Trabalho_Final de Análise_de_Dados

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Esse trabalho foi desenvolvido utilizando como ferramenta para análise dos dados a linguagem de programacao PYTHON pelas diversas caracteristicas positivas relacionas a Estatistica e exploração de dados

PARTE I

APRESENTAÇÃO DOS DADOS

In [30]:
```
import pandas as pd # importando Data Frame onde vou utilizar meu aquivo .txt
import matplotlib.pyplot as plt # lib importantíssima para plotagem dos
 #gráficos da atividade
import numpy as np  # lib matemática do python
import statsmodels.api as sm # lib estatistica
from scipy import stats # outra poderosa lib estatistica

%matplotlib inline

df=pd.read_csv("/Users/thiagozamith/Desktop/dados2.txt",index_col=0) # amostrando
                                                                     #os dados do arquivo
df.head()
```

Datetime											...							
2009-04-23 15:00:00	-28.4892	-47.5275	12.5	136	0.0	299	0.0	21.1	1014.94	19.1	...	195	66.14	171	81.01	182	3.20	5.01
2009-04-23 16:00:00	-28.4888	-47.5278	12.8	142	0.0	306	0.0	23.0	1013.87	18.1	...	237	98.73	233	81.91	229	3.05	6.03
2009-04-23 17:00:00	-28.4890	-47.5278	12.8	140	0.0	303	0.0	23.6	1013.86	18.1	...	225	115.83	229	102.89	238	2.73	4.80
2009-04-23 18:00:00	-28.4892	-47.5278	12.8	133	0.0	296	0.0	23.3	1013.60	19.2	...	225	169.52	230	166.52	227	2.91	5.21
2009-04-23 19:00:00	-28.4890	-47.5278	13.0	144	0.0	307	0.0	23.3	1014.04	18.6	...	230	154.33	238	157.37	238	2.60	5.56

5 rows × 23 columns

In [31]:
```
df.isnull().values.any()
# Verificando tem algum dado faltando ou dado como "NaN"
#, retorna False,sem dados faltando...
```

Out[31]:
```
False
```

In [32]:
```
df_=df.iloc[1:4321,[9,10]]

# gerando um Dataframe  com duas variaveis de nossa escolha, 6 meses amostragem
# 30 dias x 24h x 6 meses = 4320h
df_.head()


```

Out[32]:
```
<bound method NDFrame.head of                      Dewp  Humi
Datetime
2009-04-23 16:00:00  18.1  74.3
2009-04-23 17:00:00  18.1  71.3
2009-04-23 18:00:00  19.2  77.9
2009-04-23 19:00:00  18.6  75.0
2009-04-23 20:00:00  18.8  81.0
...                   ...   ...
2009-10-20 12:00:00  19.8  91.8
2009-10-20 13:00:00  19.8  90.2
2009-10-20 14:00:00  19.4  87.3
2009-10-20 15:00:00  19.4  87.0
2009-10-20 16:00:00  19.2  87.3

[4320 rows x 2 columns]>
```

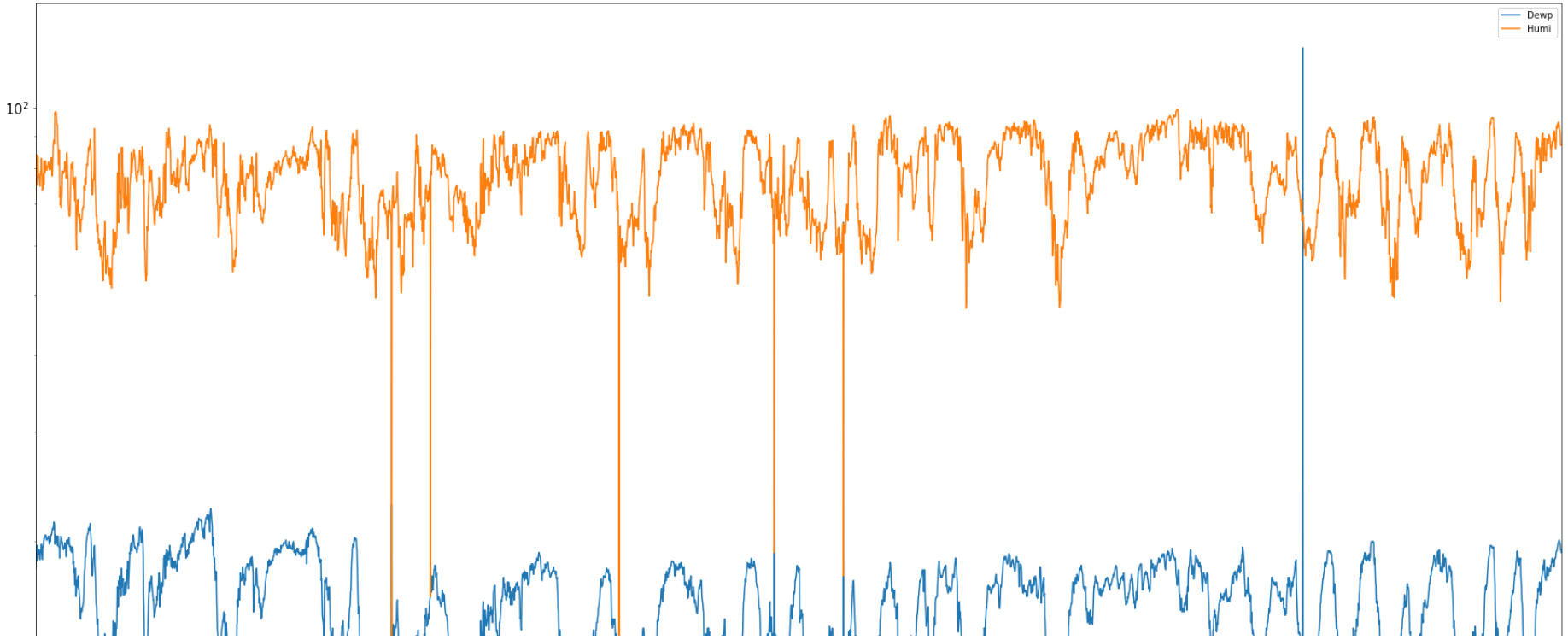
PARTE II

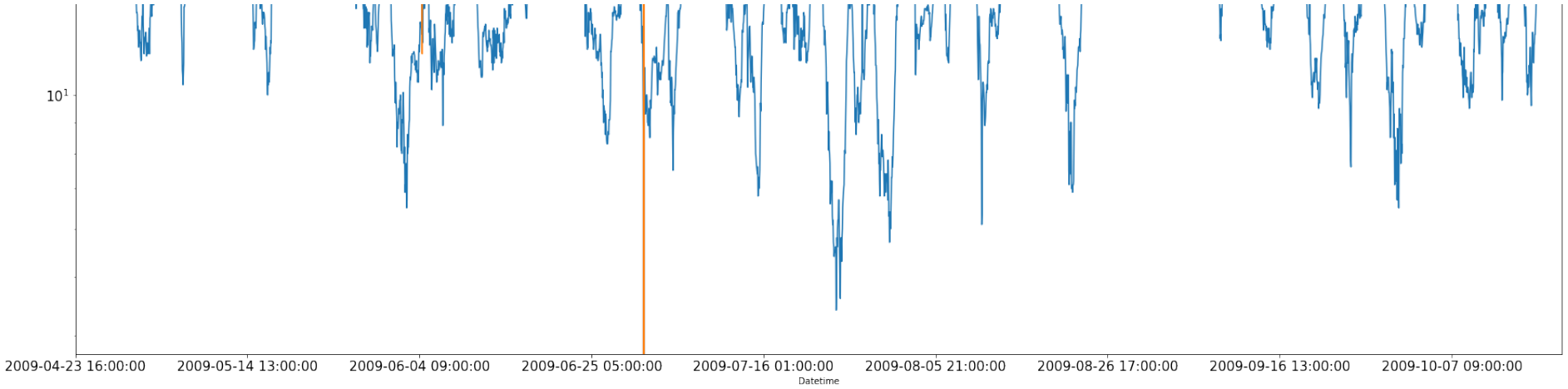
INVESTIGACAO E INTERPRETAÇÃO ESTATÍSTICA DOS DADOS

Gráfico Temporal Inicial

In [33]:
```
1 df_.plot(label="Grafico Temporal",logy=True,figsize=(30,20),fontsize=15)
```

Out[33]: <matplotlib.axes._subplots.AxesSubplot at 0x1c279bd890>






```
1
2
3
4
```

Gráfico Temporal - Filtro 01

Comentários:
Primeiramente faremos uma primeira filtragem de dados,excluindo dos dados valores absurdos do ponto de vista físico.

In [34]:

```
1 #FILTRO INICIAL= CONDICAO T> -273.15C E Ur < 0 , ABSURDOS
2 df_=df_[np.logical_and(df_["Dewp"] > -273.15 , df_["Humi"] > 0)]
3 # Nao existe Temperatura menor que o Zero Absoluto e Umidade Relativa negativa.
4
```

In [35]:
```
df_.plot(figsize=(50,20),fontsize=24)
# acerca dessa plotagem, podemos reparar a presenca de outliers,
#isto é dados que fogem d normalidade
```

Out[35]: <matplotlib.axes._subplots.AxesSubplot at 0x1c204cea90>

GRAFICO HISTOGRAMA

n=numero de amostras >>> 30 ,considerando a distribuicao normal entao podemos normalizar a curva e atribuindo um filtro para nosso desvio padrão , a fim de eliminar os outliers observados no grafico anterior.

In [36]:
```
df_.hist() # Histograma dessas amostras em 6 meses
#Observe que a presenca que mesmo com valores que
#fogem da normalidade a Var "Humi" ja apresenta caracteristica normal
#diferente da Temperatura do ponto.de.orvalho...

```

Out[36]:
```
array([[<matplotlib.axes._subplots.AxesSubplot object at 0x1c20403250>,
        <matplotlib.axes._subplots.AxesSubplot object at 0x1c202d38d0>]],
      dtype=object)
```

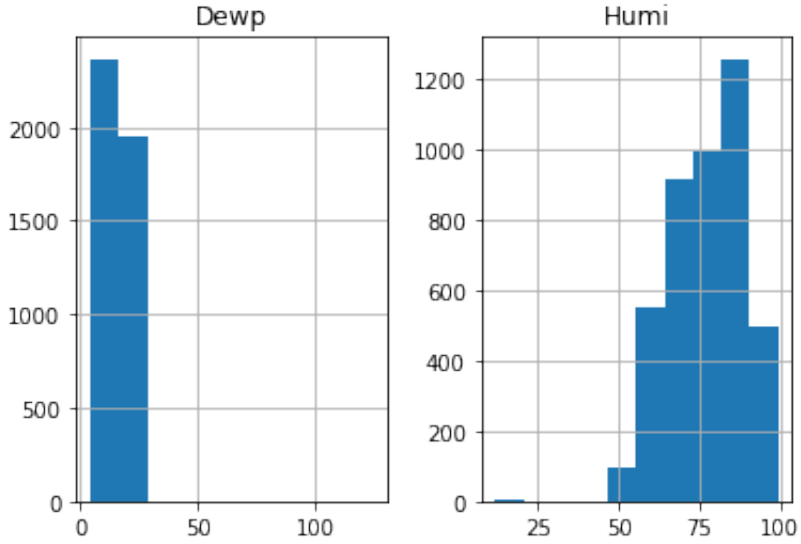
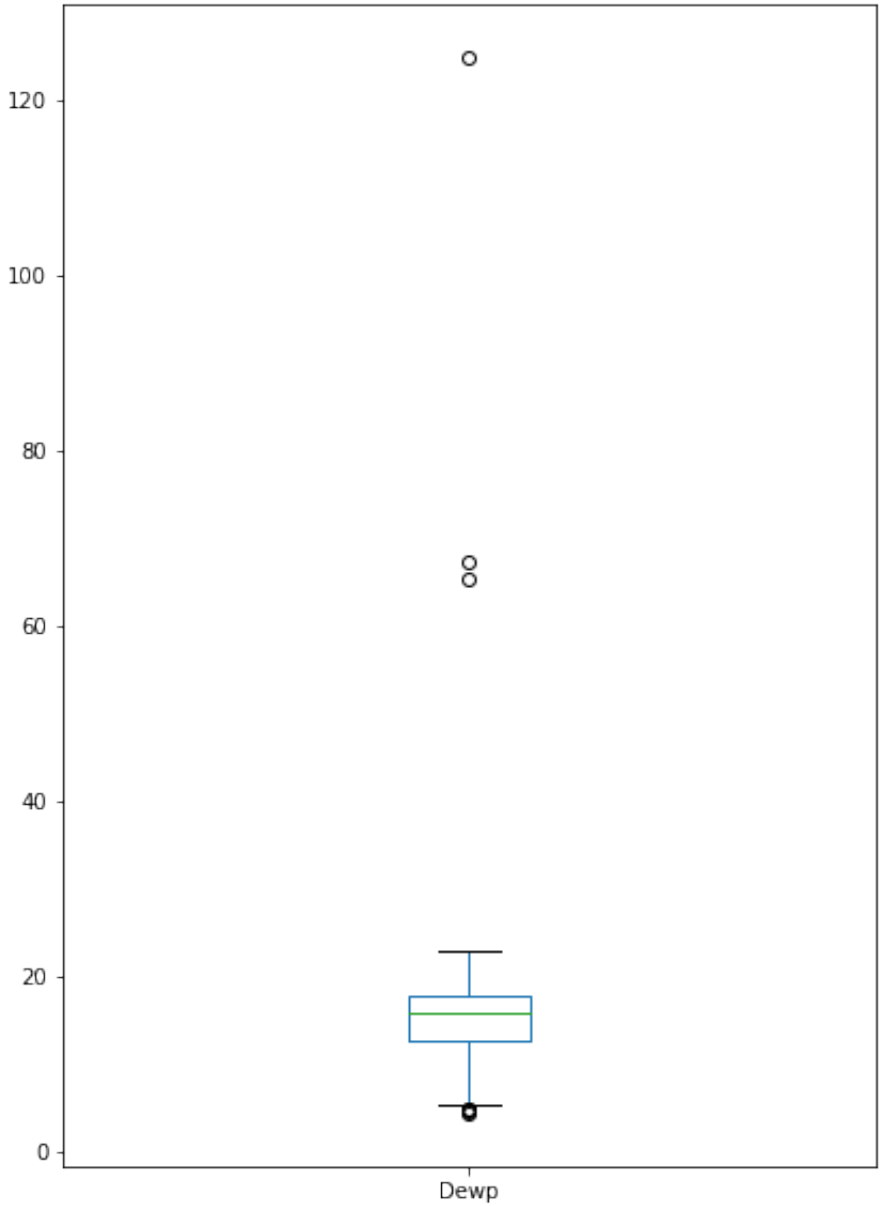


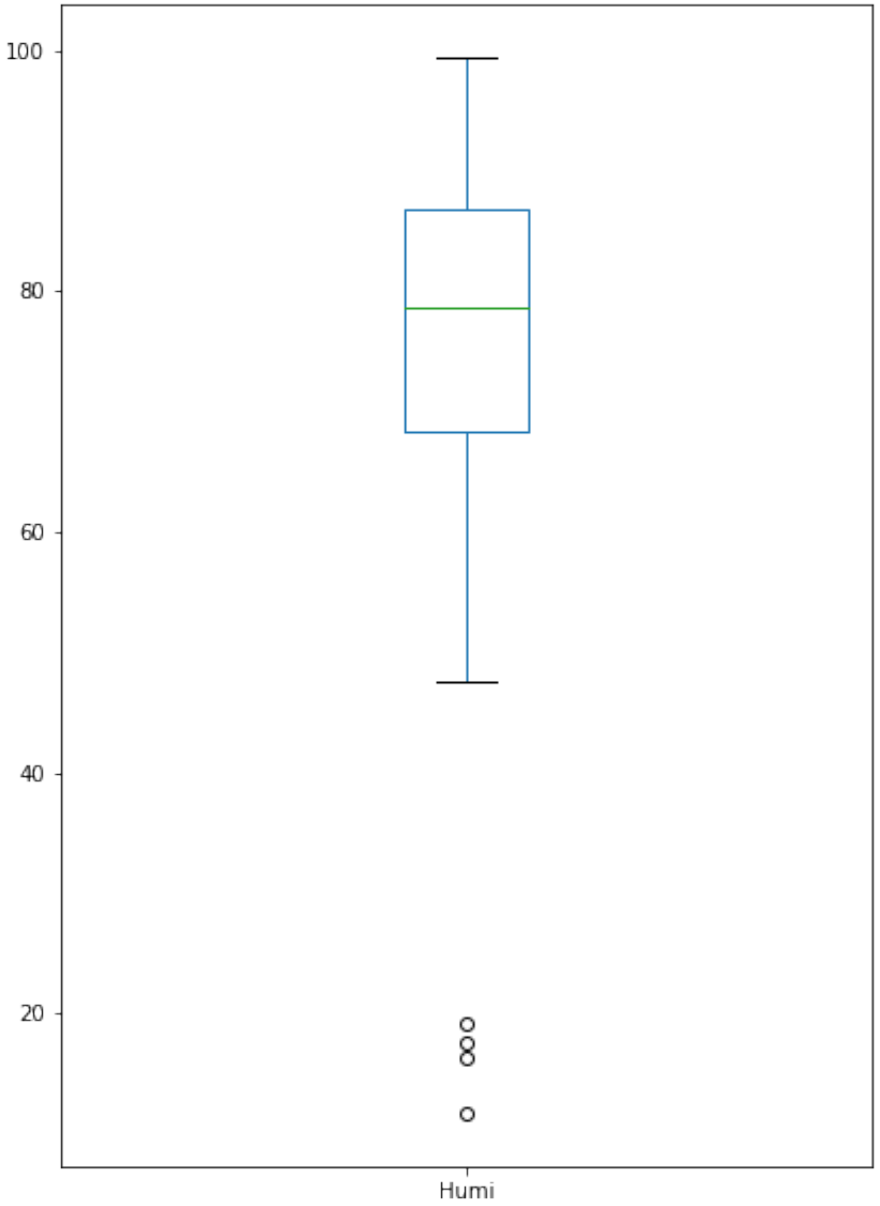
GRÁFICO 'BOXPLOT'

In [37]:
```
df_.plot(kind="box",logy=False,figsize=(15,10),subplots=True) # BOX PLOT GRAPHIC'S
```

Out[37]:
```
Dewp       AxesSubplot(0.125,0.125;0.352273x0.755)
Humi    AxesSubplot(0.547727,0.125;0.352273x0.755)
```

```
dtype: object
```





```
1
2
3
4
5
```

Variaveis Estatísticas da Amostra

Media,Moda,Mediana e Desvio Padrão

In [38]:
```
1 media=df_.mean() #media
2 media=pd.DataFrame(media)
3 print(media)
4
```

```
               0
Dewp  15.317752
Humi  77.263649
```

In [39]:
```
1 moda=df_.mode() #moda
2 moda=moda.transpose()
3 print(moda)
```

```
        0
Dewp  16.9
Humi  87.9
```

In [40]:
```
1 mediana=df_.median() #mediana
2 mediana
```

Out[40]:
```
Dewp    16.0
Humi    78.7
dtype: float64
```

In [41]:
```
d_p=df_.std() #desvio padrao
d_p
```

Out[41]:
```
Dewp     3.924542
Humi    11.226718
dtype: float64
```

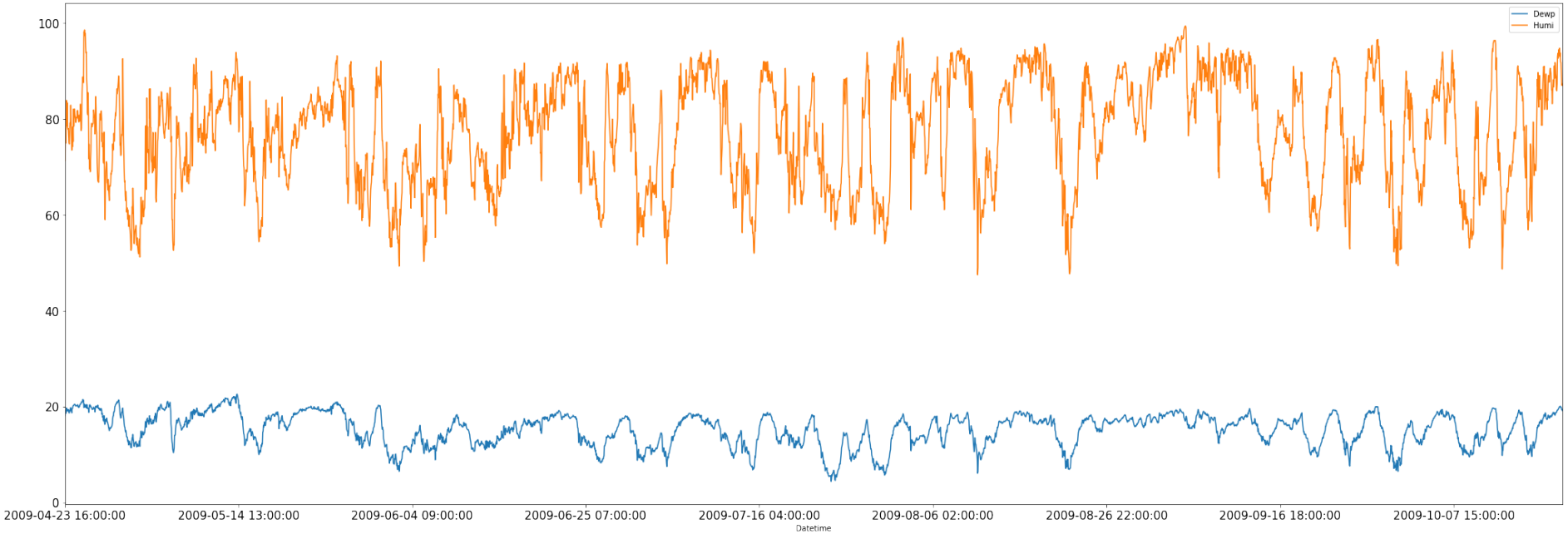
In [42]:
```
#Filtrando Outliers
# Regra Empirica " 68—95—99.7 " --->

std_dev = 3
df_ = df_[(np.abs(stats.zscore(df_)) < float(std_dev)).all(axis=1)] #


```

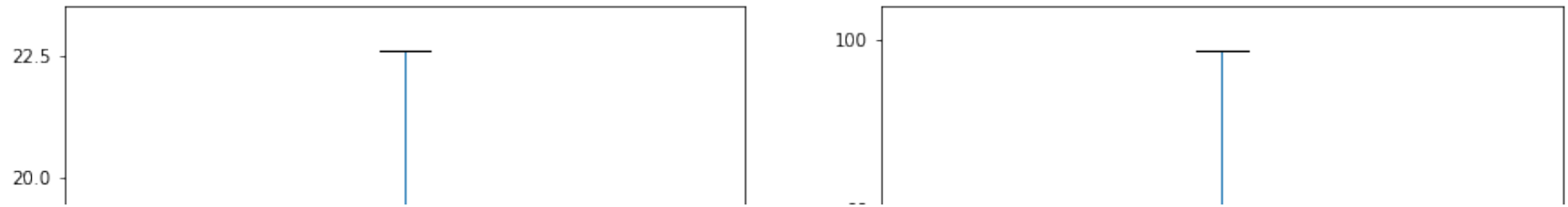
In [43]:
```
1 df_.plot(figsize=(35,12),fontsize=15) #amostrando meus dados sem a presença de Outliers
```

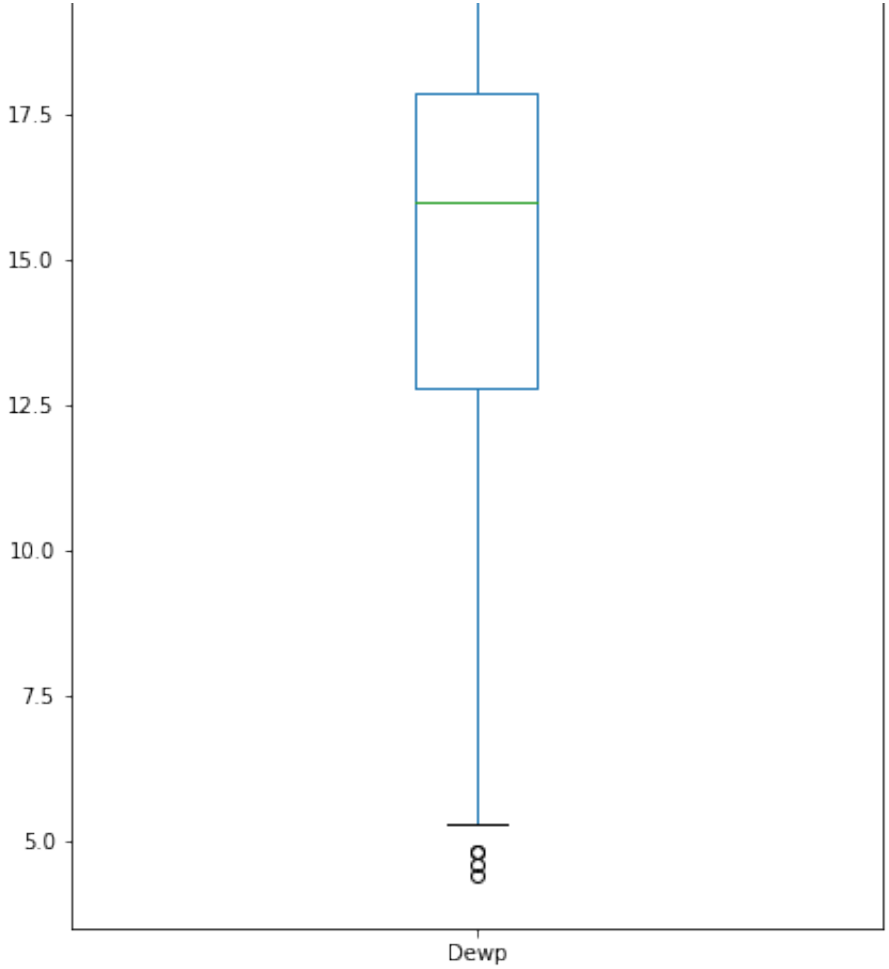
Out[43]: <matplotlib.axes._subplots.AxesSubplot at 0x1c1f21bd50>

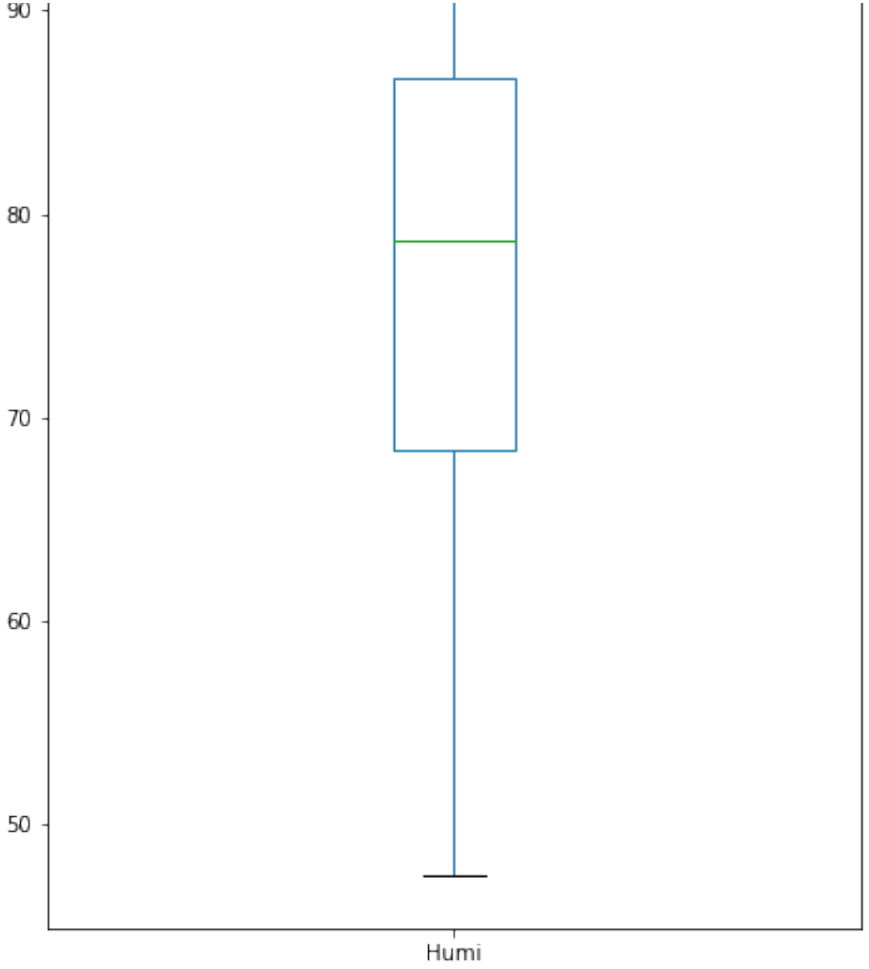


In [44]:
```
1 df_.plot(kind="box",logy=False,figsize=(15,10),subplots=True)
```

Out[44]:
```
Dewp       AxesSubplot(0.125,0.125;0.352273x0.755)
Humi    AxesSubplot(0.547727,0.125;0.352273x0.755)
dtype: object
```







In [45]:
```
1 media=df_.mean() #media
2 media=pd.DataFrame(media)
3 print(media)
```

```
                0
Dewp  15.265276
Humi  77.322763
```

In [46]:
```
moda=df_.mode() # moda
moda=pd.DataFrame(moda)
moda=moda.transpose()
print(moda)
```

```
          0
Dewp   16.9
Humi   87.9
```

In [47]:
```
d_p=df_.std() #desvio padrao
d_p
```

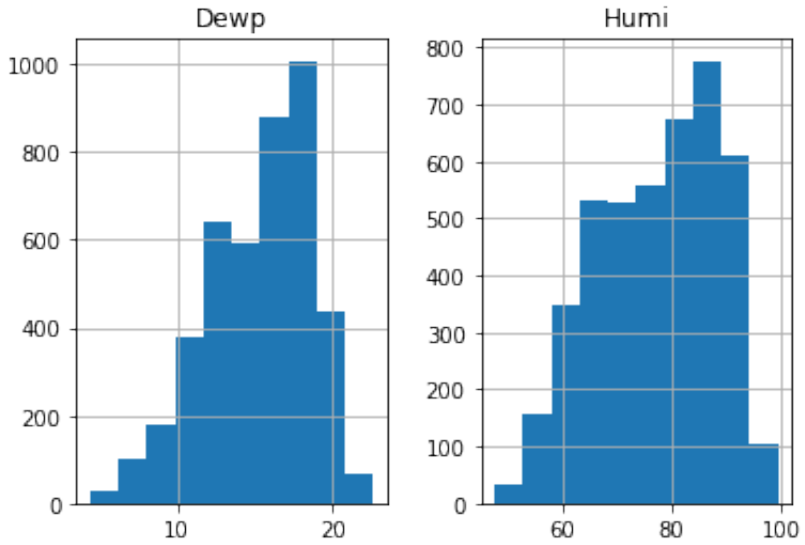
Out[47]:
```
Dewp     3.375634
Humi    11.076531
dtype: float64
```

In [48]:
```
mediana=df_.median() #mediana
mediana
```

Out[48]:
```
Dewp    16.0
Humi    78.7
dtype: float64
```

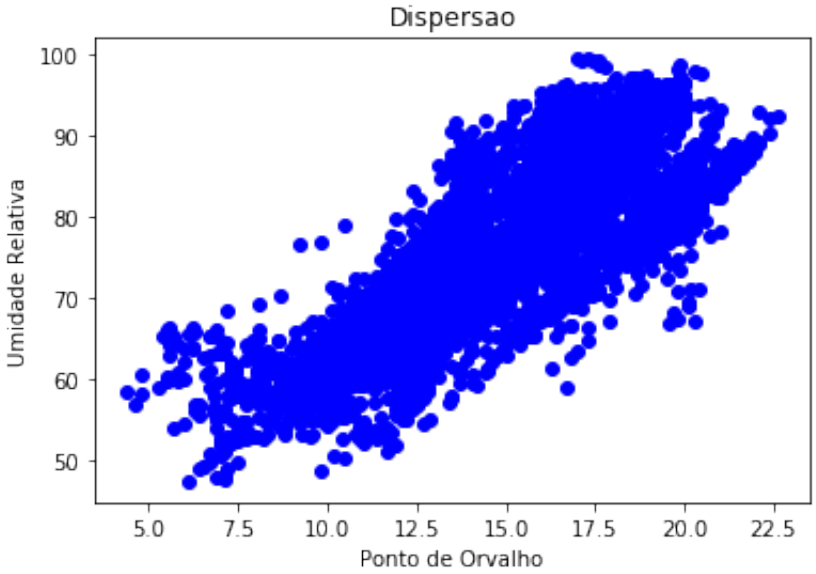
In [49]:
```
df_.hist()
# observe que uma vez extraido os outliers as variaveis apresentam distribuição normal
```

Out[49]:
```
array([[<matplotlib.axes._subplots.AxesSubplot object at 0x1c1f161b50>,
        <matplotlib.axes._subplots.AxesSubplot object at 0x1c1ec6e090>]],
      dtype=object)
```




```
GRÁFICO DE DISPERSÃO
```

In [50]:
```
1
2
3 plt.scatter(df_["Dewp"] , df_["Humi"],color="blue")
4 plt.title('Dispersao')
5 plt.xlabel('Ponto de Orvalho')
6 plt.ylabel('Umidade Relativa')
7 plt.show()
```




```
1
2
3
```

REGRESSÃO LINEAR

In [52]:
```
1 from sklearn.linear_model import LinearRegression  #Linear Regresion
2       #importando as libs estatisticas  necessarias
3 from sklearn.metrics import mean_squared_error
4 import statsmodels.api as sm
```

In [53]:
```
x=df_[["Dewp"]]
x=np.array(x)
y=df_[["Humi"]]
y=np.array(y)
```

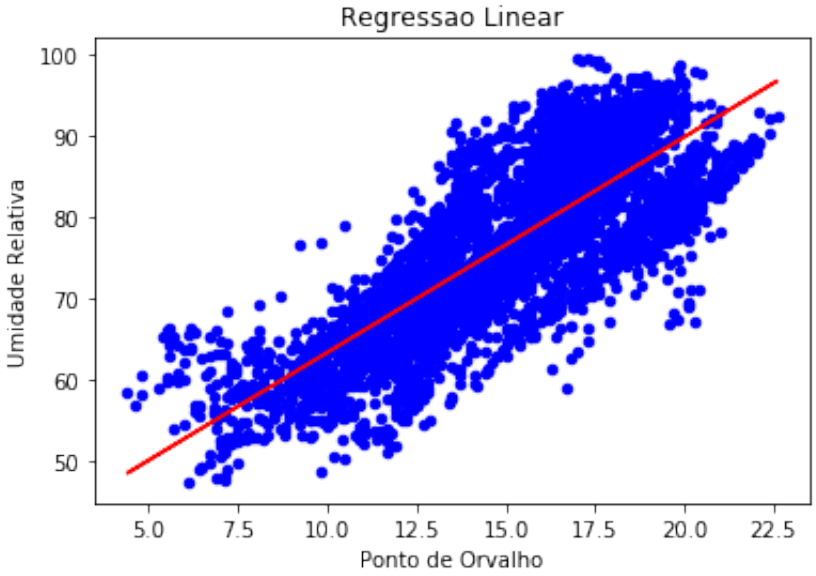
In [54]:
```
# criar modelo linear e otimizar
lm_model = LinearRegression()
lm_model.fit(x, y)
# extrair coeficientes
alfa = lm_model.coef_          # Caso ajustassemos para Yˆ=βˆ + β1 * x # uma reta #
beta = lm_model.intercept_
```

In [55]:
```
print("alfa =" + str(alfa) +  "e beta = "+ str(beta))
```

```
alfa =[[2.64450128]]e beta = [36.95372166]
```

In [56]:
```
plt.scatter(x,y,s=20,color="blue")
plt.plot(x,(x * alfa + beta), color='r')
plt.title('Regressao Linear')
plt.xlabel('Ponto de Orvalho')
plt.ylabel('Umidade Relativa')
plt.show()


```




```
                                    TABELA OLS 01

Comentários:Pode-se concluir que temos uma correlação positiva entre as duas variáveis...
```

In [57]:
```
# é necessário adicionar uma constante a matriz X
x_sm = sm.add_constant(x)
# OLS vem de Ordinary Least Squares e o método fit irá treinar o modelo
results = sm.OLS(y, x_sm).fit()
```

```
5 # mostrando as estatísticas do modelo
6 results.summary()
```

Out[57]:

OLS Regression Results

Dep. Variable:	y	**R-squared:**	0.650
Model:	OLS	**Adj. R-squared:**	0.649
Method:	Least Squares	**F-statistic:**	7991.
Date:	Tue, 23 Jun 2020	**Prob (F-statistic):**	0.00
Time:	01:38:35	**Log-Likelihood:**	-14234.
No. Observations:	4314	**AIC:**	2.847e+04
Df Residuals:	4312	**BIC:**	2.848e+04
Df Model:	1		
Covariance Type:	nonrobust		

	coef	std err	t	P>|t|	[0.025	0.975]
const	36.9537	0.462	79.900	0.000	36.047	37.860
x1	2.6445	0.030	89.393	0.000	2.587	2.702

Omnibus:	38.344	**Durbin-Watson:**	0.096
Prob(Omnibus):	0.000	**Jarque-Bera (JB):**	27.036
Skew:	-0.072	**Prob(JB):**	1.35e-06
Kurtosis:	2.640	**Cond. No.**	72.7

Warnings:

[1] Standard Errors assume that the covariance matrix of the errors is correctly specified.

```
1
2
3
```

REGRESSÃO NÃO LINEAR

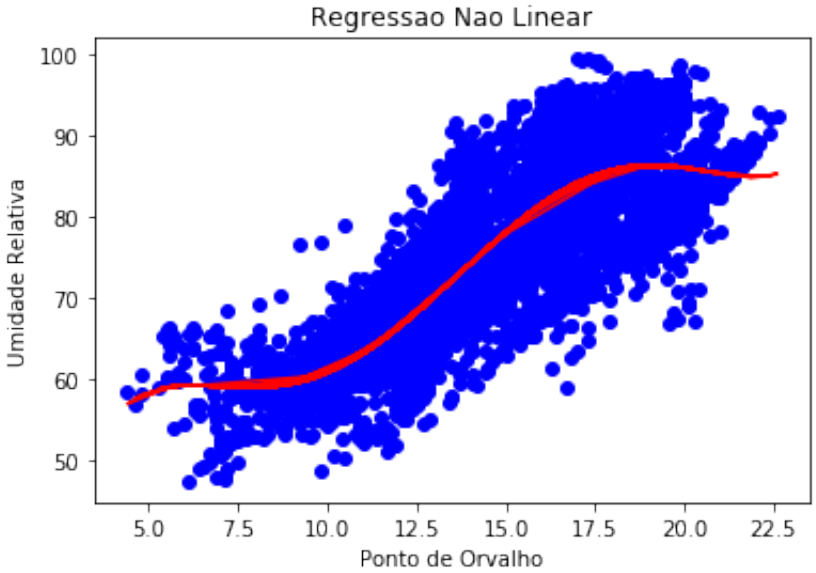
In [111]:

```
1  from sklearn.preprocessing import PolynomialFeatures # importando um modelo nao linear
2
3  poly = PolynomialFeatures(degree =5)
4  X_poly = poly.fit_transform(x)
5
6  poly.fit(X_poly, y)
7  lin2 = LinearRegression()
8  lin2.fit(X_poly, y)
```

Out[111]:

```
LinearRegression(copy_X=True, fit_intercept=True, n_jobs=None, normalize=False)
```

In [112]:
```
1
2
3  plt.scatter(x, y, color = 'blue')
4
5  plt.plot(x, lin2.predict(poly.fit_transform(x)), color = 'red')
6  plt.title('Regressao Nao Linear')
7  plt.xlabel('Ponto de Orvalho')
8  plt.ylabel('Umidade Relativa')
9  plt.show()
10
```



In [113]:
```
1  alfa2=lin2.coef_
2  beta2=lin2.intercept_
3  print("alfa2 = " + str(alfa2) + "  e beta2 = " + str(beta2))
```

```
alfa2 = [[ 0.00000000e+00  4.23274301e+01 -8.19246436e+00  7.24072507e-01
  -2.86660119e-02  4.16481852e-04]]  e beta2 = [-22.25931757]
```

```
TABELA OLS 02
```

In [122]:
```
x_sm2 = sm.add_constant(X_poly)
results = sm.OLS(y, x_sm2).fit()
# mostrando as estatísticas do modelo
results.summary()
```

Out[122]:

OLS Regression Results

Dep. Variable:	y	**R-squared:**	0.695
Model:	OLS	**Adj. R-squared:**	0.694
Method:	Least Squares	**F-statistic:**	1962.
Date:	Tue, 23 Jun 2020	**Prob (F-statistic):**	0.00
Time:	15:23:43	**Log-Likelihood:**	-13935.
No. Observations:	4314	**AIC:**	2.788e+04
Df Residuals:	4308	**BIC:**	2.792e+04
Df Model:	5		
Covariance Type:	nonrobust		

	coef	std err	t	P>|t|	[0.025	0.975]
const	-22.2593	26.080	-0.853	0.393	-73.390	28.871
x1	42.3274	10.995	3.850	0.000	20.771	63.884
x2	-8.1925	1.772	-4.623	0.000	-11.667	-4.718
x3	0.7241	0.137	5.277	0.000	0.455	0.993
x4	-0.0287	0.005	-5.591	0.000	-0.039	-0.019
x5	0.0004	7.43e-05	5.608	0.000	0.000	0.001

Omnibus:	37.635	**Durbin-Watson:**	0.120
Prob(Omnibus):	0.000	**Jarque-Bera (JB):**	38.335
Skew:	-0.225	**Prob(JB):**	4.74e-09
Kurtosis:	2.898	**Cond. No.**	4.77e+08

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors is correctly specified.
[2] The condition number is large, 4.77e+08. This might indicate that there are
strong multicollinearity or other numerical problems.

```
1
2
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```

```
GRÁFICO DENSIDADE KERNEL
```

In [121]:

```
import seaborn as sns # Grafico variado


sns.kdeplot(df_ , shade=False, cut=0.5,cmap="Purples_d",label= "kernel")

plt.show()
# Densidade de Kernel


```