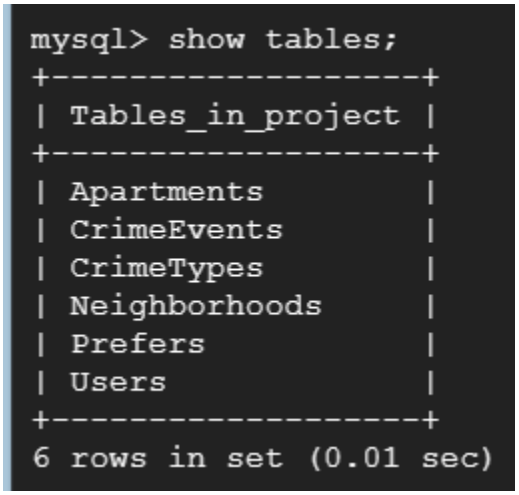
Here is a picture showing the terminal of the GCP with the databases with the tables we implemented. Our database is located on the Google GCP.



DDL Commands For Creating the Table

Users:

```
CREATE TABLE Users (
   UserId VARCHAR(255) PRIMARY KEY,
   Email VARCHAR(255) UNIQUE,
   Password VARCHAR(255),
   Gender VARCHAR(255),
   Age INT DEFAULT -1
);
```

Prefers:

```
CREATE TABLE Prefers(
   ID VARCHAR(255),
   Interest VARCHAR(255),
   FOREIGN KEY (ID) REFERENCES Users(UserId),
   FOREIGN KEY (Interest) REFERENCES Neighborhoods(NeighborhoodName),
   PRIMARY KEY (ID, Interest)
);
```

CRIME EVENTS:

```
CREATE TABLE CrimeEvents (
   CrimeId INTEGER PRIMARY KEY,
```

```
    CrimeNeighborhood VARCHAR(255),
    FOREIGN KEY (CrimeNeighborhood) REFERENCES Neighborhoods(NeighborhoodName),
    Date DATETIME,
    LocationDescription VARCHAR(255),
    Block VARCHAR(255),
    PrimaryType VARCHAR(255),
   Arrested BOOLEAN
);
```

Neighborhoods:

```
CREATE TABLE Neighborhoods (
    NeighborhoodName VARCHAR(255) PRIMARY KEY,
    AverageRent INTEGER ,
    AverageAge INTEGER ,
    Demographic VARCHAR(255)
);
```

Apartments:

```
CREATE TABLE Apartments (
    ApartmentId INTEGER PRIMARY KEY,
    Neighborhood VARCHAR(255),
    FOREIGN KEY (Neighborhood) REFERENCES Neighborhoods(NeighborhoodName),
    RenterCompanyName VARCHAR(255),
    Rating INTEGER,
    Cost INTEGER
);
```

```
mysql> show tables;
+------------------+
| Tables_in_project |
+------------------+
| Apartments       |
| CrimeEvents      |
| CrimeTypes       |
| Neighborhoods    |
| Prefers          |
| Users            |
+------------------+
6 rows in set (0.01 sec)
```

Entry into the Table Implementation

We decided to implement implement entries for Users, Crime Type and Crime Event

For Table Users, some users are inserted into the table.
INSERT INTO Users (UserId, Email, Password, Gender, Age)
VALUES ('user01', 'paul@google.com', 'password1', 'male', 32);
VALUES ('user02', 'ethan@google.com', 'password2', 'male', 23);
VALUES ('user03', 'alex@google.com', 'password3', 'male', 45);
VALUES ('user04', 'linda@google.com', 'password4', 'female', 37);
VALUES ('user05', 'mike@google.com', 'password5', 'male', 40');

For Table CrimeType, some CrimeTypes are inserted into the table.
INSERT INTO CrimeTypes (CrimeId, PrimaryType , Arrested)
VALUES (12589893, 'SEX OFFENSE', FALSE);
VALUES (12592454, 'OTHER OFFENSE', FALSE);
VALUES (12601676, 'OFFENSE INVOLVING CHILDREN', TRUE);

For Table CrimeEvent, some CrimeEvent are inserted into the table.
INSERT INTO CrimeEvent(CrimeId, Date, LocationDescription, Block)
VALUES (12589893, 1/11/2022 3:00, RESIDENCE, 087XX S KINGSTON AVE);
VALUES (12592454, 1/14/2022 15:55, RESIDENCE, 067XX S MORGAN ST);
VALUES (12601676, 1/13/2022 16:00, STREET, 031XX W AUGUSTA BLVD);

SELECT * FROM CrimeEvents;

```
                  |0-00 00:00:00 |                                                    | 026XX N Burling St
                    |00 00:00:00 | RESIDENCE                                          | 070XX W IMLAY ST
                    |00 00:00:00 | RESIDENCE                                          | 066XX S LOWE AVE
                   |0-00 00:00:00 |                                                    | 006XX W MADISON ST
                    |-00 00:00:00 | RESIDENCE                                          | 101XX S YATES AVE
                 |0-00-00 00:00:00 | APARTMENT                                          | 038XX S LAKE PARK AVE
                  |00-00 00:00:00 | RESIDENCE                                          | 065XX S SANGAMON ST
                      |0 00:00:00 | APARTMENT                                          | 011XX E 82ND ST
                 |0-00-00 00:00:00 | OTHER (SPECIFY)                                    | 035XX N GREENVIEW AVE
                   |0-00 00:00:00 | RESIDENCE                                          | 060XX S AUSTIN AVE
                   |0-00 00:00:00 | RESIDENCE                                          | 117XX S JUSTINE ST
                   |0-00 00:00:00 |                                                    | 109XX S VERNON AVE
                  |00-00 00:00:00 | AUTO / BOAT / RV DEALERSHIP                        | 019XX W PERSHING RD
                 |-00-00 00:00:00 | RESIDENCE                                          | 080XX S EXCHANGE AVE
                 |0-00-00 00:00:00 | RESIDENCE - PORCH / HALLWAY                        | 037XX W FULLERTON AVE
                 |-00-00 00:00:00 | HOSPITAL BUILDING / GROUNDS                        | 057XX W ROOSEVELT RD
                 |-00-00 00:00:00 | RESIDENCE                                          | 054XX W ROSEDALE AVE
                 |-00-00 00:00:00 | COMMERCIAL / BUSINESS OFFICE                       | 042XX S KILDARE BLVD
                  |00-00 00:00:00 | APARTMENT                                          | 021XX N KILDARE AVE
                  |00-00 00:00:00 | RESTAURANT                                         | 057XX N CENTRAL AVE
                   |0-00 00:00:00 | STREET                                             | 031XX N HALSTED ST
                 |0-00-00 00:00:00 | APARTMENT                                          | 021XX S PRINCETON AVE
                     |00 00:00:00 | SIDEWALK                                           | 031XX N BROADWAY
                    |-00 00:00:00 | ABANDONED BUILDING                                 | 021XX W GRAND AVE
                  |00-00 00:00:00 | STREET                                             | 009XX W RANDOLPH ST
                  |00-00 00:00:00 | OTHER (SPECIFY)                                    | 077XX S EMERALD AVE
                   |0-00 00:00:00 | APARTMENT                                          | 016XX W PIERCE AVE
                    |-00 00:00:00 | APARTMENT                                          | 056XX W NORTH AVE
                 |-00-00 00:00:00 | COMMERCIAL / BUSINESS OFFICE                       | 032XX W LAWRENCE AVE
                 |0-00-00 00:00:00 |                                                    | 035XX N CLAREMONT AVE
+----------+--------------------+----------------------------------------------------+--------------------------------------+
1001 rows in set (0.00 sec)
```

```
mysql> show tables;
+-------------------+
| Tables_in_project |
+-------------------+
| Apartments        |
| CrimeEvents       |
| CrimeTypes        |
| Neighborhoods     |
| Prefers           |
| Users             |
+-------------------+
6 rows in set (0.01 sec)

mysql> SELECT COUNT(*) FROM USERS;
ERROR 1146 (42S02): Table 'project.USERS' doesn't exist
mysql> SELECT COUNT(*) FROM Users;
+----------+
| COUNT(*) |
+----------+
|      644 |
+----------+
1 row in set (0.00 sec)

mysql> SELECT COUNT(*) FROM CrimeTypes;
+----------+
| COUNT(*) |
+----------+
|     1001 |
+----------+
1 row in set (0.01 sec)

mysql> SELECT COUNT(*) FROM CrimeEvents;
+----------+
| COUNT(*) |
+----------+
|     1001 |
+----------+
1 row in set (0.00 sec)
```

Users is a CSV with 1001 entries in it, but it is currently an error with showing 644.
Crime types and Crime events are working as intended.

Advanced Queries

The Following queries have empty sets as the data was automatically generated and thus not fitting into the criteria of the Advanced Queries.

1. **Get the neighborhood name and average age of neighborhoods with the most crimes**

```
SELECT n.NeighborhoodName, n.AverageAge
FROM Neighborhoods n
WHERE n.NeighborhoodName in
        (SELECT ce.CrimeNeighborhood
        FROM CrimeEvents ce
        WHERE ce.Arrested = 1
        GROUP BY ce.CrimeNeighborhood
        ORDER BY COUNT(*) DESC)
LIMIT 15;
```

***New*:**

```
mysql> SELECT n.NeighborhoodName, n.AverageAge
    -> FROM Neighborhoods n
    -> WHERE n.NeighborhoodName in
    -> (SELECT ce.CrimeNeighborhood
    -> FROM CrimeEvents ce
    -> WHERE ce.Arrested = 1
    -> GROUP BY ce.CrimeNeighborhood
    -> ORDER BY COUNT(*) DESC)
    -> LIMIT 15;
+------------------+------------+
| NeighborhoodName | AverageAge |
+------------------+------------+
| Albany Park      |         36 |
| Andersonville    |         68 |
| Archer Heights   |         53 |
| Armour Square    |         30 |
| Ashburn          |         65 |
| Auburn Gresham   |         57 |
| Austin           |         26 |
| Avalon Park      |         61 |
| Avondale         |         55 |
| Belmont Cragin   |         45 |
| Beverly          |         64 |
| Bridgeport       |         23 |
| Brighton Park    |         62 |
| Bronzeville      |         28 |
| Bucktown         |         29 |
+------------------+------------+
15 rows in set (0.01 sec)
```

Old:

1. **Find what crime type was most committed between 10 and 11 AM.**

```
SELECT CrimeTypes.PrimaryType, COUNT(CrimeEvents.CrimeId) AS CrimeNum
FROM CrimeTypes
JOIN CrimeEvents ON CrimeTypes.CrimeId = CrimeEvents.CrimeId
WHERE TIME(CrimeEvents.Date) BETWEEN '00:10:00' AND '00:11:00'
GROUP BY CrimeTypes.PrimaryType
ORDER BY CrimeNum DESC
LIMIT 15;
```

```
mysql> SELECT CrimeTypes.PrimaryType, COUNT(CrimeEvents.CrimeId) AS CrimeNum
    -> FROM CrimeTypes
    -> JOIN CrimeEvents ON CrimeTypes.CrimeId = CrimeEvents.CrimeId
    -> WHERE TIME(CrimeEvents.Date) BETWEEN '00:10:00' AND '00:11:00'
    -> GROUP BY CrimeTypes.PrimaryType
    -> ORDER BY CrimeNum DESC
    -> LIMIT 15;
Empty set (0.00 sec)
```

This Query counts the number of crimes between the times of 10 and 11 AM and returns the most common crime type in that span of time.

2. **Get 15 neighborhoods where there have been fewer than 10 arrests**

```
SELECT n.NeighborhoodName
FROM Neighborhoods n JOIN CrimeEvents ce ON n.NeighborhoodName =
ce.CrimeNeighborhood
WHERE ce.Arrested = 1
GROUP BY n.NeighborhoodName
HAVING COUNT(*) < 10
LIMIT 15;
```

NEW:

```
mysql> SELECT n.NeighborhoodName
    -> FROM Neighborhoods n JOIN CrimeEvents ce ON n.NeighborhoodName = ce.CrimeNeighborhood
    -> WHERE ce.Arrested = 1
    -> GROUP BY n.NeighborhoodName
    -> HAVING COUNT(*) < 10
    -> LIMIT 15;
+--------------------------------+
| NeighborhoodName               |
+--------------------------------+
| South Lawndale (Little Village) |
| Calumet Heights                |
| Printer's Row                  |
| The Loop                       |
| Chatham                        |
| Wicker Park                    |
| McKinley Park                  |
| Archer Heights                 |
| Lawndale                       |
| Lower West Side                |
| Oakland                        |
| Gold Coast                     |
| Margate Park                   |
| Auburn Gresham                 |
| Washington Heights             |
+--------------------------------+
15 rows in set (0.00 sec)
```

OLD:

```
mysql> SELECT n.NeighborhoodName
    -> FROM Neighborhoods n NATURAL JOIN CrimeEvents ce NATURAL JOIN CrimeTypes ct
    -> WHERE ct.Arrested = 0
    -> GROUP BY n.NeighborhoodName
    -> HAVING COUNT(*) < 20
    -> LIMIT 15;
Empty set (0.08 sec)
```

3. **Get 15 neighborhoods with an average rent less than 2000 dollars and an average rating of 5 across all renter companies**

(SELECT n.NeighborhoodName
FROM Neighborhoods n
WHERE n.AverageRent < 2000

INTERSECT

SELECT a.Neighborhood
FROM Apartments a
GROUP BY a.Neighborhood
HAVING AVG(Rating) > 5)

LIMIT 15;

NEW:

```
mysql> (SELECT n.NeighborhoodName
    -> FROM Neighborhoods n
    -> WHERE n.AverageRent < 2000
    ->
    -> INTERSECT
    ->
    -> SELECT a.Neighborhood
    -> FROM Apartments a
    -> GROUP BY a.Neighborhood
    -> HAVING AVG(Rating) > 5)
    -> LIMIT 15;
+--------------------+
| NeighborhoodName   |
+--------------------+
| Ashburn            |
| Avalon Park        |
| Bridgeport         |
| Bronzeville        |
| Cabrini-Green      |
| Chatham            |
| Clearing           |
| East Garfield Park |
| East Side          |
| Edgewater          |
| Englewood          |
| Gage Park          |
| Gold Coast         |
| Hermosa            |
| Humboldt Park      |
+--------------------+
15 rows in set (0.01 sec)
```

***OLD*:**

```
mysql> (SELECT n.NeighborhoodName
    -> FROM Neighborhoods n
    -> WHERE n.AverageRent < 1000
    ->
    -> INTERSECT
    ->
    -> SELECT a.Neighborhood
    -> FROM Apartments a
    -> GROUP BY a.Neighborhood
    -> HAVING AVG(Rating) > 7.5)
    -> LIMIT 15;
Empty set (0.01 sec)
```

4. **Get neighborhoods with an average age under 50 and where there are more males than females interested in it.**

```
SELECT DISTINCT  n.NeighborhoodName
FROM Prefers p
JOIN Users u ON p.ID = u.UserId
JOIN Neighborhoods n ON p.Interest = n.NeighborhoodName
WHERE n.AverageAge < 50
AND n.NeighborhoodName IN
        (SELECT pref.Interest
        FROM Prefers pref JOIN Users us ON pref.ID = us.UserId
        WHERE us.Gender = 'Male'
        GROUP BY pref.Interest
        HAVING COUNT(*) >
            (SELECT COUNT(*)
            FROM Prefers pref2 JOIN Users us2 ON pref2.ID = us2.UserId
            WHERE pref2.Interest = pref.Interst AND us2.Gender = ‘Female’))
LIMIT 15;
```

New:

```
mysql> SELECT DISTINCT n.NeighborhoodName
    -> FROM Prefers p
    -> JOIN Users u ON p.ID = u.UserId
    -> JOIN Neighborhoods n ON p.Interest = n.NeighborhoodName
    -> WHERE n.AverageAge < 50
    -> AND n.NeighborhoodName IN
    ->     (SELECT pref.Interest
    ->     FROM Prefers pref
    ->     JOIN Users us ON pref.ID = us.UserId
    ->     WHERE us.Gender = 'Male'
    ->     GROUP BY pref.Interest
    ->     HAVING COUNT(*) >
    ->         (SELECT COUNT(*)
    ->         FROM Prefers pref2
    ->         JOIN Users us2 ON pref2.ID = us2.UserId
    ->         WHERE pref2.Interest = pref.Interest AND us2.Gender = 'Female'))
    -> LIMIT 15;
+------------------+
| NeighborhoodName |
+------------------+
| Bridgeport       |
| Bronzeville      |
| Bucktown         |
| Clearing         |
| Forest Glen      |
| Garfield Ridge   |
| Greektown        |
| Hegewisch        |
| McKinley Park    |
| Morgan Park      |
| Pullman          |
| The Loop         |
+------------------+
12 rows in set (0.00 sec)
```

Old:

```
mysql> SELECT n.NeighborhoodName
    -> FROM Prefers p NATURAL JOIN Users u NATURAL JOIN Neighborhoods n
    -> WHERE n.AverageAge < 25 AND n.NeighborhoodName IN
    ->     (SELECT pref.NeighborhoodName
    ->     FROM Prefers pref
    ->     NATURAL JOIN Users us
    ->     WHERE us.Gender = 'Male'
    ->     GROUP BY pref.NeighborhoodName
    ->         HAVING COUNT(*) > 20)
    ->
    -> LIMIT 15;
Empty set (0.00 sec)
```

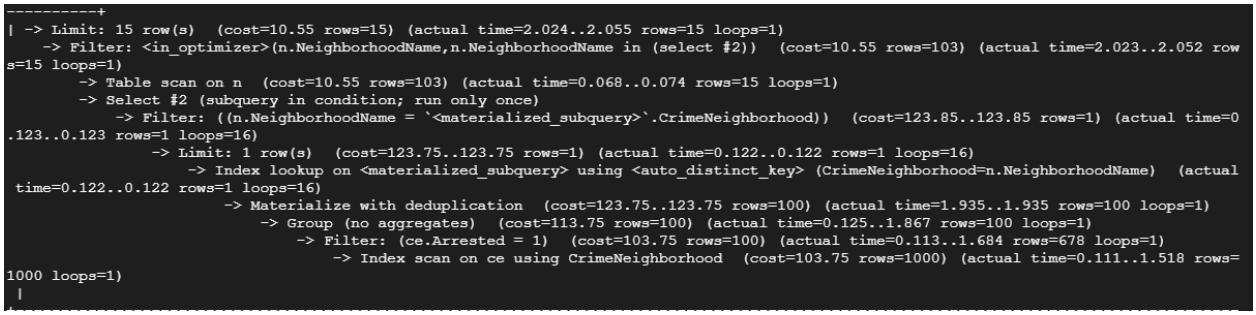
Indexing Analysis

Advanced Query 1

Using this query, we will try to improve the costs with indexing.

```
Explain Analyze
SELECT n.NeighborhoodName, n.AverageAge
FROM Neighborhoods n
WHERE n.NeighborhoodName in
        (SELECT ce.CrimeNeighborhood
        FROM CrimeEvents ce
        WHERE ce.Arrested = 1
        GROUP BY ce.CrimeNeighborhood
        ORDER BY COUNT(*) DESC)
LIMIT 15;
```

We first use Explain Analyze to find the performance of the original query.



The Cost is 10.55, Time is 2.024-2.055 seconds

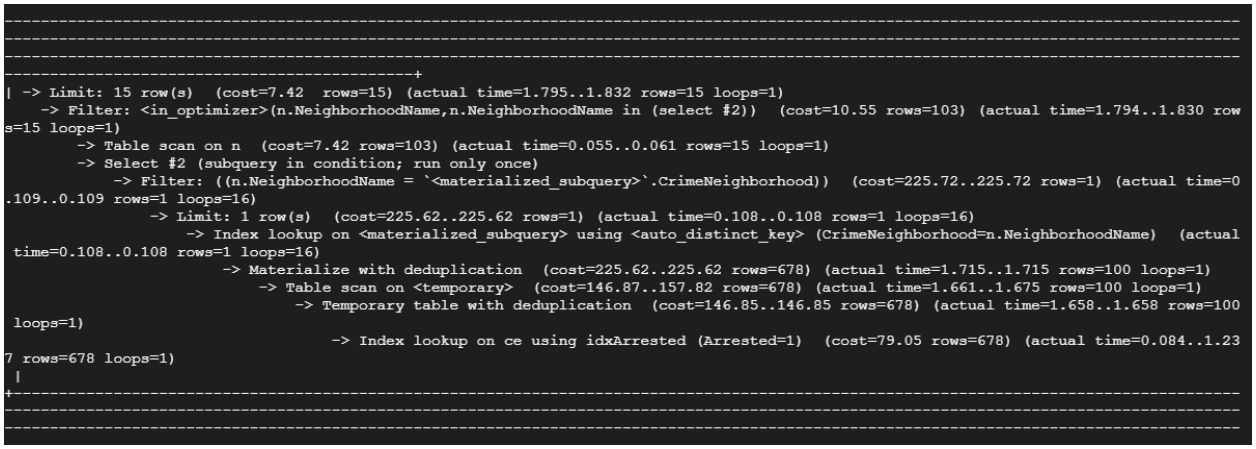
We then apply 3 indexing methods to try and attempt to improve our runtime:

1. Index on CrimeEvent table for the CrimeId

   This index will speed up the JOIN operation between CrimeType and CrimeEvent tables, as it will quickly find the corresponding crimes in the CrimeType Table based on CrimeId.

   mysql> CREATE INDEX idxCrimeId ON CrimeEvents (CrimeId)

   After implementing these changes, we noticed an improvement

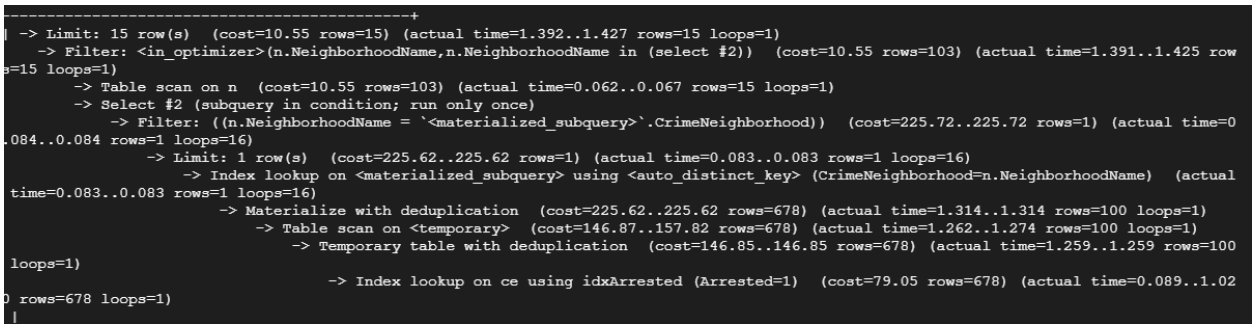


   The Cost is 7.42, Time is 1.795-1.832 seconds

   Analysis: Since the CrimeEvents table is joined with the CrimeType table using CrimeId, having an index on CrimeId in CrimeEvents will help speed up the joining process of the two. The database would find the corresponding CrimeId in the CrimeTypes table making the join operation faster.

2. Index on Neighborhood table for the AverageAge
   mysql> CREATE INDEX idxAverageAge ON Neighborhoods (AverageAge)

After implementing these changes, we did not notice much of a change in the overall cost, but the time took a large decrease.

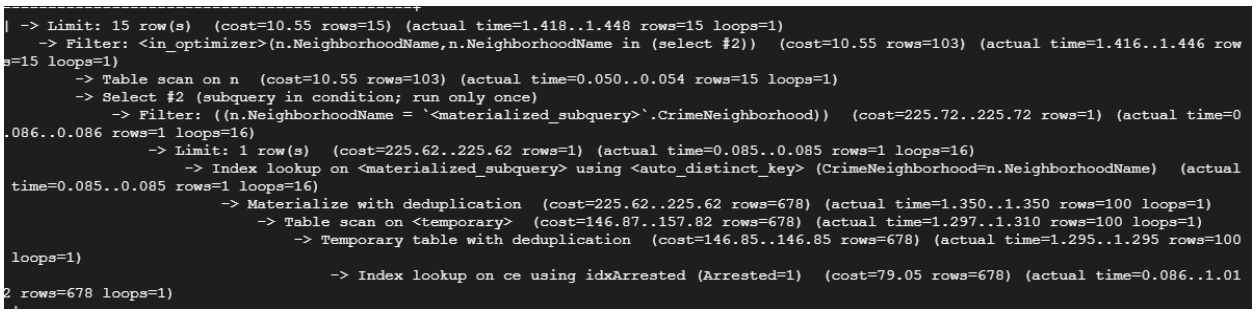


Analysis: The original cost sat at an 10.55 and remained at 10.55 and the time is 1.392-1.427.

3. Index on CrimeEvents table for the Arrested

   mysql> CREATE INDEX idxArrested ON CrimeEvents (Arrested)

   After implementing these changes, we noticed that the cost was the same and the time was slightly shorter.



The Cost remains 10.55, Time is 1.418-1.448 seconds

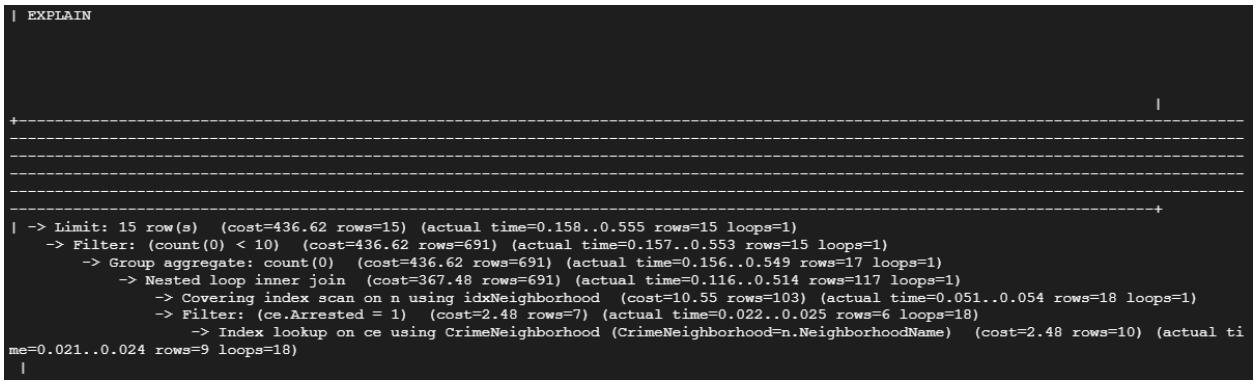
Final Index Design would be selecting the first indexing of the CrimeEvent table for the CrimeId as it led to the greatest decrease in cost out of the three attempted indexing.

Advanced Query 2

Using this query, we will try to improve the costs with indexing.
Explain Analyze
SELECT n.NeighborhoodName
FROM Neighborhoods n JOIN CrimeEvents ce ON n.NeighborhoodName = ce.CrimeNeighborhood
WHERE ce.Arrested = 1
GROUP BY n.NeighborhoodName

HAVING COUNT(*) < 10
LIMIT 15;

We first use Explain Analyze to find the performance of the original query.



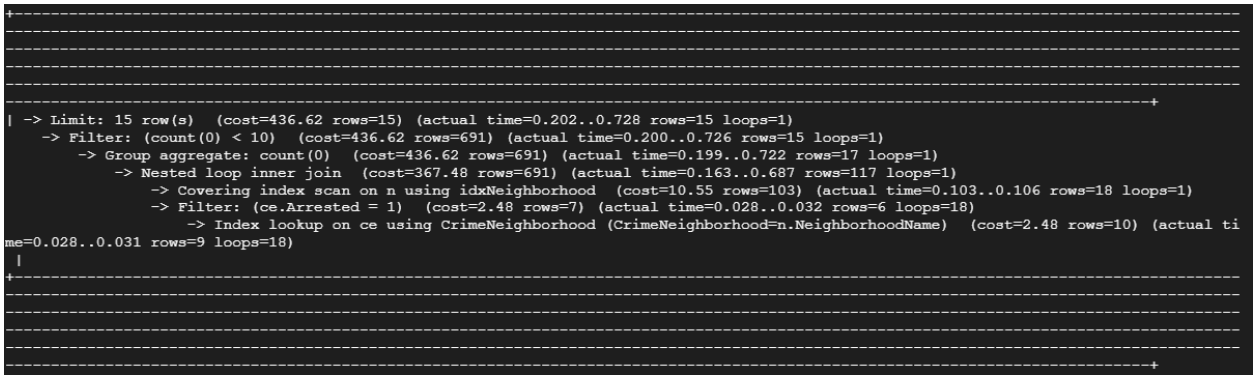
This query has an overall cost of 436.62 and a time of 0.158-0.555 seconds

We then apply 3 indexing methods to try and attempt to improve our runtime:

1. Index on CrimeEvents table for the Arrested

   mysql> CREATE INDEX idxArrested ON CrimeEvents (Arrested)

   After implementing these changes, we noticed that the cost was the same and the time was slightly shorter.

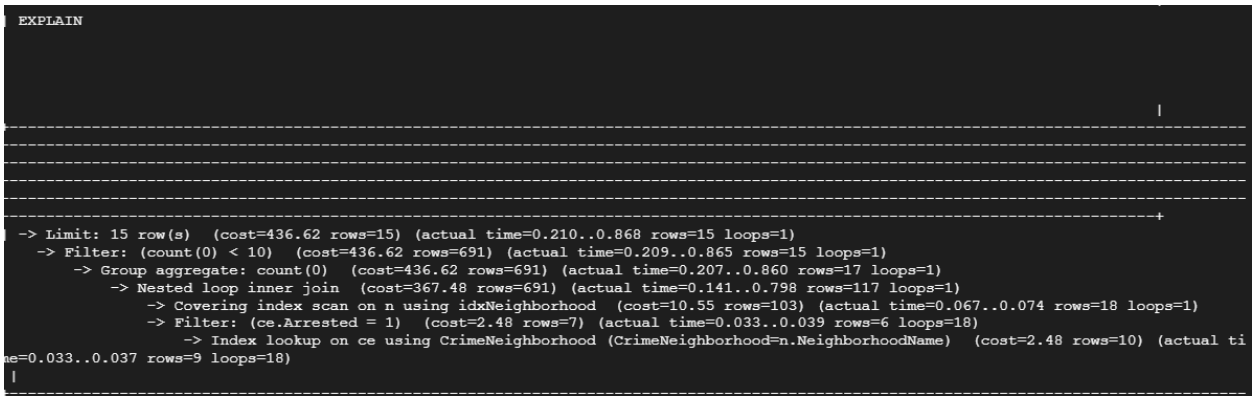


   The Cost remains 436.62, Time is 0.202-0.728 seconds

2. Index on Neighborhood table for the NeighborhoodName

   mysql> CREATE INDEX idxNeighborhoodName ON Neighborhoods (NeighborhoodName)

After implementing these changes, we did not notice any change in the overall cost.



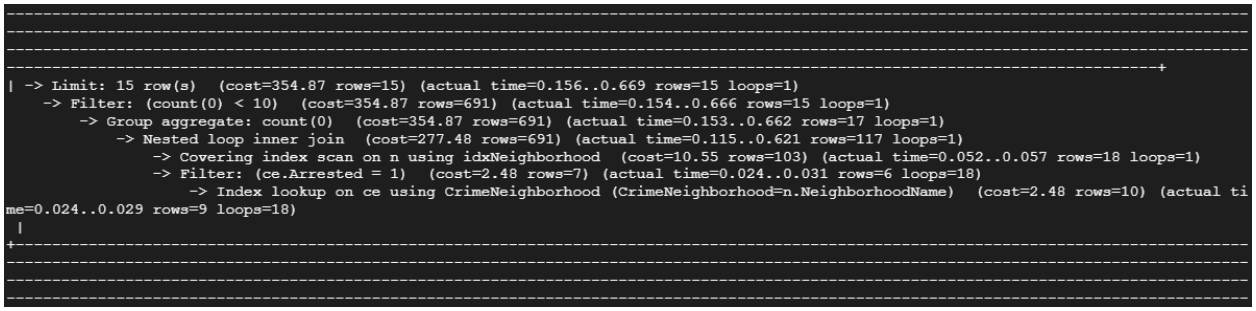
The Cost remains 436.62, Time is 0.210-0.868 seconds

3. Index on CrimeEvent table for the ce.CrimeNeighborhood

   This index will speed up the JOIN operation between Neighborhoods and CrimeEvent tables, as it will quickly find the ce.CrimeNeighborhood

   mysql> CREATE INDEX idxCrimeNeighborhood ON CrimeEvents (CrimeNeighborhood)

   After implementing these changes, we noticed an improvement in the cost



4. The Cost is now 354.87, Time is 0.156-0.669 seconds

Final Index Design would be selecting the first indexing of the CrimeEvent table for the ce.CrimeNeighborhood as it led to the greatest decrease in cost out of the three attempted indexing.

Advanced Query 3

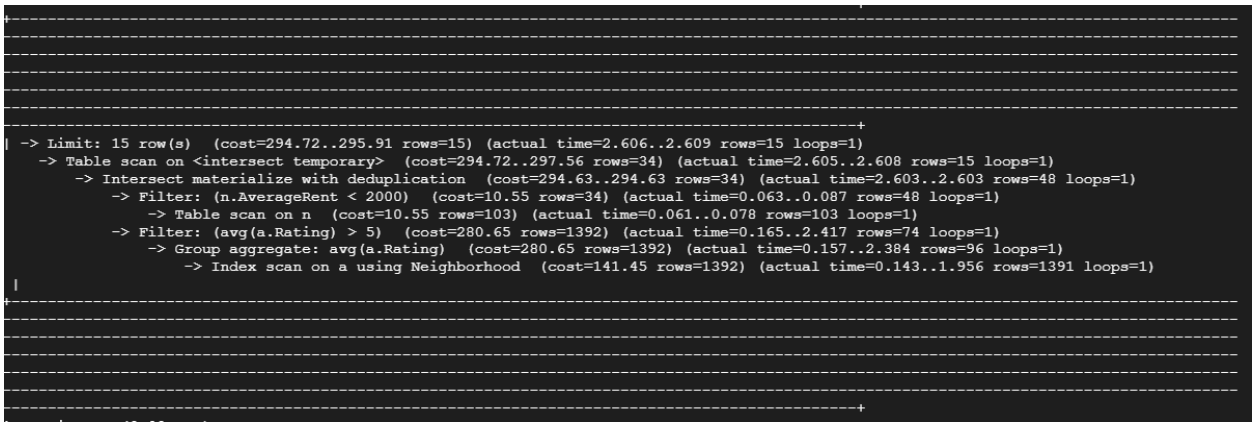
Using this query, we will try to improve the costs with indexing.

```
Explain analyze
(SELECT n.NeighborhoodName
FROM Neighborhoods n
WHERE n.AverageRent < 2000

INTERSECT

SELECT a.Neighborhood
FROM Apartments a
GROUP BY a.Neighborhood
HAVING AVG(Rating) > 5)
LIMIT 15;
```

We first use Explain Analyze to find the performance of the original query.



```
| -> Limit: 15 row(s)  (cost=294.72..295.91 rows=15) (actual time=2.606..2.609 rows=15 loops=1)
    -> Table scan on <intersect temporary>  (cost=294.72..297.56 rows=34) (actual time=2.605..2.608 rows=15 loops=1)
        -> Intersect materialize with deduplication  (cost=294.63..294.63 rows=34) (actual time=2.603..2.603 rows=48 loops=1)
            -> Filter: (n.AverageRent < 2000)  (cost=10.55 rows=34) (actual time=0.063..0.087 rows=48 loops=1)
                -> Table scan on n  (cost=10.55 rows=103) (actual time=0.061..0.078 rows=103 loops=1)
            -> Filter: (avg(a.Rating) > 5)  (cost=280.65 rows=1392) (actual time=0.165..2.417 rows=74 loops=1)
                -> Group aggregate: avg(a.Rating)  (cost=280.65 rows=1392) (actual time=0.157..2.384 rows=96 loops=1)
                    -> Index scan on a using Neighborhood  (cost=141.45 rows=1392) (actual time=0.143..1.956 rows=1391 loops=1)
|
```

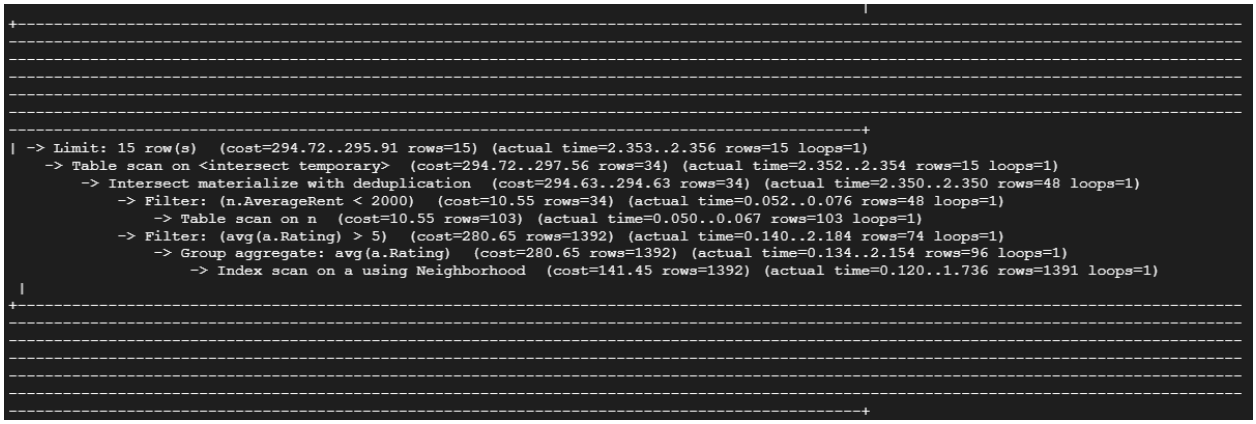
This query has an overall cost of 294.72-295.91 and a time of 2.606-2.609 seconds

We then apply 3 indexing methods to try and attempt to improve our runtime:

1. Index on Neighborhoods table for the Neighborhood

   mysql> CREATE INDEX idxNeighborhood ON Neighborhoods (Neighborhood)

   After implementing these changes, we noticed that the cost was the same.

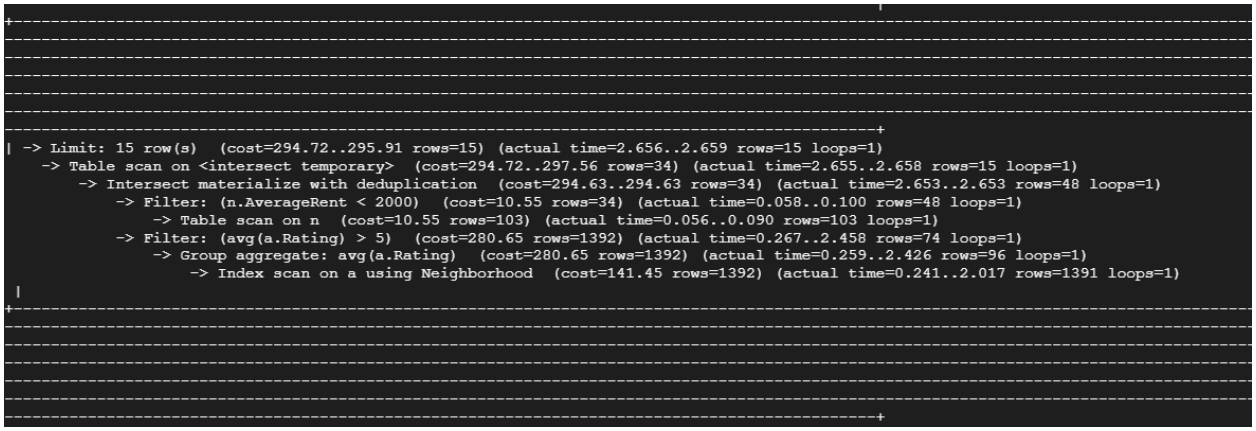


The Cost remains 294.72-295.91, Time is 2.353-2.356 seconds

2. Index on Neighborhoods table for the n.AverageRent

   mysql> CREATE INDEX idxAverageRent ON Neighborhoods (AverageRent)

   After implementing these changes, we did not notice any change in the overall cost.

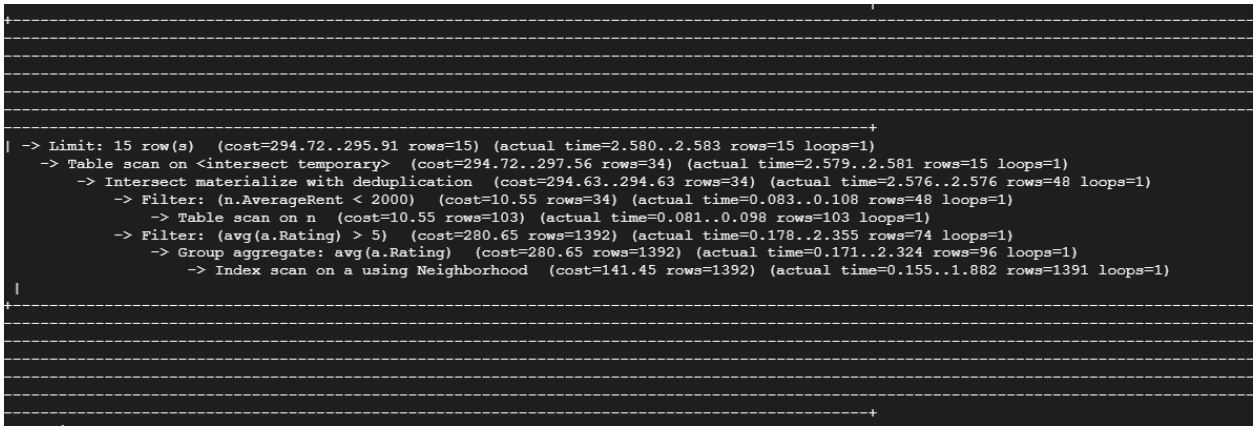


The Cost remains 294.72-295.91, Time is 2.656-2.659 seconds

3. Index on Apartments table for the Rating

   mysql> CREATE INDEX idxRating ON Apartments (Rating)

   After implementing these changes, we did not notice any change in the overall cost.



The Cost remains 294.72-295.91, Time is 2.580-2.583 seconds

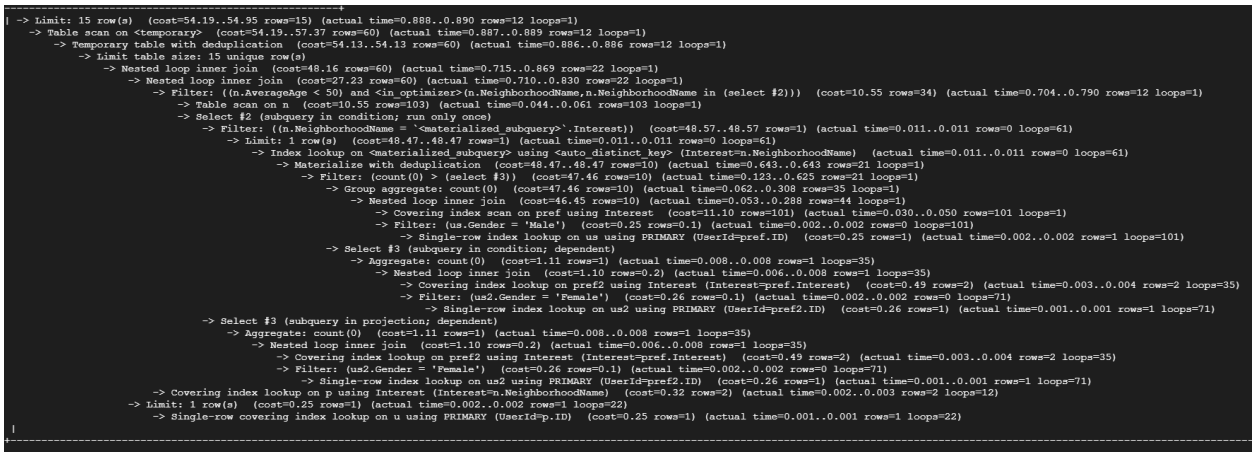
Final Index Design would be selecting the original query as the indexing did not make any significant differences in changing the original query.

Advanced Query 4

Using this query, we will try to improve the costs with indexing.

```
Explain analyze
SELECT DISTINCT n.NeighborhoodName
FROM Prefers p
JOIN Users u ON p.ID = u.UserId
JOIN Neighborhoods n ON p.Interest = n.NeighborhoodName
WHERE n.AverageAge < 50
AND n.NeighborhoodName IN
   (SELECT pref.Interest
   FROM Prefers pref
   JOIN Users us ON pref.ID = us.UserId
   WHERE us.Gender = 'Male'
   GROUP BY pref.Interest
   HAVING COUNT(*) >
      (SELECT COUNT(*)
      FROM Prefers pref2
      JOIN Users us2 ON pref2.ID = us2.UserId
      WHERE pref2.Interest = pref.Interest AND us2.Gender = 'Female'))
LIMIT 15;
```

We first use Explain Analyze to find the performance of the original query.



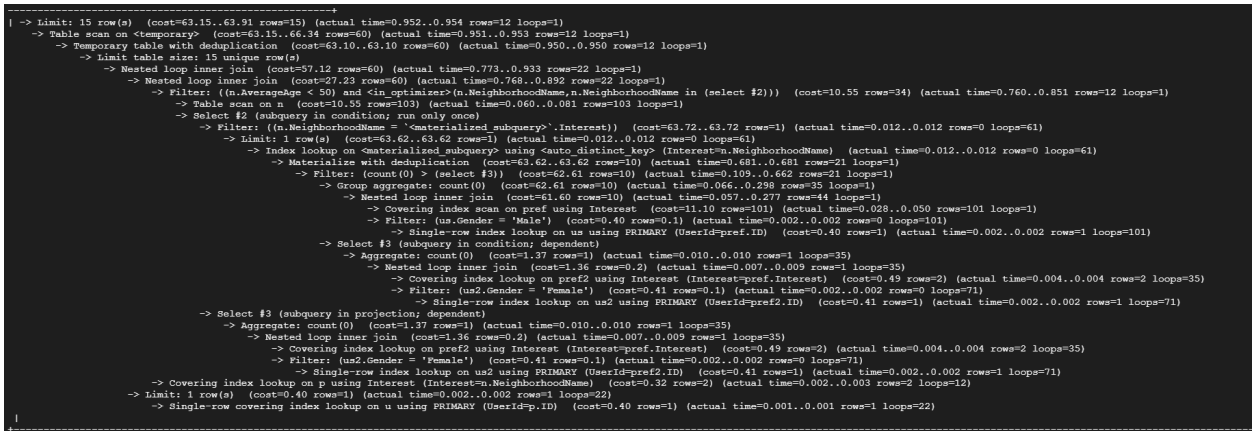
This query has an overall cost of 54.19-54.95 and a time of 0.888-0.890 seconds

We then apply 3 indexing methods to try and attempt to improve our runtime:

4. Index on Users table for the UserId

   mysql> CREATE INDEX idxUserId ON Users (UserId)

   After implementing these changes, we noticed that the cost slightly increased.

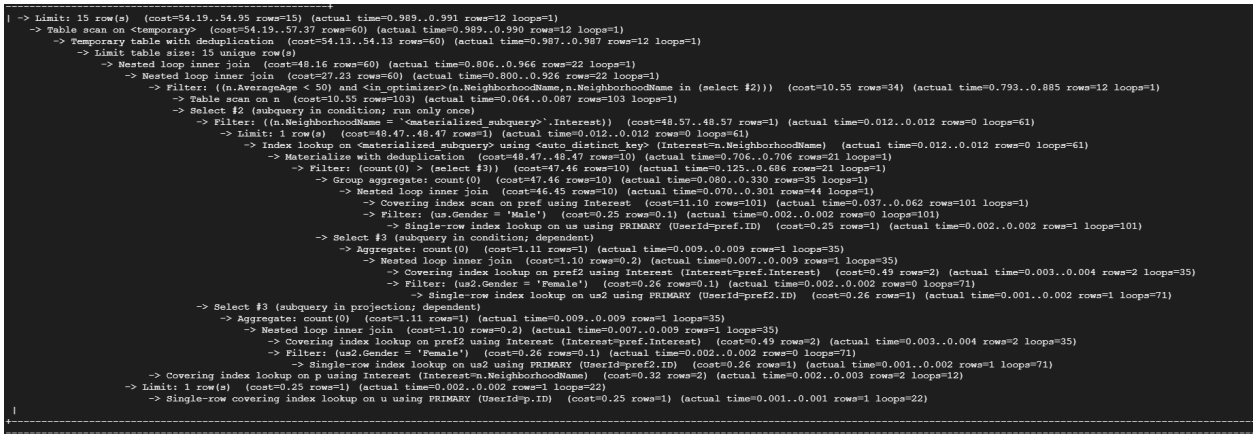


The Cost increased to 63.15-63.91 and a time of 0.952-0.954 seconds

5. Index on Prefers table for the us.UserId

   mysql> CREATE INDEX idxUserId ON Prefers (UserId)

   After implementing these changes, we noticed that the cost was the same.

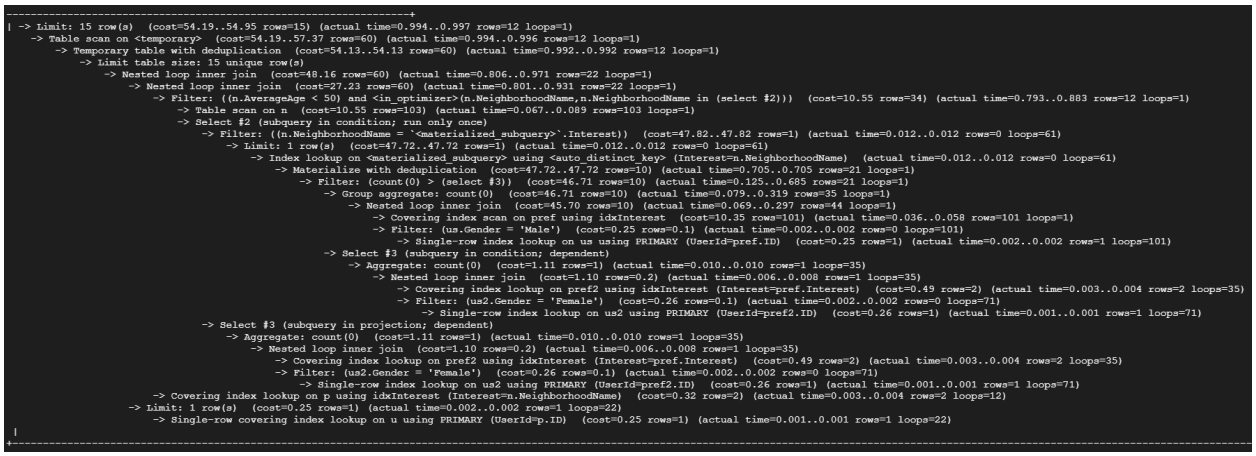


The Cost remained at 54.19-54.95 and a time of 0.989-0.991 seconds

6. Index on Prefers table for the Interest

   mysql> CREATE INDEX idxInterest ON Prefers(Interest)

   After implementing these changes, we did not notice any change in the overall cost.



The Cost remained at 54.19-54.95 and a time of 0.994-0.997 seconds

Final Index Design would be selecting the original query as the indexing did not make any significant differences in changing the original query. There was one change that increased the cost of the query so we will be avoiding that index.