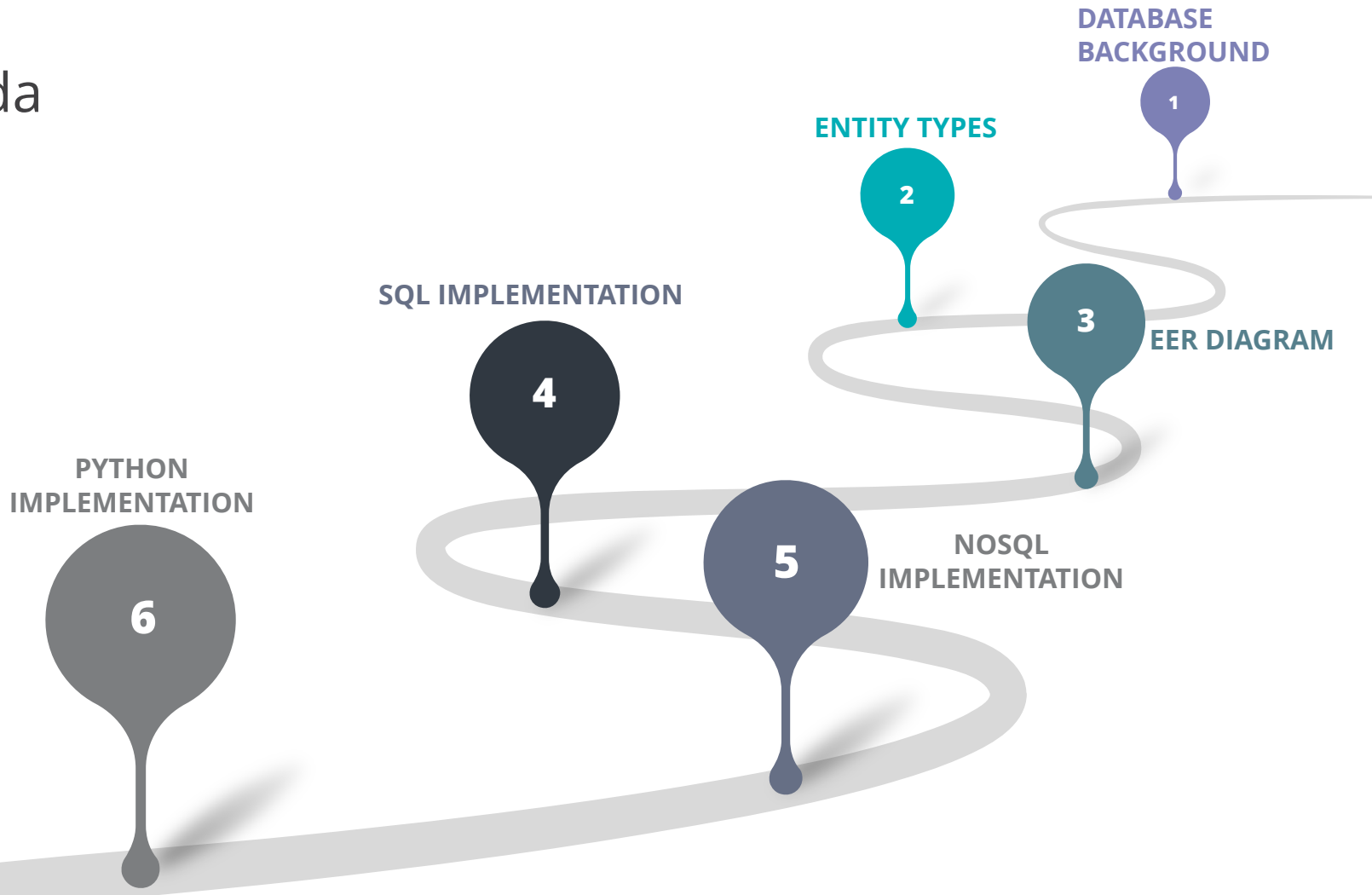




# Health Insurance DB System

Presented by,  
Aryak Bodkhe and Shreyans Thesis Group 23

# Agenda



# Overall Goal



- Create an efficient database which can store the Health Insurance data of Students and can provide insights about the types of Insurance Plans and their benefits.
- Selected Application:
  - Creating, updating and monitoring flow of money insured for various injuries and diseases and if it is covered in the insurance.
- Special Functions:
  - Cost of Medical Test performed
  - Average cost of Treating a particular test
  - Which Hospitals comes under insurance, and which are not.
  - Which insurance has highest money insured and is opted by the students.

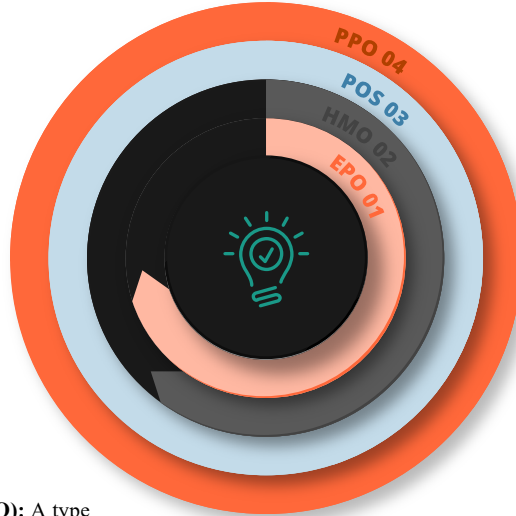
# Insurance Types

01

**Exclusive Provider Organization (EPO):** A managed care plan where services are covered only if you use doctors, specialists, or hospitals in the plan's network (except in an emergency).

02

**Health Maintenance Organization (HMO):** A type of health insurance plan that usually limits coverage to care from doctors who work for or contract with the HMO. It generally won't cover out-of-network care except in an emergency. An HMO may require you to live or work in its service area to be eligible for coverage. HMOs often provide integrated care and focus on prevention and wellness.



03

**Point of Service (POS):** A type of plan where you pay less if you use doctors, hospitals, and other health care providers that belong to the plan's network. POS plans require you to get a referral from your primary care doctor in order to see a specialist.

04

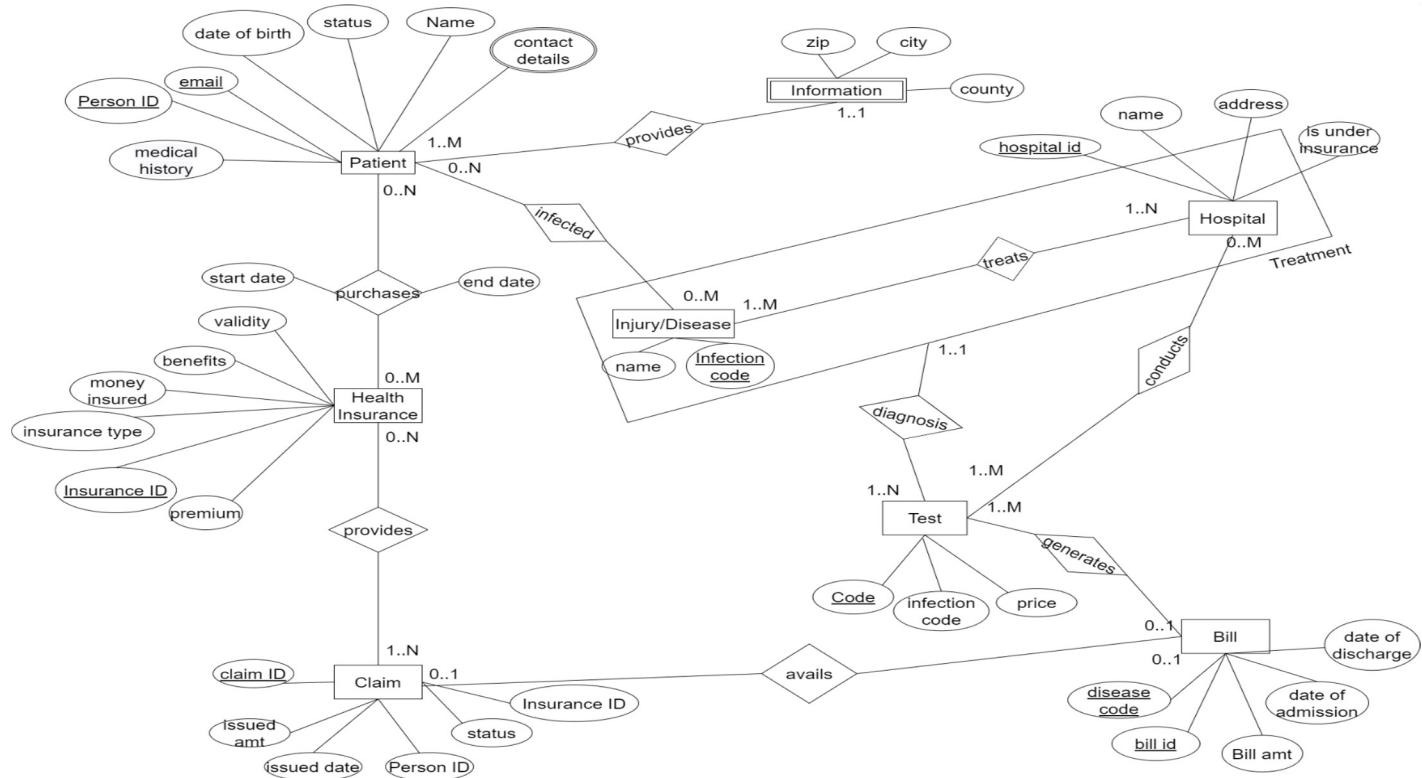
**Preferred Provider Organization (PPO):** A type of health plan where you pay less if you use providers in the plan's network. You can use doctors, hospitals, and providers outside of the network without a referral for an additional cost.

