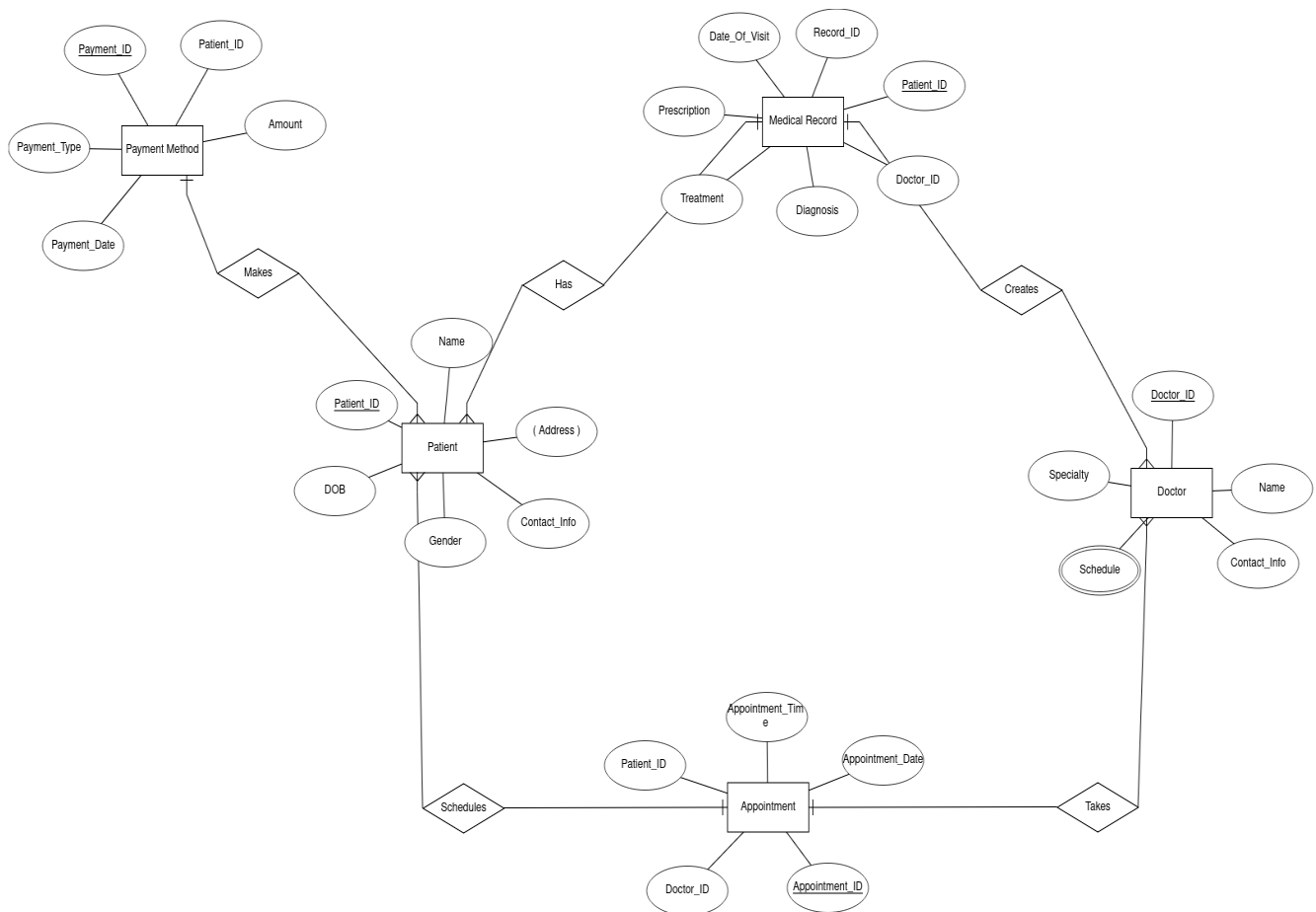# DBMS Assignment 1

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Aim: Decide a real time application and formulate a problem statement for the application to be developed. Propose a Conceptual Design using ER features using tools like ERD plus, ER Win etc. (Identifying entities, relationships between entities, attributes, keys, cardinalities, generalization, specialization etc.) Convert the ER diagram into tables on paper and propose an optimal database design using different normalization concepts.

<u>ER Diagram</u>

Entities and Attributes:

- Patient
  - Primary Key: Patient_ID
  - Attributes: Name, DOB, Gender, Contact_Info, Address
- Doctor
  - Primary Key: Doctor_ID
  - Attributes: Name, Specialty, Contact_Info, Schedule
- Medical Record
  - Primary Key: Record_ID
  - Attributes: Date_Of_Visit, Prescription, Treatment, Diagnosis
  - Foreign Keys: Patient_ID, Doctor_ID
- Appointment
  - Primary Key: Appointment_ID
  - Attributes: Appointment_Date, Appointment_Time
  - Foreign Keys: Patient_ID, Doctor_ID
- Payment Method
  - Primary Key: Payment_ID
  - Attributes: Payment_Type, Payment_Date, Amount
  - Foreign Key: Patient_ID

Primary Keys List:

- Patient: Patient_ID
- Doctor: Doctor_ID
- Medical Record: Record_ID
- Appointment: Appointment_ID
- Payment Method: Payment_ID

Cardinalities:

- One-to-One (1:1)
  - Doctor - Specialty (One doctor has one specialty, and each specialty belongs to one doctor)
- One-to-Many (1:M)
  - Patient - Payment (One patient can make multiple payments)
  - Patient - Medical Record (One patient can have multiple medical records)
  - Doctor - Medical Record (One doctor can create multiple medical records)
  - Patient - Appointment (One patient can schedule multiple appointments)
  - Doctor - Appointment (One doctor can take multiple appointments)
- Many-to-One (M:1) (Reverse of 1:M)
  - Multiple Payments - One Patient

- ○ Multiple Medical Records - One Patient
- ○ Multiple Medical Records - One Doctor
- ○ Multiple Appointments - One Patient
- ○ Multiple Appointments - One Doctor
- ● Many-to-Many (M:N)
  - ○ Doctor - Appointment (A doctor can have multiple appointments, and a patient can have appointments with multiple doctors)
  - ○ Patient - Doctor (via Medical Record) (A patient can have multiple medical records created by different doctors, and a doctor can create medical records for multiple patients)

SQL Query to create tables and insert the data:

```
CREATE TABLE Doctors (

    doctor_id INT PRIMARY KEY ,

    name VARCHAR(50),

    specialty VARCHAR(50),

    contact_number VARCHAR(15),

    schedule TEXT,

    gender VARCHAR(10)

);


CREATE TABLE Patients (

    patient_id INT PRIMARY KEY,

    Name VARCHAR(50),

    date_of_birth DATE,

    gender VARCHAR(10),

    contact_number VARCHAR(15),

    address TEXT

);
```

```sql
CREATE TABLE Appointments (

    appointment_id INT PRIMARY KEY,

    patient_id INT,

    doctor_id INT,

    appointment_date DATE,

    appointment_status VARCHAR(20),

    FOREIGN KEY (patient_id) REFERENCES Patients(patient_id),

    FOREIGN KEY (doctor_id) REFERENCES Doctors(doctor_id)

);


CREATE TABLE MedicalRecords (

    record_id INT PRIMARY KEY,

    appointment_id INT,

    diagnosis TEXT,

    prescription TEXT,

    treatment_plan TEXT,

    date_of_visit DATE,

    FOREIGN KEY (appointment_id) REFERENCES Appointments(appointment_id)

);


CREATE TABLE Payments (

    payment_id INT PRIMARY KEY,

    appointment_id INT,
```

```sql
    amount DECIMAL(10, 2),

    payment_date DATE,

    payment_status VARCHAR(20),

    payment_method VARCHAR(20),

    FOREIGN KEY (appointment_id) REFERENCES Appointments(appointment_id)
);


INSERT INTO Doctors (doctor_id, name, specialty, contact_number, schedule, gender)
VALUES
(1, 'Dr. Arvind Kumar', 'Cardiologist', '9876543210', 'Mon 9 AM - 1 PM, Wed 2 PM - 5 PM',
'Male'),

(2, 'Dr. Priya Sharma', 'Neurologist', '9887654321', 'Tue 10 AM - 12 PM, Fri 3 PM - 6 PM',
'Female'),

(3, 'Dr. Rajeev Reddy', 'Orthopedist', '9442112233', 'Mon 10 AM - 2 PM, Thu 1 PM - 4 PM',
'Male'),

(4, 'Dr. Meena Desai', 'Pediatrician', '9900112233', 'Mon 8 AM - 11 AM, Sat 2 PM - 5 PM',
'Female'),

(5, 'Dr. Sunil Agarwal', 'Dermatologist', '9222334455', 'Tue 9 AM - 12 PM, Thu 3 PM - 6 PM',
'Male'),

(6, 'Dr. Kavitha Nair', 'Gynecologist', '9955778899', 'Mon 10 AM - 1 PM, Fri 3 PM - 6 PM',
'Female'),

(7, 'Dr. Sameer Gupta', 'ENT Specialist', '9311223344', 'Wed 9 AM - 12 PM, Fri 4 PM - 7 PM',
'Male'),

(8, 'Dr. Neha Patil', 'Ophthalmologist', '9977886655', 'Tue 11 AM - 3 PM, Thu 9 AM - 12 PM',
'Female');


SELECT * FROM Doctors;
```

```sql
INSERT INTO Patients (patient_id, name, date_of_birth, gender, contact_number, address)

VALUES

(1, 'Ravi Kumar', '1985-05-14', 'Male', '9888776655', 'Bangalore, Karnataka, India'),

(2, 'Sneha Patel', '1992-08-22', 'Female', '9123456789', 'Mumbai, Maharashtra, India'),

(3, 'Arvind Singh', '1980-12-01', 'Male', '9933445566', 'Delhi, India'),

(4, 'Priya Joshi', '1987-10-10', 'Female', '9837465521', 'Chennai, Tamil Nadu, India'),

(5, 'Amit Sharma', '1995-03-05', 'Male', '9955332211', 'Hyderabad, Telangana, India'),

(6, 'Meera Yadav', '1990-06-14', 'Female', '9855223344', 'Ahmedabad, Gujarat, India'),

(7, 'Vikram Reddy', '1982-07-18', 'Male', '9001223344', 'Bhubaneswar, Odisha, India'),

(8, 'Shalini Rao', '1989-12-20', 'Female', '9776655443', 'Pune, Maharashtra, India'),

(9, 'Nikhil Jain', '1993-01-15', 'Male', '9554433221', 'Kolkata, West Bengal, India'),

(10, 'Nina Deshmukh', '1994-09-08', 'Female', '9344221188', 'Mumbai, Maharashtra, India');


SELECT * FROM Patients;


INSERT INTO Appointments (appointment_id, patient_id, doctor_id, appointment_date, appointment_status)

VALUES

(1, 1, 1, '2025-02-15', 'Scheduled'),

(2, 2, 2, '2025-02-16', 'Scheduled'),

(3, 3, 3, '2025-02-17', 'Scheduled'),

(4, 4, 4, '2025-02-18', 'Scheduled'),

(5, 5, 5, '2025-02-19', 'Scheduled'),

(6, 6, 6, '2025-02-20', 'Scheduled'),

(7, 7, 7, '2025-02-21', 'Scheduled'),
```

```sql
(8, 8, 8, '2025-02-22', 'Scheduled'),

(9, 9, 1, '2025-02-23', 'Scheduled'),

(10, 10, 2, '2025-02-24', 'Scheduled');


SELECT * FROM Appointments;


INSERT INTO MedicalRecords (record_id, appointment_id, diagnosis, prescription,
treatment_plan, date_of_visit)

VALUES

(1, 1, 'High Blood Pressure', 'Amlodipine 5mg', 'Regular exercise, low salt diet', '2025-02-15'),

(2, 2, 'Migraine', 'Sumatriptan 50mg', 'Avoid stress, regular sleep pattern', '2025-02-16'),

(3, 3, 'Knee Pain', 'Ibuprofen 200mg', 'Physical therapy, knee strengthening exercises', '2025-02-17'),

(4, 4, 'Fever', 'Paracetamol 500mg', 'Bed rest, fluid intake', '2025-02-18'),

(5, 5, 'Skin Rash', 'Hydrocortisone cream', 'Avoid sun exposure, use prescribed ointment', '2025-02-19'),

(6, 6, 'Abdominal Pain', 'Omeprazole 20mg', 'Avoid spicy food, drink plenty of water', '2025-02-20'),

(7, 7, 'Throat Infection', 'Amoxicillin 500mg', 'Warm saline gargles, rest', '2025-02-21'),

(8, 8, 'Eye Infection', 'Tobramycin eye drops', 'Avoid rubbing eyes, follow eye hygiene', '2025-02-22'),

(9, 9, 'Hypertension', 'Amlodipine 5mg', 'Reduce salt intake, avoid stress', '2025-02-23'),

(10, 10, 'Cold and Cough', 'Cetirizine 10mg', 'Rest, steam inhalation, warm water gargles', '2025-02-24');


SELECT * FROM MedicalRecords;
```

INSERT INTO Payments (payment_id, appointment_id, amount, payment_date, payment_status, payment_method)

VALUES

(1, 1, 1000.00, '2025-02-15', 'Paid', 'Credit Card'),

(2, 2, 1200.00, '2025-02-16', 'Paid', 'Cash'),

(3, 3, 1500.00, '2025-02-17', 'Pending', 'Debit Card'),

(4, 4, 800.00, '2025-02-18', 'Paid', 'UPI'),

(5, 5, 900.00, '2025-02-19', 'Paid', 'Cash'),

(6, 6, 1100.00, '2025-02-20', 'Paid', 'Credit Card'),

(7, 7, 950.00, '2025-02-21', 'Pending', 'Debit Card'),

(8, 8, 1400.00, '2025-02-22', 'Paid', 'UPI'),

(9, 9, 1300.00, '2025-02-23', 'Paid', 'Cash'),

(10, 10, 1600.00, '2025-02-24', 'Paid', 'Credit Card');

SELECT * FROM Payments;

Normal Forms :

Doctors Table

- 1NF: ☑ (Atomic values, unique rows)

- 2NF: ☑ (No partial dependencies, doctor_id is the only candidate key)

- 3NF: ✖ (Schedule contains multiple values in a single field, violating 3NF)

Decomposed Tables:

CREATE TABLE Doctor_Schedule (

   doctor_id INT,

day VARCHAR(10),

time_slot VARCHAR(20),

PRIMARY KEY (doctor_id, day, time_slot),

FOREIGN KEY (doctor_id) REFERENCES Doctors(doctor_id)

);

INSERT INTO Doctor_Schedule (doctor_id, day, time_slot) VALUES

(1, 'Mon', '9 AM - 1 PM'),

(1, 'Wed', '2 PM - 5 PM');

Output:

```
+-----------+------------------+-----------------+-----------------+----------------------------------------+--------+
| doctor_id | name             | specialty       | contact_number  | schedule                               | gender |
+-----------+------------------+-----------------+-----------------+----------------------------------------+--------+
|         1 | Dr. Arvind Kumar | Cardiologist    | 9876543210      | Mon 9 AM - 1 PM, Wed 2 PM - 5 PM       | Male   |
|         2 | Dr. Priya Sharma | Neurologist     | 9887654321      | Tue 10 AM - 12 PM, Fri 3 PM - 6 PM     | Female |
|         3 | Dr. Rajeev Reddy | Orthopedist     | 9442112233      | Mon 10 AM - 2 PM, Thu 1 PM - 4 PM      | Male   |
|         4 | Dr. Meena Desai  | Pediatrician    | 9900112233      | Mon 8 AM - 11 AM, Sat 2 PM - 5 PM      | Female |
|         5 | Dr. Sunil Agarwal| Dermatologist   | 9222334455      | Tue 9 AM - 12 PM, Thu 3 PM - 6 PM      | Male   |
|         6 | Dr. Kavitha Nair | Gynecologist    | 9955778899      | Mon 10 AM - 1 PM, Fri 3 PM - 6 PM      | Female |
|         7 | Dr. Sameer Gupta | ENT Specialist  | 9311223344      | Wed 9 AM - 12 PM, Fri 4 PM - 7 PM      | Male   |
|         8 | Dr. Neha Patil   | Ophthalmologist | 9977886655      | Tue 11 AM - 3 PM, Thu 9 AM - 12 PM     | Female |
+-----------+------------------+-----------------+-----------------+----------------------------------------+--------+

+-----------+-----+-------------+
| doctor_id | day | time_slot   |
+-----------+-----+-------------+
|         1 | Mon | 9 AM - 1 PM |
|         1 | Wed | 2 PM - 5 PM |
+-----------+-----+-------------+
```

1. **Patients Table**

   ○ **1NF:** ☑ (Atomic values, unique rows)

   ○ **2NF:** ☑ (No partial dependencies, patient_id is the only candidate key)

   ○ **3NF:** ☑ (No transitive dependencies)

2. **Appointments Table**

- ○ **1NF:** ☑ (Atomic values, unique rows)

- ○ **2NF:** ☑ (No partial dependencies)

- ○ **3NF:** ☑ (No transitive dependencies)

3. **MedicalRecords Table**

  - ○ **1NF:** ☑ (Atomic values, unique rows)

  - ○ **2NF:** ☑ (No partial dependencies)

  - ○ **3NF:** ☑ (No transitive dependencies)

4. **Payments Table**

  - ○ **1NF:** ☑ (Atomic values, unique rows)

  - ○ **2NF:** ☑ (No partial dependencies)

  - ○ **3NF:** ☑ (No transitive dependencies)