# USP - EACH - SIN5007 - Reconhecimento de Padrões

## Grupo H/8 - Atividade 03 - PCA

### Tratamento do Arquivo Total SPHARM

## 1) Abertura do Arquivo

In [1]:

```
# Importando e abrindo o arquivo
import numpy as np
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
import re

dx = pd.read_csv('Total_SPHARM_20200326.csv', header=None)

print(f'Nome do Arquivo: Total_SPHARM_20200326.csv')
print(f'Estrutura do arquivo: \nQuantidade de linhas: {dx.shape[0]} \nQuantidade de Car
acterísticas: {dx.shape[1]}')
dx.head()
```

```
Nome do Arquivo: Total_SPHARM_20200326.csv
Estrutura do arquivo:
Quantidade de linhas: 400
Quantidade de Características: 718
```

Out[1]:

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
|---|---|---|---|---|---|---|---|---|---|
| 0 | id001 | 29.0 | 0.0 | 1.0 | -7881.480247 | -5759.969698 | -24465.608592 | -15275.106756 | -229 |
| 1 | id002 | 31.0 | 0.0 | 1.0 | -567.772697 | -33.292309 | -465.179132 | -525.981010 | -4 |
| 2 | id003 | 27.0 | 0.0 | 1.0 | -135372.767326 | -115124.114646 | -772665.053883 | -292331.423079 | -580 |
| 3 | id004 | 52.0 | 0.0 | 1.0 | -582.939571 | -366.425893 | -281.022452 | -437.739821 | -2 |
| 4 | id005 | 56.0 | 0.0 | 1.0 | -913.082501 | -334.221895 | -449.102108 | -113.637478 | - |

5 rows × 718 columns

## 2) Tratamento das colunas de Sexo e Exclusão da primeira coluna

In [7]:

```
# Transformando a coluna de idade em numérica
dx[1].astype(int)

#Transformando a coluna de classe em numérica
dx[717].astype(int)

print(type(dx[1]), type(dx[717]))
```

```
<class 'pandas.core.series.Series'> <class 'pandas.core.series.Series'>
```

In [3]:

```
#Vamos excluir a primeira coluna que identifica a amostra
df = dx.iloc[:, 1:]
df.columns = range(df.shape[1])

print(f'Estrutura do arquivo: \nQuantidade de linhas: {df.shape[0]} \nQuantidade de Car
acterísticas: {df.shape[1]}')
df.head()
```

```
Estrutura do arquivo:
Quantidade de linhas: 400
Quantidade de Características: 717
```

Out[3]:

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | |
|---|---|---|---|---|---|---|---|---|
| **0** | 29.0 | 0.0 | 1.0 | -7881.480247 | -5759.969698 | -24465.608592 | -15275.106756 | -22974.378 |
| **1** | 31.0 | 0.0 | 1.0 | -567.772697 | -33.292309 | -465.179132 | -525.981010 | -469.546 |
| **2** | 27.0 | 0.0 | 1.0 | -135372.767326 | -115124.114646 | -772665.053883 | -292331.423079 | -58059.255 |
| **3** | 52.0 | 0.0 | 1.0 | -582.939571 | -366.425893 | -281.022452 | -437.739821 | -206.814 |
| **4** | 56.0 | 0.0 | 1.0 | -913.082501 | -334.221895 | -449.102108 | -113.637478 | -50.065 |

5 rows × 717 columns

In [4]:

```
# Calculando a média das colunas
media = list(df.mean(axis=0))
print(media)
```

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7792, -28.565197825818657, -147.56432061012538, -154.6271468607464, -226.0
60014548262, -102.31300862606552, -80.94447696877826, -85.18901651221168,
-23.690767449435462, -128.6003516299086, -105.62037408871531, -87.28193660

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867313, -192.86256917267585, -90.19540603321363, -0.2517502202015791, -17
6.3174575724266, -121.65508326390871, -157.02312909532498, -134.0534181537
5476, -86.23990719213889, -108.10591701529869, -180.22012211133114, -153.7
1305578689092, -148.95369339818322, -72.20200587913797, -80.7409691089659
6, -45.08076685908083, -266.4904325003428, -10.92238875799037, -91.0884976
1728744, -136.60967395689966, -146.72780622901175, -133.07886585380166, -1
07.95600522046246, -168.3524879807629, -113.33792805209805, -130.482406403
72964, -129.25841011418248, -48.40498161842616, -158.60829952166358, -68.3
2735360880797, -46.54243403676999, -80.48098770892615, -23.61216372300364
3, -8.70550090043741, -40.850228228781965, -254.8261006114677, -154.766814
49556503, -97.4452038797357, -238.2798866096579, -40.49721460567706, -59.2
4291272591389, -58.33562126021404, -1.9603829062384763, -149.2223551437679
7, -233.56254150983744, -126.601100455228, -154.98409602264366, -155.46896
24738703, -124.5294091730563, -148.21161390800174, -86.0111452435614, 1.03
75]
```

## 3) Ajustando as colunas do arquivo

Nesta parte vamos verificar, por colunas (características), aquelas que não possuem conteúdo, ou que precisam de um ajuste.

In [5]:

```
# verificando os tipos de dados contidos nas colunas
for col in df.columns:
    print(f'{col}: {df[col].dtype}')
```

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```

### Colunas Idade, Sexo e Classe

In [8]:

```
# Coluna de Idade
# Através do MS/Excel (mais fácil) alteramos todos os conteúdos que não eram numéricos
# para 0 (já havíamos verificado a não existência desta idade).
# Alterando de 0 para a média da idade
for i in range(len(df)):
    if (df.iloc[i, 0] == 0):
        df.iloc[i, 0] = int(media[0])
```

In [9]:

```
df.head()
```

Out[9]:

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | |
|---|---|---|---|---|---|---|---|---|
| **0** | 29.0 | 0.0 | 1.0 | -7881.480247 | -5759.969698 | -24465.608592 | -15275.106756 | -22974.378( |
| **1** | 31.0 | 0.0 | 1.0 | -567.772697 | -33.292309 | -465.179132 | -525.981010 | -469.546( |
| **2** | 27.0 | 0.0 | 1.0 | -135372.767326 | -115124.114646 | -772665.053883 | -292331.423079 | -58059.255( |
| **3** | 52.0 | 0.0 | 1.0 | -582.939571 | -366.425893 | -281.022452 | -437.739821 | -206.814( |
| **4** | 56.0 | 0.0 | 1.0 | -913.082501 | -334.221895 | -449.102108 | -113.637478 | -50.065( |

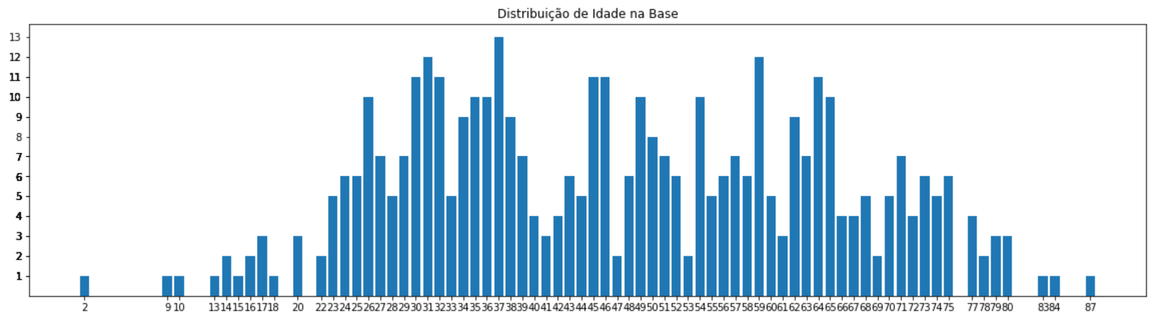
5 rows × 717 columns

In [10]:

```
# Vamos verificar a distribuição das idades no modelo
vc = df[0].value_counts()
#print(vc)

# armazena os nomes das classes
cl = list(vc.index)
ncl = list(vc)

# Gráfico de distribuição
plt.figure(figsize=(20, 5))
plt.bar(cl, ncl)
plt.xticks(cl)
plt.yticks(ncl)
plt.title('Distribuição de Idade na Base')
plt.show(True)
```



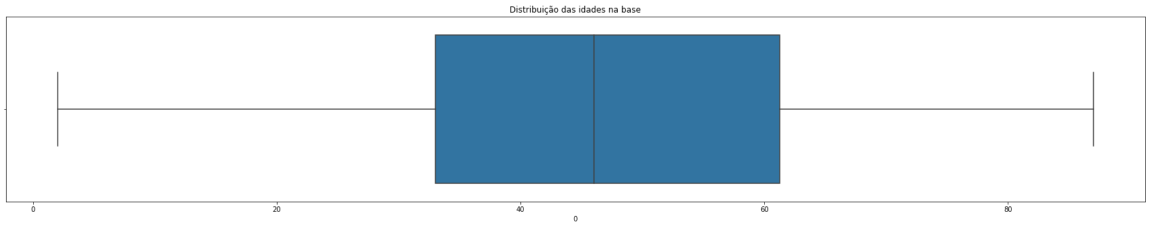

In [11]:

```
# Vamos verificar a média e desvio padrão da Idade
media_Idade = df[0].mean()
desvio_Idade = df[0].std()
print(f'A média das idades da base é: {media_Idade} anos')
print(f'O Desvio Padrão das idades da base é: {desvio_Idade}')
```

```
A média das idades da base é: 47.0775 anos
O Desvio Padrão das idades da base é: 17.03487484993307
```

In [12]:

```
plt.figure(figsize=(30, 5))
sns.boxplot(x=0, data=df)
plt.title('Distribuição das idades na base');
```



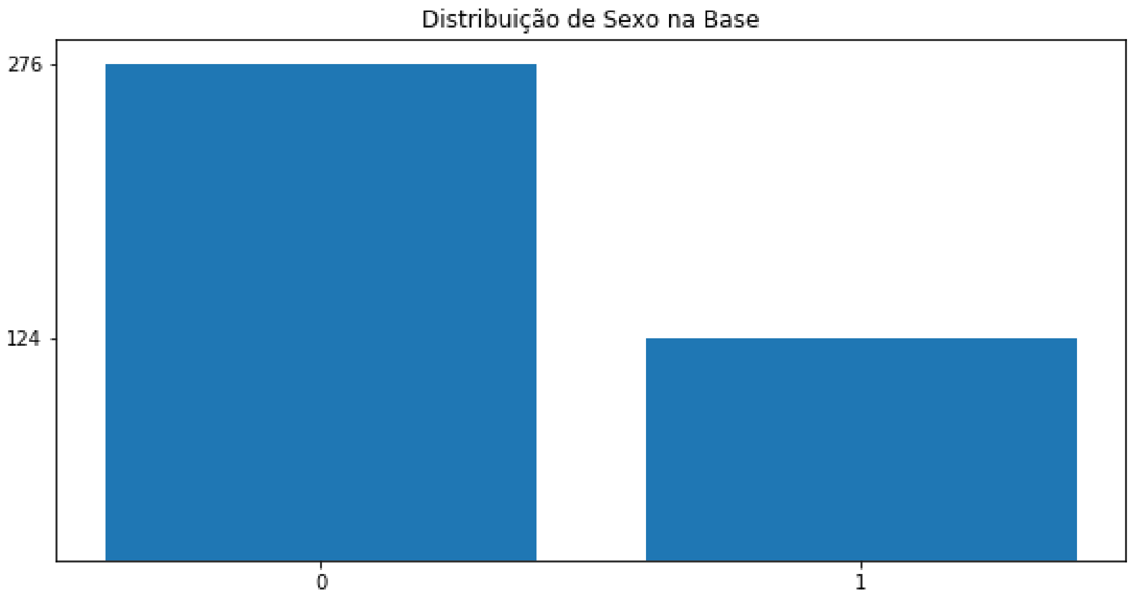

In [13]:

```
# Coluna de Sexo
# Vamos verificar se existe algum conteúdo diferente de 'M' ou 'F' e a quantidade de oc
orrêcia dos mesmos
vc = df[1].value_counts()
print(vc)

# armazena os nomes das classes
cl = list(vc.index)
ncl = list(vc)

# Gráfico de distribuição
plt.figure(figsize=(10, 5))
plt.bar(cl, ncl)
plt.xticks(cl)
plt.yticks(ncl)
plt.title('Distribuição de Sexo na Base')
plt.show(True)
```

```
0.0    276
1.0    124
Name: 1, dtype: int64
```



Observamos um predominância de, o dobro, do sexo 'M' em relação ao sexo 'F'.

Se formos considerar este atributo nos modelos, precisamos verificar o impacto que esta predominância provoca.

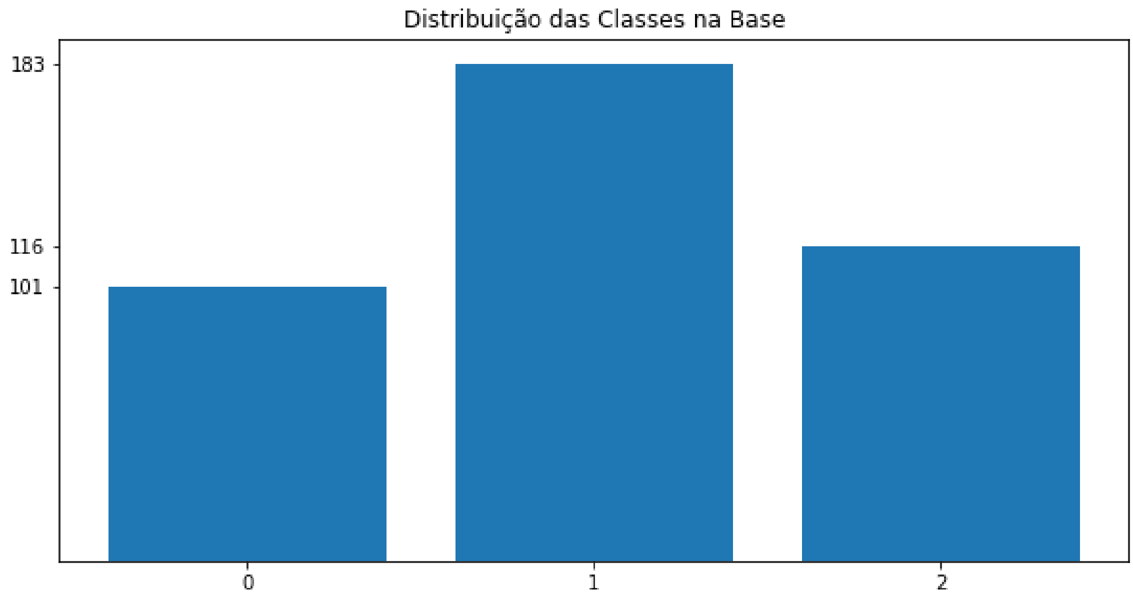
In [15]:

```
# Coluna da Variável Alvo - Classes: 0, 1, 2
# Vamos verificar se existe algum conteúdo diferente de 0, 1, 2 e a quantidade de ocorr
êcia dos mesmos
vc = df[716].value_counts()
print(vc)

# armazena os nomes das classes
cl = list(vc.index)
ncl = list(vc)

# Gráfico de distribuição
plt.figure(figsize=(10, 5))
plt.bar(cl, ncl)
plt.xticks(cl)
plt.yticks(ncl)
plt.title('Distribuição das Classes na Base')
plt.show(True)
```

```
1.0    183
2.0    116
0.0    101
Name: 716, dtype: int64
```



A Classe 1 possuí quase dobro a mais de ocorrências na amostra que as demais duas classes.

Isto com certeza irá provocar um desvio dependendo do modelo utilizado.

A tentativa de ajustar as três classes com quantidades de ocorrências iguais, nos traz desafios de interpretação

do modelo da base de dados.

Táticas Possíveis:

1) A exclusão de metade das ocorrências de Classe 1.

Como podemos fazer este "corte" sem levar em consideração que as amostras excluídas teriam em suas colunas,

conteúdos que fizessem real diferença para uma classificação mais próxima.

Uma possível solução seria: Como vamos fazer um Hold-Out (80% Treinamento, 20% Teste),

uma possibilidade é pegar esta parte excluída das ocorrências da classe 1 e incluí-la na base de teste, junto com a

distribuição. Este acréscimo na base de teste ajudaria a verificar se o modelo treinado,

consegue explicar melhor a classe 1.

2) Criar novas ocorrências nas Classes 0 e 2, com a média ou moda das respectivas colunas (clones).

Temos que estudar o impacto, pois aplicando o Hold-Out podemos ter a parte de treinamento carregando muito

das ocorrências clonadas e não as originais, e, portanto, puxando o modelo de forma irregular.

Uma possível solução aqui é criar os clones com pequenos ruídos em seus conteúdos numéricos. O que

precisa ser estudado neste caso é se estes ruídos não afetam o conteúdo de maneira a mudá-los de classe.

#### Colunas dos Atributos SPHARM

In [ ]:

```

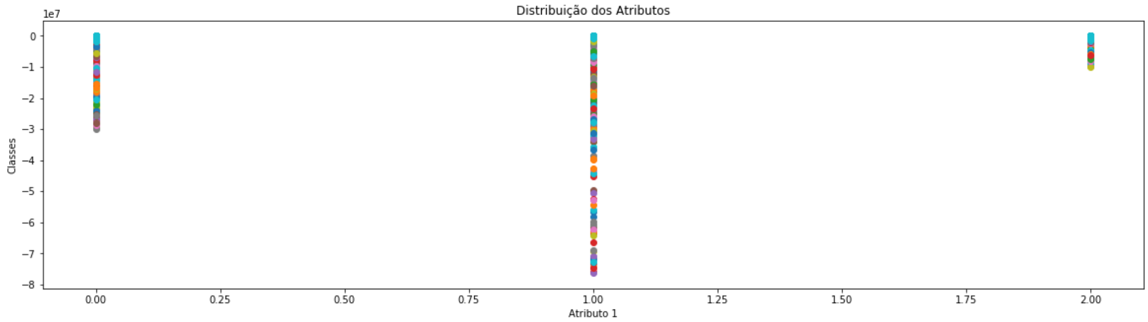
```

In [16]:

```
###### Vamos verificar a distribuição dos atributos de SPHARM
# Gráfico de distribuição
plt.figure(figsize=(20, 5))

for i in range(0, 200):
    plt.scatter(df[716], df[i])

plt.ylabel('Classes')
plt.xlabel('Atributo 1')
plt.title('Distribuição dos Atributos')
plt.show(True)
```



In [18]:

```
# Verificar a quantidade de amostras por faixa de atributos
fx_atrib = {}

for c in range(len(df.columns)):
    if (c in [0, 1, 2, 716]):
        continue

    print(f'Atributo: {c}')
    faixas = {-6.00:0, -3.00:0, 0.00:0, 0.10:0, 1.00:0, 2.00:0, 3.00:0, 4.00:0}

    for l in range(len(df)):
        v = df.iloc[l, c]

        if v <= -6.00:
            faixas[-6.00] += 1
        elif v <= -3.00:
            faixas[-3.00] += 1
        elif v <= 0.00:
            faixas[0.00] += 1
        elif v <= 0.10:
            faixas[0.10] += 1
        elif v <= 1.00:
            faixas[1.00] += 1
        elif v <= 2.00:
            faixas[2.00] += 1
        elif v <= 3.00:
            faixas[3.00] += 1
        else:
            faixas[4.00] += 1

    fx_atrib[c] = faixas

    print(faixas)
```

```
Atributo: 3
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```
---------------------------------------------------------------------------
-
TypeError                                 Traceback (most recent call las
t)
<ipython-input-18-a61651963f72> in <module>
     12         v = df.iloc[l, c]
     13 
---> 14         if v <= -6.00:
     15             faixas[-6.00] += 1
     16         elif v <= -3.00:

TypeError: '<=' not supported between instances of 'str' and 'float'
```

**Eliminação de Colunas**

Observamos na lista anterior que temos uma quantidade de atributos com muitos elemntos faltantes.

Se levarmos em conta que temos uma base com 400 linhas vamos tomar como base 10% de elementos faltantes

por atributo é razoável.

Desta maneira vamos desconsiderar as colunas acima da 194, considerando a última coluna que é nossa classe.

Para os elementos vamos utilizar a o valor médio da coluna para preenchimento.

In [20]:

```
# Criando um novo dataframe com apenas 194 colunas
dx = df.iloc[:, :195]
dx[195] = df.iloc[:, 716]

print(f'Nova base possui {dx.shape[0]} linhas e {dx.shape[1]} colunas')
dx.head()
```

```
Nova base possui 400 linhas e 196 colunas
```

Out[20]:

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | |
|---|---|---|---|---|---|---|---|---|
| **0** | 29.0 | 0.0 | 1.0 | -7881.480247 | -5759.969698 | -24465.608592 | -15275.106756 | -22974.378( |
| **1** | 31.0 | 0.0 | 1.0 | -567.772697 | -33.292309 | -465.179132 | -525.981010 | -469.546( |
| **2** | 27.0 | 0.0 | 1.0 | -135372.767326 | -115124.114646 | -772665.053883 | -292331.423079 | -58059.255( |
| **3** | 52.0 | 0.0 | 1.0 | -582.939571 | -366.425893 | -281.022452 | -437.739821 | -206.814( |
| **4** | 56.0 | 0.0 | 1.0 | -913.082501 | -334.221895 | -449.102108 | -113.637478 | -50.065( |

5 rows × 196 columns

**Conteúdos faltantes**

In [21]:

```
# Preenchendo os valores faltantes com as médias das colunas

media = dx.mean(axis=0)

dx.fillna(media, inplace=True)

dx.isna()
```

Out[21]:

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | ... | 186 | 187 | 1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **0** | False | False | False | False | False | False | False | False | False | False | ... | False | False | Fa |
| **1** | False | False | False | False | False | False | False | False | False | False | ... | False | False | Fa |
| **2** | False | False | False | False | False | False | False | False | False | False | ... | False | False | Fa |
| **3** | False | False | False | False | False | False | False | False | False | False | ... | False | False | Fa |
| **4** | False | False | False | False | False | False | False | False | False | False | ... | False | False | Fa |
| **5** | False | False | False | False | False | False | False | False | False | False | ... | False | False | Fa |
| **6** | False | False | False | False | False | False | False | False | False | False | ... | False | False | Fa |
| **7** | False | False | False | False | False | False | False | False | False | False | ... | False | False | Fa |
| **8** | False | False | False | False | False | False | False | False | False | False | ... | False | False | Fa |
| **9** | False | False | False | False | False | False | False | False | False | False | ... | False | False | Fa |
| **10** | False | False | False | False | False | False | False | False | False | False | ... | False | False | Fa |
| **11** | False | False | False | False | False | False | False | False | False | False | ... | False | False | Fa |
| **12** | False | False | False | False | False | False | False | False | False | False | ... | False | False | Fa |
| **13** | False | False | False | False | False | False | False | False | False | False | ... | False | False | Fa |
| **14** | False | False | False | False | False | False | False | False | False | False | ... | False | False | Fa |
| **15** | False | False | False | False | False | False | False | False | False | False | ... | False | False | Fa |
| **16** | False | False | False | False | False | False | False | False | False | False | ... | False | False | Fa |
| **17** | False | False | False | False | False | False | False | False | False | False | ... | False | False | Fa |
| **18** | False | False | False | False | False | False | False | False | False | False | ... | False | False | Fa |
| **19** | False | False | False | False | False | False | False | False | False | False | ... | False | False | Fa |
| **20** | False | False | False | False | False | False | False | False | False | False | ... | False | False | Fa |
| **21** | False | False | False | False | False | False | False | False | False | False | ... | False | False | Fa |
| **22** | False | False | False | False | False | False | False | False | False | False | ... | False | False | Fa |
| **23** | False | False | False | False | False | False | False | False | False | False | ... | False | False | Fa |
| **24** | False | False | False | False | False | False | False | False | False | False | ... | False | False | Fa |
| **25** | False | False | False | False | False | False | False | False | False | False | ... | False | False | Fa |
| **26** | False | False | False | False | False | False | False | False | False | False | ... | False | False | Fa |
| **27** | False | False | False | False | False | False | False | False | False | False | ... | False | False | Fa |
| **28** | False | False | False | False | False | False | False | False | False | False | ... | False | False | Fa |
| **29** | False | False | False | False | False | False | False | False | False | False | ... | False | False | Fa |
| **...** | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | |
| **370** | False | False | False | False | False | False | False | False | False | False | ... | False | False | Fa |
| **371** | False | False | False | False | False | False | False | False | False | False | ... | False | False | Fa |
| **372** | False | False | False | False | False | False | False | False | False | False | ... | False | False | Fa |
| **373** | False | False | False | False | False | False | False | False | False | False | ... | False | False | Fa |
| **374** | False | False | False | False | False | False | False | False | False | False | ... | False | False | Fa |
| **375** | False | False | False | False | False | False | False | False | False | False | ... | False | False | Fa |

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | ... | 186 | 187 | 1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **376** | False | False | False | False | False | False | False | False | False | False | ... | False | False | Fa |
| **377** | False | False | False | False | False | False | False | False | False | False | ... | False | False | Fa |
| **378** | False | False | False | False | False | False | False | False | False | False | ... | False | False | Fa |
| **379** | False | False | False | False | False | False | False | False | False | False | ... | False | False | Fa |
| **380** | False | False | False | False | False | False | False | False | False | False | ... | False | False | Fa |
| **381** | False | False | False | False | False | False | False | False | False | False | ... | False | False | Fa |
| **382** | False | False | False | False | False | False | False | False | False | False | ... | False | False | Fa |
| **383** | False | False | False | False | False | False | False | False | False | False | ... | False | False | Fa |
| **384** | False | False | False | False | False | False | False | False | False | False | ... | False | False | Fa |
| **385** | False | False | False | False | False | False | False | False | False | False | ... | False | False | Fa |
| **386** | False | False | False | False | False | False | False | False | False | False | ... | False | False | Fa |
| **387** | False | False | False | False | False | False | False | False | False | False | ... | False | False | Fa |
| **388** | False | False | False | False | False | False | False | False | False | False | ... | False | False | Fa |
| **389** | False | False | False | False | False | False | False | False | False | False | ... | False | False | Fa |
| **390** | False | False | False | False | False | False | False | False | False | False | ... | False | False | Fa |
| **391** | False | False | False | False | False | False | False | False | False | False | ... | False | False | Fa |
| **392** | False | False | False | False | False | False | False | False | False | False | ... | False | False | Fa |
| **393** | False | False | False | False | False | False | False | False | False | False | ... | False | False | Fa |
| **394** | False | False | False | False | False | False | False | False | False | False | ... | False | False | Fa |
| **395** | False | False | False | False | False | False | False | False | False | False | ... | False | False | Fa |
| **396** | False | False | False | False | False | False | False | False | False | False | ... | False | False | Fa |
| **397** | False | False | False | False | False | False | False | False | False | False | ... | False | False | Fa |
| **398** | False | False | False | False | False | False | False | False | False | False | ... | False | False | Fa |
| **399** | False | False | False | False | False | False | False | False | False | False | ... | False | False | Fa |

400 rows × 196 columns

#### Gravação de Arquivo Tratado

In [22]:

```
# Gravando o arquivo de Saída
dx.to_csv (r'Total_SPHARM_20200403.csv', index = False, header = False)
```

In [23]:

```
# Verificando se a gravação foi ok
import numpy as np
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
dy = pd.read_csv('Total_SPHARM_20200403.csv', header=None)
dy
```

Out[23]:

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | |
|---|---|---|---|---|---|---|---|---|
| **0** | 29.0 | 0.0 | 1.0 | -7.881480e+03 | -5.759970e+03 | -24465.608592 | -1.527511e+04 | -2.297438e+ |
| **1** | 31.0 | 0.0 | 1.0 | -5.677727e+02 | -3.329231e+01 | -465.179132 | -5.259810e+02 | -4.695469e+ |
| **2** | 27.0 | 0.0 | 1.0 | -1.353728e+05 | -1.151241e+05 | -772665.053883 | -2.923314e+05 | -5.805926e+ |
| **3** | 52.0 | 0.0 | 1.0 | -5.829396e+02 | -3.664259e+02 | -281.022452 | -4.377398e+02 | -2.068149e+ |
| **4** | 56.0 | 0.0 | 1.0 | -9.130825e+02 | -3.342219e+02 | -449.102108 | -1.136375e+02 | -5.006534e+ |
| **5** | 35.0 | 1.0 | 0.0 | -1.366224e+02 | -2.199550e+02 | -58.230194 | -4.328410e+01 | -5.360079e+ |
| **6** | 57.0 | 0.0 | 1.0 | -3.297554e+03 | -1.648603e+03 | -1826.976716 | -1.772262e+03 | -3.546650e+ |
| **7** | 38.0 | 0.0 | 1.0 | -2.442526e+02 | -7.486417e+02 | -835.703744 | -9.245954e+01 | -1.056221e+ |
| **8** | 31.0 | 0.0 | 1.0 | -9.637751e+03 | -8.027820e+03 | -5467.031364 | -1.027926e+04 | -5.241849e+ |
| **9** | 52.0 | 0.0 | 1.0 | -2.487505e+03 | -5.893294e+03 | -1921.054444 | -6.216152e+03 | -4.697064e+ |
| **10** | 35.0 | 0.0 | 1.0 | -4.768730e+02 | -1.362988e+03 | -1457.880666 | -1.111917e+03 | -1.830148e+ |
| **11** | 34.0 | 0.0 | 1.0 | -2.605087e+04 | -1.473219e+00 | -39260.420820 | -1.246688e+05 | -7.419543e+ |
| **12** | 31.0 | 0.0 | 1.0 | -8.408447e+02 | -1.007348e+03 | -696.233886 | -4.659840e+02 | -7.410065e+ |
| **13** | 35.0 | 0.0 | 1.0 | -5.830271e+03 | -4.275993e+03 | -4695.216087 | -2.029802e+03 | -3.513195e+ |
| **14** | 67.0 | 0.0 | 1.0 | -7.373532e+02 | -8.577445e+01 | -299.292120 | -2.558461e+02 | -4.904883e+ |
| **15** | 37.0 | 0.0 | 1.0 | -1.939732e+05 | -2.555080e+05 | -637349.620003 | -6.172288e+05 | -6.130578e+ |
| **16** | 24.0 | 0.0 | 1.0 | -1.234546e+04 | -2.466000e+04 | -34583.600042 | -1.758072e+04 | -4.750892e+ |
| **17** | 40.0 | 1.0 | 0.0 | -1.975407e+03 | -3.928906e+03 | -519.970806 | -1.428224e+03 | -2.069862e+ |
| **18** | 59.0 | 1.0 | 0.0 | -2.965385e+01 | -1.005491e+03 | -427.524169 | -1.541901e+03 | -3.378050e+ |
| **19** | 45.0 | 0.0 | 1.0 | -6.985784e+03 | -1.575974e+03 | -6226.239818 | -3.621642e+03 | -2.053579e+ |
| **20** | 23.0 | 0.0 | 1.0 | -3.165760e+03 | -6.637580e+03 | -1141.221562 | -1.984825e+04 | -1.025843e+ |
| **21** | 25.0 | 0.0 | 1.0 | -1.843351e+04 | -6.983452e+03 | -12971.478639 | -3.375355e+03 | -1.158002e+ |
| **22** | 42.0 | 0.0 | 1.0 | -4.888414e+02 | -1.059763e+03 | -644.330143 | -3.450683e+02 | -1.294610e+ |
| **23** | 23.0 | 0.0 | 1.0 | -1.037149e+02 | -8.570231e+01 | -38.865049 | -1.297267e+02 | -1.812836e+ |
| **24** | 35.0 | 0.0 | 1.0 | -1.471685e+02 | -1.210296e+02 | -359.786824 | -4.481863e+02 | -1.135414e+ |
| **25** | 39.0 | 0.0 | 1.0 | -4.356068e+01 | -3.991769e+02 | -148.657240 | -1.414063e+02 | -3.693157e+ |
| **26** | 28.0 | 0.0 | 1.0 | -1.621457e+05 | -2.282778e+05 | -37281.031339 | -2.472966e+05 | -2.299448e+ |
| **27** | 26.0 | 0.0 | 1.0 | -7.647399e+03 | -1.107888e+01 | -2739.908928 | -2.833898e+03 | -7.743274e+ |
| **28** | 31.0 | 0.0 | 1.0 | -5.576614e+04 | -2.898171e+04 | -21714.739023 | -1.246992e+05 | -5.833079e+ |
| **29** | 34.0 | 1.0 | 0.0 | -7.036986e+03 | -5.495268e+03 | -6708.475802 | -7.235843e+03 | -9.031120e+ |
| **...** | ... | ... | ... | ... | ... | ... | ... | |
| **370** | 64.0 | 0.0 | 1.0 | -2.123185e+02 | -2.003174e+02 | -1164.322970 | -5.212812e+02 | -1.253588e+ |
| **371** | 51.0 | 0.0 | 1.0 | -1.092637e+06 | -1.029095e+06 | -496288.691490 | -1.031039e+06 | -1.209041e+ |
| **372** | 59.0 | 0.0 | 1.0 | -1.595783e+03 | -3.129432e+03 | -5718.329830 | -4.201645e+03 | -7.930190e+ |
| **373** | 55.0 | 0.0 | 1.0 | -8.412583e+02 | -1.723350e+03 | -2085.425893 | -8.785994e+02 | -4.018711e+ |
| **374** | 59.0 | 0.0 | 1.0 | -5.746846e+02 | -1.369321e+03 | -104.635421 | -2.053959e+03 | -1.349388e+ |
| **375** | 39.0 | 0.0 | 1.0 | -2.893650e+03 | -2.158697e+03 | -267.445740 | -1.953194e+03 | -8.030228e+ |

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | |
|---|---|---|---|---|---|---|---|---|
| **376** | 63.0 | 0.0 | 1.0 | -3.036861e+02 | -5.751973e+02 | -1161.662218 | -9.622598e+02 | -1.108696e+ |
| **377** | 54.0 | 0.0 | 1.0 | -1.540265e+04 | -2.169498e+04 | -27419.023456 | -1.040324e+05 | -6.180849e+ |
| **378** | 70.0 | 1.0 | 0.0 | -1.112629e+04 | -1.583282e+04 | -15633.258388 | -2.926192e+03 | -5.095644e+ |
| **379** | 34.0 | 0.0 | 1.0 | -5.453420e+03 | -4.028552e+03 | -2555.298376 | -1.557641e+03 | -6.914947e+ |
| **380** | 54.0 | 0.0 | 1.0 | -4.458359e+04 | -1.173561e+04 | -18321.934737 | -2.013349e+04 | -5.391768e+ |
| **381** | 75.0 | 0.0 | 1.0 | -7.631249e+02 | -4.829211e+02 | -464.524393 | -7.439314e+01 | -2.187503e+ |
| **382** | 44.0 | 0.0 | 1.0 | -6.033824e+03 | -4.249743e+03 | -5989.952192 | -1.482744e+03 | -3.841627e+ |
| **383** | 65.0 | 1.0 | 0.0 | -1.110345e+03 | -1.446968e+02 | -905.564362 | -1.302779e+03 | -7.496522e+ |
| **384** | 42.0 | 0.0 | 1.0 | -1.963345e+02 | -2.764987e+03 | -964.060887 | -3.276351e+02 | -1.903452e+ |
| **385** | 72.0 | 0.0 | 1.0 | -7.789314e+04 | -3.691938e+05 | -319525.553558 | -1.374414e+05 | -4.749440e+ |
| **386** | 50.0 | 1.0 | 0.0 | -9.773002e+03 | -1.825279e+04 | -13273.094795 | -3.374229e+03 | -7.710764e+ |
| **387** | 75.0 | 0.0 | 1.0 | -9.773002e+03 | -1.825279e+04 | -13273.094795 | -3.374229e+03 | -7.710764e+ |
| **388** | 66.0 | 1.0 | 0.0 | -3.610507e+02 | -4.257124e+02 | -265.402414 | -7.200476e+02 | -4.102195e+ |
| **389** | 54.0 | 0.0 | 1.0 | -1.144933e+03 | -4.090116e+02 | -776.242840 | -1.894642e+02 | -2.748449e+ |
| **390** | 46.0 | 0.0 | 1.0 | -3.112529e+03 | -9.422838e+01 | -2911.332390 | -4.376021e+03 | -2.210641e+ |
| **391** | 68.0 | 1.0 | 0.0 | -7.386287e+00 | -9.850329e+02 | -362.244176 | -9.246079e+02 | -1.484045e+ |
| **392** | 36.0 | 1.0 | 0.0 | -7.386287e+00 | -9.850329e+02 | -362.244176 | -9.246079e+02 | -1.484045e+ |
| **393** | 80.0 | 0.0 | 1.0 | -8.431052e+02 | -3.255629e+02 | -420.200125 | -1.874834e+02 | -1.056372e+ |
| **394** | 70.0 | 0.0 | 1.0 | -5.335541e+04 | -2.603940e+04 | -30552.558802 | -2.401038e+04 | -3.625281e+ |
| **395** | 31.0 | 1.0 | 0.0 | -1.836571e+05 | -6.745670e+05 | -398795.513057 | -4.435872e+05 | -1.316958e+ |
| **396** | 70.0 | 0.0 | 1.0 | -9.806476e+02 | -1.872219e+03 | -520.334038 | -5.216247e+02 | -1.306109e+ |
| **397** | 48.0 | 1.0 | 0.0 | -8.778657e+03 | -9.578976e+03 | -3980.433446 | -5.960246e+03 | -8.827803e+ |
| **398** | 46.0 | 0.0 | 1.0 | -1.271969e+02 | -5.049371e+00 | -124.475009 | -1.609458e+02 | -1.816993e+ |
| **399** | 46.0 | 1.0 | 0.0 | -4.504015e+02 | -1.227387e+02 | -338.262264 | -4.661443e+02 | -3.392533e+ |

400 rows × 196 columns

In [ ]: