

Group No 7

Invention Management

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Goal:

The objective is to build a database management system to maintain details of various inventions and the related details of that invention.

Overview:

With the required information, we started by creating different entities and established various relationships between them like one to one, many to one, many to many, unary, aggregation, total participation, partial participation.

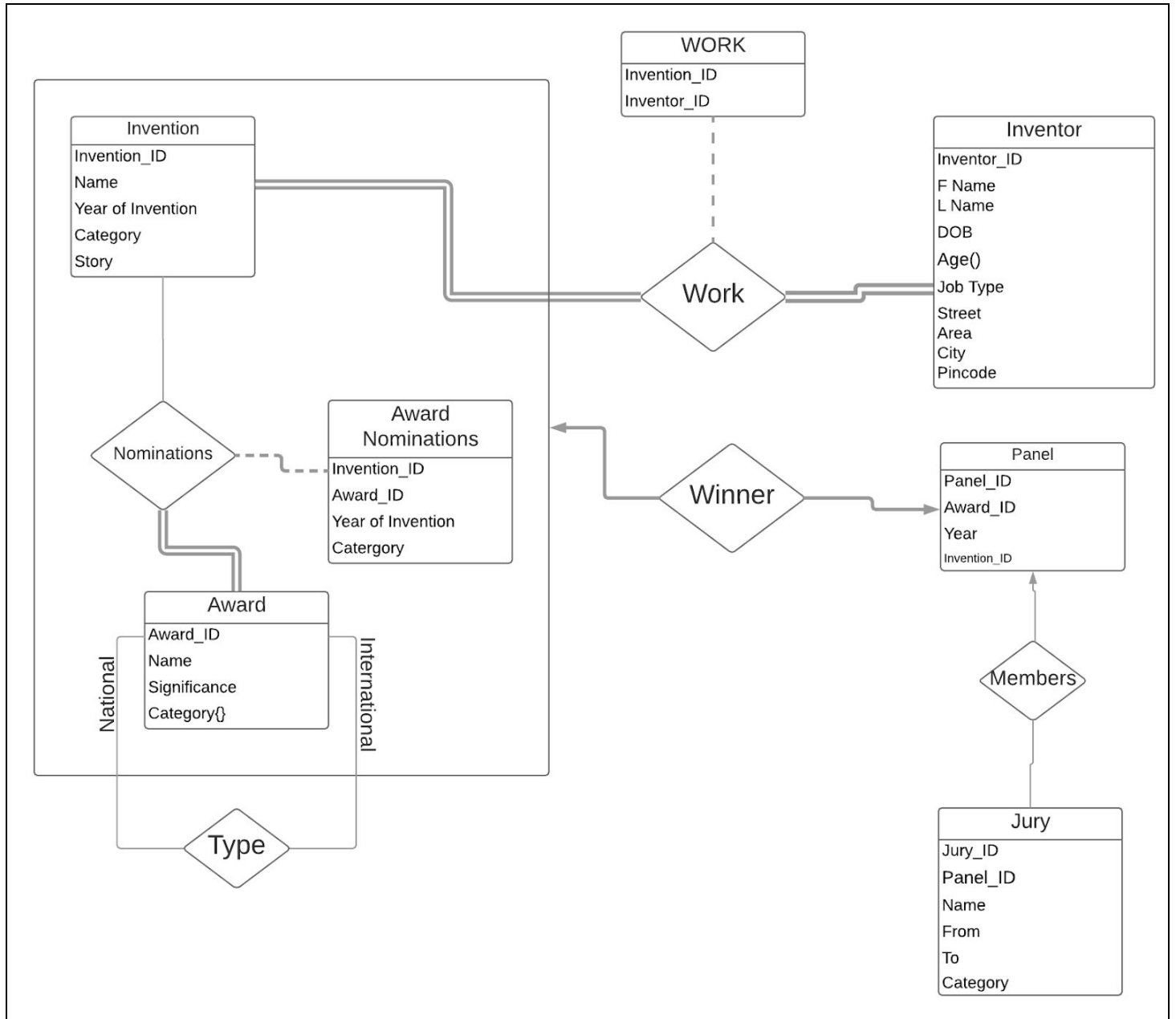
Specification:

I started by creating the Invention entity set which has details of the various invention(s). Next, I created the Inventor entity set with the details of the inventor(s) and these two entity sets are in many-to-many relation with total participation. Next, we created an entity set for Awards with details of all the awards and it has a multi-valued attribute, Category. The award is a unary relation which can be National or International. A many-to-many relationship is established between Awards and Invention with a total participation of Awards to store the details of various nominations for each award and different nomination for the given invention. This entire relationship is aggregated and has a one-to-one relationship with Panel who decides the winner for each award by considering the different nominations for the award. The Panel maintains one-to-many relation with the Jury. We are considering the case that an award can get nominated in its year of invention.

