LivingALifeProject

July 19, 2022

<!DOCTYPE html>

Living a life project by Michał Kaszuba

Sources and credits:

FREE DATA FROM WORLD BANK VIA GAPMINDER.ORG, CC-BY LICENSE

lhttps://www.gapminder.org/data/t

http://gapm.io/dhapiscore_whrt

https://www.systemicpeace.org/polityproject.html

https://hdr.undp.org/ent

https://worldpopulationreview.com/continents/asia-population

In this one I will try to anwser following questions:

Do people living in democratic countries tends to be more happy?

Do they earn more money?

Which continent has the highest score on average in human development report?

Which country made the biggest progress in terms of human development in the last decade?

What would be 10 greatest countries to live in terms of happiness and prosperity?

[1]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
%matplotlib inline
```

[2]:
```
hdindex = pd.read_csv('./hdi_human_development_index.
↪csv',usecols=['country','2005','2006','2007','2008','2009',
                                                                  ␣
↪'2010','2011','2012','2013','2014','2015',
                                                                  ␣
↪'2016','2017','2018','2019'])
```

[3]:
```
income = pd.read_csv('./income_per_person_gdppercapita_ppp_inflation_adjusted.
↪csv',
```

```
 ↪usecols=['country','2005','2006','2007','2008','2009','2010','2011','2012','2013','2014',
                                '2015','2016','2017','2018','2019'])
```

[4]:
```
happy = pd.read_csv('./hapiscore_whr.csv')
```

[5]:
```
democracy = pd.read_csv('./democracy_score_use_as_color.
 ↪csv',usecols=['country','2005','2006','2007','2008','2009',

 ↪'2010','2011'])
```

Preparing datasets

[6]:
```
hdindex.head(3)
```

[6]:
```
       country   2005   2006   2007   2008   2009   2010   2011   2012   2013  \
0  Afghanistan  0.418  0.429  0.447  0.447  0.460  0.472  0.477  0.489  0.496
1       Angola  0.460  0.473  0.489  0.501  0.515  0.517  0.533  0.544  0.555
2      Albania  0.706  0.713  0.722  0.728  0.733  0.745  0.764  0.775  0.782

    2014   2015   2016   2017   2018   2019
0  0.500  0.500  0.502  0.506  0.509  0.511
1  0.565  0.572  0.578  0.582  0.582  0.581
2  0.787  0.788  0.788  0.790  0.792  0.795
```

[7]:
```
income.head(3)
```

[7]:
```
       country  2005  2006  2007  2008   2009   2010   2011   2012   2013  \
0  Afghanistan  1290  1320  1460  1480   1760   1960   1910   2080   2120
1       Angola  4310  5610  6960  7850   7760   7690   7680   8040   8140
2      Albania  8040  8570  9150  9910  10.3k  10.7k  11.1k  11.2k  11.4k

    2014   2015   2016   2017   2018   2019
0   2100   2070   2060   2060   2030   2070
1   8240   8040   7570   7310   6930   6670
2  11.6k  11.9k  12.3k  12.8k  13.3k  13.7k
```

[8]:
```
happy.head(3)
```

[8]:
```
       country  2005  2006  2007  2008  2009  2010  2011  2012  2013  2014  \
0  Afghanistan   NaN   NaN   NaN  37.2  44.0  47.6  38.3  37.8  35.7  31.3
1       Angola   NaN   NaN   NaN   NaN   NaN   NaN  55.9  43.6  39.4  37.9
2      Albania   NaN   NaN  46.3   NaN  54.9  52.7  58.7  55.1  45.5  48.1

   2015  2016  2017  2018  2019
0  39.8  42.2  26.6  26.9  25.7
1   NaN   NaN   NaN   NaN   NaN
```

```
 2  46.1  45.1  46.4  50.0  48.8
```

[9]:
```
democracy.head(3)
```

[9]:
```
       country 2005 2006 2007 2008 2009 2010 2011
0  Afghanistan  NaN  NaN  NaN  NaN  NaN  NaN  NaN
1       Angola   -2   -2   -2   -2   -2   -2   -2
2      Albania    9    9    9    9    9    9    9
```

[10]:
```
income.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 195 entries, 0 to 194
Data columns (total 16 columns):
 #   Column   Non-Null Count  Dtype
---  ------   --------------  -----
 0   country  195 non-null    object
 1   2005     195 non-null    object
 2   2006     195 non-null    object
 3   2007     195 non-null    object
 4   2008     195 non-null    object
 5   2009     195 non-null    object
 6   2010     195 non-null    object
 7   2011     195 non-null    object
 8   2012     195 non-null    object
 9   2013     195 non-null    object
 10  2014     195 non-null    object
 11  2015     195 non-null    object
 12  2016     195 non-null    object
 13  2017     195 non-null    object
 14  2018     195 non-null    object
 15  2019     195 non-null    object
dtypes: object(16)
memory usage: 24.5+ KB
```

[11]:
```
happy.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 163 entries, 0 to 162
Data columns (total 16 columns):
 #   Column   Non-Null Count  Dtype
---  ------   --------------  -----
 0   country  163 non-null    object
 1   2005     27 non-null     float64
 2   2006     89 non-null     float64
 3   2007     101 non-null    float64
 4   2008     109 non-null    float64
 5   2009     113 non-null    float64
```

```
 6   2010     123 non-null    float64
 7   2011     145 non-null    float64
 8   2012     140 non-null    float64
 9   2013     135 non-null    float64
 10  2014     143 non-null    float64
 11  2015     141 non-null    float64
 12  2016     140 non-null    float64
 13  2017     146 non-null    float64
 14  2018     134 non-null    float64
 15  2019     151 non-null    float64
dtypes: float64(15), object(1)
memory usage: 20.5+ KB
```

[12]:
```
democracy.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 175 entries, 0 to 174
Data columns (total 8 columns):
 #   Column   Non-Null Count  Dtype
---  ------   --------------  -----
 0   country  175 non-null    object
 1   2005     163 non-null    object
 2   2006     163 non-null    object
 3   2007     162 non-null    object
 4   2008     163 non-null    object
 5   2009     163 non-null    object
 6   2010     163 non-null    object
 7   2011     163 non-null    object
dtypes: object(8)
memory usage: 11.1+ KB
```

[13]:
```
hdindex.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 189 entries, 0 to 188
Data columns (total 16 columns):
 #   Column   Non-Null Count  Dtype
---  ------   --------------  -----
 0   country  189 non-null    object
 1   2005     185 non-null    float64
 2   2006     186 non-null    float64
 3   2007     186 non-null    float64
 4   2008     186 non-null    float64
 5   2009     186 non-null    float64
 6   2010     188 non-null    float64
 7   2011     188 non-null    float64
 8   2012     188 non-null    float64
 9   2013     188 non-null    float64
```

```
 10  2014     188 non-null    float64
 11  2015     188 non-null    float64
 12  2016     188 non-null    float64
 13  2017     189 non-null    float64
 14  2018     189 non-null    float64
 15  2019     189 non-null    float64
dtypes: float64(15), object(1)
memory usage: 23.8+ KB
```

[14]:
```
def timesK(x):
    if 'k' in x:
        try:
            first,second = x.split(sep='k')
            result = float(first)*1000
            return float(result)
        except:
            return x
    elif 'k' not in x:
        try:
            return float(x)
        except:
            return x
```

[15]:
```
for year in income:
    income[year] = income[year].apply(timesK)
```

[16]:
```
income.head()
```

[16]:

	country	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
0	Afghanistan	1290.0	1320.0	1460.0	1480.0	1760.0	1960.0	1910.0	2080.0	2120.0	2100.0	2070.0	2060.0	2060.0	2030.0	2070.0
1	Angola	4310.0	5610.0	6960.0	7850.0	7760.0	7690.0	7680.0	8040.0	8140.0	8240.0	8040.0	7570.0	7310.0	6930.0	6670.0
2	Albania	8040.0	8570.0	9150.0	9910.0	10300.0	10700.0	11100.0	11200.0	11400.0	11600.0	11900.0	12300.0	12800.0	13300.0	13700.0
3	Andorra	45000.0	48400.0	49200.0	46900.0	47200.0	44100.0	47500.0	47500.0	49500.0	50900.0	52700.0	54500.0	56300.0	58300.0	
4	United Arab Emirates	80800.0	86400.0	76600.0	68800.0	58400.0	54900.0	56100.0	57400.0	59900.0	62500.0	65300.0	66500.0	67200.0	67000.0	

```
3  58400.0
4  68300.0
```

[17]:
```
income.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 195 entries, 0 to 194
Data columns (total 16 columns):
 #   Column   Non-Null Count  Dtype
---  ------   --------------  -----
 0   country  195 non-null    object
 1   2005     195 non-null    float64
 2   2006     195 non-null    float64
 3   2007     195 non-null    float64
 4   2008     195 non-null    float64
 5   2009     195 non-null    float64
 6   2010     195 non-null    float64
 7   2011     195 non-null    float64
 8   2012     195 non-null    float64
 9   2013     195 non-null    float64
 10  2014     195 non-null    float64
 11  2015     195 non-null    float64
 12  2016     195 non-null    float64
 13  2017     195 non-null    float64
 14  2018     195 non-null    float64
 15  2019     195 non-null    float64
dtypes: float64(15), object(1)
memory usage: 24.5+ KB
```

[18]:
```
def makeAnumber(x):
    if '-' in x:
        try:
            first,second = x.split(sep='-')
            result = float(second)*(-1)
            return float(result)
        except:
            return x
    elif '-' not in x:
        try:
            return float(x)
        except:
            return x
```

[19]:
```
democracy = democracy.astype(str)
```

[20]:
```
for year in democracy:
    democracy[year] = democracy[year].apply(makeAnumber)
```

[21]:
```
democracy.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 175 entries, 0 to 174
Data columns (total 8 columns):
 #   Column   Non-Null Count  Dtype
---  ------   --------------  -----
 0   country  175 non-null    object
 1   2005     163 non-null    float64
 2   2006     163 non-null    float64
 3   2007     162 non-null    float64
 4   2008     163 non-null    float64
 5   2009     163 non-null    float64
 6   2010     163 non-null    float64
 7   2011     163 non-null    float64
dtypes: float64(7), object(1)
memory usage: 11.1+ KB
```

Prepering datasets Democracy vs Happiness

[22]:
```
democracy = democracy.fillna(axis=1,method='bfill')
```

[23]:
```
happy = happy.fillna(axis=1,method='bfill')
```

[24]:
```
demohappy = democracy.
  ↪merge(happy,how='inner',on='country',suffixes=['_democracy','_happyness'],sort=True)
```

[25]:
```
demohappy.head()
```

[25]:

	country	2005_democracy	2006_democracy	2007_democracy	2008_democracy	\
0	Afghanistan	NaN	NaN	NaN	NaN	
1	Albania	9.0	9.0	9.0	9.0	
2	Algeria	2.0	2.0	2.0	2.0	
3	Angola	-2.0	-2.0	-2.0	-2.0	
4	Argentina	8.0	8.0	8.0	8.0	

	2009_democracy	2010_democracy	2011_democracy	2005_happyness	2006_happyness	\
0	NaN	NaN	NaN	37.2	37.2	
1	9.0	9.0	9.0	46.3	46.3	
2	2.0	2.0	2.0	54.6	54.6	
3	-2.0	-2.0	-2.0	55.9	55.9	
4	8.0	8.0	8.0	63.1	63.1	

	…	2010_happyness	2011_happyness	2012	2013	2014	2015	2016	2017	\
0	…	47.6	38.3	37.8	35.7	31.3	39.8	42.2	26.6	
1	…	52.7	58.7	55.1	45.5	48.1	46.1	45.1	46.4	
2	…	54.6	53.2	56.0	63.5	63.5	53.4	53.4	52.5	
3	…	55.9	55.9	43.6	39.4	37.9	NaN	NaN	NaN	

```
4  …           64.4           67.8  64.7  65.8  66.7  67.0  64.3  60.4

   2018  2019
0  26.9  25.7
1  50.0  48.8
2  50.4  50.1
3   NaN   NaN
4  57.9  59.7

[5 rows x 23 columns]
```

[26]:
```
demohappy.
↪drop(axis=1,columns=['2012','2013','2014','2015','2016','2017','2018','2019'],inplace=True)
```

[27]:
```
demohappy.head()
```

[27]:
```
       country 2005_democracy 2006_democracy 2007_democracy 2008_democracy  \
0  Afghanistan            NaN            NaN            NaN            NaN
1      Albania            9.0            9.0            9.0            9.0
2      Algeria            2.0            2.0            2.0            2.0
3       Angola           -2.0           -2.0           -2.0           -2.0
4    Argentina            8.0            8.0            8.0            8.0

  2009_democracy 2010_democracy 2011_democracy 2005_happyness 2006_happyness  \
0            NaN            NaN            NaN           37.2           37.2
1            9.0            9.0            9.0           46.3           46.3
2            2.0            2.0            2.0           54.6           54.6
3           -2.0           -2.0           -2.0           55.9           55.9
4            8.0            8.0            8.0           63.1           63.1

  2007_happyness 2008_happyness 2009_happyness 2010_happyness 2011_happyness
0           37.2           37.2           44.0           47.6           38.3
1           46.3           54.9           54.9           52.7           58.7
2           54.6           54.6           54.6           54.6           53.2
3           55.9           55.9           55.9           55.9           55.9
4           60.7           59.6           64.2           64.4           67.8
```

[28]:
```
demohappy.dropna(inplace=True)
```

[29]:
```
demohappy = demohappy.astype(str)
```

[30]:
```
for year in demohappy:
    demohappy[year] = demohappy[year].apply(makeAnumber)
```

[31]:
```
demohappy.sort_index().info()
```

```
<class 'pandas.core.frame.DataFrame'>
```

```
Int64Index: 151 entries, 1 to 155
Data columns (total 15 columns):
 #   Column           Non-Null Count  Dtype
---  ------           --------------  -----
 0   country          151 non-null    object
 1   2005_democracy   151 non-null    float64
 2   2006_democracy   151 non-null    float64
 3   2007_democracy   151 non-null    float64
 4   2008_democracy   151 non-null    float64
 5   2009_democracy   151 non-null    float64
 6   2010_democracy   151 non-null    float64
 7   2011_democracy   151 non-null    float64
 8   2005_happyness   151 non-null    float64
 9   2006_happyness   151 non-null    float64
 10  2007_happyness   151 non-null    float64
 11  2008_happyness   151 non-null    float64
 12  2009_happyness   151 non-null    float64
 13  2010_happyness   151 non-null    float64
 14  2011_happyness   151 non-null    float64
dtypes: float64(14), object(1)
memory usage: 18.9+ KB
```

Prepering datasets Democracy vs Income

[32]:
```
democracy = democracy.fillna(axis=1,method='bfill')
```

[33]:
```
demoinc = democracy.
 ↪merge(income,how='inner',on='country',suffixes=['_democracy','_income'],sort=True)
```

[34]:
```
demoinc.
 ↪drop(axis=1,columns=['2012','2013','2014','2015','2016','2017','2018','2019'],inplace=True)
```

[35]:
```
demoinc.dropna(inplace=True)
```

[36]:
```
demoinc.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 162 entries, 1 to 164
Data columns (total 15 columns):
 #   Column           Non-Null Count  Dtype
---  ------           --------------  -----
 0   country          162 non-null    object
 1   2005_democracy   162 non-null    float64
 2   2006_democracy   162 non-null    float64
 3   2007_democracy   162 non-null    float64
 4   2008_democracy   162 non-null    float64
 5   2009_democracy   162 non-null    float64
 6   2010_democracy   162 non-null    float64
```

```
 7   2011_democracy  162 non-null    float64
 8   2005_income     162 non-null    float64
 9   2006_income     162 non-null    float64
 10  2007_income     162 non-null    float64
 11  2008_income     162 non-null    float64
 12  2009_income     162 non-null    float64
 13  2010_income     162 non-null    float64
 14  2011_income     162 non-null    float64
dtypes: float64(14), object(1)
memory usage: 20.2+ KB
```

Prepering datasets Split for continents in HDI

[37]:
```
africa = pd.read_csv('./Africa.csv',usecols=['name'])
asia = pd.read_csv('./Asia.csv',usecols=['name'])
europe = pd.read_csv('./Europe.csv',usecols=['name'])
northamerica = pd.read_csv('./NorthAmerica.csv',usecols=['name'])
southamerica = pd.read_csv('./SouthAmerica.csv',usecols=['name'])
```

[38]:
```
hdindex.tail(2)
```

[38]:

	country	2005	2006	2007	2008	2009	2010	2011	2012	2013	\
187	Zambia	0.471	0.482	0.488	0.503	0.517	0.527	0.534	0.549	0.557	
188	Zimbabwe	0.411	0.414	0.421	0.422	0.458	0.482	0.499	0.525	0.537	

	2014	2015	2016	2017	2018	2019
187	0.561	0.569	0.571	0.578	0.582	0.584
188	0.547	0.553	0.558	0.563	0.569	0.571

[39]:
```
hdindex.insert(loc=1,column='continent',value=0)
```

[40]:
```
africat= ['Cote d\'Ivoire','Congo, Dem. Rep.','Congo, Rep.']
for country in africa['name']:
    africat.append(country)
```

[41]:
```
asiat = ['Hong Kong, China','Kyrgyz Republic','Lao']
for country in asia['name']:
    asiat.append(country)
```

[42]:
```
europet = ['Slovak Republic']
for country in europe['name']:
    europet.append(country)
```

[43]:
```
northamericat = ['St. Kitts and Nevis','St. Lucia','St. Vincent and the␣
 ↪Grenadines']
for country in northamerica['name']:
    northamericat.append(country)
```

[44]:
```
southamericat = []
for country in southamerica['name']:
    southamericat.append(country)
```

[45]:
```
for country in hdindex['country']:
    if country in africat:
        hdindex.loc[hdindex['country']==country,['continent']] = 'africa'

    elif country in asiat:
        hdindex.loc[hdindex['country']==country,['continent']] = 'asia'

    elif country in europet:
        hdindex.loc[hdindex['country']==country,['continent']] = 'europe'

    elif country in northamericat:
        hdindex.loc[hdindex['country']==country,['continent']] = 'north america'

    elif country in southamericat:
        hdindex.loc[hdindex['country']==country,['continent']] = 'south america'
    else:
        hdindex.loc[hdindex['country']==country,['continent']] = 'australia &␣
 ↪oceania'
```

[46]:
```
contgroups = hdindex.groupby(by='continent').mean()
```

[47]:
```
contgroups.head()
```

[47]:

continent	2005	2006	2007	2008	2009
africa	0.477769	0.485288	0.493346	0.501538	0.509692
asia	0.671283	0.679196	0.687174	0.693457	0.697413
australia & oceania	0.669545	0.673182	0.678091	0.681364	0.683273
europe	0.829707	0.834143	0.839905	0.844595	0.845381
north america	0.710696	0.717870	0.722913	0.728130	0.728870

continent	2010	2011	2012	2013	2014
africa	0.514792	0.521585	0.528792	0.535962	0.541509
asia	0.703000	0.709532	0.715702	0.718723	0.721596
australia & oceania	0.688818	0.692273	0.694545	0.700273	0.703000
europe	0.849119	0.853524	0.856595	0.861667	0.865333
north america	0.731826	0.734304	0.736000	0.738478	0.743261

continent	2015	2016	2017	2018	2019
africa	0.545811	0.549170	0.553736	0.557038	0.560736

```
asia                  0.725787  0.728745  0.733277  0.736021  0.739362
australia & oceania   0.708091  0.709000  0.709667  0.710917  0.714083
europe                0.867952  0.871238  0.874238  0.877310  0.879881
north america         0.746478  0.749391  0.751435  0.753174  0.755957
```

Prepering data for HDI last decade

[48]:
```
hdindex.head(2)
```

[48]:
```
       country continent   2005   2006   2007   2008   2009   2010   2011  \
0  Afghanistan      asia  0.418  0.429  0.447  0.447  0.460  0.472  0.477
1       Angola    africa  0.460  0.473  0.489  0.501  0.515  0.517  0.533

    2012   2013   2014   2015   2016   2017   2018   2019
0  0.489  0.496  0.500  0.500  0.502  0.506  0.509  0.511
1  0.544  0.555  0.565  0.572  0.578  0.582  0.582  0.581
```

[49]:
```
hdilastdecade = hdindex.
 ↪drop(axis=1,columns=['continent','2005','2006','2007','2008']).
 ↪set_index('country')
```

[50]:
```
hdilastdecade.head(2)
```

[50]:
```
              2009   2010   2011   2012   2013   2014   2015   2016   2017  \
country
Afghanistan  0.460  0.472  0.477  0.489  0.496  0.500  0.500  0.502  0.506
Angola       0.515  0.517  0.533  0.544  0.555  0.565  0.572  0.578  0.582

              2018   2019
country
Afghanistan  0.509  0.511
Angola       0.582  0.581
```

[51]:
```
hdilastdecade.insert(loc=0,column='progress_2009-2019',value=0)
```

[52]:
```
for country in hdilastdecade['2009']:
    hdilastdecade['progress_2009-2019'] = hdilastdecade['2019'] -␣
 ↪hdilastdecade['2009']
```

Prepering data for top 10 countries

[53]:
```
happy2019 = happy.drop(axis=1,columns=['2005','2006','2007','2008','2009',
                                       ␣
 ↪'2010','2011','2012','2013','2014','2015','2016','2017','2018'])
```

[54]:
```
income2019 = income.drop(axis=1,columns=['2005','2006','2007','2008','2009',
                                         ␣
 ↪'2010','2011','2012','2013','2014','2015','2016','2017','2018'])
```

[55]:
```
top = income2019.
↪merge(happy2019,how='inner',on='country',suffixes=['_income','_happyness'],sort=True).
↪set_index('country').dropna()
```

[56]:
```
top.head()
```

[56]:

country	2019_income	2019_happyness
Afghanistan	2070.0	25.7
Albania	13700.0	48.8
Algeria	11500.0	50.1
Argentina	22100.0	59.7
Armenia	13700.0	46.8

Closer look on to the data

Do people living in democratic countries tends to be more happy?

[57]:
```
demohappy.head()
```

[57]:

	country	2005_democracy	2006_democracy	2007_democracy	2008_democracy	\
1	Albania	9.0	9.0	9.0	9.0	
2	Algeria	2.0	2.0	2.0	2.0	
3	Angola	-2.0	-2.0	-2.0	-2.0	
4	Argentina	8.0	8.0	8.0	8.0	
5	Armenia	5.0	5.0	5.0	5.0	

	2009_democracy	2010_democracy	2011_democracy	2005_happyness	\
1	9.0	9.0	9.0	46.3	
2	2.0	2.0	2.0	54.6	
3	-2.0	-2.0	-2.0	55.9	
4	8.0	8.0	8.0	63.1	
5	5.0	5.0	5.0	42.9	

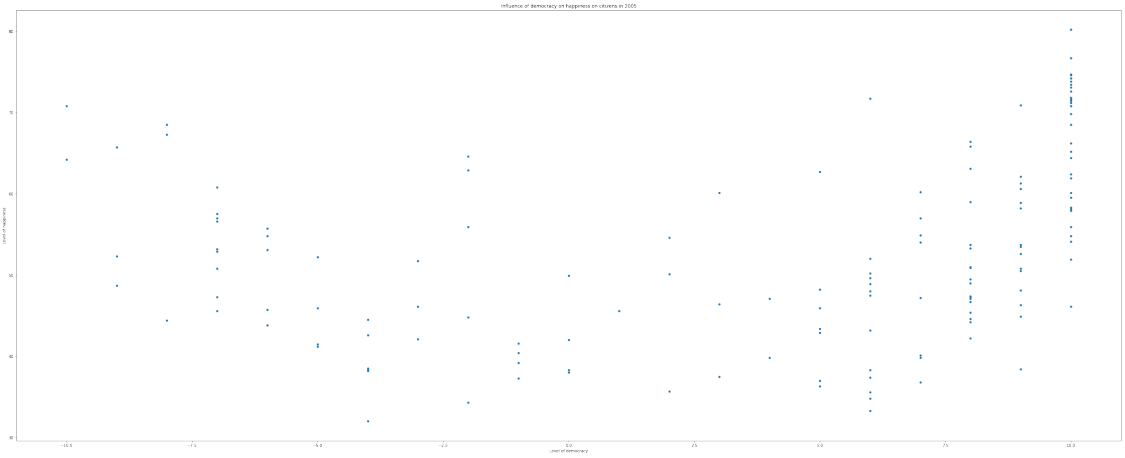
	2006_happyness	2007_happyness	2008_happyness	2009_happyness	\
1	46.3	46.3	54.9	54.9	
2	54.6	54.6	54.6	54.6	
3	55.9	55.9	55.9	55.9	
4	63.1	60.7	59.6	64.2	
5	42.9	48.8	46.5	41.8	

	2010_happyness	2011_happyness
1	52.7	58.7
2	54.6	53.2
3	55.9	55.9
4	64.4	67.8
5	43.7	42.6

To answer this question, we will compare democracy indexes in range -10 to 10, where -10 means no democracy at all and 10 means pure democracy with level of happiness of their societies in range 0 to 100.

[67]:
```
demohappy.
 ↪plot(x='2005_democracy',y='2005_happyness',kind='scatter',figsize=(50,20),xlabel='Level␣
 ↪of democracy',
              ylabel='Level of happiness',title='Influence of democracy on␣
 ↪happiness on citizens in 2005')
```

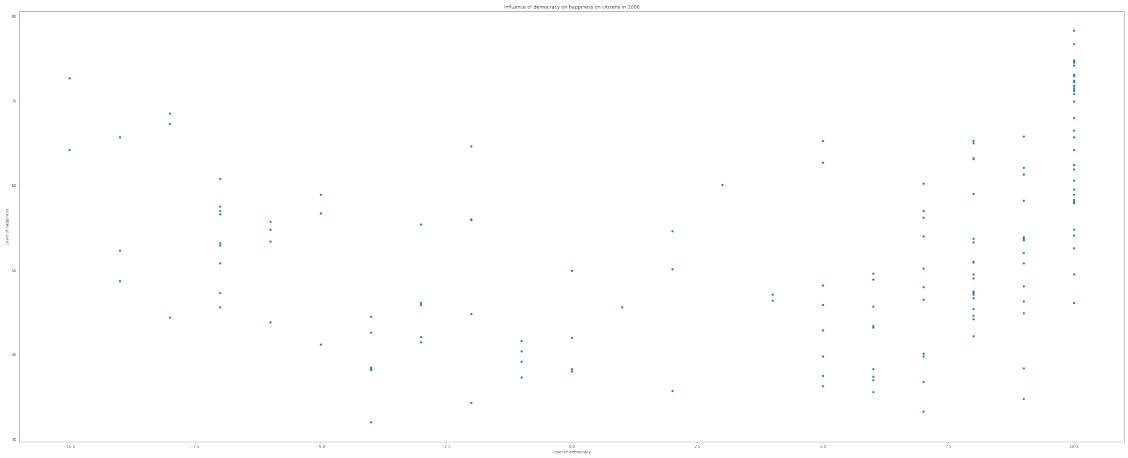
[67]:
```
<AxesSubplot:title={'center':'Influence of democracy on happiness on citizens in
2005'}, xlabel='Level of democracy', ylabel='Level of happiness'>
```



As we can see on the scatter plot above: Yes, peoples in democratic countries tends to be more happy. What is also interesting that peoples in countries with no democracy at all seems to be happy as well. The lowest happiness is in countries around 0 on the democracy index. I guess it can be quite frustrating to have something to say, but not enough to change anything. Understandable. Let's check if situation will change in following years.

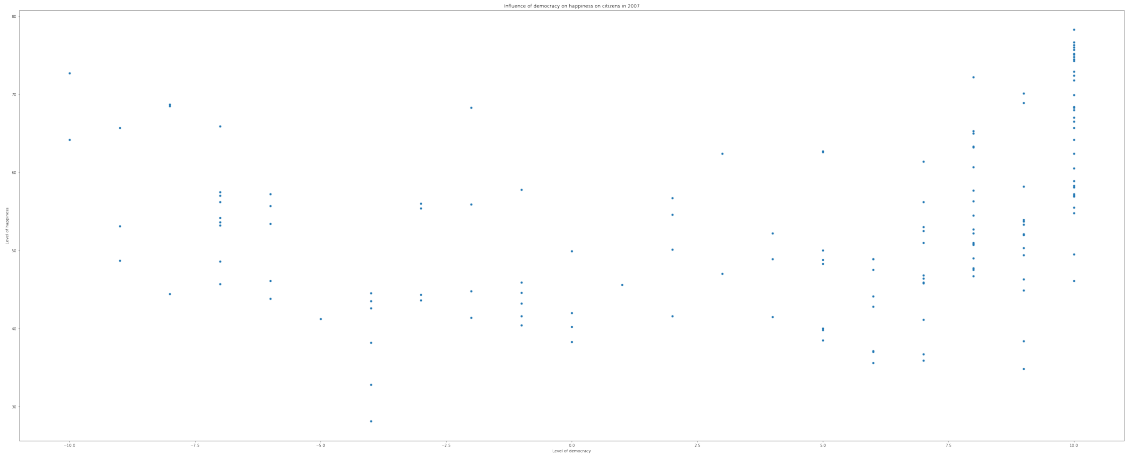
[68]:
```
demohappy.
 ↪plot(x='2006_democracy',y='2006_happyness',kind='scatter',figsize=(50,20),xlabel='Level␣
 ↪of democracy',
              ylabel='Level of happiness',title='Influence of democracy on␣
 ↪happiness on citizens in 2006')
```

[68]:
```
<AxesSubplot:title={'center':'Influence of democracy on happiness on citizens in
2006'}, xlabel='Level of democracy', ylabel='Level of happiness'>
```



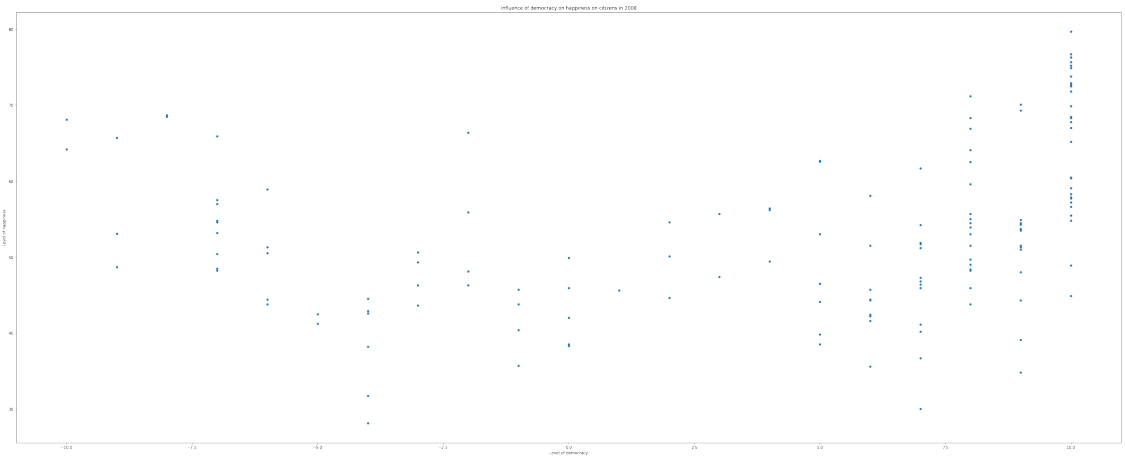
[69]:
```
demohappy.
 ↪plot(x='2007_democracy',y='2007_happyness',kind='scatter',figsize=(50,20),xlabel='Level␣
 ↪of democracy',
                ylabel='Level of happiness',title='Influence of democracy on␣
 ↪happiness on citizens in 2007')
```

[69]:
```
<AxesSubplot:title={'center':'Influence of democracy on happiness on citizens in
2007'}, xlabel='Level of democracy', ylabel='Level of happiness'>
```



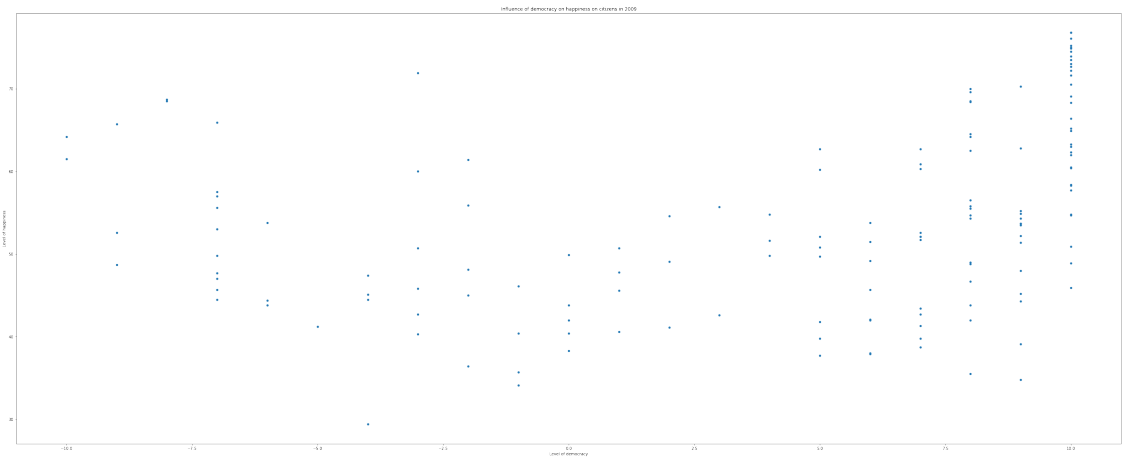
[70]:
```
demohappy.
 ↪plot(x='2008_democracy',y='2008_happyness',kind='scatter',figsize=(50,20),xlabel='Level␣
 ↪of democracy',
                ylabel='Level of happiness',title='Influence of democracy on␣
 ↪happiness on citizens in 2008')
```

[70]: <AxesSubplot:title={'center':'Influence of democracy on happiness on citizens in 2008'}, xlabel='Level of democracy', ylabel='Level of happiness'>



[71]:
```
demohappy.
 ↪plot(x='2009_democracy',y='2009_happyness',kind='scatter',figsize=(50,20),xlabel='Level␣
 ↪of democracy',
                ylabel='Level of happiness',title='Influence of democracy on␣
 ↪happiness on citizens in 2009')
```

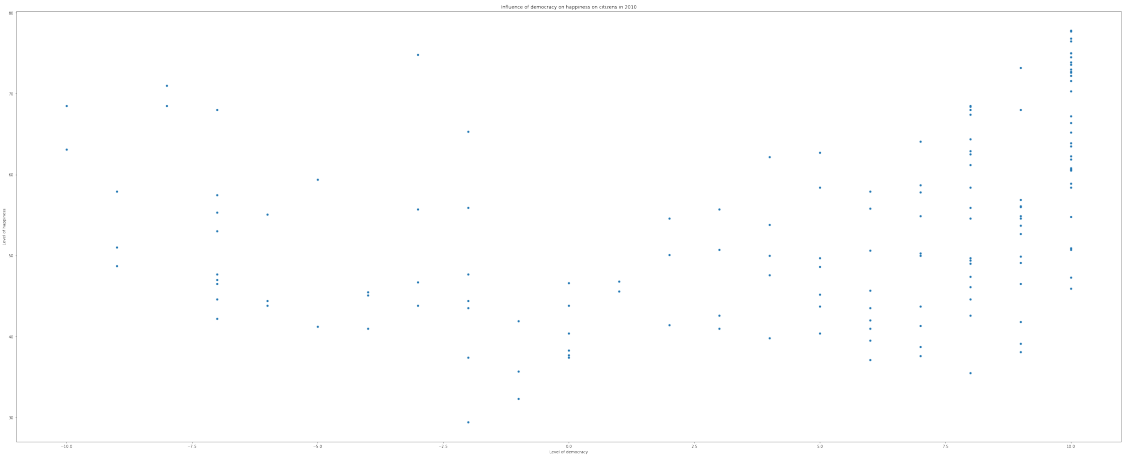
[71]: <AxesSubplot:title={'center':'Influence of democracy on happiness on citizens in 2009'}, xlabel='Level of democracy', ylabel='Level of happiness'>



[72]:
```
demohappy.
 ↪plot(x='2010_democracy',y='2010_happyness',kind='scatter',figsize=(50,20),xlabel='Level␣
 ↪of democracy',
```

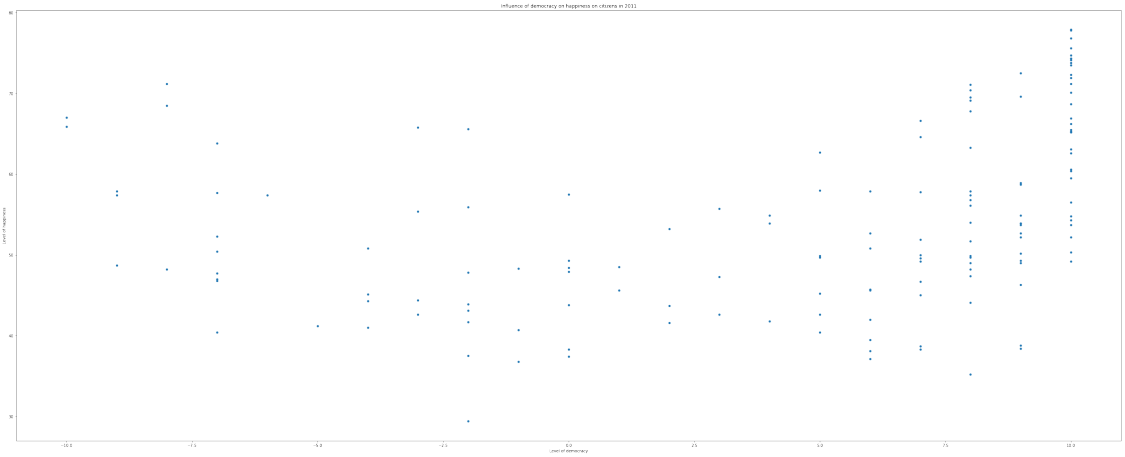
```
                ylabel='Level of happiness',title='Influence of democracy on␣
↪happiness on citizens in 2010')
```

[72]:
```
<AxesSubplot:title={'center':'Influence of democracy on happiness on citizens in
2010'}, xlabel='Level of democracy', ylabel='Level of happiness'>
```



[73]:
```
demohappy.
↪plot(x='2011_democracy',y='2011_happyness',kind='scatter',figsize=(50,20),xlabel='Level␣
↪of democracy',
                ylabel='Level of happiness',title='Influence of democracy on␣
↪happiness on citizens in 2011')
```

[73]:
```
<AxesSubplot:title={'center':'Influence of democracy on happiness on citizens in
2011'}, xlabel='Level of democracy', ylabel='Level of happiness'>
```



And no, We couldn't see many changes in people's perspective over the years. Peoples are still more

happy in democratic countries. Let's jump to the next question, but do they earn more money?

[66]:
```
demoinc.head()
```

[66]:

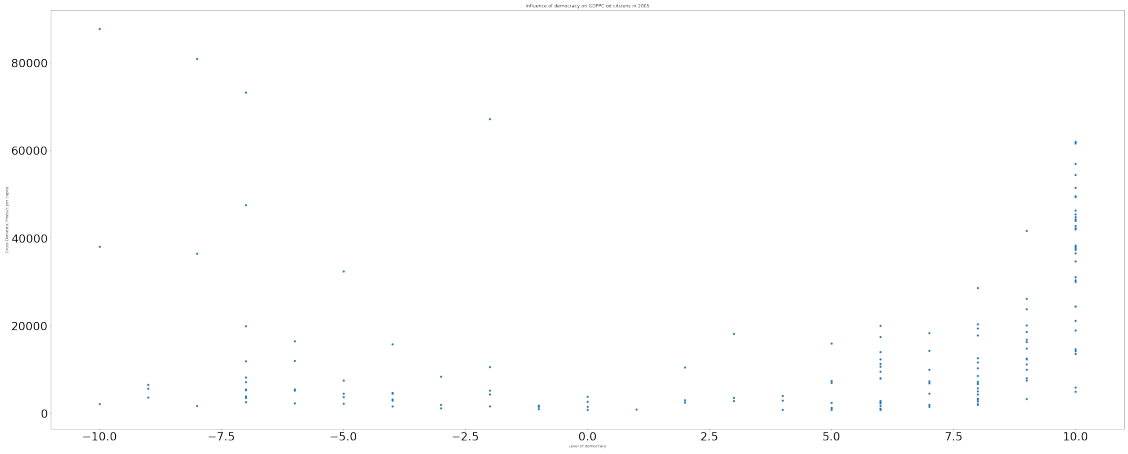
	country	2005_democracy	2006_democracy	2007_democracy	2008_democracy	\
1	Albania	9.0	9.0	9.0	9.0	
2	Algeria	2.0	2.0	2.0	2.0	
3	Angola	-2.0	-2.0	-2.0	-2.0	
4	Argentina	8.0	8.0	8.0	8.0	
5	Armenia	5.0	5.0	5.0	5.0	

	2009_democracy	2010_democracy	2011_democracy	2005_income	2006_income	\
1	9.0	9.0	9.0	8040.0	8570.0	
2	2.0	2.0	2.0	10500.0	10500.0	
3	-2.0	-2.0	-2.0	4310.0	5610.0	
4	8.0	8.0	8.0	19400.0	20800.0	
5	5.0	5.0	5.0	7420.0	8460.0	

	2007_income	2008_income	2009_income	2010_income	2011_income
1	9150.0	9910.0	10300.0	10700.0	11100.0
2	10700.0	10800.0	10800.0	11000.0	11100.0
3	6960.0	7850.0	7760.0	7690.0	7680.0
4	22400.0	23100.0	21500.0	23500.0	24600.0
5	9710.0	10500.0	9050.0	9290.0	9730.0

[74]:
```
demoinc.
 ↪plot(x='2005_democracy',y='2005_income',kind='scatter',figsize=(50,20),fontsize=30,
            xlabel='Level of democracy',ylabel='Gross Domestic Product per␣
 ↪capita',title='Influence of democracy on GDPPC od citizens in 2005')
```

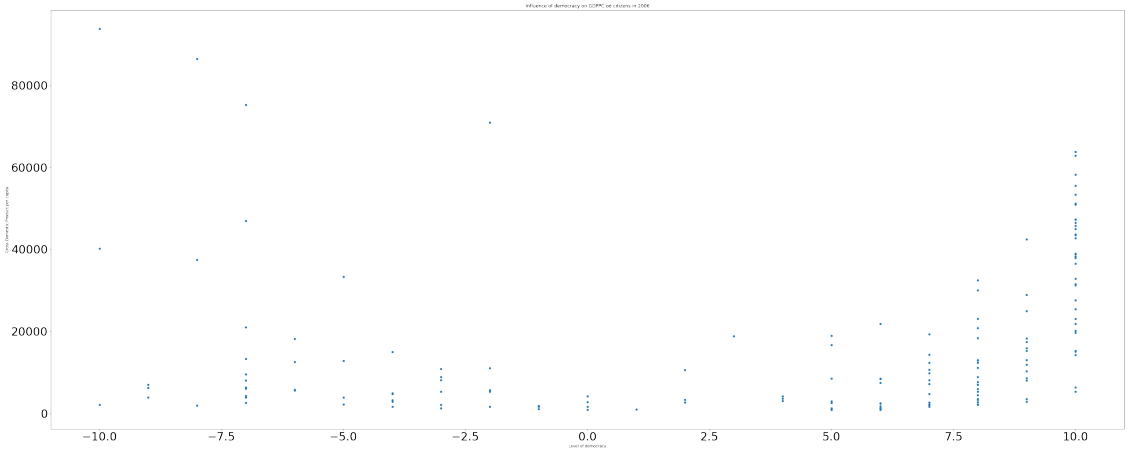
[74]:
```
<AxesSubplot:title={'center':'Influence of democracy on GDPPC od citizens in
2005'}, xlabel='Level of democracy', ylabel='Gross Domestic Product per capita'>
```



In 2005 peoples were earning more money in democratic countries in general. We can see some exceptions of well-developed countries which are not democratic, but in general, there is a massive disproportion between democratic and not democratic countries in terms of income per capita. As previously, let's check the following years if the trend remained the same.

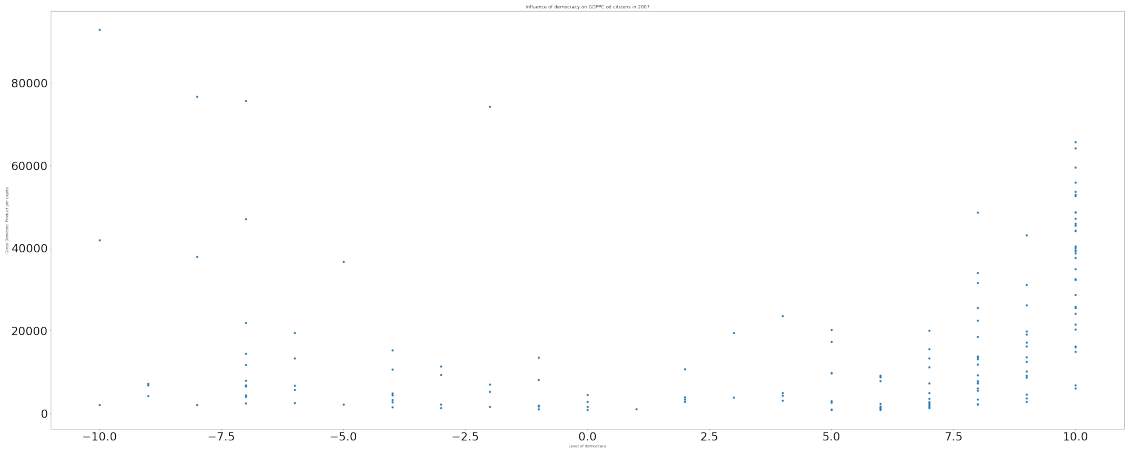
[75]:
```
demoinc.
↪plot(x='2006_democracy',y='2006_income',kind='scatter',figsize=(50,20),fontsize=30,xlabel='
↪of democracy',
            ylabel='Gross Domestic Product per capita',title='Influence of␣
↪democracy on GDPPC od citizens in 2006')
```

[75]:
```
<AxesSubplot:title={'center':'Influence of democracy on GDPPC od citizens in
2006'}, xlabel='Level of democracy', ylabel='Gross Domestic Product per capita'>
```



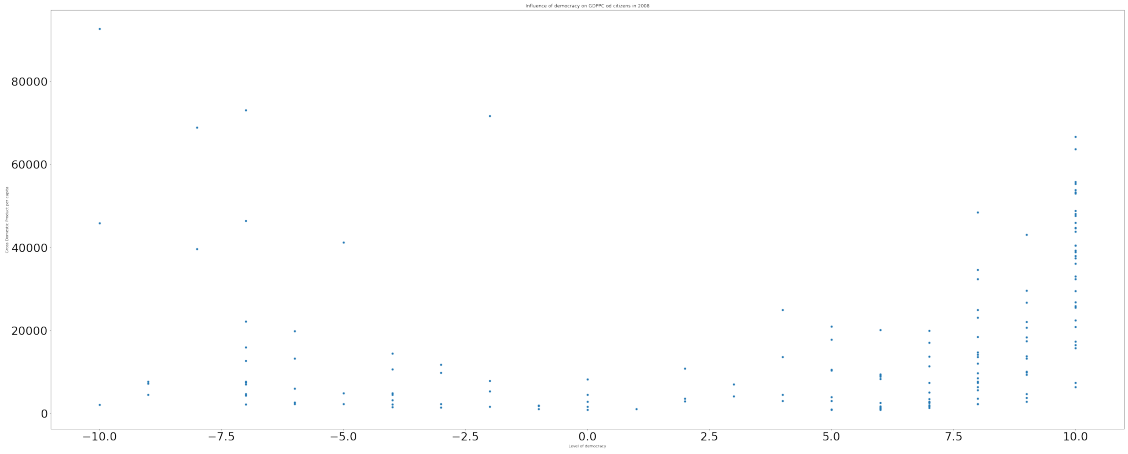
[76]:
```
demoinc.
↪plot(x='2007_democracy',y='2007_income',kind='scatter',figsize=(50,20),fontsize=30,
            xlabel='Level of democracy',ylabel='Gross Domestic Product per␣
↪capita',title='Influence of democracy on GDPPC od citizens in 2007')
```

[76]:
```
<AxesSubplot:title={'center':'Influence of democracy on GDPPC od citizens in
2007'}, xlabel='Level of democracy', ylabel='Gross Domestic Product per capita'>
```



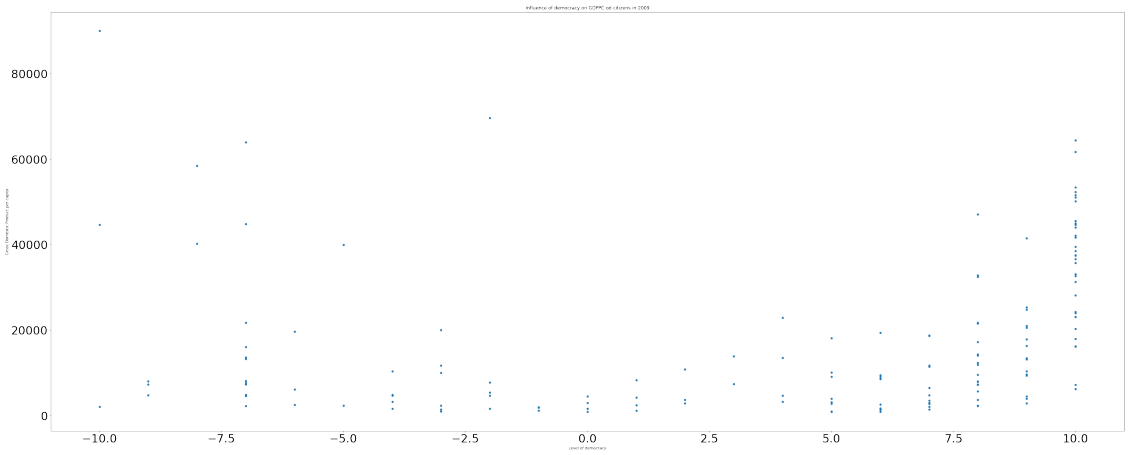
[77]:
```
demoinc.
 ↪plot(x='2008_democracy',y='2008_income',kind='scatter',figsize=(50,20),fontsize=30,xlabel='
 ↪of democracy',
            ylabel='Gross Domestic Product per capita',title='Influence of␣
 ↪democracy on GDPPC od citizens in 2008')
```

[77]:
```
<AxesSubplot:title={'center':'Influence of democracy on GDPPC od citizens in
2008'}, xlabel='Level of democracy', ylabel='Gross Domestic Product per capita'>
```



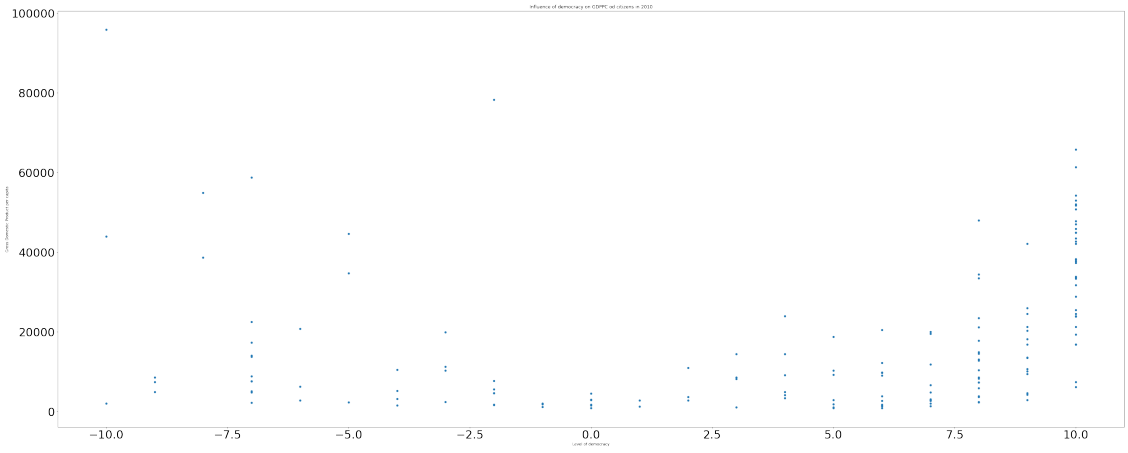
[78]:
```
demoinc.
 ↪plot(x='2009_democracy',y='2009_income',kind='scatter',figsize=(50,20),fontsize=30,xlabel='
 ↪of democracy',
            ylabel='Gross Domestic Product per capita',title='Influence of␣
 ↪democracy on GDPPC od citizens in 2009')
```

[78]: <AxesSubplot:title={'center':'Influence of democracy on GDPPC od citizens in 2009'}, xlabel='Level of democracy', ylabel='Gross Domestic Product per capita'>



[79]:
```
demoinc.
↪plot(x='2010_democracy',y='2010_income',kind='scatter',figsize=(50,20),fontsize=30,xlabel='
↪of democracy',
            ylabel='Gross Domestic Product per capita',title='Influence of␣
↪democracy on GDPPC od citizens in 2010')
```

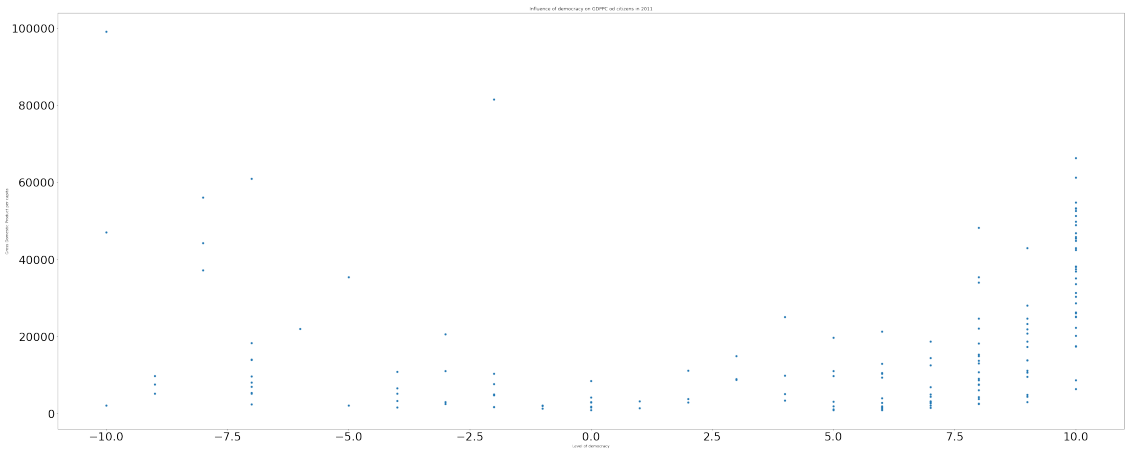
[79]: <AxesSubplot:title={'center':'Influence of democracy on GDPPC od citizens in 2010'}, xlabel='Level of democracy', ylabel='Gross Domestic Product per capita'>



[80]:
```
demoinc.
↪plot(x='2011_democracy',y='2011_income',kind='scatter',figsize=(50,20),fontsize=30,xlabel='
↪of democracy',
```

```
            ylabel='Gross Domestic Product per capita',title='Influence of␣
↪democracy on GDPPC od citizens in 2011')
```

[80]:
```
<AxesSubplot:title={'center':'Influence of democracy on GDPPC od citizens in
2011'}, xlabel='Level of democracy', ylabel='Gross Domestic Product per capita'>
```



And again following years did not change much, so the answer is, Yes peoples do earn more in democratic countries.

Which continent has the highest score on average in human development index?

"The Human Development Index (HDI) is a summary measure of average achievement in key dimensions of human development: a long and healthy life, being knowledgeable and have a decent standard of living. The HDI is the geometric mean of normalized indices for each of the three dimensions." - https://hdr.undp.org/data-center/human-development-index#/indicies/HDI

[81]:
```
contgroups.head()
```

[81]:

continent	2005	2006	2007	2008	2009
africa	0.477769	0.485288	0.493346	0.501538	0.509692
asia	0.671283	0.679196	0.687174	0.693457	0.697413
australia & oceania	0.669545	0.673182	0.678091	0.681364	0.683273
europe	0.829707	0.834143	0.839905	0.844595	0.845381
north america	0.710696	0.717870	0.722913	0.728130	0.728870

continent	2010	2011	2012	2013	2014
africa	0.514792	0.521585	0.528792	0.535962	0.541509
asia	0.703000	0.709532	0.715702	0.718723	0.721596
australia & oceania	0.688818	0.692273	0.694545	0.700273	0.703000
europe	0.849119	0.853524	0.856595	0.861667	0.865333
north america	0.731826	0.734304	0.736000	0.738478	0.743261

	2015	2016	2017	2018	2019
continent					
africa	0.545811	0.549170	0.553736	0.557038	0.560736
asia	0.725787	0.728745	0.733277	0.736021	0.739362
australia & oceania	0.708091	0.709000	0.709667	0.710917	0.714083
europe	0.867952	0.871238	0.874238	0.877310	0.879881
north america	0.746478	0.749391	0.751435	0.753174	0.755957

[82]:
```
contgroups.transpose().
↪plot(kind='bar',figsize=(50,20),fontsize=30,xlabel='Years',ylabel='Human␣
↪Development Index',
                          title="HDI by continents")
```

[82]: <AxesSubplot:title={'center':'HDI by continents'}, xlabel='Years', ylabel='Human Development Index'>

Clearly, Europe is most developed in terms of human development by far.

Which country made the biggest progress in terms of human development in the last decade?

[84]:
```
hdilastdecade.tail(5)
```

[84]:

	progress_2009-2019	2009	2010	2011	2012	2013	2014	\
country								
Samoa	0.024	0.691	0.698	0.701	0.698	0.700	0.703	
Yemen	-0.032	0.502	0.506	0.506	0.504	0.509	0.502	
South Africa	0.054	0.655	0.664	0.665	0.675	0.685	0.693	
Zambia	0.067	0.517	0.527	0.534	0.549	0.557	0.561	
Zimbabwe	0.113	0.458	0.482	0.499	0.525	0.537	0.547	

2015	2016	2017	2018	2019

```
country
Samoa          0.707  0.710  0.710  0.709  0.715
Yemen          0.483  0.474  0.467  0.468  0.470
South Africa   0.701  0.703  0.705  0.707  0.709
Zambia         0.569  0.571  0.578  0.582  0.584
Zimbabwe       0.553  0.558  0.563  0.569  0.571
```

[85]:
```
hdilastdecade['progress_2009-2019'].max()
```

[85]:
```
0.11299999999999999
```

[86]:
```
hdilastdecade.where(hdilastdecade['progress_2009-2019'] == 0.11299999999999999).
↪dropna()
```

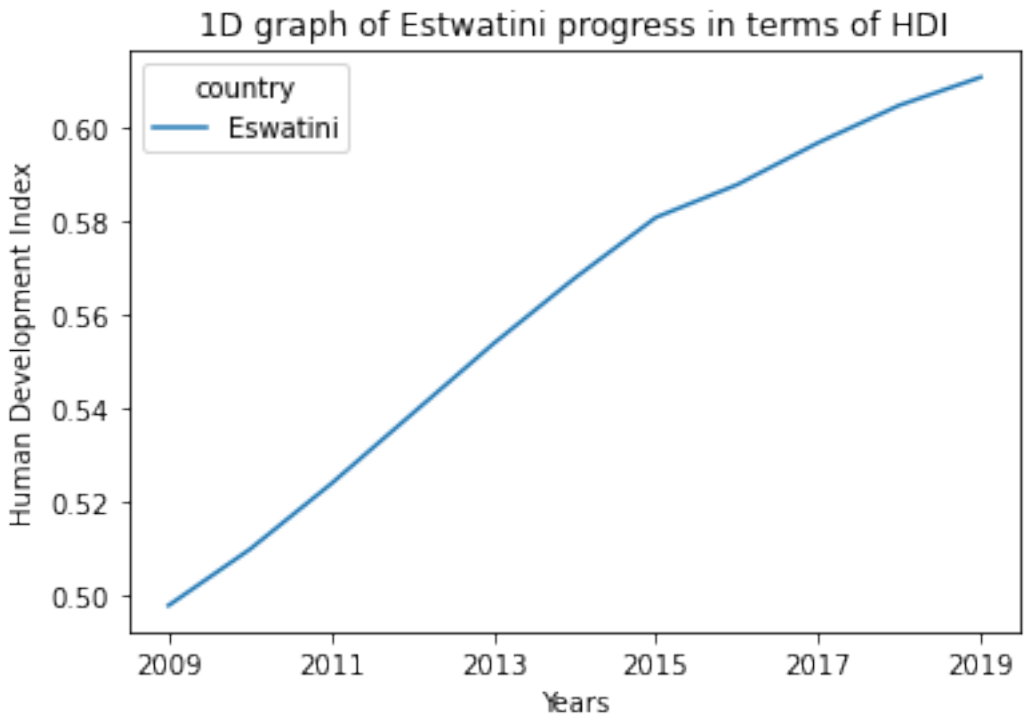
[86]:
```
          progress_2009-2019   2009  2010   2011   2012   2013   2014   2015  \
country
Eswatini               0.113  0.498  0.51  0.524  0.539  0.554  0.568  0.581

           2016   2017   2018   2019
country
Eswatini  0.588  0.597  0.605  0.611
```

[87]:
```
EstwaniProgress = hdilastdecade.where(hdilastdecade['progress_2009-2019'] == 0.
↪11299999999999999).dropna().drop(axis=1,columns='progress_2009-2019')
```

[88]:
```
EstwaniProgress.transpose().plot(kind='line',xlabel='Years',ylabel='Human␣
↪Development Index',
                                 title='1D graph of Estwatini progress in terms␣
↪of HDI')
```

[88]:
```
<AxesSubplot:title={'center':'1D graph of Estwatini progress in terms of HDI'},
xlabel='Years', ylabel='Human Development Index'>
```



And the winner is Eswatini! Good for You peoples of Eswatini, keep it that way!

What would be 10 greatest countries to live in terms of happiness and prosperity in 2019?

[89]:
```
top.head()
```

[89]:
```
             2019_income 2019_happyness
country
Afghanistan       2070.0           25.7
Albania          13700.0           48.8
Algeria          11500.0           50.1
Argentina        22100.0           59.7
Armenia          13700.0           46.8
```

[90]:
```
top.sort_values(by='2019_income',ascending=False).head(10)
```

[90]:
```
                     2019_income 2019_happyness
country
Luxembourg              117000.0           72.4
Singapore                98400.0           63.8
Ireland                  86700.0           70.9
Switzerland              70900.0           75.6
United Arab Emirates     68300.0           67.9
Norway                   64400.0           74.9
```

```
United States             62600.0          69.4
Hong Kong, China          59600.0          55.1
Denmark                   57200.0          76.5
Iceland                   56900.0          75.0
```

We got top 10 countries to live in terms of income above and hapiness below.

[91]:
```
top.sort_values(by='2019_happyness',ascending=False).head(10)
```

[91]:

country	2019_income	2019_happyness
Finland	48600.0	78.1
Denmark	57200.0	76.5
Switzerland	70900.0	75.6
Iceland	56900.0	75.0
Norway	64400.0	74.9
Netherlands	56800.0	74.5
Sweden	52900.0	73.5
New Zealand	42900.0	73.0
Austria	55800.0	72.9
Luxembourg	117000.0	72.4

Anyone thinking about moving there? ;)

Summary:

In this project, we found that peoples living in democratic countries tends to be more happy, and they do earn more money. Europe is the most developed country according to Human Development Index. Eswatini is the quickest developing country in the same index, and we have found 10 top countries to live in 2019.

Limitations: Some countries were excluded due to lack of data, however it was not a significant number. Some values were also filled with first known value for that country if some years were missing, however it was not a great amount and I believe my discoveries reflects the situation in general.