribute	Type	Key	Description
class_id	INT	PK	Class ID
name	VARCHAR	-	Class name
trainer_id	INT	FK (trainer.trainer_id)	Instructor
room_id	INT	FK (room.room_id)	Room used
start_time	DATETIME	-	Class start
end_time	DATETIME	-	Class end
capacity	INT	-	Maximum number of participants

9. ClassRegistration

Attribute	Type	Key	Description
registration_id	INT	PK	Registration ID
member_id	INT	FK (member.member_id)	Registered member
class_id	INT	FK (group_class.class_id)	Class joined
registered_at	DATETIME	-	Timestamp

Normalization (2NF and 3NF Proof)

1NF Verification

All relations satisfy 1NF because:

- All attributes are atomic (no multivalued fields)

- No repeating groups

- Each table has a primary key

All tables are in 1NF

2NF Verification

A table violates 2NF only if:

- It has a composite primary key

- And a non-key attribute depends on part of that key

All tables in my schema use single-attribute primary keys, so:

- No partial dependencies can exist
  All tables automatically satisfy 2NF

3NF Verification

A table violates 3NF if a non-key attribute depends on another non-key attribute.

Checking each table:

- Member: all fields depend only on member_id

- HealthMetric: all fields depend only on metric_id

- FitnessGoal: all fields depend only on goal_id

- Trainer: specialty, name, email all depend only on trainer_id

- Room: capacity depends only on room_id

- PT_Session: member_id, trainer_id, room_id, timestamps depend only on session_id

- GroupClass: fields depend only on class_id

- ClassRegistration: member_id & class_id depend only on registration_id

No transitive dependencies
Schema is fully in 3NF