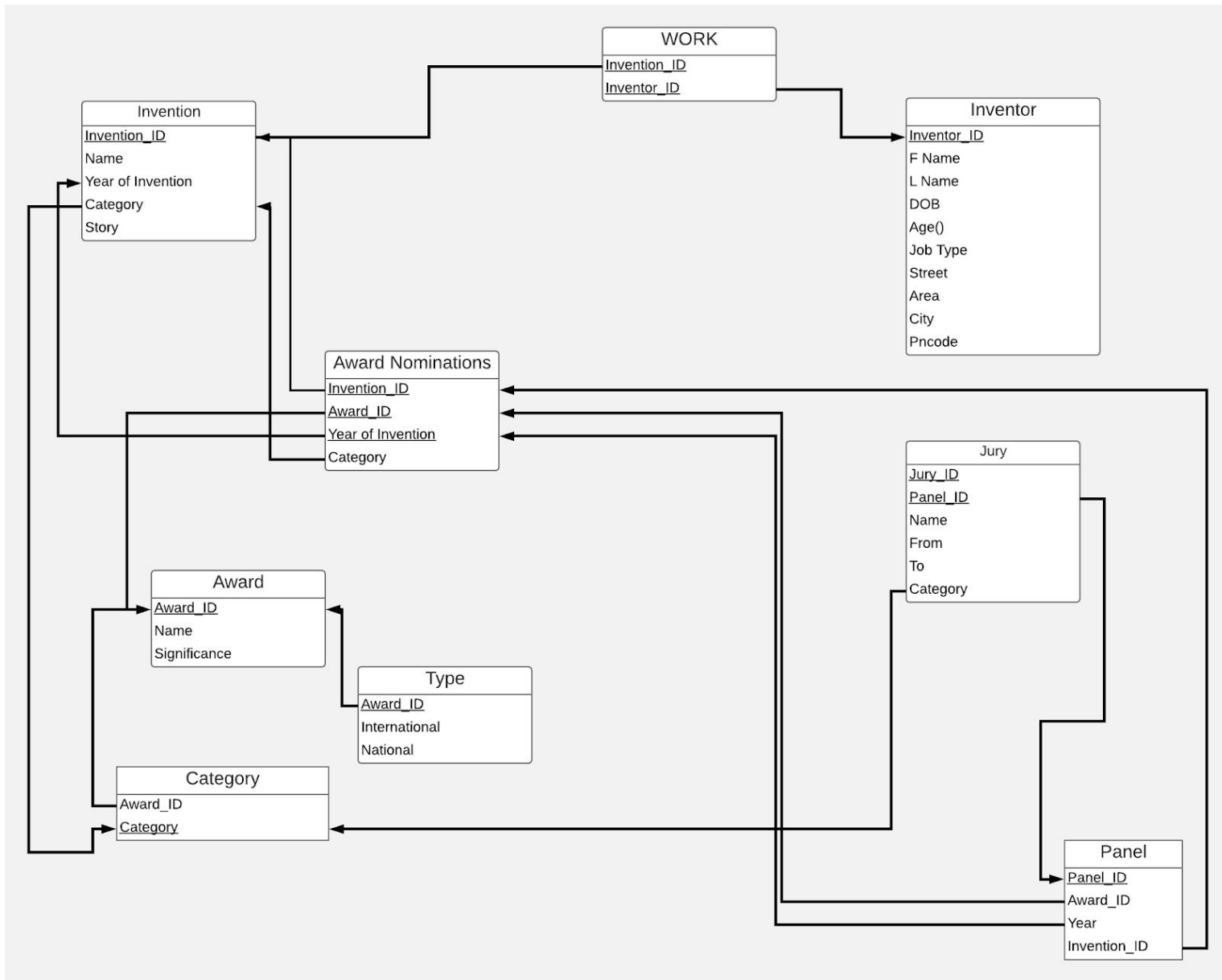
Out of space:

An Award cannot be nominated after it's the year of invention. I am also neglecting the case where there is no award that can declare a winner without the panel's decision.

ER Diagram



Schema Diagram:



Relational Schema:

Invention(Invention_ID, Name, Year of invention, Story)

Inventor(Inventor_ID, F-Name, L-Name, DOB, Age, Job Type, Address)

Work(Invention_ID, Inventor_ID)

Award(Award_ID, Name, Significance)

Category(Award_ID, Category)

Award Nomination(Invention_ID, Award_ID, Year of Invention, Category)

Jury(Jury_ID, Name, Span, Category)

Type(Award_ID, National, International)

Panel(Panel_ID, Award_ID, Year, Invention_ID)

The initial table contains the following attributes:

invention_id, invention_name, year_invention,
story, invention_category, inventor_id, inventor_name, DOB,
Job_type, Address, nomination_year, Award_id, Award_name,
Significance, Award_Category, Jury_id, Jury_name, Span)

The Relation is defined by

Invention_Management(invention_id, invention_name,
year_invention, story, invention_category, inventor_id,
inventor_name, DOB, Job_type, Address, nomination_year,
Award_id, Award_name, Significance, Award_Category, Jury_id,
Jury_name, Span)

Invention Management
Inventor_ID
Invention Name
Year of Invention
year_invention
invention_category
Story
Inventor_id
Inventor_Name{F_Name, L_Name}
DOB
Job_type
Address{Area, Clty, Pincode}
Nomination_year
Award_id
Award_name
Significance
Award_Category
Jury_id
Jury_name
Span{Start_Year, End_Year}

The attributes are defined as follows:

invention_id: used to identify the invention details

invention_name: Name of the invention

year_invention: Year of the invention.

story: The story behind the invention.

inventor_id: Used to identify inventors details

inventor_name: Name of the inventor, contains the First name and the Last name

DOB: Date of birth of inventor

Job_type: Job of the inventor

Address: Address of inventor, contains Area, City, Pincode

Nomination_year: The year in which the invention is nominated for an award

Award_id: Used to identify all the awards uniquely

Award_name: Name of the award

Significance: The reason why this award is given

Award_Category: The category to which this award belongs to

Jury_id: Used to identify jury

Jury_name: Name of the Jury

Span: The working time of the jury, contains Start and End Year

Applying Normal Forms

In 1NF, each tuple will have only single-valued attributes i.e, they should be atomic. All the multi-valued attributes will be split into individual tuples.

Now by applying First Normal Form (1NF) :

1. Invention_name is split into (F_name, L_name), Span is split into Start_date, End_date
2. An invention can have multiple inventors, so each of the inventor details for a specific invention will be shown in separate tuples.
3. Similarly, an invention can have multiple awards, so each award for a specific invention will be shown in separate tuples.

After applying 1NF:

Invention_Management(invention_id, invention_name, year_invention, story, invention_category, inventor_id, F_name, L_name, DOB, Job_type, Area, City, Pincode, nomination_year, Award_id, Award_name, Significance, Award_Category, Jury_id, Jury_name, Start_Year, End_Year)

Invention Management
Inventor_ID
Invention Name
Year of Invention
year_invention
invention_category
Story
Inventor_id
F_Name
L_Name
DOB
Job_type
Area
City
Pincode
Nomination_year
Award_id
Award_name
Significance
Award_Category
Jury_id
Jury_name
Start_Year
End_Year

From the above table, the functional dependencies obtained are

- invention_id -> invention_name, year_invention, story, invention_category
- inventor_id -> F_name, L_name, DOB, Job_type, Area, City, Pincode
- Award_id -> Award_name, Significance, Award_Category, Jury_id, Jury_name, Start_Year, End_Year
- Invention_id, Award_id -> nomination_year

Primary key:

invention_id, inventor_id, award_id
invention_id, inventor_id, award_id -> invention_name, year_invention, story, F_name, L_name, DOB, Job_type, Area, City, Pincode, nomination_year, Award_name, Significance, Award_Category, Jury_id, Jury_name, Start_Year, End_Year

Now by applying 2NF, we eliminate the partial dependencies.

After applying 2NF:

- Invention(invention_id, invention_name, year_invention, invention_category, story)
- Inventor(inventor_id, F_name, L_name, DOB, Job_type, Area, City, Pincode)
- Award(Award_id, Award_name, Significance, Award_Category, Jury_id, Jury_name, Start_Year, End_Year)
- Award_Nomination(invention_id, Award_id, nomination_year)
- Invention_Management(invention_id, inventor_id, award_id)

Invention
invention_id
invention_name
year_invention
story

Inventor
inventor_id
F_Name
L_Name
DOB
Job_type
Area
City
Pincode

Award
Award_id
Award_name
Significance
Award_Category
Jury_id
Jury_name
Start_year
last_year

Nominations
invention_id
Award_id
nomination_year

Invention Management
invention_id
inventor_id
award_id

From the above table, we will get the transitive dependency in the following case

jury_id-> jury_name, Start_year, End_year

In 3NF, we eliminate all transitive dependencies. Transitive dependencies mean that a non-prime attribute is dependent on another attribute which is not a part of the candidate key but is dependent on candidate key.

After applying 3NF:

- Invention(invention_id, invention_name, year_invention, story)
- Inventor(inventor_id, F_name, L_name, DOB, Job_type, Area, City, Pincode)
- Award(Award_id, Award_name, Significance, Award_Category, jury_id)
- Award_Nomination(invention_id, Award_id, nomination_year)
- Invention_Management(invention_id, inventor_id, award_id)
- Jury(jury_id, jury_name, Start_year, End_year)

Invention
<u>invention_id</u>
invention_name
year_invention
story
invention_category

Nominations
<u>invention_id</u>
<u>Award_id</u>
nomination_year

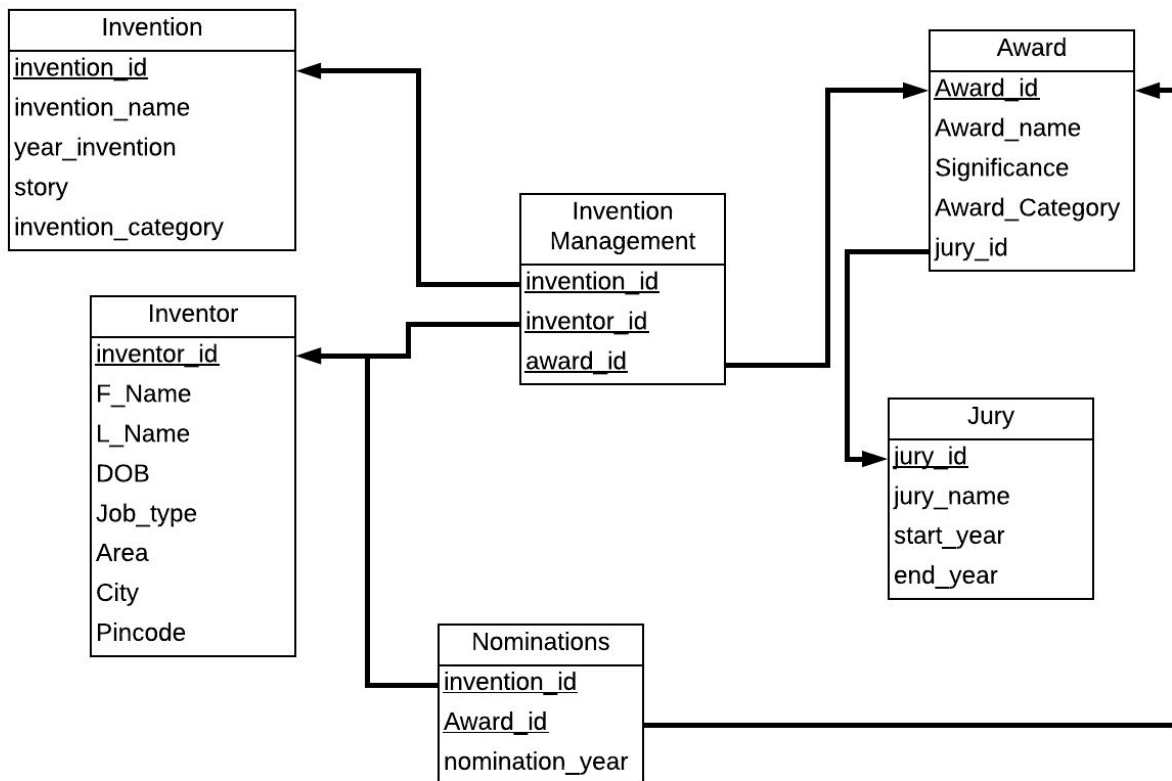
Award
<u>Award_id</u>
Award_name
Significance
Award_Category
jury_id

Inventor
<u>inventor_id</u>
F_Name
L_Name
DOB
Job_type
Area
City
Pincode

Invention Management
<u>invention_id</u>
<u>inventor_id</u>
<u>award_id</u>

Jury
<u>jury_id</u>
jury_name
start_year
end_year

Schema diagram



Differences between the ER model and Normalization_Model

1. Before applying the normalization the tables were defined based on the ER diagram. By doing so, there is a possibility for data redundancy and inconsistency. In order to avoid that, we applied normalization on the complete table.
2. From the table defined from the ER model, we neglect some of the cases like an invention can get an award after many years of invention, in other words, an invention will get nominated for an award only in its year of invention. However, from the table, we got after normalization, resolves this issue.
3. Unnecessary data usage is also reduced by removing unnecessary attributes.
4. The number of tables of the final model is also reduced.

Data Entry:

ONF:

Invention_Id	Invention_Name	Year_of_Invention	invention Category	Story	Inventor_Id
Inv001	Autonomous Cars	26-03-2000	Autonomous Systems	ABC	Inr001, Inr002
Inv002	Automatic Web Design	12-07-2011	Automation of design	DEF	Inr003, Inr004
Inv003	Text Understanding	26-03-2010	Text Understanding	GHI	Inr005, Inr006
Inv004	Autonomous Cars	26-03-2006	Autonomous Systems	JKL	Inr007, Inr008
Inv005	Adobe XD	26-03-2008	Development Tools	MNO	Inr009, Inr010

F	G	H	I	J	K
Inventor_Id	Inventor_Name		Job_Type	DOB	Address
Inr001, Inr002	Andrej Karpathy, Jeffery Hinton		Scientist, Scientist	13-07-1987, 25-02-1988	1,2,3, a,b,c
Inr003, Inr004	Siraj Raval, Venu Vardhan		Scientist, Student	17-05-1975, 28-07-1998	4,5,6, d,e,f
Inr005, Inr006	Jeffery Hinton, Srinivas Machiraju		Scientist, Student	25-02-1988, 19-02-1998	a,b,c, 7,8,9
Inr007, Inr008	Andrej Karpathy, Vinay Varma		Scientist, Student	13-07-1987, 18-09-1999	1,2,3, g,h,i
Inr009, Inr010	Jared Spool, Satya Pramod		Scientist, Student	01-05-1987, 25-02-1998	10,11,12, j,k,l

K	L	M	N	O	P
Address	Award_Id	Award_Name	Significance	Category	Jury_Id
1,2,3, a,b,c	Aw001	Breakthrough Autonomous System	Self-Driving	Autonomous Systems	Jr001
4,5,6, d,e,f	Aw002	Best Automating Technology	Automation	Automation of design	Jr002
a,b,c, 7,8,9	Aw003	The Best Software for Text Underst	Text Understanding	Text Understanding	Jr003
1,2,3, g,h,i	Aw004	The Best Potential Future Technolo	Self-Driving	Autonomous Systems	Jr004
10,11,12, j,k,l	Aw005, Aw006	Best Tool For Development, People	Developing Tool	Development Tools	Jr005, Jr006

O	P	Q	R
Category	Jury_Id	Jury_Name	Span
Autonomous Systems	Jr001	Suresh Patel	2000 2001
Automation of design	Jr002	Ramesh Saxena	2011 2012
Text Understanding	Jr003	Mike Rooney	2010 2011
Autonomous Systems	Jr004	Kritika Singh	2006 2007
Development Tools	Jr005, Jr006	Donald Lee, Harsh Dwivedi	2008 2009

1NF:

Invention_Id	Invention_Name	Year_of_Invention	Story	Inventor_Id	F Name	L Name
Inv001	Autonomous Cars	26-03-2000	ABC	Inr001	Andrej	Karpathy
Inv001	Autonomous Cars	26-03-2000	ABC	Inr002	Jeffery	Hinton
Inv002	Automatic Web Design	12-07-2011	DEF	Inr003	Siraj	Raval
Inv002	Automatic Web Design	12-07-2011	DEF	Inr004	Venu	Vardhan
Inv003	Text Understanding	26-03-2010	GHI	Inr002	Jeffery	Hinton
Inv003	Text Understanding	26-03-2010	GHI	Inr005	Srinivas	Machiraju
Inv004	Autonomous Cars	26-03-2006	JKL	Inr001	Andrej	Karpathy
Inv004	Autonomous Cars	26-03-2006	JKL	Inr006	Vinay	Varma
Inv005	Adobe XD	26-03-2008	MNO	Inr007	Jared	Spool
Inv005	Adobe XD	26-03-2008	MNO	Inr007	Jared	Spool
Inv005	Adobe XD	26-03-2008	MNO	Inr008	Satya	Pramod
Inv005	Adobe XD	26-03-2008	MNO	Inr008	Satya	Pramod

L Name	Job_Type	DOB	Address	Award_Id
Karpathy	Scientist	13-07-1987	1,2,3	Aw001
Hinton	Scientist	25-02-1982	a,b,c	Aw001
Raval	Scientist	17-05-1975	4,5,6	Aw002
Vardhan	Student	28-07-1987	d,e,f	Aw002
Hinton	Scientist	25-02-1982	a,b,c	Aw003
Machiraju	Student	19-02-1989	7,8,9	Aw003
Karpathy	Scientist	13-07-1987	1,2,3	Aw004
Varma	Student	18-09-1989	g,h,i	Aw004
Spool	Scientist	01-05-1987	10,11,12	Aw005
Spool	Scientist	01-05-1987	10,11,12	Aw006
Pramod	Student	16-12-1988	j,k,l	Aw005
Pramod	Student	16-12-1988	j,k,l	Aw006

Award_Id	Award_Name	Significance	Category	Jury_Id
Aw001	Breakthrough Autonomous Systems	Self-Driving	Autonomous Systems	Jr001
Aw001	Breakthrough Autonomous Systems	Self-Driving	Autonomous Systems	Jr001
Aw002	Best Automating Technology	Automation	Automation of design	Jr002
Aw002	Best Automating Technology	Automation	Automation of design	Jr002
Aw003	The Best Software for Text Understanding	Text Understanding	Text Understanding	Jr003
Aw003	The Best Software for Text Understanding	Text Understanding	Text Understanding	Jr003
Aw004	The Best Potential Future Technology	Self-Driving	Autonomous Systems	Jr004
Aw004	The Best Potential Future Technology	Self-Driving	Autonomous Systems	Jr004
Aw005	Best Tool For Development	Developing Tool	Development Tools	Jr005
Aw006	People's Choice Best Tool	Developing Tool	Development Tools	Jr006
Aw005	Best Tool For Development	Developing Tool	Development Tools	Jr005
Aw006	People's Choice Best Tool	Developing Tool	Development Tools	Jr006

Category	Jury_Id	Jury_Name	Start Date	Last Date	Invention Category
Autonomous Systems	Jr001	Suresh Patel	2000	2001	Autonomous Systems
Autonomous Systems	Jr001	Suresh Patel	2000	2001	Autonomous Systems
Automation of design	Jr002	Ramesh Saxena	2011	2012	Automation of design
Automation of design	Jr002	Ramesh Saxena	2011	2012	Automation of design
Text Understanding	Jr003	Mike Rooney	2010	2011	Text Understanding
Text Understanding	Jr003	Mike Rooney	2010	2011	Text Understanding
Autonomous Systems	Jr004	Kritika Singh	2006	2007	Autonomous Systems
Autonomous Systems	Jr004	Kritika Singh	2006	2007	Autonomous Systems
Development Tools	Jr005	Donald Lee	2008	2009	Development Tools
Development Tools	Jr006	Harsh Dwivedi	2008	2009	Development Tools
Development Tools	Jr005	Donald Lee	2008	2009	Development Tools
Development Tools	Jr006	Harsh Dwivedi	2008	2009	Development Tools

2NF:

Invention				
Invention_Id	Invention_Name	Story	Year_of_Invention	invention Category
Inv001	Autonomous Cars	ABC	26-03-2000	Autonomous Systems
Inv002	Automatic Web Design	DEF	12-07-2011	Automation of design
Inv003	Text Understanding	GHI	26-03-2010	Text Understanding
Inv004	Autonomous Cars	JKL	26-03-2006	Autonomous Systems
Inv005	Adobe XD	MNO	26-03-2008	Development Tools

Inventor							
Inventor_Id	F Name	L Name	Job_Type	DOB	Area	City	Pincode
Inr001	Andrej	Karpathy	Scientist	13-07-1987	1	2	3
Inr002	Jeffery	Hinton	Scientist	25-02-1988	a	b	c
Inr003	Siraj	Raval	Scientist	17-05-1975	4	5	6
Inr004	Venu	Vardhan	Student	28-07-1998	d	e	f
Inr005	Srinivas	Machiraju	Student	19-02-1998	7	8	9
Inr006	Vinay	Varma	Student	18-09-1999	g	h	i
Inr007	Jared	Spool	Scientist	01-05-1987	10	11	12
Inr008	Satya	Pramod	Student	16-12-1998	j	k	l

Award							
Award_Id	Award_Name	Significance	Category	Jury_Id	Jury_Name	Start_Year	End_Year
Aw001	Breakthrough Autonomous Systems	Self-Driving	Autonomous Systems	Jr001	Suresh Patel	2000	2001
Aw002	Best Automating Technology	Automation	Automation of design	Jr002	Ramesh Saxena	2011	2012
Aw003	The Best Software for Text Understanding	Text Understanding	Text Understanding	Jr003	Mike Rooney	2010	2011
Aw004	The Best Potential Future Technology	Self-Driving	Autonomous Systems	Jr004	Kritika Singh	2006	2007
Aw005	Best Tool For Development	Developing Tool	Development Tools	Jr005	Donald Lee	2008	2009
Aw006	People's Choice Best Tool	Developing Tool	Development Tools	Jr006	Harsh Dwivedi	2008	2009

Nominations		
Invention_Id	Award_Id	nomination_year
Inv001	Aw001	2001
Inv001	Aw002	2000
Inv001	Aw004	2002
Inv002	Aw002	2011
Inv002	Aw004	2012
Inv002	Aw005	2013
Inv003	Aw003	2012
Inv003	Aw005	2010
Inv003	Aw006	2011
Inv004	Aw004	2006
Inv004	Aw002	2008
Inv004	Aw001	2010
Inv005	Aw005	2009
Inv005	Aw006	2010

Invention_id	Award_id	Inventor_id
Inv001	Aw001	Inr001
Inv001	Aw001	Inr002
Inv002	Aw002	Inr003
Inv002	Aw002	Inr004
Inv003	Aw003	Inr002
Inv003	Aw003	Inr005
Inv004	Aw004	Inr001
Inv004	Aw004	Inr006
Inv005	Aw005	Inr007
Inv005	Aw006	Inr007
Inv005	Aw005	Inr008
Inv005	Aw006	Inr008

3NF:

Awards				
Award_Id	Award_Name	Significance	Category	Jury_Id
Aw001	Breakthrough Autonomous Systems	Self-Driving	Autonomous Systems	Jr001
Aw002	Best Automating Technology	Automation	Automation of design	Jr002
Aw003	The Best Software for Text Understanding	Text Understanding	Text Understanding	Jr003
Aw004	The Best Potential Future Technology	Self-Driving	Autonomous Systems	Jr004
Aw005	Best Tool For Development	Developing Tool	Development Tools	Jr005
Aw006	People's Choice Best Tool	Developing Tool	Development Tools	Jr006

Jury			
Jury_Id	Jury_Name	Start Date	Last Date
Jr001	Suresh Patel	2000	2001
Jr002	Ramesh Saxena	2011	2012
Jr003	Mike Rooney	2010	2011
Jr004	Kritika Singh	2006	2007
Jr005	Donald Lee	2008	2009
Jr006	Harsh Dwivedi	2008	2009

SQL Queries:

Creating Tables

```
create table Inventions(
    invention_id varchar(10) primary key,
    invention_name varchar(20),
    story varchar(100),
    year_invention date,
    invention_category varchar(100));
```

```
create table Inventor(  
    inventor_id varchar(10) primary key,  
    F_name varchar(10),  
    L_name varchar(10),  
    DOB date,  
    job_type varchar(20),  
    area varchar(10),  
    city varchar(10),  
    pincode varchar(10));
```

```
create table Awards(  
    award_id varchar(10) primary key,  
    award_name varchar(40),  
    significance varchar(50),  
    award_category varchar(20),  
    jury_id varchar(10),  
    foreign key (jury_id) references Jury);
```

```
create table Award_nominations(  
    invention_id varchar(10),  
    award_id varchar(10),  
    year_of_nomination int,  
    primary key(invention_id, award_id),  
    foreign key (invention_id) references Inventions,  
    foreign key (award_id) references Awards);
```

```
create table Jury(  
    jury_id varchar(10) primary key,  
    jury_name varchar(20),  
    start_year int,  
    end_year int);
```

```
create table Invention_management(  
    invention_id varchar(10),  
    award_id varchar(10),  
    inventor_id varchar(10),  
    primary key (invention_id, inventor_id, award_id),  
    foreign key (invention_id) references Inventions,  
    foreign key (inventor_id) references Inventor,  
    foreign key (award_id) references Awards);
```


Inserting Data

```
INSERT INTO Inventions VALUES ('Inv001','Autonomous  
Cars','ABC','26-MAR-2000','Autonomous Systems');  
INSERT INTO Inventions VALUES ('Inv002','Automatic Web  
Design','DEF','12-JUL-2011','Automation of design');  
INSERT INTO Inventions VALUES ('Inv003','Text  
Understanding','GHI','26-MAR-2010','Text Understanding');  
INSERT INTO Inventions VALUES ('Inv004','Autonomous  
Cars','JKL','26-MAR-2006','Autonomous Systems');  
INSERT INTO Inventions VALUES ('Inv005','Adobe  
XD','MNO','26-MAR-2008','Development Tools');
```

```
INSERT INTO Inventor VALUES ('Inr001','Andrej  
,','Karpathy','13-JUL-1987','Scientist','1','2','3');  
INSERT INTO Inventor VALUES ('Inr002','Jeffery  
,','Hinton','25-FEB-1988','Scientist','a','b','c');  
INSERT INTO Inventor VALUES ('Inr003','Siraj  
,','Raval','17-MAY-1975','Scientist','4','5','6');  
INSERT INTO Inventor VALUES ('Inr004','Venu  
,','Vardhan','28-JUL-1998','Student','d','e','f');  
INSERT INTO Inventor VALUES ('Inr005','Srinivas  
,','Machiraju','19-FEB-1998','Student','7','8','9');  
INSERT INTO Inventor VALUES ('Inr006','Vinay  
,','Varma','18-SEP-1999','Student','g','h','i');  
INSERT INTO Inventor VALUES ('Inr007','Jared  
,','Spool','01-MAY-1987','Scientist','10','11','12');  
INSERT INTO Inventor VALUES ('Inr008','Satya  
,','Pramod','16-DEC-1998','Student','j','k','l');
```

```
INSERT INTO Jury VALUES ('Jr001','Suresh Patel',2000,2001);  
INSERT INTO Jury VALUES ('Jr002','Ramesh Saxena',2011,2012);  
INSERT INTO Jury VALUES ('Jr003','Mike Rooney',2010,2011);  
INSERT INTO Jury VALUES ('Jr004','Kritika Singh',2006,2007);  
INSERT INTO Jury VALUES ('Jr005','Donald Lee',2008,2009);  
INSERT INTO Jury VALUES ('Jr006','Harsh Dwivedi',2008,2009);
```

```
INSERT INTO Awards VALUES ('Aw001','Breakthrough Autonomous  
Systems','Self-Driving','Autonomous Systems','Jr001');  
INSERT INTO Awards VALUES ('Aw002','Best Automating  
Technology','Automation','Automation of design','Jr002');  
INSERT INTO Awards VALUES ('Aw003','The Best Software for Text  
Understanding','Text Understanding','Text Understanding','Jr003');
```

```

INSERT INTO Awards VALUES ('Aw004','The Best Potential Future
Technology','Self-Driving','Autonomous Systems','Jr004');
INSERT INTO Awards VALUES ('Aw005','Best Tool For
Development','Developing Tool','Development Tools','Jr005');
INSERT INTO Awards VALUES ('Aw006','Peoples Choice Best Tool','Developing
Tool','Development Tools','Jr006');

```

```

INSERT INTO Award_nominations VALUES ('Inv001','Aw001',2001);
INSERT INTO Award_nominations VALUES ('Inv001','Aw002',2000);
INSERT INTO Award_nominations VALUES ('Inv001','Aw004',2002);
INSERT INTO Award_nominations VALUES ('Inv002','Aw002',2011);
INSERT INTO Award_nominations VALUES ('Inv002','Aw004',2012);
INSERT INTO Award_nominations VALUES ('Inv002','Aw005',2013);
INSERT INTO Award_nominations VALUES ('Inv003','Aw003',2012);
INSERT INTO Award_nominations VALUES ('Inv003','Aw005',2010);
INSERT INTO Award_nominations VALUES ('Inv003','Aw006',2011);
INSERT INTO Award_nominations VALUES ('Inv004','Aw004',2006);
INSERT INTO Award_nominations VALUES ('Inv004','Aw002',2008);
INSERT INTO Award_nominations VALUES ('Inv004','Aw001',2010);
INSERT INTO Award_nominations VALUES ('Inv005','Aw005',2009);
INSERT INTO Award_nominations VALUES ('Inv005','Aw006',2010);

```

```

INSERT INTO Invention_management VALUES ('Inv001','Aw001','Inr001');
INSERT INTO Invention_management VALUES ('Inv001','Aw001','Inr002');
INSERT INTO Invention_management VALUES ('Inv002','Aw002','Inr003');
INSERT INTO Invention_management VALUES ('Inv002','Aw002','Inr004');
INSERT INTO Invention_management VALUES ('Inv003','Aw003','Inr002');
INSERT INTO Invention_management VALUES ('Inv003','Aw003','Inr005');
INSERT INTO Invention_management VALUES ('Inv004','Aw004','Inr001');
INSERT INTO Invention_management VALUES ('Inv004','Aw004','Inr006');
INSERT INTO Invention_management VALUES ('Inv005','Aw005','Inr007');
INSERT INTO Invention_management VALUES ('Inv005','Aw006','Inr007');
INSERT INTO Invention_management VALUES ('Inv005','Aw005','Inr008');
INSERT INTO Invention_management VALUES ('Inv005','Aw006','Inr008');

```

Questions

To select the years with more than one nomination: (Aggregate functions, Group By, Having)

```

SELECT COUNT(invention_id) AS Nominations, year_of_nomination FROM
Award_nominations GROUP BY year_of_nomination HAVING COUNT(invention_id)>1;

```

	nominations bigint	year_of_nomination integer
1	2	2012
2	3	2010
3	2	2011

Inventions according to the year of Invention (here, ascending) (Order By)

```
SELECT invention_id FROM Inventions ORDER BY (date_part('year',
year_invention));
```

	invention_id character varying(10)
1	Inv001
2	Inv004
3	Inv005
4	Inv003
5	Inv002

Inventors according to their Date of Birth (here, descending)(Order by)

```
SELECT inventor_id, F_name, L_name FROM Inventor ORDER BY(DOB) DESC;
```

	inventor_id character varying(10)	f_name character varying(10)	l_name character varying(10)
1	Inr006	Vinay	Varma
2	Inr008	Satya	Pramod
3	Inr004	Venu	Vardhan
4	Inr005	Srinivas	Machiraju
5	Inr002	Jeffery	Hinton
6	Inr001	Andrej	Karpathy
7	Inr007	Jared	Spool
8	Inr003	Siraj	Raval

Select from invention management where award_id from invention_management=awards_id from awards_nominains (Join)

```
SELECT FROM Invention_management LEFT JOIN Award_nominations ON
Invention_management.award_id=Award_nominations.award_id;
```

invention_id character varying(10)	award_id character varying(10)	inventor_id character varying(10)	invention_id character varying(10)	award_id character varying(10)	year_of_nomination integer
Inv001	Aw001	Inr002	Inv001	Aw001	2001
Inv001	Aw001	Inr001	Inv001	Aw001	2001
Inv002	Aw002	Inr004	Inv001	Aw002	2000
Inv002	Aw002	Inr003	Inv001	Aw002	2000
Inv004	Aw004	Inr006	Inv001	Aw004	2002
Inv004	Aw004	Inr001	Inv001	Aw004	2002
Inv002	Aw002	Inr004	Inv002	Aw002	2011
Inv002	Aw002	Inr003	Inv002	Aw002	2011
Inv004	Aw004	Inr006	Inv002	Aw004	2012
Inv004	Aw004	Inr001	Inv002	Aw004	2012
Inv005	Aw005	Inr008	Inv002	Aw005	2013
Inv005	Aw005	Inr007	Inv002	Aw005	2013
Inv003	Aw003	Inr005	Inv003	Aw003	2012
Inv003	Aw003	Inr002	Inv003	Aw003	2012
Inv005	Aw005	Inr008	Inv003	Aw005	2010
Inv005	Aw005	Inr007	Inv003	Aw005	2010
Inv005	Aw006	Inr008	Inv003	Aw006	2011
Inv005	Aw006	Inr007	Inv003	Aw006	2011
Inv004	Aw004	Inr006	Inv004	Aw004	2006
Inv004	Aw004	Inr001	Inv004	Aw004	2006
Inv002	Aw002	Inr004	Inv004	Aw002	2008
Inv002	Aw002	Inr003	Inv004	Aw002	2008
Inv001	Aw001	Inr002	Inv004	Aw001	2010

Number of Unique awards for each invention (aggregate functions)

```
SELECT COUNT(DISTINCT(award_id)),invention_id FROM Invention_management
GROUP BY invention_id;
```

	count bigint	invention_id character varying(10)
1	1	Inv001
2	1	Inv002
3	1	Inv003
4	1	Inv004
5	2	Inv005

To select the names of the inventor who is a Scientist, and whose last name is 'Karpathy' or 'Raval' (Boolean)

```
SELECT * FROM Inventor WHERE job_type = 'Scientist' AND (L_name =
'Karpathy' OR L_name = 'Raval');
```

	inventor_id character varying(10)	f_name character varying(10)	l_name character varying(10)	dob date	job_type character varying(20)	area character varying(10)	city character varying(10)	pincode character varying(10)
1	Inr001	Andrej	Karpathy	1987-07-13	Scientist	1	2	3
2	Inr003	Siraj	Raval	1975-05-17	Scientist	4	5	6

Age of all inventors(Age calculation)

```
SELECT age(DOB) FROM Inventor;
```

	age interval
1	31 years 4 mons 19 days
2	30 years 9 mons 5 days
3	43 years 6 mons 15 days
4	20 years 4 mons 4 days
5	20 years 9 mons 10 days
6	19 years 2 mons 13 days
7	31 years 7 mons
8	19 years 11 mons 16 days

Display the full name of the inventor (String operations)

```
SELECT concat_ws ('.', F_name, L_name) AS full_name FROM Inventor;
```

	full_name text
1	Andrej .Karpathy
2	Jeffery .Hinton
3	Siraj .Raval
4	Venu .Vardhan
5	Srinivas .Machiraju
6	Vinay .Varma
7	Jared .Spool
8	Satya .Pramod

Display year of the invention(YYYY) (format of year_invention is YYYY-MM-DD) (Extract)

```
SELECT EXTRACT(YEAR FROM year_invention), invention_id FROM Inventions;
```

	date_part double precision	invention_id character varying(10)
1	2000	Inv001
2	2011	Inv002
3	2010	Inv003
4	2006	Inv004
5	2008	Inv005

Converting DOB to the DD/MM/YYYY format (to_char)

```
SELECT to_char(DOB, 'DD/MM/YYYY') FROM Inventor;
```

	to_char text
1	13/07/1987
2	25/02/1988
3	17/05/1975
4	28/07/1998
5	19/02/1998
6	18/09/1999
7	01/05/1987
8	16/12/1998

Display the jury whose start year is in the year 2006 and 2007 (in)

```
SELECT * from Jury where start_year in(2006,2007);
```

	jury_id character varying(10)	jury_name character varying(20)	start_year integer	end_year integer
1	Jr004	Kritika Singh	2006	2007

To display the details of the inventions which are not invented between 2000 and 2005 (Not Between)

```
SELECT * FROM Inventions WHERE invention_id IN (SELECT invention_id FROM Inventions WHERE EXTRACT(YEAR FROM year_invention) NOT BETWEEN 2000 AND 2005);
```

	invention_id character varying(10)	invention_name character varying(20)	story character varying(100)	year_invention date	invention_category character varying(100)
1	Inv002	Automatic Web Design	DEF	2011-07-12	Automation of design
2	Inv003	Text Understanding	GHI	2010-03-26	Text Understanding
3	Inv004	Autonomous Cars	JKL	2006-03-26	Autonomous Systems
4	Inv005	Adobe XD	MNO	2008-03-26	Development Tools

Details of the invention which did not get nominated (in, Not in subqueries)

```
SELECT invention_id FROM Inventions WHERE invention_id NOT IN (SELECT invention_id FROM Award_nominations);
```

// Null for our data

Inventions which are nominated at least once (IN)

```
SELECT invention_id FROM Inventions WHERE invention_id IN (SELECT invention_id FROM Award_nominations);
```

	invention_id character varying(10)
1	Inv001
2	Inv002
3	Inv003
4	Inv004
5	Inv005

Inventions which are nominated (common in Inventions and Award_Nominations) (set operations)

```
SELECT invention_id FROM Inventions INTERSECT SELECT invention_id FROM Award_nominations;
```

```
SELECT DISTINCT(invention_id) FROM Inventions UNION SELECT DISTINCT(invention_id) FROM Award_nominations;
```

	invention_id character varying(10)
1	Inv002
2	Inv004
3	Inv001
4	Inv005
5	Inv003

	invention_id character varying(10)
1	Inv002
2	Inv004
3	Inv001
4	Inv003
5	Inv005

Inventions which are nominated for the Aw001 (Subqueries)

```
SELECT DISTINCT (invention_id) FROM Invention_management WHERE invention_id IN (SELECT invention_id FROM Award_nominations WHERE award_id='Aw001');
```

	invention_id character varying(10)
1	Inv001
2	Inv004

Winning inventions from all the nominations (Subqueries Exists)

```
SELECT DISTINCT invention_id, award_id FROM Invention_management WHERE EXISTS (SELECT invention_id, award_id FROM Award_nominations);
```


	invention_id character varying(10)	award_id character varying(10)
1	Inv001	Aw001
2	Inv005	Aw006
3	Inv002	Aw002
4	Inv003	Aw003
5	Inv005	Aw005
6	Inv004	Aw004

Inventions nominated for the award Aw004 (Sub Queries ANY)

```
SELECT DISTINCT invention_id FROM Invention_management WHERE invention_id
= ANY(SELECT invention_id FROM Award_nominations WHERE award_id='Aw004');
```

	invention_id character varying(10)
1	Inv001
2	Inv002
3	Inv004

Select all inventions where awards_id not null in award_nominations (Subqueries ALL)

```
SELECT DISTINCT invention_id FROM Invention_management WHERE invention_id
= ALL(SELECT invention_id FROM Award_nominations WHERE award_id!=NULL);
```

	invention_id character varying(10)
1	Inv002
2	Inv004
3	Inv001
4	Inv005
5	Inv003