# Business Entities



- Patient - Includes Entities such as insurance status, medical history, contact details.
- Information – Include regional information such as zip code, city.
- Health Insurance - Includes attributes such as insurance type, benefits, validity etc.
- Claim – Includes attributes such as issued amount, claim status.
- Injury/Disease – Includes injury/disease name and its code.
- Hospital – Includes attributes such as hospital, its location, if it is under insurance.
- Test – Includes infection code, price of the test
- Bill - Includes disease, date of admission and discharge and amount.

# EER Model of Database



# Implementing Analytical MySQL Queries

*Count of hospitals that are under the insurance, and which are not under insurance simultaneously*

```
SELECT COUNT(hospital_id) AS Count, isunderinsurance, h_address
FROM hospital
WHERE h_address = 'Boston, MA'
GROUP BY isunderinsurance
```

	Count	isunderinsuran...	h_address	
	7	TRUE	Boston, MA	
	4	FALSE	Boston, MA	

*infection code/injury which has the highest bill amount to treat that disease or injury.*

```
SELECT
  a.bill_amt AS Amount,
  b.injury_Name AS Injury,
  b.infection_code AS Infection_Code
FROM
  bill a,
  injury b
WHERE
  b.infection_code = a.injury_code
GROUP BY b.injury_Name
ORDER BY a.bill_amt DESC
LIMIT 10;
```

	Amount	Injury	Infection_Code
►	99501	Poisoning by unsp topical agent, undetermined,...	20
	99329	Fracture of mandible, unsp, subs for fx w routn...	150
	97940	Displ commnt fx r patella, 7thR	21
	97683	Cholera, unspecified	100
	97157	Corrosion of second degree of left lower leg, init...	75
	96573	Malignant neoplasm of appendix	187
	96498	Nondisp commnt fx shaft of unsp femr, 7thE	86
	96455	Allergy status to unsp drug/meds/biol subst status	184
	96284	Non-pressure chronic ulcer of unspecified ankle	6

*Query to fetch Patient information who were treated in Hospitals in Boston and had their insurance covered.*

```
SELECT
DISTINCT(e.Person_ID),
e.P_Name AS PatientName,
b.treats_infection_code AS InfectionCode,
c.Injury_Name AS Injury,
A.hospital_name,
a.h_address
FROM
    hospital a,
    treats b,
    injury c,
    infected d,
    patient_info e
WHERE
    a.hospital_id = b.treats_hospital_id
    AND b.treats_infection_code = c.infection_code
    AND c.infection_code = d.infection_cod
    AND d.person_id = e.Person_ID
    AND e.Status = 'true'
    AND a.h_address LIKE '%Boston%'
    AND a.isunderinsurance = 'TRUE'
LIMIT 10
```

Person_ID	PatientName	InfectionCode	Injury	hospital_name	h_address
67	Katina Pepall	2	Sltr-haris Type IV physl fx low end humer, l arm,...	Beth Israel Deaconess Medical Center	Boston, MA
192	Jacinda Shelliday	156	Benign neoplasm of connective and oth soft tiss...	Brigham and Women's Faulkner Hospital	Boston, MA
10	Cilka Frances	136	Scrotal pain	Brigham and Women's Faulkner Hospital	Boston, MA
22	Binky Marousek	136	Scrotal pain	Brigham and Women's Faulkner Hospital	Boston, MA
116	Bren Aizikovitch	30	Underdosing of unspecified systemic antibiotic, i...	Brigham and Women's Hospital	Boston, MA
73	Miles Dradey	24	Rheumatoid bursitis, left hand	Massachusetts Eye and Ear Infirmary	Boston, MA
15	Ruy Presland	167	Unsp fracture of navicular bone of right wrist, se...	Massachusetts General Hospital	Boston, MA
64	Jessie Whiteman	101	Toxic effect of petroleum products, self-harm, init	Massachusetts General Hospital	Boston, MA
159	Bobina Culcheth	105	Military operations involving other explosions an...	Tufts Medical Center	Boston, MA
106	Krystyna Quirk	62	Contusion of unspecified forearm	Tufts Medical Center	Boston, MA



Query to fetch Patient information who were treated in Hospitals in Boston and had their insurance covered.

```
SELECT
    DISTINCT(e.Person_ID),
    e.P_Name AS PatientName,
    b.treats_infection_code AS InfectionCode,
    c.Injury_Name AS Injury,
    a.hospital_name,
    a.h_address
FROM
    hospital a,
    treats b,
    injury c,
    infected d,
    patient_info e
WHERE
    a.hospital_id = b.treats_hospital_id
    AND b.treats_infection_code = c.infection_code
    AND c.infection_code = d.infection_cod
    AND d.person_id = e.Person_ID
    AND e.Status = 'true'
    AND a.h_address LIKE '%Boston%'
    AND a.isunderinsurance = 'TRUE'
LIMIT 10
```

Person_ID	PatientName	InfectionCode	Injury	hospital_name	h_address
67	Katina Pepall	2	Sltr-haris Type IV physl fx low end humer, l arm,....	Beth Israel Deaconess Medical Center	Boston, MA
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# Implementing Analytical NoSQL Queries

*Count of hospitals in Massachusetts that are under insurance cover*

```
db.hospital.aggregate(  
[  
  {  
    $match: {  
      isunderinsurance: {  
        $eq :true  
      }  
    }  
  },  
  {  
    $count: "Hospital under Insurance"  
  }  
]  
)
```

```
{  
  "Hospital under Insurance" : NumberInt(47)  
}
```



*Query to find top 10 costliest tests for different infections.*

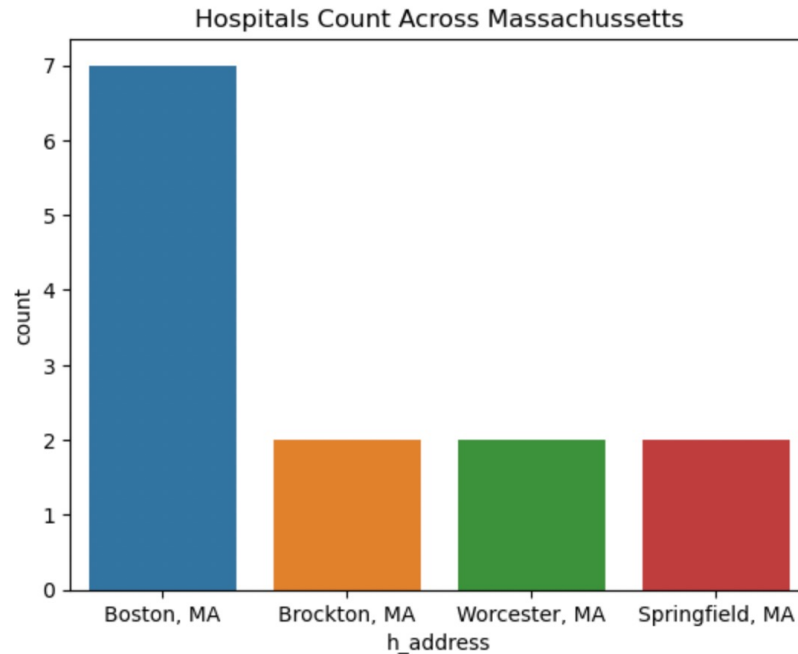
```
db.getCollection("test").find({})

db.test.aggregate([
  {$group: {_id: "$Test_code", Price: {$max: "$Price"}}},
  {$project: {_id: 0, "Test_code": "$_id", Price: 1}},
  {$sort: {Price: -1}},
  {$limit: 10}
])
```

```
{
  "Price" : NumberInt(9962),
  "Test_code" : NumberInt(64)
}
{
  "Price" : NumberInt(9944),
  "Test_code" : NumberInt(193)
}
{
  "Price" : NumberInt(9938),
  "Test_code" : NumberInt(194)
}
{
  "Price" : NumberInt(9930),
  "Test_code" : NumberInt(129)
}
{
  "Price" : NumberInt(9909),
  "Test_code" : NumberInt(59)
}
{
  "Price" : NumberInt(9857),
  "Test_code" : NumberInt(36)
}
{
  "Price" : NumberInt(9851),
  "Test_code" : NumberInt(13)
}
{
  "Price" : NumberInt(9830),
  "Test_code" : NumberInt(9)
}
```

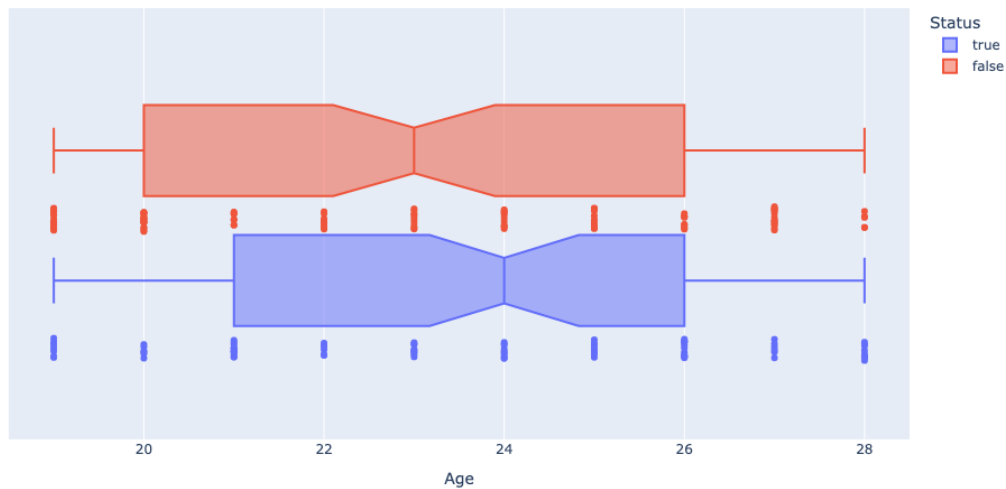
# Python Implementation

*The number of hospitals that are under insurance of PPO type which has the most number of tests being performed at the hospital.*



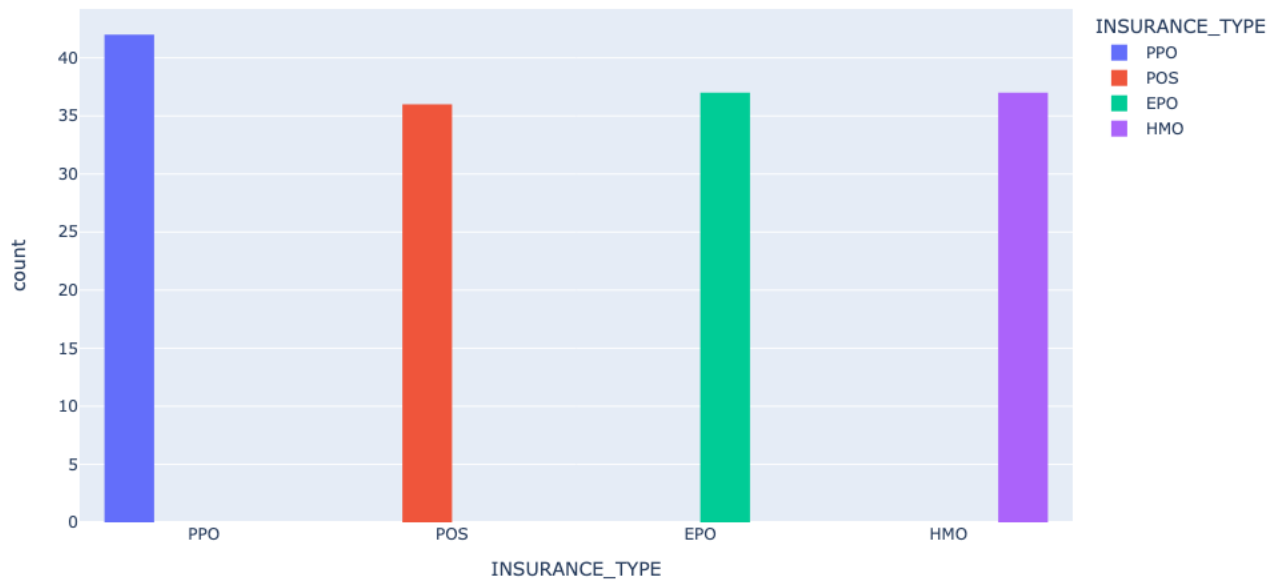


*Box plot distribution of age of patients vs status of whether they have active insurance plans*





*Count of Insurance Plans that have been successfully claimed at least one time*





**THANK YOU**