```
North West 12108 ...
East of England 10090 ...
South East 12108 ...
                                                      0.399917
8
                                        35.697093
9
                                        38.701718
                                                      0.512950
                                        54.908644
10
                                                      0.713793
[11 rows x 14 columns]
******************
VEHICLE TYPE COMPARISON
  year region_id ... all_motor_vehicles other_vehicles
   1993
            373 ...
                          256.214013
                                         5.211234
25 2018
            373 ...
                           328.114695
                                         5.036214
[2 rows x 13 columns]
+----+
| Vehicle type | Billion vehicle miles |
Í--------
all motor vehicles
                                    328.115
cars and taxis
                                    255.013
vans
                                    50.9832
lorries
                                    17,0826
                                     3.32911 l
pedal_cycles
                                     2.73903
| two_wheeled_motor_vehicles |
                                     2.29719 İ
buses and coaches
+----+
***********************
MODEL Decision tree regression
features= Index(['year', 'region_id', 'road_category_id'], dtype='object')
score: 0.9951
regression error: 0.1106
*******************
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: 0.9999
regression_error: 0.0352
*******************
MODEL SVRegression
features= Index(['year', 'region_id', 'road_category_id'], dtype='object')
score: 0.9999
regression error: 0.0352
*******************
MODEL Random forest regression
features= Index(['year', 'region_id', 'road_category_id'], dtype='object')
score model forest: 0.9951
regression_error: 0.1214
******************
MODEL Linear regression 1
features= Index(['pedal_cycles', 'two_wheeled_motor_vehicles', 'cars_and_taxis',
     'buses_and_coaches', 'vans'],
    dtype='object')
```

score linear: 0.9978 regression error: 0.1235

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

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

[8 rows x 12 columns]

| GRO | OUP DIS | TRIBUTION O | N 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 |

373

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

```
TRAFFIC BY REGION IN 2018
                                  year
                                         ... all_motor_vehicles other_vehicles
                           name
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
                                         . . .
    Yorkshire and The Humber 12108
Scotland 10090
4
                                                          27.760255
                                                                              0.374354
                                         . . .
5
                                                          29.716436
                                                                              0.507561
                                         . . .
                West Midlands 12108
South West 10090
6
                                                          31.554014
                                                                              0.372814
                                         . . .
7
                                                          33.238699
                                                                             0.513533
                                         . . .
              North West 12108 ...
East of England 10090 ...
8
                                                          35.697093
                                                                             0.399917
9
                                                          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 |
| | 328.115 328.115 255.013 50.9832 17.0826 3.32911 2.73903 2.29719 |
| + | ·+ |

MODEL Decision tree regression

features= Index(['year', 'region_id', 'road_category_id'], dtype='object')

score: 0.9913

regression_error: 0.1339

```
MODEL 4 SVRegression with all features
```

score: 0.9999

regression_error: 0.0350

```
MODEL SVRegression
```

features= Index(['year', 'region_id', 'road_category_id'], dtype='object')

