```
75%    2012.000000    9.000000  ...   0.414246        7.396709
max    2018.000000   11.000000  ...   1.386260       15.845616

[8 rows x 12 columns]


*********************************************************
GROUP DISTRIBUTION ON TRAFFIC BY YEAR
    year  region_id  road_category_id  ...       vans    lorries  all_motor_vehicles
0   1993        373               219  ...  11.087950  10.849047           16.140504
1   1994        373               219  ...  11.553254  11.082147           16.501645
2   1995        373               219  ...  11.867358  11.382132           16.822704
3   1996        373               219  ...  12.317925  11.736691           17.270079
4   1997        373               219  ...  12.949367  12.014887           17.631146
5   1998        373               219  ...  13.548895  12.411285           17.951606
6   1999        373               219  ...  13.760718  12.586221           18.283915
7   2000        373               219  ...  13.925848  12.627528           18.252833
8   2001        367               216  ...  14.257194  12.544484           18.507065
9   2002        367               216  ...  14.585115  12.653575           18.941853
10  2003        367               216  ...  15.315447  12.717592           19.057797
11  2004        367               216  ...  16.064099  13.102573           19.343582
12  2005        368               218  ...  16.498701  12.951695           19.339939
13  2006        368               218  ...  17.158052  12.996429           19.622870
14  2007        367               216  ...  17.981100  13.093525           19.794497
15  2008        367               216  ...  17.865668  12.799325           19.603296
16  2009        367               216  ...  17.480556  11.743582           19.417265
17  2010        367               216  ...  17.630435  11.783215           19.107573
18  2011        367               216  ...  17.775096  11.466826           19.144793
19  2012        367               216  ...  17.732849  11.185769           19.072997
20  2013        367               216  ...  18.292121  11.284625           19.140180
21  2014        367               216  ...  19.337688  11.576409           19.640368
22  2015        367               216  ...  20.154004  12.003396           19.962072
23  2016        373               219  ...  21.142740  12.115465           20.354558
24  2017        373               219  ...  21.704466  12.258545           20.617241
25  2018        373               219  ...  21.908306  12.300529           20.681070

[26 rows x 12 columns]


*********************************************************
TRAFFIC BY REGION IN 2018
                          name   year  ...  all_motor_vehicles  other_vehicles
0                    North East  12108  ...           12.274201        0.221726
1                         Wales  10090  ...           18.260918        0.309984
2                        London  10090  ...           18.354733        0.744356
3                 East Midlands  10090  ...           27.647983        0.365226
4     Yorkshire and The Humber  12108  ...           27.760255        0.374354
5                      Scotland  10090  ...           29.716436        0.507561
6                 West Midlands  12108  ...           31.554014        0.372814
7                    South West  10090  ...           33.238699        0.513533
8                    North West  12108  ...           35.697093        0.399917
9               East of England  10090  ...           38.701718        0.512950
10                   South East  12108  ...           54.908644        0.713793

[11 rows x 14 columns]


*********************************************************
VEHICLE TYPE COMPARISON
    year  region_id  ...  all_motor_vehicles  other_vehicles
0   1993        373  ...          256.214013        5.211234
25  2018        373  ...          328.114695        5.036214
```

```
[2 rows x 13 columns]
+----------------------------+------------------------+
| Vehicle type               | Billion vehicle miles  |
|----------------------------+------------------------|
| all_motor_vehicles         |                328.115 |
| cars_and_taxis             |                255.013 |
| vans                       |                50.9832 |
| lorries                    |                17.0826 |
| pedal_cycles               |                3.32911 |
| two_wheeled_motor_vehicles |                2.73903 |
| buses_and_coaches          |                2.29719 |
+----------------------------+------------------------+


************************************************************
MODEL Decision tree regression
features= Index(['year', 'region_id', 'road_category_id'], dtype='object')
score: 0.9945
regression_error: 0.0343


************************************************************
MODEL 4 SVRegression with all features
features= Index(['year', 'region_id', 'road_category_id', 'total_link_length_km',
       'total_link_length_miles', 'pedal_cycles', 'two_wheeled_motor_vehicles',
       'cars_and_taxis', 'buses_and_coaches', 'vans', 'lorries'],
      dtype='object')
score: 0.9979
regression_error: 0.0367


************************************************************
MODEL SVRegression
features= Index(['year', 'region_id', 'road_category_id'], dtype='object')
score: 0.9979
regression_error: 0.0367


************************************************************
MODEL Random forest regression
features= Index(['year', 'region_id', 'road_category_id'], dtype='object')
score model_forest: 0.9966
regression_error: 0.0265


************************************************************
MODEL Random forest regression hyp
features= Index(['year', 'region_id', 'road_category_id'], dtype='object')
score model_forest_hyp: 0.9968
regression_error: 0.0300
<Figure size 432x288 with 0 Axes>

In [25]: runfile('C:/Users/Utente/Desktop/DataScience/code/main.py', wdir='C:/Users/
Utente/Desktop/DataScience/code')
Reloaded modules: init, model, util, visualization, preprocessing


************************************************************
UNIQUE DISTRIBUTION OF FEATURES
Total number of regions:  11
Total number of road categories:  6
              year     region_id  ...      lorries  all_motor_vehicles
count  1547.000000  1547.000000  ...  1547.000000         1547.000000
```

```
mean    2005.475760        6.212023    ...    0.283026         5.028188
std        7.517803        3.187790    ...    0.292345         3.616128
min     1993.000000        1.000000    ...    0.000648         0.010438
25%     1999.000000        3.000000    ...    0.067333         2.238600
50%     2005.000000        6.000000    ...    0.168881         4.270186
75%     2012.000000        9.000000    ...    0.414246         7.396709
max     2018.000000       11.000000    ...    1.386260        15.845616

[8 rows x 12 columns]


*************************************************************
GROUP DISTRIBUTION ON TRAFFIC BY YEAR
     year  region_id  road_category_id  ...        vans    lorries  all_motor_vehicles
0    1993        373               219  ...   11.087950  10.849047           16.140504
1    1994        373               219  ...   11.553254  11.082147           16.501645
2    1995        373               219  ...   11.867358  11.382132           16.822704
3    1996        373               219  ...   12.317925  11.736691           17.270079
4    1997        373               219  ...   12.949367  12.014887           17.631146
5    1998        373               219  ...   13.548895  12.411285           17.951606
6    1999        373               219  ...   13.760718  12.586221           18.283915
7    2000        373               219  ...   13.925848  12.627528           18.252833
8    2001        367               216  ...   14.257194  12.544484           18.507065
9    2002        367               216  ...   14.585115  12.653575           18.941853
10   2003        367               216  ...   15.315447  12.717592           19.057797
11   2004        367               216  ...   16.064099  13.102573           19.343582
12   2005        368               218  ...   16.498701  12.951695           19.339939
13   2006        368               218  ...   17.158052  12.996429           19.622870
14   2007        367               216  ...   17.981100  13.093525           19.794497
15   2008        367               216  ...   17.865668  12.799325           19.603296
16   2009        367               216  ...   17.480556  11.743582           19.417265
17   2010        367               216  ...   17.630435  11.783215           19.107573
18   2011        367               216  ...   17.775096  11.466826           19.144793
19   2012        367               216  ...   17.732849  11.185769           19.072997
20   2013        367               216  ...   18.292121  11.284625           19.140180
21   2014        367               216  ...   19.337688  11.576409           19.640368
22   2015        367               216  ...   20.154004  12.003396           19.962072
23   2016        373               219  ...   21.142740  12.115465           20.354558
24   2017        373               219  ...   21.704466  12.258545           20.617241
25   2018        373               219  ...   21.908306  12.300529           20.681070

[26 rows x 12 columns]


*************************************************************
TRAFFIC BY REGION IN 2018
                         name   year  ...  all_motor_vehicles  other_vehicles
0                  North East  12108  ...           12.274201        0.221726
1                       Wales  10090  ...           18.260918        0.309984
2                      London  10090  ...           18.354733        0.744356
3               East Midlands  10090  ...           27.647983        0.365226
4   Yorkshire and The Humber  12108  ...           27.760255        0.374354
5                    Scotland  10090  ...           29.716436        0.507561
6               West Midlands  12108  ...           31.554014        0.372814
7                  South West  10090  ...           33.238699        0.513533
8                  North West  12108  ...           35.697093        0.399917
9             East of England  10090  ...           38.701718        0.512950
10                 South East  12108  ...           54.908644        0.713793

[11 rows x 14 columns]


*************************************************************
```

```
VEHICLE TYPE COMPARISON
    year  region_id  ...  all_motor_vehicles  other_vehicles
0   1993        373  ...          256.214013        5.211234
25  2018        373  ...          328.114695        5.036214

[2 rows x 13 columns]
+----------------------------+------------------------+
| Vehicle type               | Billion vehicle miles  |
|----------------------------+------------------------|
| all_motor_vehicles         |                328.115 |
| cars_and_taxis             |                255.013 |
| vans                       |                50.9832 |
| lorries                    |                17.0826 |
| pedal_cycles               |                3.32911 |
| two_wheeled_motor_vehicles |                2.73903 |
| buses_and_coaches          |                2.29719 |
+----------------------------+------------------------+


************************************************************
MODEL Decision tree regression
features= Index(['year', 'region_id', 'road_category_id'], dtype='object')
score: 0.9940
regression_error: 0.0335


************************************************************
MODEL 4 SVRegression with all features
features= Index(['year', 'region_id', 'road_category_id', 'total_link_length_km',
       'total_link_length_miles', 'pedal_cycles', 'two_wheeled_motor_vehicles',
       'cars_and_taxis', 'buses_and_coaches', 'vans', 'lorries'],
      dtype='object')
score: 0.9982
regression_error: 0.0351


************************************************************
MODEL SVRegression
features= Index(['year', 'region_id', 'road_category_id'], dtype='object')
score: 0.9982
regression_error: 0.0351


************************************************************
MODEL Random forest regression
features= Index(['year', 'region_id', 'road_category_id'], dtype='object')
score model_forest: 0.9983
regression_error: 0.0246


************************************************************
MODEL Random forest regression hyp
features= Index(['year', 'region_id', 'road_category_id'], dtype='object')
score model_forest_hyp: 0.9977
regression_error: 0.0272
<Figure size 432x288 with 0 Axes>

In [26]: runfile('C:/Users/Utente/Desktop/DataScience/code/main.py', wdir='C:/Users/
Utente/Desktop/DataScience/code')
Reloaded modules: init, model, util, visualization, preprocessing


************************************************************
```

UNIQUE DISTRIBUTION OF FEATURES
Total number of regions: 11
Total number of road categories: 6

```
            year     region_id  ...      lorries   all_motor_vehicles
count  1547.000000  1547.000000  ...  1547.000000        1547.000000
mean   2005.475760     6.212023  ...     0.283026           5.028188
std       7.517803     3.187790  ...     0.292345           3.616128
min    1993.000000     1.000000  ...     0.000648           0.010438
25%    1999.000000     3.000000  ...     0.067333           2.238600
50%    2005.000000     6.000000  ...     0.168881           4.270186
75%    2012.000000     9.000000  ...     0.414246           7.396709
max    2018.000000    11.000000  ...     1.386260          15.845616
```

[8 rows x 12 columns]

****
GROUP DISTRIBUTION ON TRAFFIC BY YEAR

```
    year  region_id  road_category_id  ...       vans     lorries  all_motor_vehicles
0   1993        373               219  ...  11.087950  10.849047           16.140504
1   1994        373               219  ...  11.553254  11.082147           16.501645
2   1995        373               219  ...  11.867358  11.382132           16.822704
3   1996        373               219  ...  12.317925  11.736691           17.270079
4   1997        373               219  ...  12.949367  12.014887           17.631146
5   1998        373               219  ...  13.548895  12.411285           17.951606
6   1999        373               219  ...  13.760718  12.586221           18.283915
7   2000        373               219  ...  13.925848  12.627528           18.252833
8   2001        367               216  ...  14.257194  12.544484           18.507065
9   2002        367               216  ...  14.585115  12.653575           18.941853
10  2003        367               216  ...  15.315447  12.717592           19.057797
11  2004        367               216  ...  16.064099  13.102573           19.343582
12  2005        368               218  ...  16.498701  12.951695           19.339939
13  2006        368               218  ...  17.158052  12.996429           19.622870
14  2007        367               216  ...  17.981100  13.093525           19.794497
15  2008        367               216  ...  17.865668  12.799325           19.603296
16  2009        367               216  ...  17.480556  11.743582           19.417265
17  2010        367               216  ...  17.630435  11.783215           19.107573
18  2011        367               216  ...  17.775096  11.466826           19.144793
19  2012        367               216  ...  17.732849  11.185769           19.072997
20  2013        367               216  ...  18.292121  11.284625           19.140180
21  2014        367               216  ...  19.337688  11.576409           19.640368
22  2015        367               216  ...  20.154004  12.003396           19.962072
23  2016        373               219  ...  21.142740  12.115465           20.354558
24  2017        373               219  ...  21.704466  12.258545           20.617241
25  2018        373               219  ...  21.908306  12.300529           20.681070
```

[26 rows x 12 columns]

****
TRAFFIC BY REGION IN 2018

```
                        name   year  ...  all_motor_vehicles  other_vehicles
0                 North East  12108  ...           12.274201        0.221726
1                      Wales  10090  ...           18.260918        0.309984
2                     London  10090  ...           18.354733        0.744356
3              East Midlands  10090  ...           27.647983        0.365226
4   Yorkshire and The Humber  12108  ...           27.760255        0.374354
5                   Scotland  10090  ...           29.716436        0.507561
6              West Midlands  12108  ...           31.554014        0.372814
7                 South West  10090  ...           33.238699        0.513533
8                 North West  12108  ...           35.697093        0.399917
9            East of England  10090  ...           38.701718        0.512950
10                South East  12108  ...           54.908644        0.713793
```

```
[11 rows x 14 columns]


*************************************************************
VEHICLE TYPE COMPARISON
    year   region_id  ...  all_motor_vehicles  other_vehicles
0   1993         373  ...          256.214013        5.211234
25  2018         373  ...          328.114695        5.036214

[2 rows x 13 columns]
+---------------------------+------------------------+
| Vehicle type              | Billion vehicle miles  |
|---------------------------+------------------------|
| all_motor_vehicles        |                328.115 |
| cars_and_taxis            |                255.013 |
| vans                      |                50.9832 |
| lorries                   |                17.0826 |
| pedal_cycles              |                3.32911 |
| two_wheeled_motor_vehicles|                2.73903 |
| buses_and_coaches         |                2.29719 |
+---------------------------+------------------------+


*************************************************************
MODEL Decision tree regression
features= Index(['year', 'region_id', 'road_category_id'], dtype='object')
score: 0.9978
regression_error: 0.0273


*************************************************************
MODEL 4 SVRegression with all features
features= Index(['year', 'region_id', 'road_category_id', 'total_link_length_km',
       'total_link_length_miles', 'pedal_cycles', 'two_wheeled_motor_vehicles',
       'cars_and_taxis', 'buses_and_coaches', 'vans', 'lorries'],
      dtype='object')
score: 0.9982
regression_error: 0.0350


*************************************************************
MODEL SVRegression
features= Index(['year', 'region_id', 'road_category_id'], dtype='object')
Traceback (most recent call last):

  File "C:\Users\Utente\Desktop\DataScience\code\main.py", line 47, in <module>
    model_SVR(frame)

  File "C:/Users/Utente/Desktop/DataScience/code\model.py", line 133, in model_SVR
    model_SVR.fit(X_train, y_train)

NameError: name 'X_train' is not defined

<Figure size 432x288 with 0 Axes>

In [27]: runfile('C:/Users/Utente/Desktop/DataScience/code/main.py', wdir='C:/Users/
Utente/Desktop/DataScience/code')
Reloaded modules: init, model, util, visualization, preprocessing


*************************************************************
UNIQUE DISTRIBUTION OF FEATURES
```

```
Total number of regions:   11
Total number of road categories:   6
            year    region_id  ...      lorries  all_motor_vehicles
count  1547.000000  1547.000000  ...  1547.000000         1547.000000
mean   2005.475760     6.212023  ...     0.283026            5.028188
std       7.517803     3.187790  ...     0.292345            3.616128
min    1993.000000     1.000000  ...     0.000648            0.010438
25%    1999.000000     3.000000  ...     0.067333            2.238600
50%    2005.000000     6.000000  ...     0.168881            4.270186
75%    2012.000000     9.000000  ...     0.414246            7.396709
max    2018.000000    11.000000  ...     1.386260           15.845616

[8 rows x 12 columns]


*************************************************************
GROUP DISTRIBUTION ON TRAFFIC BY YEAR
    year  region_id  road_category_id  ...       vans     lorries  all_motor_vehicles
0   1993        373               219  ...  11.087950   10.849047           16.140504
1   1994        373               219  ...  11.553254   11.082147           16.501645
2   1995        373               219  ...  11.867358   11.382132           16.822704
3   1996        373               219  ...  12.317925   11.736691           17.270079
4   1997        373               219  ...  12.949367   12.014887           17.631146
5   1998        373               219  ...  13.548895   12.411285           17.951606
6   1999        373               219  ...  13.760718   12.586221           18.283915
7   2000        373               219  ...  13.925848   12.627528           18.252833
8   2001        367               216  ...  14.257194   12.544484           18.507065
9   2002        367               216  ...  14.585115   12.653575           18.941853
10  2003        367               216  ...  15.315447   12.717592           19.057797
11  2004        367               216  ...  16.064099   13.102573           19.343582
12  2005        368               218  ...  16.498701   12.951695           19.339939
13  2006        368               218  ...  17.158052   12.996429           19.622870
14  2007        367               216  ...  17.981100   13.093525           19.794497
15  2008        367               216  ...  17.865668   12.799325           19.603296
16  2009        367               216  ...  17.480556   11.743582           19.417265
17  2010        367               216  ...  17.630435   11.783215           19.107573
18  2011        367               216  ...  17.775096   11.466826           19.144793
19  2012        367               216  ...  17.732849   11.185769           19.072997
20  2013        367               216  ...  18.292121   11.284625           19.140180
21  2014        367               216  ...  19.337688   11.576409           19.640368
22  2015        367               216  ...  20.154004   12.003396           19.962072
23  2016        373               219  ...  21.142740   12.115465           20.354558
24  2017        373               219  ...  21.704466   12.258545           20.617241
25  2018        373               219  ...  21.908306   12.300529           20.681070

[26 rows x 12 columns]


*************************************************************
TRAFFIC BY REGION IN 2018
                       name   year  ...  all_motor_vehicles  other_vehicles
0                 North East  12108  ...           12.274201        0.221726
1                      Wales  10090  ...           18.260918        0.309984
2                     London  10090  ...           18.354733        0.744356
3              East Midlands  10090  ...           27.647983        0.365226
4   Yorkshire and The Humber  12108  ...           27.760255        0.374354
5                   Scotland  10090  ...           29.716436        0.507561
6              West Midlands  12108  ...           31.554014        0.372814
7                 South West  10090  ...           33.238699        0.513533
8                 North West  12108  ...           35.697093        0.399917
9            East of England  10090  ...           38.701718        0.512950
10                South East  12108  ...           54.908644        0.713793
```

```
[11 rows x 14 columns]


*************************************************************
VEHICLE TYPE COMPARISON
    year  region_id  ...  all_motor_vehicles  other_vehicles
0   1993        373  ...          256.214013        5.211234
25  2018        373  ...          328.114695        5.036214

[2 rows x 13 columns]
+---------------------------+------------------------+
| Vehicle type              | Billion vehicle miles  |
|---------------------------+------------------------|
| all_motor_vehicles        |                328.115 |
| cars_and_taxis            |                255.013 |
| vans                      |                50.9832 |
| lorries                   |                17.0826 |
| pedal_cycles              |                3.32911 |
| two_wheeled_motor_vehicles|                2.73903 |
| buses_and_coaches         |                2.29719 |
+---------------------------+------------------------+


*************************************************************
MODEL Decision tree regression
features= Index(['year', 'region_id', 'road_category_id'], dtype='object')
score: 0.9980
regression_error: 0.0286


*************************************************************
MODEL 4 SVRegression with all features
features= Index(['year', 'region_id', 'road_category_id', 'total_link_length_km',
       'total_link_length_miles', 'pedal_cycles', 'two_wheeled_motor_vehicles',
       'cars_and_taxis', 'buses_and_coaches', 'vans', 'lorries'],
      dtype='object')
score: 0.9978
regression_error: 0.0372


*************************************************************
MODEL SVRegression
features= Index(['year', 'region_id', 'road_category_id'], dtype='object')
score: 0.9978
regression_error: 0.0372


*************************************************************
MODEL Random forest regression
features= Index(['year', 'region_id', 'road_category_id'], dtype='object')
score model_forest: 0.9958
regression_error: 0.0365


*************************************************************
MODEL Random forest regression hyp
features= Index(['year', 'region_id', 'road_category_id'], dtype='object')
score model_forest_hyp: 0.9968
regression_error: 0.0313
<Figure size 432x288 with 0 Axes>
```

In [**28**]: