SOFE 3700U Data Management Systems
Project Phase 2

Used Rim Market Place Database

Project member name	Student Number
Diba Shojaei	100621768
Walid Safi	100623815
Hyon Lee	100488516

Deliverables:

Part A: Relational Schema

The schema of the database was named 'rim_sale', and it consists of 4 tables – "car", "listing", "manufacturer", and "rim".

Figure 1, shows the graphical diagram of each table and cardinality relation. **Please note that** the "car" table is not linked to "rim" table in the figure below. This is because they do not share any foreign key with another, **however**, **they do share a relation** between the two tables as it can be seen in the ER diagram (Figure 2).
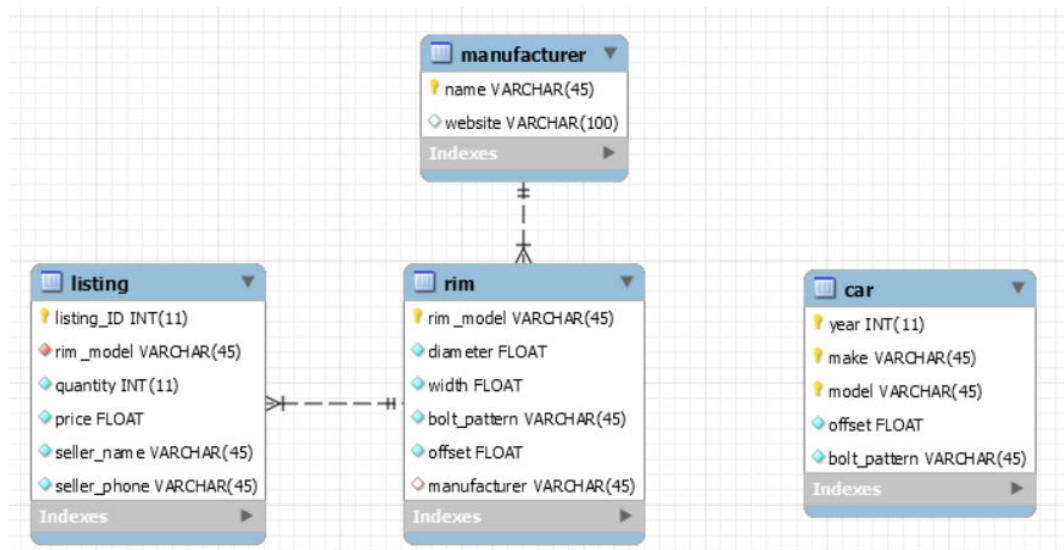

Figure 1. Graphical diagram of the 'rim_sale' database

The CREATE TABLE commands for each table are as following:

"car" table:

```
CREATE TABLE `car` (
  `year` int(11) NOT NULL,
  `make` varchar(45) NOT NULL,
  `model` varchar(45) NOT NULL,
  `offset` float NOT NULL,
  `bolt_pattern` varchar(45) NOT NULL,
  PRIMARY KEY (`year`,`make`,`model`)
);
```

"rim" table:

```sql
CREATE TABLE `rim` (
  `rim_model` varchar(45) NOT NULL,
  `diameter` float NOT NULL,
  `width` float NOT NULL,
  `bolt_pattern` varchar(45) NOT NULL,
  `offset` float NOT NULL,
  `manufacturer` varchar(45) DEFAULT NULL,
  PRIMARY KEY (`rim_model`),
  UNIQUE KEY `rim_model_UNIQUE` (`rim_model`),
  KEY `manufacturer_idx` (`manufacturer`),
  CONSTRAINT `manufacturer` FOREIGN KEY (`manufacturer`) REFERENCES `manufacturer` (`name`) ON UPDATE CASCADE
);
```

"manufacturer" table:

```sql
CREATE TABLE `manufacturer` (
  `name` varchar(45) NOT NULL,
  `website` varchar(100) DEFAULT NULL,
  PRIMARY KEY (`name`)
);
```

"listing" table:

```sql
CREATE TABLE `listing` (
  `listing_ID` int(11) NOT NULL AUTO_INCREMENT,
  `rim_model` varchar(45) NOT NULL,
  `quantity` int(11) NOT NULL,
  `price` float NOT NULL,
  `seller_name` varchar(45) NOT NULL,
  `seller_phone` varchar(45) NOT NULL,
  PRIMARY KEY (`listing_ID`),
  UNIQUE KEY `idListing_UNIQUE` (`listing_ID`),
  KEY `rim_model_idx` (`rim_model`),
  CONSTRAINT `rim_model` FOREIGN KEY (`rim_model`) REFERENCES `rim` (`rim_model`) ON UPDATE CASCADE
);
```

Part B: Sample Data

For each table, sample data containing more than 6 tuples were inserted. Following are the screenshots of each table containing data and insert clause used for each table.

"car" table:

```
mysql> SELECT * FROM car;
+------+---------------+----------------+--------+-------------+
| year | make          | model          | offset | bolt_pattern |
+------+---------------+----------------+--------+-------------+
| 2003 | Daewoo        | Lanos          |     40 | 4x100       |
| 2012 | Subaru        | Impreza WRX STI |    55 | 5x114.3     |
| 2013 | Audi          | Q5             |     39 | 5x112       |
| 2014 | Infinity      | Q50            |     45 | 5x114.3     |
| 2016 | Mercedes-Benz | S-Class AMG    |     38 | 5x112       |
| 2016 | Toyota        | Camry          |     40 | 5x114.3     |
| 2020 | BMW           | X6             |     35 | 5x112       |
+------+---------------+----------------+--------+-------------+
7 rows in set (0.00 sec)
```

Insert clause format used:

```
INSERT INTO `rim_resale`.`car`(`year`, `make`,`model`,`offset`,`bolt_pattern`)
VALUES(<{year: }>,<{make: }>,<{model: }>,<{offset: }>,<{bolt_pattern: }>);
```

"rim" table:

```
mysql> SELECT * FROM rim;
+-------------------------+----------+-------+-------------+--------+-------------+
| rim_model               | diameter | width | bolt_pattern | offset | manufacturer |
+-------------------------+----------+-------+-------------+--------+-------------+
| 108.18080.5112.45S.66.CG |      18 |     8 | 5x112       |     45 | Vorsteiner  |
| 446-770-0245ZP          |       17 |     7 | 5x114.3     |     45 | Enkei       |
| 806BM Triton            |       20 |   5.7 | 6x139.7     |    5.7 | WORX        |
| G745HDBK                |       17 |   8.5 | 5x114.3     |     55 | BBS         |
| R143190007+25           |       19 |    10 | 5x112       |     25 | Rotiform    |
| V-CE28N-26              |       18 |   7.5 | 5x114.3     |     44 | Volk Racing |
| YAT8H42MBG              |       18 |   8.5 | 5x112       |     42 | Advan       |
+-------------------------+----------+-------+-------------+--------+-------------+
7 rows in set (0.00 sec)
```

Insert clause format used:

```
INSERT INTO `rim_resale`.`rim`(`rim_model`,`diameter`,`width`,`bolt_pattern`,`offset`,`manufacturer`)
VALUES(<{rim_model: }>,<{diameter: }>,<{width: }>,<{bolt_pattern: }>,<{offset: }>,<{manufacturer: }>);
```

"manufacturer" table

```
mysql> SELECT * FROM manufacturer;
+-------------+-------------------------------------+
| name        | website                             |
+-------------+-------------------------------------+
| Advan       | https://www.yokohama.com.au/wheels  |
| BBS         | https://bbs.com/en/                 |
| Enkei       | http://enkei.com/                   |
| Rotiform    | http://www.rotiform.com/            |
| Volk Racing | https://www.rayswheels.co.jp/       |
| Vorsteiner  | http://vorsteiner.com/              |
| WORX        | http://www.worx.com/                |
+-------------+-------------------------------------+
7 rows in set (0.00 sec)
```

Insert clause format used:

```
INSERT INTO `rim_resale`.`manufacturer`(`name`,`website`)
VALUES(<{name: }>,<{website: }>);
```

"listing" table

```
mysql> SELECT * FROM listing;
+------------+------------------------+----------+-------+------------------+--------------+
| listing_ID | rim_model              | quantity | price | seller_name      | seller_phone |
+------------+------------------------+----------+-------+------------------+--------------+
|          1 | 108.18080.5112.45S.66.CG |        4 |   120 | Marky Mark       | 905-232-1312 |
|          2 | 108.18080.5112.45S.66.CG |        2 |   110 | Thomas Engine    | 416-231-6823 |
|          3 | G745HDBK               |        8 |   150 | Melvin Calvin    | 905-124-6823 |
|          4 | 446-770-0245ZP         |        1 |   200 | Rosalind Franklin | 416-392-2932 |
|          5 | 446-770-0245ZP         |        2 |   170 | Francis Crick    | 203-131-2932 |
|          6 | 446-770-0245ZP         |        3 |   130 | James Watson     | 416-747-4352 |
|          7 | R143190007+25          |       10 |   200 | Marshall Hatch   | 402-194-6839 |
|          8 | R143190007+25          |        4 |   230 | Yuri Karpilov    | 402-496-2947 |
|          9 | YAT8H42MBG             |        5 |   300 | John Malkovich   | 203-183-4782 |
|         10 | YAT8H42MBG             |        8 |   310 | Pingu Williams   | 392-192-5151 |
|         11 | YAT8H42MBG             |        2 |   231 | Bot Boris        | 416-392-6193 |
|         12 | YAT8H42MBG             |        6 |   400 | Raisin Price     | 418-394-2416 |
+------------+------------------------+----------+-------+------------------+--------------+
12 rows in set (0.00 sec)
```

Insert clause format used:

```
INSERT INTO `rim_resale`.`listing`(`listing_ID`,`rim_model`,`quantity`,`price`,`seller_name`,`seller_phone`)
VALUES(<{listing_ID: }>,<{rim_model: }>,<{quantity: }>,<{price: }>,<{seller_name: }>,<{seller_phone: }>);
```

Part C: Views

View 1: Joining 3 tables

Query:

```sql
SELECT listing.listing_ID, listing.rim_model, listing.price, car.year, car.make, car.model
FROM ((listing JOIN rim ON listing.rim_model=rim.rim_model) JOIN car ON rim.bolt_pattern=car.bolt_pattern);
```

Goal: match listing with rim that matches car model

Result:

```
mysql> SELECT listing.listing_ID,listing.rim_model,listing.price,car.make,car.model
    -> FROM ((listing JOIN rim ON listing.rim_model=rim.rim_model) JOIN car ON rim.bolt_pattern=car.bolt_pattern);
+------------+----------------------+-------+---------------+-----------------+
| listing_ID | rim_model            | price | make          | model           |
+------------+----------------------+-------+---------------+-----------------+
|          4 | 446-770-0245ZP       |   200 | Subaru        | Impreza WRX STI |
|          5 | 446-770-0245ZP       |   170 | Subaru        | Impreza WRX STI |
|          6 | 446-770-0245ZP       |   130 | Subaru        | Impreza WRX STI |
|          3 | G745HDBK             |   150 | Subaru        | Impreza WRX STI |
|          1 | 108.18080.5112.45S.66.CG |  120 | Audi      | Q5              |
|          2 | 108.18080.5112.45S.66.CG |  110 | Audi      | Q5              |
|          7 | R143190007+25        |   200 | Audi          | Q5              |
|          8 | R143190007+25        |   230 | Audi          | Q5              |
|          9 | YAT8H42MBG           |   300 | Audi          | Q5              |
|         10 | YAT8H42MBG           |   310 | Audi          | Q5              |
|         11 | YAT8H42MBG           |   231 | Audi          | Q5              |
|         12 | YAT8H42MBG           |   400 | Audi          | Q5              |
|          4 | 446-770-0245ZP       |   200 | Infinity      | Q50             |
|          5 | 446-770-0245ZP       |   170 | Infinity      | Q50             |
|          6 | 446-770-0245ZP       |   130 | Infinity      | Q50             |
|          3 | G745HDBK             |   150 | Infinity      | Q50             |
|          1 | 108.18080.5112.45S.66.CG |  120 | Mercedes-Benz | S-Class AMG |
|          2 | 108.18080.5112.45S.66.CG |  110 | Mercedes-Benz | S-Class AMG |
|          7 | R143190007+25        |   200 | Mercedes-Benz | S-Class AMG     |
|          8 | R143190007+25        |   230 | Mercedes-Benz | S-Class AMG     |
|          9 | YAT8H42MBG           |   300 | Mercedes-Benz | S-Class AMG     |
|         10 | YAT8H42MBG           |   310 | Mercedes-Benz | S-Class AMG     |
|         11 | YAT8H42MBG           |   231 | Mercedes-Benz | S-Class AMG     |
|         12 | YAT8H42MBG           |   400 | Mercedes-Benz | S-Class AMG     |
|          4 | 446-770-0245ZP       |   200 | Toyota        | Camry           |
|          5 | 446-770-0245ZP       |   170 | Toyota        | Camry           |
|          6 | 446-770-0245ZP       |   130 | Toyota        | Camry           |
|          3 | G745HDBK             |   150 | Toyota        | Camry           |
|          1 | 108.18080.5112.45S.66.CG |  120 | BMW       | X6              |
|          2 | 108.18080.5112.45S.66.CG |  110 | BMW       | X6              |
|          7 | R143190007+25        |   200 | BMW           | X6              |
|          8 | R143190007+25        |   230 | BMW           | X6              |
|          9 | YAT8H42MBG           |   300 | BMW           | X6              |
|         10 | YAT8H42MBG           |   310 | BMW           | X6              |
|         11 | YAT8H42MBG           |   231 | BMW           | X6              |
|         12 | YAT8H42MBG           |   400 | BMW           | X6              |
+------------+----------------------+-------+---------------+-----------------+
36 rows in set (0.00 sec)
```

View 2: Nested query with 'ANY' and group by

Query:

```
SELECT rim_model, COUNT(*) as posts FROM listing WHERE price < ANY
(SELECT price FROM listing WHERE rim_model='G745HDBK') GROUP BY rim_model;
```

Goal: For each rim model posted on listing, count the listing with a price lower than any listing advertising rim model 'G745HDBK'

Result:

```
mysql> SELECT rim_model, COUNT(*) as posts FROM listing WHERE price < ANY
    -> (SELECT price FROM listing WHERE rim_model='G745HDBK') GROUP BY rim_model;
+--------------------------+-------+
| rim_model                | posts |
+--------------------------+-------+
| 108.18080.5112.45S.66.CG |     2 |
| 446-770-0245ZP           |     1 |
+--------------------------+-------+
2 rows in set (0.00 sec)
```

View 3: Correlated nested query

Query:

```
SELECT * FROM listing
WHERE price < (SELECT avg(price) FROM listing) AND rim_model='446-770-0245ZP';
```

Goal: get all the listing for rim model "446-770-0245ZP" with listed price under the average listing price

Result:

```
mysql> SELECT * FROM listing
    -> WHERE price < (SELECT avg(price) FROM listing) AND rim_model='446-770-0245ZP';
+------------+----------------+----------+-------+------------------+--------------+
| listing_ID | rim_model      | quantity | price | seller_name      | seller_phone |
+------------+----------------+----------+-------+------------------+--------------+
|          4 | 446-770-0245ZP |        1 |   200 | Rosalind Franklin | 416-392-2932 |
|          5 | 446-770-0245ZP |        2 |   170 | Francis Crick    | 203-131-2932 |
|          6 | 446-770-0245ZP |        3 |   130 | James Watson     | 416-747-4352 |
+------------+----------------+----------+-------+------------------+--------------+
3 rows in set (0.00 sec)
```

View 4: uses full join

Query:

```sql
SELECT * FROM listing
LEFT JOIN rim ON listing.rim_model=rim.rim_model
UNION
SELECT * FROM listing
RIGHT JOIN rim ON listing.rim_model=rim.rim_model;
```

Goal: **Since the listing table has foreign key constraint with bound to rim,** and therefore listing cannot exist for rim_model that does not exist in rim table, the goal of this search is to view all the listing matching the rim_model that exist, and also see if there is no listing available for particular rim_model (listing info appeared as NULL).

Result:

```
mysql> SELECT * FROM listing
    -> LEFT JOIN rim ON listing.rim_model=rim.rim_model
    -> UNION
    -> SELECT * FROM listing
    -> RIGHT JOIN rim ON listing.rim_model=rim.rim_model
    -> ;
+------------+-------------------------+----------+-------+------------------+--------------+-------------------------+----------+-------+-------------+--------+-------------+
| listing_ID | rim_model               | quantity | price | seller_name      | seller_phone | rim_model               | diameter | width | bolt_pattern | offset | manufacturer |
+------------+-------------------------+----------+-------+------------------+--------------+-------------------------+----------+-------+-------------+--------+-------------+
|          1 | 108.18080.5112.45S.66.CG |        4 |   120 | Marky Mark       | 905-232-1312 | 108.18080.5112.45S.66.CG |       18 |     8 | 5x112       |     45 | Vorsteiner   |
|          2 | 108.18080.5112.45S.66.CG |        2 |   110 | Thomas Engine    | 416-231-6823 | 108.18080.5112.45S.66.CG |       18 |     8 | 5x112       |     45 | Vorsteiner   |
|          3 | G745HDBK                |        8 |   150 | Melvin Calvin    | 905-124-6823 | G745HDBK                |       17 |   8.5 | 5x114.3     |     55 | BBS          |
|          4 | 446-770-0245ZP          |        1 |   200 | Rosalind Franklin| 416-392-2932 | 446-770-0245ZP          |       17 |     7 | 5x114.3     |     45 | Enkei        |
|          5 | 446-770-0245ZP          |        2 |   170 | Francis Crick    | 203-131-2932 | 446-770-0245ZP          |       17 |     7 | 5x114.3     |     45 | Enkei        |
|          6 | 446-770-0245ZP          |        3 |   130 | James Watson     | 416-747-4352 | 446-770-0245ZP          |       17 |     7 | 5x114.3     |     45 | Enkei        |
|          7 | R143190007+25           |       10 |   200 | Marshall Hatch   | 402-194-6839 | R143190007+25           |       19 |    10 | 5x112       |     25 | Rotiform     |
|          8 | R143190007+25           |        4 |   230 | Yuri Karpilov    | 402-496-2947 | R143190007+25           |       19 |    10 | 5x112       |     25 | Rotiform     |
|          9 | YAT8H42MBG              |        5 |   300 | John Malkovich   | 203-183-4782 | YAT8H42MBG              |       18 |   8.5 | 5x112       |     42 | Advan        |
|         10 | YAT8H42MBG              |        8 |   310 | Pingu Williams   | 392-192-5151 | YAT8H42MBG              |       18 |   8.5 | 5x112       |     42 | Advan        |
|         11 | YAT8H42MBG              |        2 |   231 | Bot Boris        | 416-392-6193 | YAT8H42MBG              |       18 |   8.5 | 5x112       |     42 | Advan        |
|         12 | YAT8H42MBG              |        6 |   400 | Raisin Price     | 418-394-2416 | YAT8H42MBG              |       18 |   8.5 | 5x112       |     42 | Advan        |
|       NULL | NULL                    |     NULL |  NULL | NULL             | NULL         | 806BM Triton            |       20 |   5.7 | 6x139.7     |    5.7 | WORX         |
|       NULL | NULL                    |     NULL |  NULL | NULL             | NULL         | V-CE28N-26              |       18 |   7.5 | 5x114.3     |     44 | Volk Racing  |
+------------+-------------------------+----------+-------+------------------+--------------+-------------------------+----------+-------+-------------+--------+-------------+
14 rows in set (0.00 sec)
```

View 5: Use Union

Query:

```sql
(SELECT rim_model from rim) UNION (SELECT DISTINCT rim_model from listing);
```

Goal: get combined list of all the rim models that exist in the 'listing' table, and 'rim' table

Result:

```
+-------------------------+
| rim_model               |
+-------------------------+
| 108.18080.5112.45S.66.CG |
| 446-770-0245ZP          |
| 806BM Triton            |
| G745HDBK                |
| R143190007+25           |
| V-CE28N-26              |
| YAT8H42MBG              |
+-------------------------+
7 rows in set (0.00 sec)
```

View 6:

Query:

```sql
SELECT * FROM listing WHERE rim_model IN (SELECT rim_model FROM rim WHERE bolt_pattern='5x114.3');
```

Goal: get all the attribute information from listing where the listed rim model matches the bolt pattern '5x114.3'

Result:

listing_ID	rim_model	quantity	price	seller_name	seller_phone
4	446-770-0245ZP	1	200	Rosalind Franklin	416-392-2932
5	446-770-0245ZP	2	170	Francis Crick	203-131-2932
6	446-770-0245ZP	3	130	James Watson	416-747-4352
3	G745HDBK	8	150	Melvin Calvin	905-124-6823

View 7:

Query:

```sql
SELECT * FROM manufacturer WHERE manufacturer.name IN
(SELECT manufacturer FROM rim WHERE bolt_pattern='5x112');
```

Goal: get the names and websites of the manufacturers that produces rim with '5x112' bolt pattern

Result:

name	website
Vorsteiner	http://vorsteiner.com/
Rotiform	http://www.rotiform.com/
Advan	https://www.yokohama.com.au/wheels

View 8:

Query:

```sql
SELECT rim_model, COUNT(*) as posts FROM listing GROUP BY rim_model HAVING COUNT(*) >2;
```

Goal: for each listing of a rim model that has more than 2 posts, count the number of posts found in the listing

Result:

rim_model	posts
446-770-0245ZP	3
YAT8H42MBG	4

View 9:

Query:

```sql
SELECT name, website FROM manufacturer WHERE website NOT LIKE '%https%';
```

Goal: get the name and website of the manufacturer that does not use https protocol in their website

Result:

name	website
Enkei	http://enkei.com/
Rotiform	http://www.rotiform.com/
Vorsteiner	http://vorsteiner.com/
WORX	http://www.worx.com/

View 10:

Query:

```sql
SELECT * FROM listing WHERE seller_phone LIKE '416%' AND rim_model IN
(SELECT DISTINCT rim.rim_model
FROM rim
INNER JOIN car ON rim.bolt_pattern=car.bolt_pattern
WHERE car.model="Q50");
```

Goal: Get all the listing information of the listing where the rim model matches the bolt pattern for car model "Q50" and the seller's phone number starts with 416.
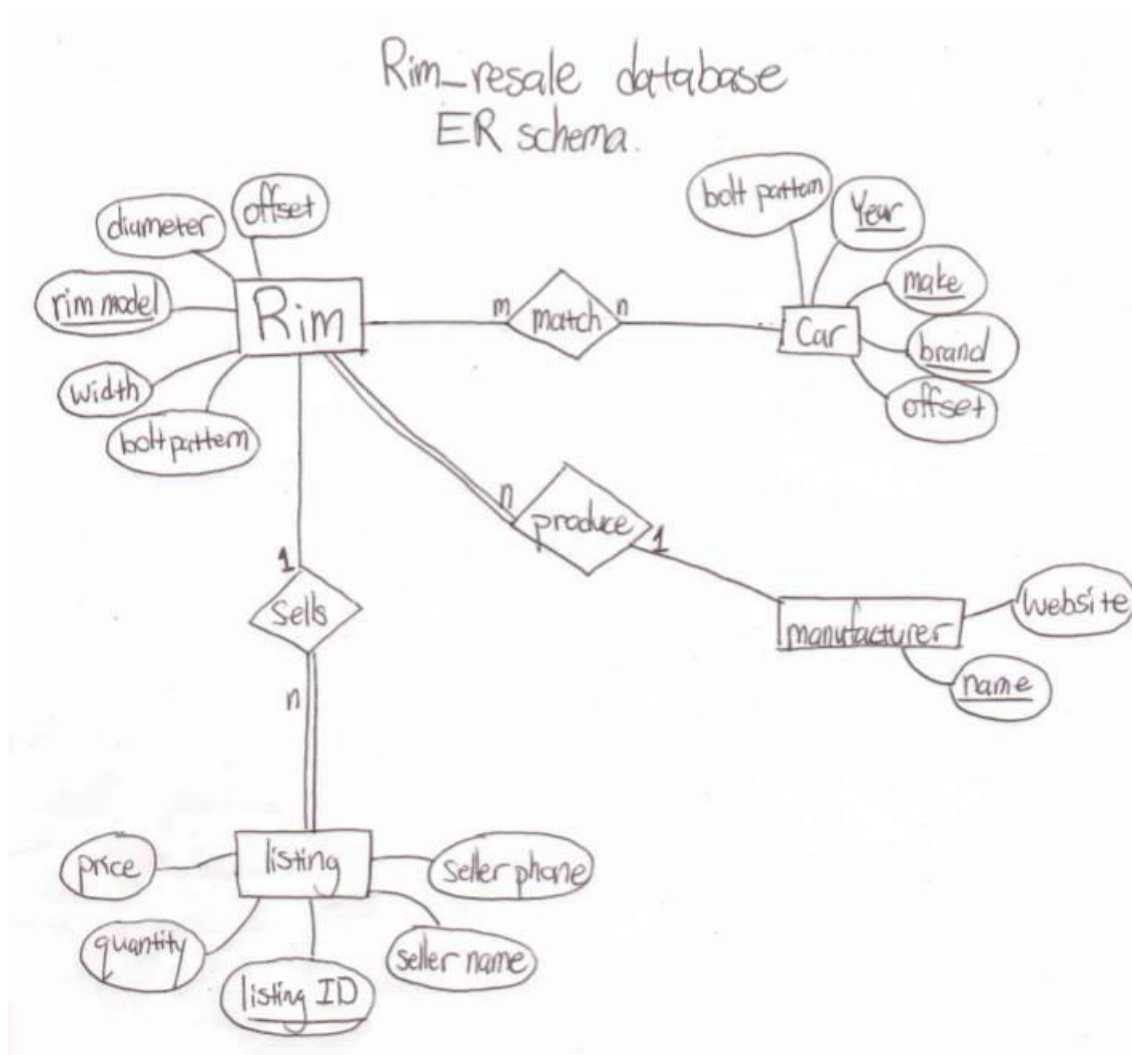
Part D: ER schema

Figure 2. Entity-Relationship schema diagram of rim_resale database