```
score: 0.9999
regression error: 0.0350
*******************
MODEL Random forest regression
features= Index(['year', 'region_id', 'road_category_id'], dtype='object')
score model forest: 0.9970
regression_error: 0.1009
************************
MODEL Linear regression 1
features= Index(['pedal_cycles', 'two_wheeled_motor_vehicles', 'cars_and_taxis',
      'buses_and_coaches', 'vans'],
     dtype='object')
score linear: 0.9976
regression error: 0.1254
******************
MODEL Linear regression 2
features= Index(['year', 'region_id', 'road_category_id', 'total_link_length_km',
      'total_link_length_miles'],
     dtype='object')
score linear2: 0.1766
regression_error: 2.5073
<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
                   region_id ...
                                     lorries all_motor_vehicles
            year
count 1547.000000 1547.000000 ... 1547.000000
                                                   1547.000000
                    6.212023 ...
mean
     2005.475760
                                    0.283026
                                                     5.028188
                    3.187790 ...
std
        7.517803
                                    0.292345
                                                      3.616128
      1993.000000
                    1.000000 ...
                                  0.000648
                                                     0.010438
min
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
     2018.000000 11.000000 ...
                                   1.386260
                                                     15.845616
max
[8 rows x 12 columns]
******************
GROUP DISTRIBUTION ON TRAFFIC BY YEAR
   year region_id road_category_id ...
                                                  lorries all motor vehicles
                                           vans
   1993
              373
                              219 ... 11.087950 10.849047
                                                                  16.140504
   1994
                              219 ... 11.553254 11.082147
1
              373
                                                                  16.501645
   1995
                              219 ... 11.867358 11.382132
              373
                                                                  16.822704
3
   1996
             373
                              219 ... 12.317925 11.736691
                                                                  17.270079
   1997
1
             373
                              219 ... 12.949367 12.014887
                                                                  17,631146
   1998
             373
                              219 ... 13.548895 12.411285
                                                                  17.951606
                              219 ... 13.760718 12.586221
6
   1999
             373
                                                                  18.283915
7
   2000
             373
                             219 ... 13.925848 12.627528
                                                                  18.252833
```

216 ... 14.257194 12.544484

2001

367

18.507065

| 9 | 2002 | 367 | 216 | 14.58511 | 5 12.653575 | 18.941853 |
|----|------|-----|-----|----------|-------------|-----------|
| 10 | 2003 | 367 | 216 | 15.31544 | 7 12.717592 | 19.057797 |
| 11 | 2004 | 367 | 216 | 16.06409 | 9 13.102573 | 19.343582 |
| 12 | 2005 | 368 | 218 | 16.49870 | 1 12.951695 | 19.339939 |
| 13 | 2006 | 368 | 218 | 17.15805 | 2 12.996429 | 19.622870 |
| 14 | 2007 | 367 | 216 | 17.98110 | 0 13.093525 | 19.794497 |
| 15 | 2008 | 367 | 216 | 17.86566 | 8 12.799325 | 19.603296 |
| 16 | 2009 | 367 | 216 | 17.48055 | 6 11.743582 | 19.417265 |
| 17 | 2010 | 367 | 216 | 17.63043 | 5 11.783215 | 19.107573 |
| 18 | 2011 | 367 | 216 | 17.77509 | 6 11.466826 | 19.144793 |
| 19 | 2012 | 367 | 216 | 17.73284 | 9 11.185769 | 19.072997 |
| 20 | 2013 | 367 | 216 | 18.29212 | 1 11.284625 | 19.140180 |
| 21 | 2014 | 367 | 216 | 19.33768 | 8 11.576409 | 19.640368 |
| 22 | 2015 | 367 | 216 | 20.15400 | 4 12.003396 | 19.962072 |
| 23 | 2016 | 373 | 219 | 21.14274 | 0 12.115465 | 20.354558 |
| 24 | 2017 | 373 | 219 | 21.70446 | 6 12.258545 | 20.617241 |
| 25 | 2018 | 373 | 219 | 21.90830 | 6 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]

| 4 | L |
|--|---|
| Vehicle type | Billion vehicle miles |
| all_motor_vehicles cars_and_taxis vans lorries pedal_cycles two_wheeled_motor_vehicles buses_and_coaches | 328.115 255.013 50.9832 17.0826 3.32911 2.73903 2.29719 |
| 1 | |

MODEL Decision tree regression

features= Index(['year', 'region_id', 'road_category_id'], dtype='object')

score: 0.9931

```
*********************
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: 0.9998
regression_error: 0.0349
*******************
MODEL SVRegression
features= Index(['year', 'region_id', 'road_category_id'], dtype='object')
score: 0.9998
regression error: 0.0349
*******************
MODEL Random forest regression
features= Index(['year', 'region_id', 'road_category_id'], dtype='object')
score model forest: 0.9982
regression_error: 0.0944
*******************
MODEL Linear regression 1
features= Index(['pedal_cycles', 'two_wheeled_motor_vehicles', 'cars_and_taxis',
      'buses_and_coaches', 'vans'],
     dtype='object')
score linear: 0.9977
regression_error: 0.1261
**********************
MODEL Linear regression 2
features= Index(['year', 'region_id', 'road_category_id', 'total_link_length_km',
      'total_link_length_miles'],
     dtype='object')
score linear2: 0.2097
regression_error: 2.4114
<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
                                    lorries all_motor_vehicles
            year
                   region_id ...
count 1547.000000 1547.000000 ... 1547.000000
                                                  1547.000000
     2005.475760
                   6.212023 ... 0.283026
                                                    5.028188
mean
                   3.187790 ...
        7.517803
                                   0.292345
                                                    3.616128
std
                   1.000000 ...
     1993.000000
                                 0.000648
                                                    0.010438
min
                   3.000000 ...
25%
     1999.000000
                                 0.067333
                                                    2.238600
50%
     2005.000000
                  6.000000 ... 0.168881
                                                    4.270186
                  9.000000 ...
75%
     2012.000000
                                 0.414246
                                                    7.396709
```

1.386260

15.845616

2018.000000 11.000000 ...

max

regression error: 0.1292

| 444 | | ***** | • | | | | |
|-----|---------|-----------------------------------|---|--------|-------------|-----------|-------------------|
| | | ************** IBUTION ON TRAF | | **** | ***** | ***** | |
| GNU | | | _category_id | | vans | lorries | all motor vehicle |
| 0 | 1993 | 373 | 219 | | 11.087950 | 10.849047 | 16.14050 |
| 1 | 1994 | 373 | 219 | | 11.553254 | 11.082147 | 16.50164 |
| 2 | 1995 | 373 | 219 | | 11.867358 | 11.382132 | 16.82270 |
| 3 | | | | • • • | | | |
| | 1996 | 373 | 219 | • • • | 12.317925 | 11.736691 | 17.27007 |
| 4 | 1997 | 373 | 219 | • • • | 12.949367 | 12.014887 | 17.63114 |
| 5 | 1998 | 373 | 219 | • • • | 13.548895 | 12.411285 | 17.95160 |
| 6 | 1999 | 373 | 219 | • • • | 13.760718 | 12.586221 | 18.28391 |
| 7 | 2000 | 373 | 219 | • • • | 13.925848 | 12.627528 | 18.25283 |
| 8 | 2001 | 367 | 216 | • • • | 14.257194 | 12.544484 | 18.50706 |
| 9 | 2002 | 367 | 216 | • • • | 14.585115 | 12.653575 | 18.94185 |
| 10 | 2003 | 367 | 216 | • • • | 15.315447 | 12.717592 | 19.05779 |
| 11 | 2004 | 367 | 216 | • • • | 16.064099 | 13.102573 | 19.34358 |
| 12 | 2005 | 368 | 218 | • • • | 16.498701 | 12.951695 | 19.33993 |
| 13 | 2006 | 368 | 218 | • • • | 17.158052 | 12.996429 | 19.62287 |
| 14 | 2007 | 367 | 216 | | 17.981100 | 13.093525 | 19.79449 |
| 15 | 2008 | 367 | 216 | | 17.865668 | 12.799325 | 19.60329 |
| 16 | 2009 | 367 | 216 | | 17.480556 | 11.743582 | 19.41726 |
| 17 | 2010 | 367 | 216 | | 17.630435 | 11.783215 | 19.10757 |
| 18 | 2011 | 367 | 216 | | 17.775096 | 11.466826 | 19.14479 |
| 19 | 2012 | 367 | 216 | | 17.732849 | 11.185769 | 19.07299 |
| 20 | 2013 | 367 | 216 | | 18.292121 | 11.284625 | 19.14018 |
| 21 | 2014 | 367 | 216 | | 19.337688 | 11.576409 | 19.64036 |
| 22 | 2015 | 367 | 216 | | 20.154004 | 12.003396 | 19.96207 |
| 23 | 2016 | 373 | 219 | | 21.142740 | 12.115465 | 20.35455 |
| 24 | 2017 | 373 | 219 | | 21.704466 | 12.258545 | 20.61724 |
| 25 | 2018 | 373 | 219 | | 21.908306 | 12.300529 | 20.681070 |
| - | | 12 columns] | | | | | |
| | | ****** | ********* | **** | ******** | ***** | |
| IKA | LLIC BA | REGION IN 2018 | | | 11 | | |
| ^ | | | me year | | ll_motor_ve | | er_vehicles |
| 0 | | North Ea | | • | | 274201 | 0.221726 |
| 1 | | Wa] | | • | | 260918 | 0.309984 |
| 2 | | | lon 10090 | | | 354733 | 0.744356 |
| 3 | | East Midlar | | | | 647983 | 0.365226 |
| 4 | Yorksh1 | re and The Humb | | | | 760255 | 0.374354 |
| 5 | | Scotla | | | | 716436 | 0.507561 |
| 6 | | West Midlar | | • | | 554014 | 0.372814 |
| 7 | | South We | | • | | 238699 | 0.513533 |
| 8 | | North We | | | | 697093 | 0.399917 |
| 9 | | East of Engla | | | | 701718 | 0.512950 |
| 10 | | South Ea | ıst 12108 | • | 54. | 908644 | 0.713793 |
| [11 | rows x | 14 columns] | | | | | |
| *** | ***** | ****** | ****** | **** | ***** | ***** | |
| | | E COMPARISON | | | | | |
| 1 | | egion_id | all motor veh | icle. | s other ve | hicles | |
| 0 | 1993 | 373 | 256.2 | | | 211234 | |
| 25 | 2018 | 373 | 328.1 | | | 036214 | |
| | ZU10 | ٠٠٠ د ر د | 240.1 | .エーひろう | ,). | 070214 | |

[2 rows x 13 columns]

7

```
| Vehicle type
                            Billion vehicle miles
all_motor_vehicles
                                      328.115
cars_and_taxis
                                       255.013
                                       50.9832
| vans
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: 0.9974
regression error: 0.1025
*******************
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: 0.9998
regression error: 0.0373
******************
MODEL SVRegression
features= Index(['year', 'region_id', 'road_category_id'], dtype='object')
score: 0.9998
regression_error: 0.0373
******************
MODEL Random forest regression
features= Index(['year', 'region_id', 'road_category_id'], dtype='object')
score model_forest: 0.9977
regression_error: 0.1021
**********************
MODEL Linear regression 1
features= Index(['pedal_cycles', 'two_wheeled_motor_vehicles', 'cars_and_taxis',
      'buses_and_coaches', 'vans'],
     dtype='object')
score linear: 0.9977
regression error: 0.1188
*******************
MODEL Linear regression 2
features= Index(['year', 'region_id', 'road_category_id', 'total_link_length_km',
      'total_link_length_miles'],
     dtype='object')
score linear2: 0.2360
regression error: 2.5767
<Figure size 432x288 with 0 Axes>
```

In [28]: