Analysis of Bordeaux Airbnb Data

Importing Libraries

In [1]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
import plotly.express as px
import scipy.stats as stats
import statsmodels.api as sm
import statsmodels.stats.contingency_tables as ct
from sklearn.metrics import r2_score, mean_absolute_error, mean_squared_error
from sklearn.metrics import accuracy_score,classification_report,confusion_matrix
from statsmodels.graphics.gofplots import qqplot
from statsmodels.stats.weightstats import ztest
from nltk.stem import PorterStemmer
from nltk.tokenize import word_tokenize
from gensim import corpora
from numpy import linalg as LA
from sklearn.preprocessing import LabelEncoder
from sklearn.neural_network import MLPRegressor
from sklearn.datasets import make_regression
from sklearn.tree import DecisionTreeClassifier
from sklearn.model_selection import train_test_split
from sklearn.metrics import mean_absolute_error
from sklearn.preprocessing import QuantileTransformer
from sklearn.compose import TransformedTargetRegressor
import nltk
from sklearn.metrics import mean_squared_error
from nltk.tokenize import RegexpTokenizer
from nltk.stem import WordNetLemmatizer,PorterStemmer
from nltk.corpus import stopwords
import re
from utils import *
%matplotlib inline

sns.set_style("whitegrid")
plt.style.use("fivethirtyeight")
pd.set_option('display.max_columns', 200)
pd.set_option('display.max_rows', 100)
pd.set_option('display.min_rows', 100)
pd.set_option('display.expand_frame_repr', True)

```

```
[nltk_data] Downloading package stopwords to /home/mouad/nltk_data...
[nltk_data]   Package stopwords is already up-to-date!
[nltk_data] Downloading package wordnet to /home/mouad/nltk_data...
[nltk_data]   Package wordnet is already up-to-date!
[nltk_data] Downloading package omw-1.4 to /home/mouad/nltk_data...
[nltk_data]   Package omw-1.4 is already up-to-date!
```

Loading the data

In [2]:
```
df = pd.read_csv("33000-BORDEAUX_nettoye.csv")
display(df.sample(3))
```

	Identifiant	Url	Titre	PrixNuitee	Latitude	Longitude	Resume	Capacite_accueil	NombreSdB	NbChambres	NbLit
1601	6952547	https://www.airbnb.fr/rooms/6952547	Bel appartement spacieux (87m2)	55	44.850479	-0.613598	Appartement spacieux refait à neuf l'an passé....	3	5	2	
1530	6791767	https://www.airbnb.fr/rooms/6791767	Chambre dans grande maison	30	44.834473	-0.588220	Chambre avec avec lit pour 2 personnes en mezz...	3	1	1	
911	4981809	https://www.airbnb.fr/rooms/4981809	Appartement T2 - Centre-ville	50	44.831654	-0.583236	Deux-pièces, quartier calme en centre-ville. A...	4	1	1	

In [3]:
```
print('Number of observations: '+ str(df.shape[0]))
print('Number of variables: '+ str(df.shape[1]))
```

```
Number of observations: 5237
Number of variables: 61
```

In [4]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 5237 entries, 0 to 5236
Data columns (total 61 columns):
 #   Column                   Non-Null Count  Dtype
---  ------                   --------------  -----
 0   Identifiant              5237 non-null   int64
 1   Url                      5237 non-null   object
 2   Titre                    5237 non-null   object
 3   PrixNuitee               5237 non-null   int64
 4   Latitude                 5237 non-null   float64
 5   Longitude                5237 non-null   float64
 6   Resume                   5236 non-null   object
 7   Capacite_accueil         5237 non-null   int64
 8   NombreSdB                5237 non-null   int64
 9   NbChambres               5237 non-null   int64
 10  NbLits                   5237 non-null   int64
 11  Type_logement            5237 non-null   object
 12  type_propriete           5237 non-null   object
 13  type_lit                 2375 non-null   object
```

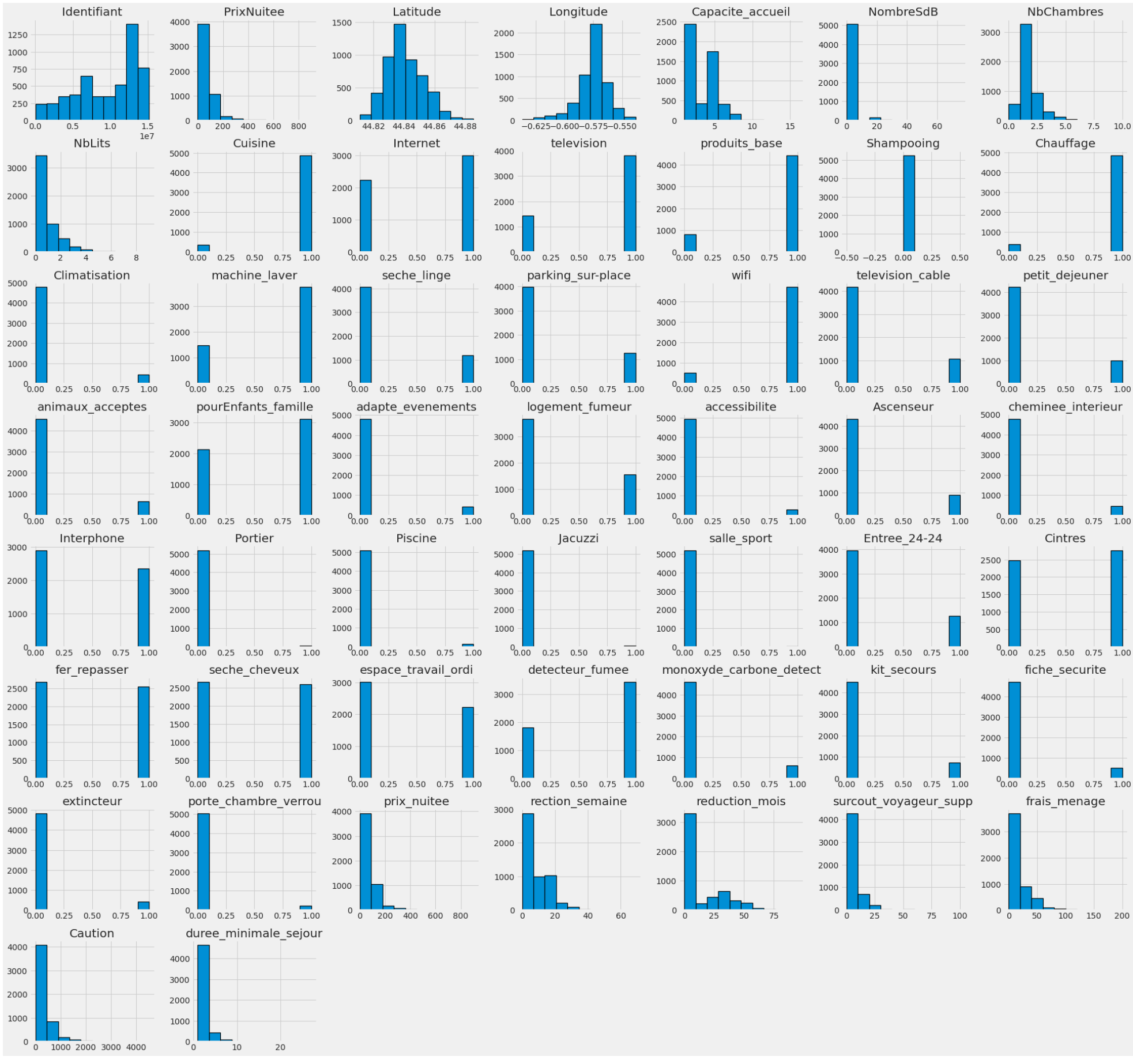
In [5]:
```
# Checking for missing values
display(df.isnull().sum())
```

```
Identifiant                 0
Url                         0
Titre                       0
PrixNuitee                  0
Latitude                    0
Longitude                   0
Resume                      1
Capacite_accueil            0
NombreSdB                   0
NbChambres                  0
NbLits                      0
Type_logement               0
type_propriete              0
type_lit                 2862
Animal_sur_place         4847
Cuisine                     0
Internet                    0
television                  0
produits_base               0
```

In [6]:
```
for column in df.columns:
    if df[column].isnull().sum() != 0:
        print("=======================================================")
        print(f"{column} ==> Missing Values : {df[column].isnull().sum()}, dtypes : {df[column].dtypes}")
```

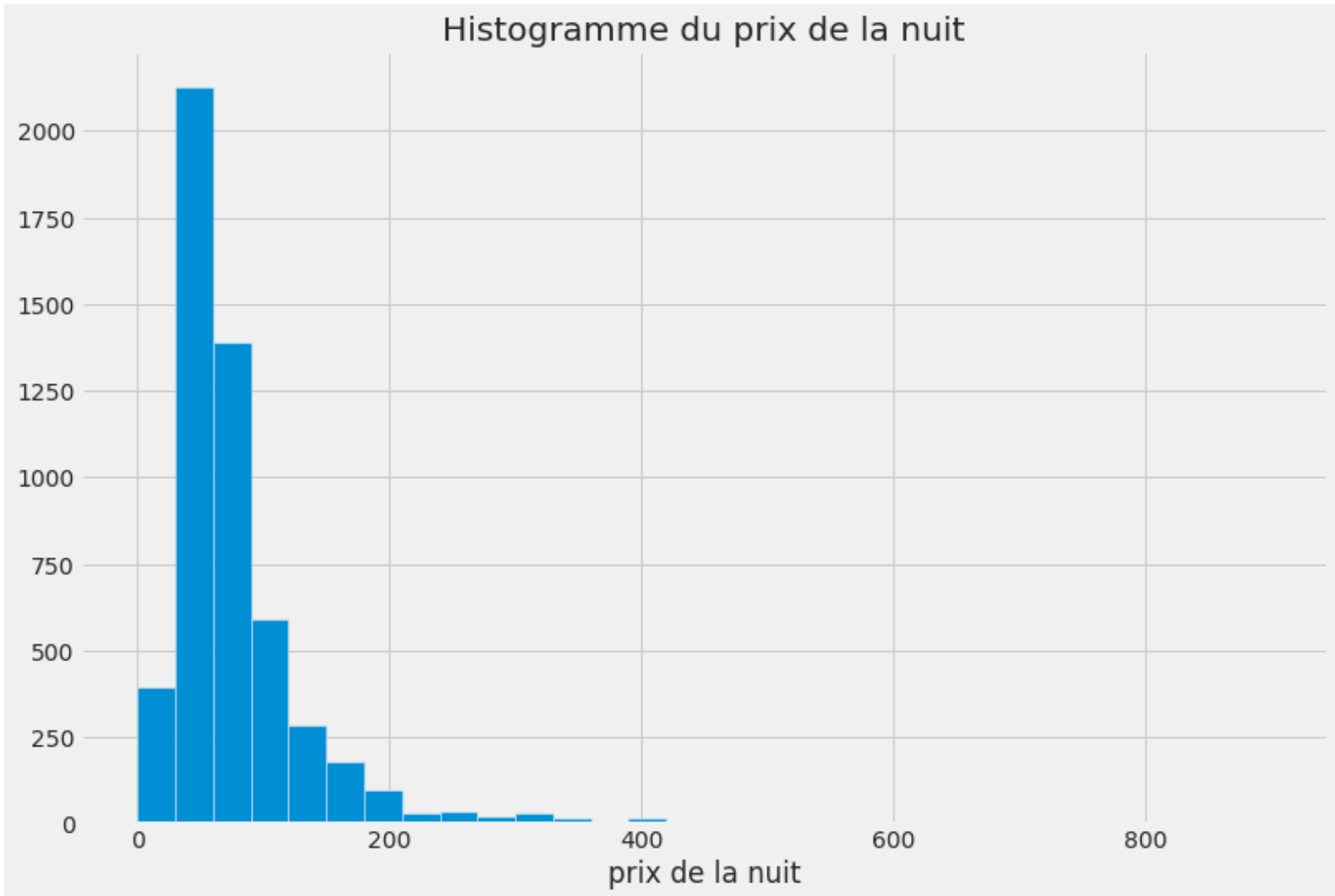
```
=======================================================
Resume ==> Missing Values : 1, dtypes : object
=======================================================
type_lit ==> Missing Values : 2862, dtypes : object
=======================================================
Animal_sur_place ==> Missing Values : 4847, dtypes : object
=======================================================
conditions_annulation ==> Missing Values : 965, dtypes : object
=======================================================
Description ==> Missing Values : 4, dtypes : object
=======================================================
reglement_interieur ==> Missing Values : 862, dtypes : object
```

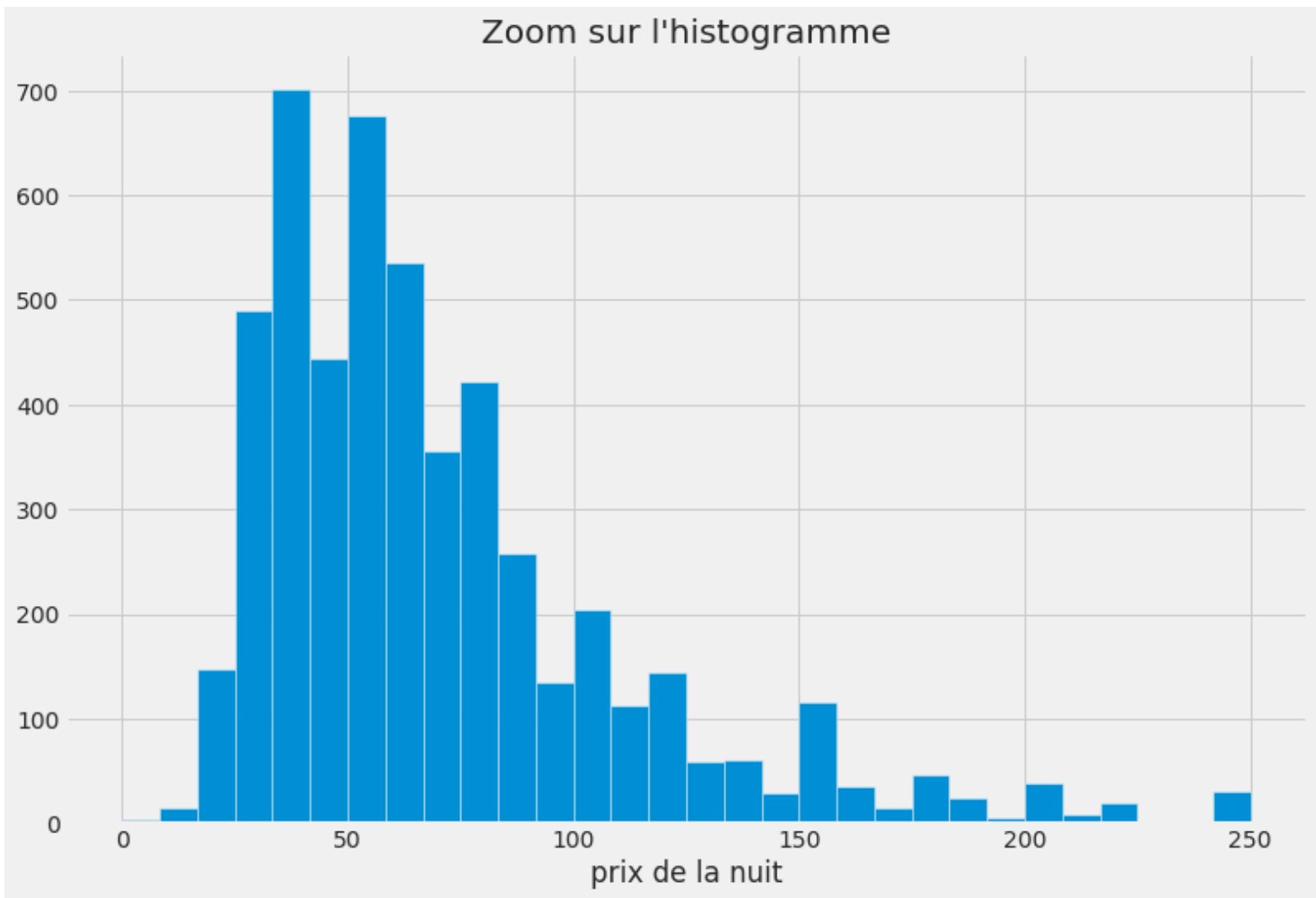
In [7]:
```
# Visualizing the distribution for every "feature"
df.hist(edgecolor="black", linewidth=1.2, figsize=(30, 30));
```



In [8]:
```
plt.figure(figsize=(12, 8))
plt.title('Histogramme du prix de la nuit')
plt.xlabel('prix de la nuit')
df.PrixNuitee.hist(bins=30)
plt.figure(figsize=(12, 8))
plt.title("Zoom sur l'histogramme")
plt.xlabel('prix de la nuit')
df.PrixNuitee[df.PrixNuitee < 260].hist(bins=30)
```

Out[8]: <AxesSubplot:title={'center':"Zoom sur l'histogramme"}, xlabel='prix de la nuit'>





In [9]:
```
print(f"Prix moyen par nuit : {df.PrixNuitee.mean():.2f} €")
print(f"Prix maximum par nuit : {df.PrixNuitee.max()} €")
print(f"Prix minimum par nuit : {df.PrixNuitee.min()} €")
```

```
Prix moyen par nuit : 76.24 €
Prix maximum par nuit : 900 €
Prix minimum par nuit : 0 €
```

In [10]:
```
df[df.PrixNuitee == 0]
```

Out[10]:

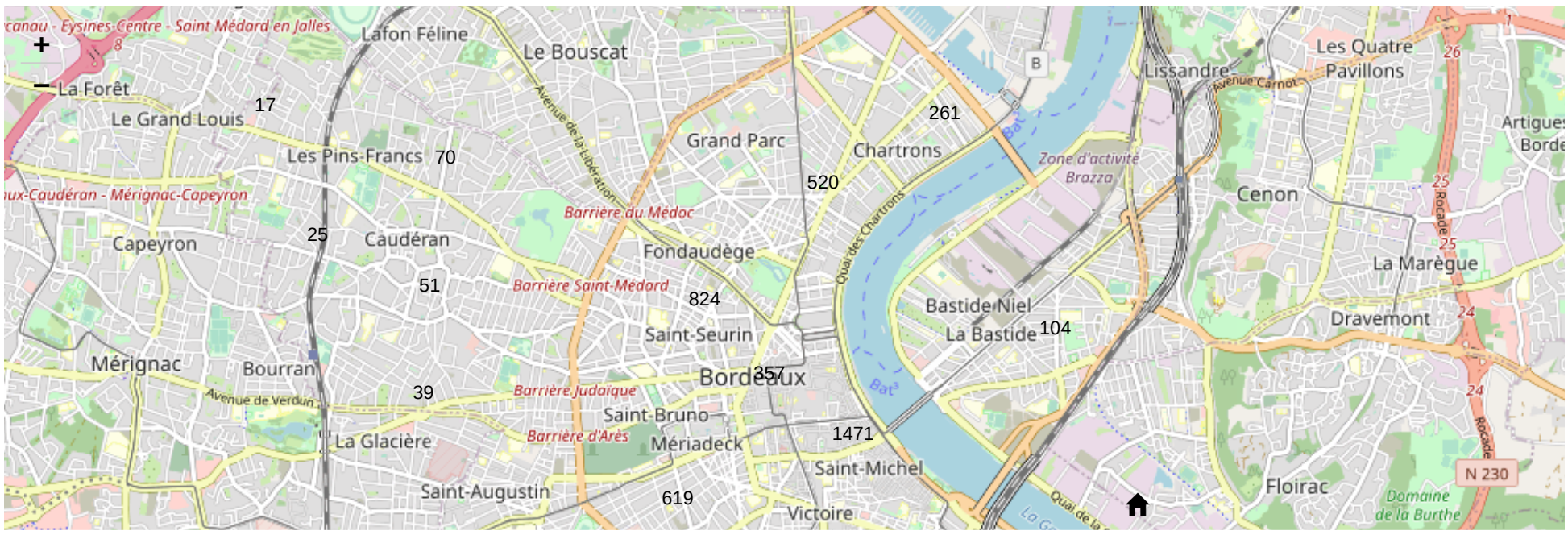
	Identifiant	Url	Titre	PrixNuitee	Latitude	Longitude	Resume	Capacite_accueil	NombreSdB	NbChambres	NbLits
4327	13507580	https://www.airbnb.fr/rooms/13507580	Bel appartement de 45m² au cœur de Bordeaux	0	44.832659	-0.565469	A seulement 10 min du centre-ville de Bordeaux...	4	1	1	0
4416	13594315	https://www.airbnb.fr/rooms/13594315	Echoppe ensoleillée	0	44.852209	-0.586533	Mon logement est proche de le centre ville, pa...	2	1	1	0
5111	14854384	https://www.airbnb.fr/rooms/14854384	Chambre cozy dans l'hyper centre	0	44.839525	-0.574569	Mon logement est proche de parcs, la vue excep...	2	1	1	0

Wow, il y a des maisons gratuites

In [11]:
```
df = df[df['PrixNuitee']!=0]
```

In [12]:
```
#to make the interactive maps
import folium
from folium.plugins import FastMarkerCluster

lats2018 = df['Latitude'].tolist()
lons2018 = df['Longitude'].tolist()
locations = list(zip(lats2018, lons2018))

map1 = folium.Map(location=[44.8350, -0.5800], zoom_start=12.5)
FastMarkerCluster(data=locations).add_to(map1)
map1
```

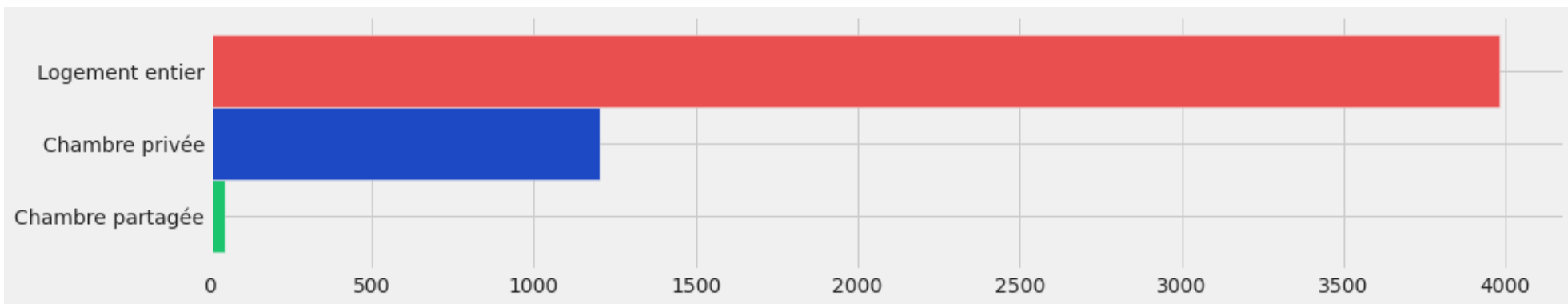
Out[12]:



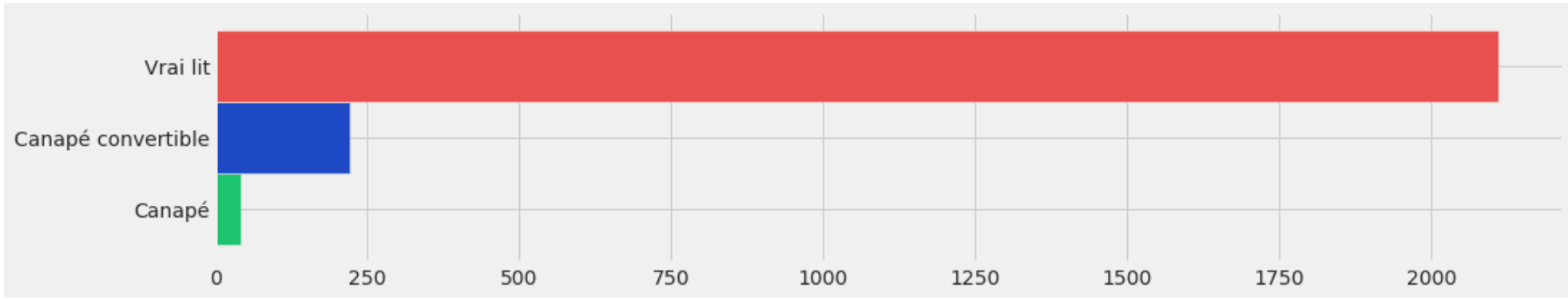
In [13]:
```
print("Type_logement : ",df.Type_logement.unique())
print("type_lit : ",df.type_lit.unique())
print("type_propriete : ",df.type_propriete.unique())
```

```
Type_logement :  ['Chambre privée' 'Logement entier' 'Chambre partagée']
type_lit :  [nan 'Vrai lit' 'Canapé convertible' 'Canapé']
type_propriete :  ['Maison' 'Appartement' 'Bed & Breakfast' 'Maison de ville' 'Loft'
 'Cabane' 'Appartement en résidence' 'Bungalow' 'Inconnue'
 'Maison écologique' 'Villa' 'Dortoir' 'Autre']
```

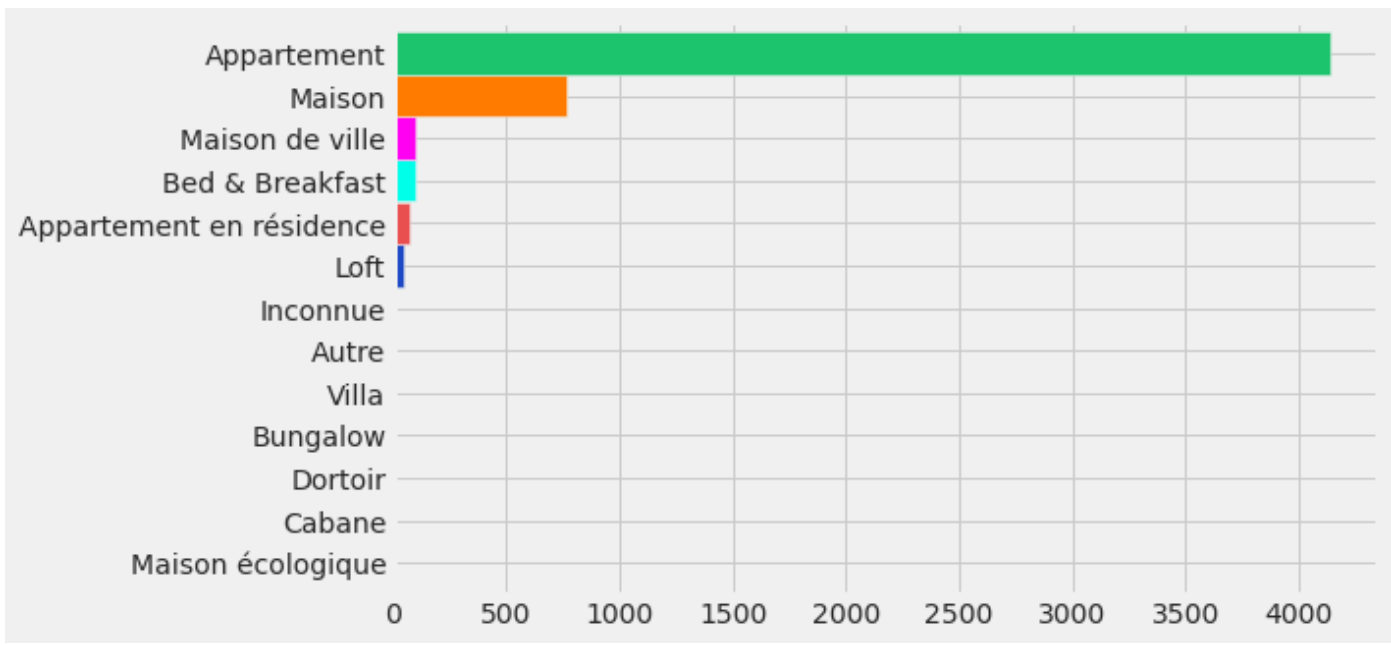
In [14]:
```
freq = df['Type_logement'].value_counts().sort_values(ascending=True)
freq.plot.barh(figsize=(15, 3), width=1, color = ["#1dc46e","#1d49c4","#ea4f4f"])
plt.show()
```



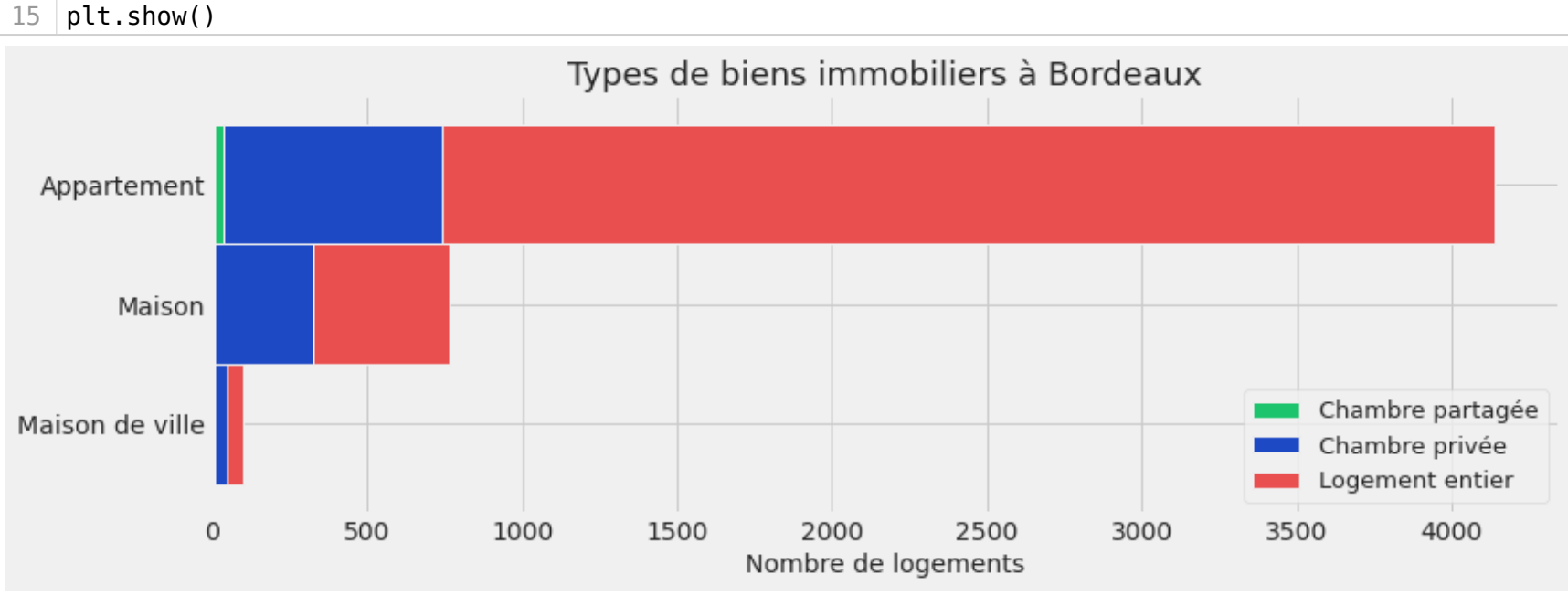
In [15]:
```
freq = df['type_lit'].value_counts().sort_values(ascending=True)
freq.plot.barh(figsize=(15, 3), width=1, color = ["#1dc46e","#1d49c4","#ea4f4f"])
plt.show()
```



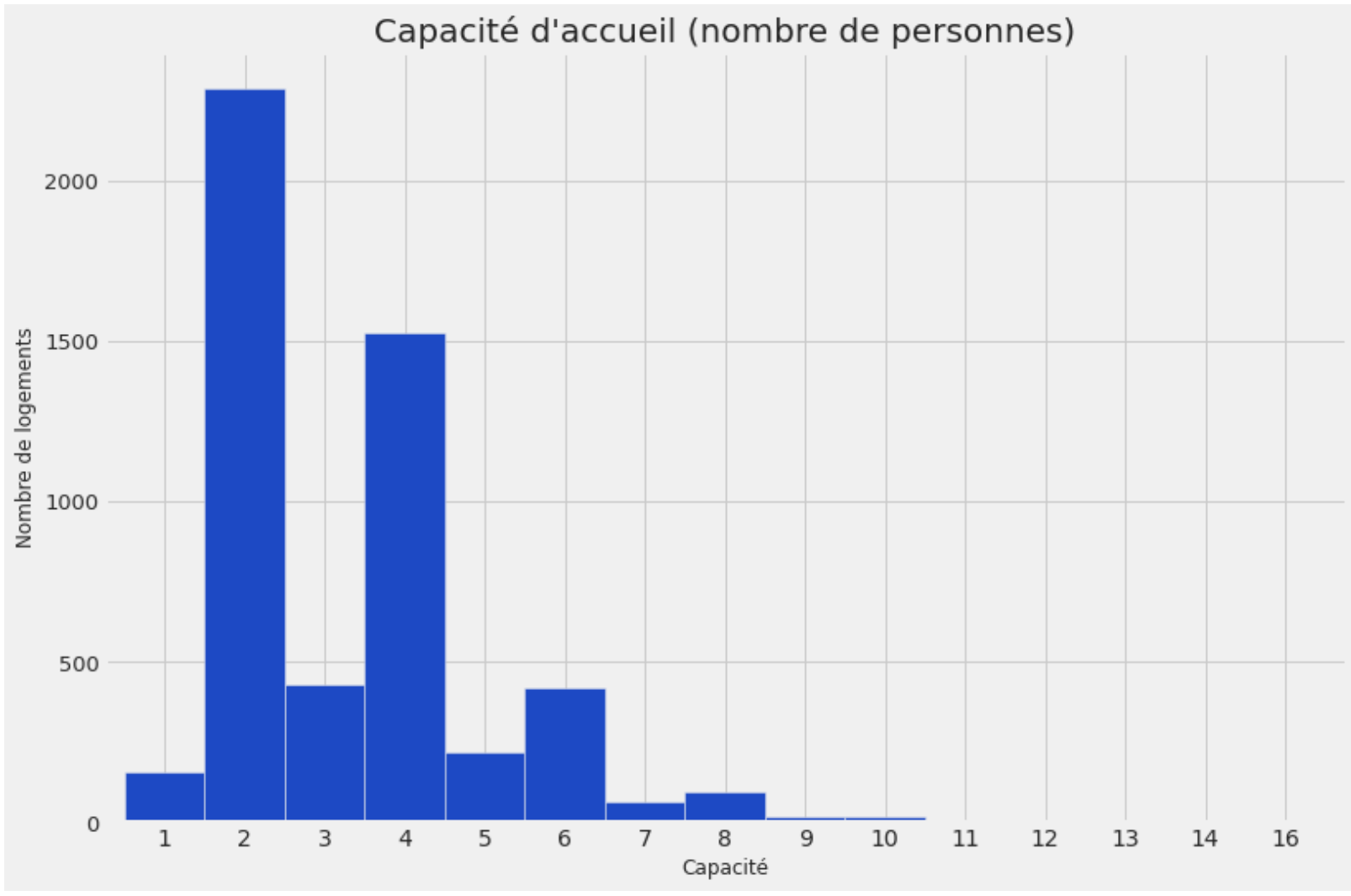
In [16]:
```
freq = df['type_propriete'].value_counts().sort_values(ascending=True)
freq.plot.barh(figsize=(8, 5), width=1, color = ["#1dc46e","#1d49c4","#ea4f4f","#00ffe9","#ff00f2","#ff7b00"])
plt.show()
```



In [17]:
```
prop = df.groupby(['type_propriete','Type_logement']).Type_logement.count()
prop = prop.unstack()
prop['total'] = prop.iloc[:,0:3].sum(axis = 1)
prop = prop.sort_values(by=['total'])
prop = prop[prop['total']>=100]
prop = prop.drop(columns=['total'])

prop.plot(kind='barh',stacked=True, color = ["#1dc46e","#1d49c4","#ea4f4f"],
              linewidth = 1, grid=True, figsize=(12,4), width=1)
plt.title('Types de biens immobiliers à Bordeaux', fontsize=18)
plt.xlabel('Nombre de logements', fontsize=14)
plt.ylabel("")
plt.legend(loc = 4,prop = {"size" : 13})
plt.rc('ytick', labelsize=13)
plt.show()
```



In [18]:
```
feq=df['Capacite_accueil'].value_counts().sort_index()
feq.plot.bar(figsize=(12, 8), color='#1d49c4', width=1, rot=0)
plt.title("Capacité d'accueil (nombre de personnes)", fontsize=20)
plt.ylabel('Nombre de logements', fontsize=12)
plt.xlabel('Capacité', fontsize=12)
plt.show()
```



Factors defining the price :

In [19]:
```
df.columns
```

Out[19]:
```
Index(['Identifiant', 'Url', 'Titre', 'PrixNuitee', 'Latitude', 'Longitude',
       'Resume', 'Capacite_accueil', 'NombreSdB', 'NbChambres', 'NbLits',
       'Type_logement', 'type_propriete', 'type_lit', 'Animal_sur_place',
       'Cuisine', 'Internet', 'television', 'produits_base', 'Shampooing',
       'Chauffage', 'Climatisation', 'machine_laver', 'seche_linge',
       'parking_sur-place', 'wifi', 'television_cable', 'petit_dejeuner',
       'animaux_acceptes', 'pourEnfants_famille', 'adapte_evenements',
       'logement_fumeur', 'accessibilite', 'Ascenseur', 'cheminee_interieur',
       'Interphone', 'Portier', 'Piscine', 'Jacuzzi', 'salle_sport',
       'Entree_24-24', 'Cintres', 'fer_repasser', 'seche_cheveux',
       'espace_travail_ordi', 'detecteur_fumee', 'monoxyde_carbone_detect',
       'kit_secours', 'fiche_securite', 'extincteur', 'porte_chambre_verrou',
       'prix_nuitee', 'rection_semaine', 'reduction_mois',
       'surcout_voyageur_supp', 'frais_menage', 'Caution',
       'conditions_annulation', 'Description', 'reglement_interieur',
       'duree_minimale_sejour'],
      dtype='object')
```

Numeric Data

In [20]:
```
df_N = df.loc[:,df.dtypes!=np.object]
```

```
<ipython-input-20-5feecf6cec31>:1: DeprecationWarning: `np.object` is a deprecated alias for the builtin `object`. To
silence this warning, use `object` by itself. Doing this will not modify any behavior and is safe.
Deprecated in NumPy 1.20; for more details and guidance: https://numpy.org/devdocs/release/1.20.0-notes.html#deprecati
ons (https://numpy.org/devdocs/release/1.20.0-notes.html#deprecations)
  df_N = df.loc[:,df.dtypes!=np.object]
```

In [21]:
```
df_N
```

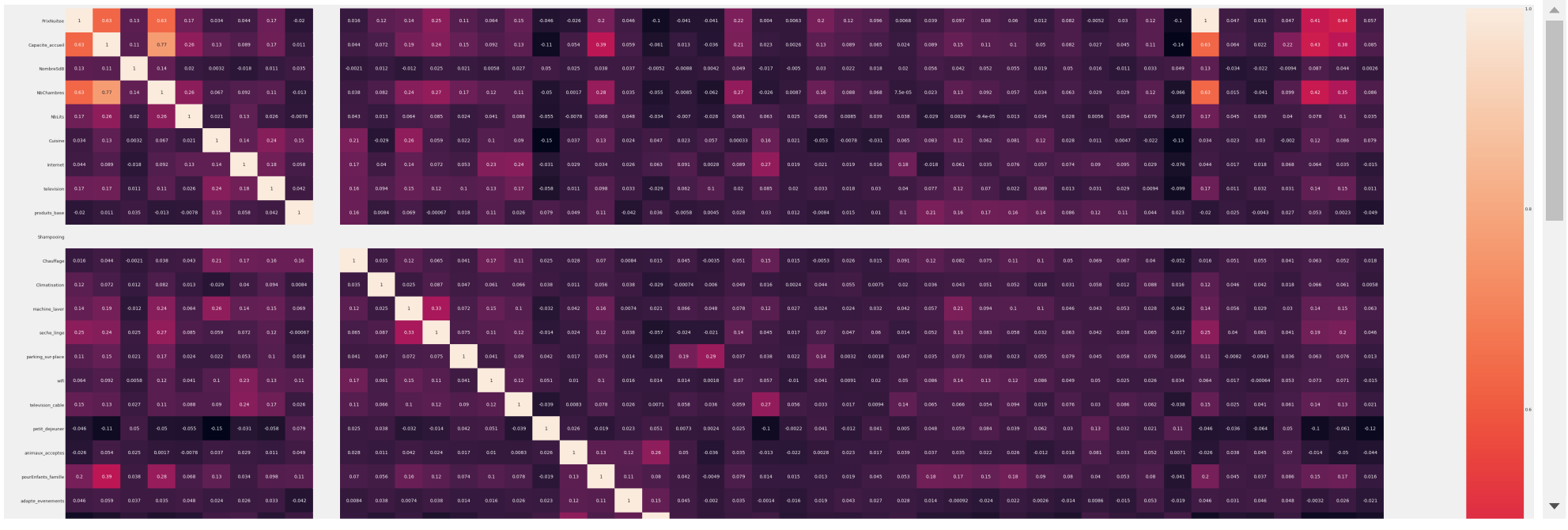
Out[21]:

	Identifiant	PrixNuitee	Latitude	Longitude	Capacite_accueil	NombreSdB	NbChambres	NbLits	Cuisine	Internet	television	produits_base	Shampooin
0	28925	25	44.849101	-0.593501	2	2	1	0	1	1	1	1	
1	40151	71	44.856533	-0.574601	2	1	1	0	1	1	1	1	
2	185534	75	44.830634	-0.593309	2	3	1	0	0	0	1	0	
3	222887	155	44.836383	-0.566032	4	15	2	0	1	1	1	1	
4	286581	80	44.837695	-0.573713	4	1	1	0	1	1	1	1	
5	315524	120	44.839047	-0.568513	2	1	1	0	1	1	0	0	
6	317273	140	44.847342	-0.580340	3	15	1	0	1	1	0	1	
7	317658	159	44.838148	-0.569889	6	15	2	0	1	1	1	1	
8	333031	55	44.842669	-0.576564	3	1	0	0	1	0	1	1	
9	333357	155	44.840296	-0.588328	2	1	1	0	0	0	1	0	

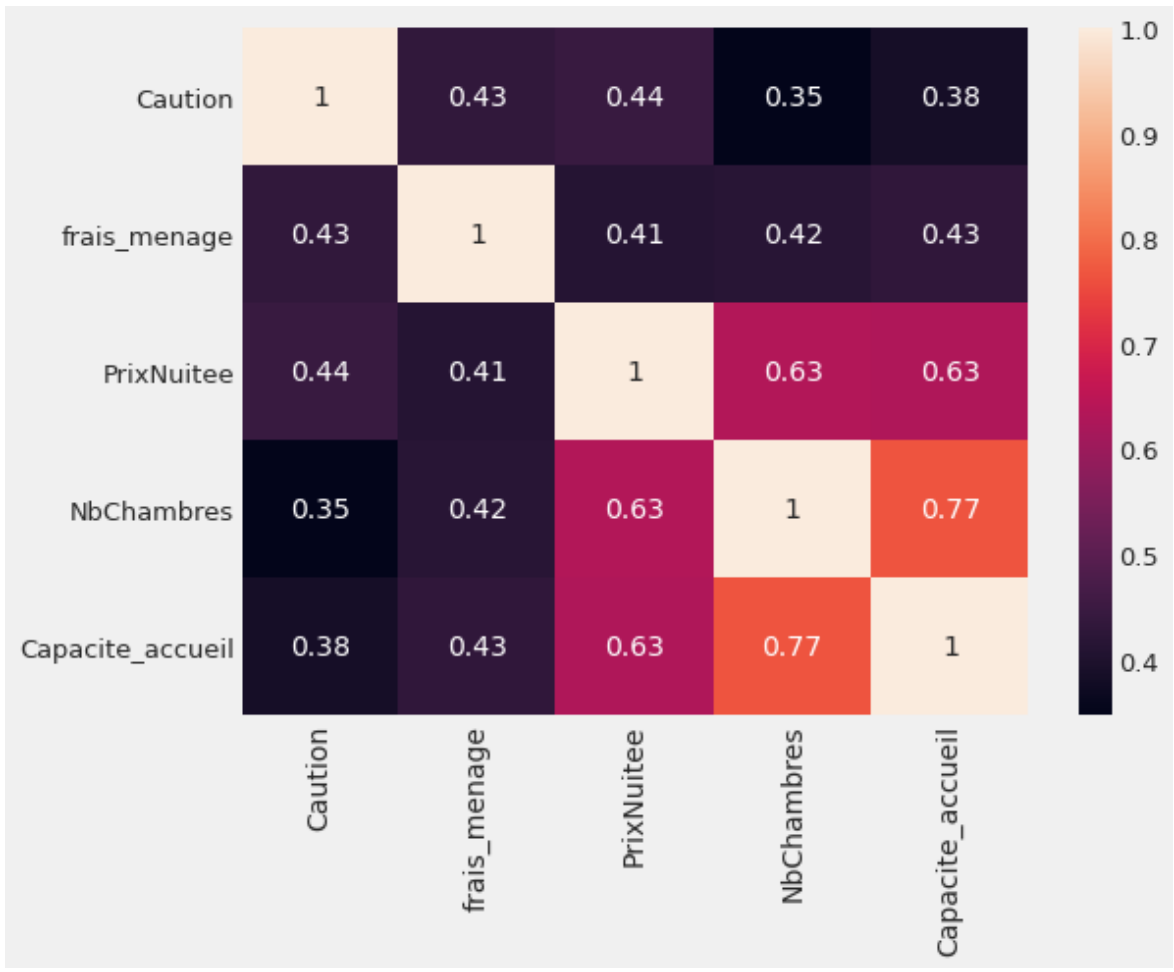
In [22]:
```
df_N = df_N.drop(columns=['Identifiant','Latitude','Longitude'])
```

In [23]:
```
#df_N = remove_outlayers('PrixNuitee',df_N)
#df_N = remove_outlayers('',df_N)
```

In [24]:
```
corr_df = df_N.corr(method='pearson')

plt.figure(figsize=(80, 60))
sns.heatmap(corr_df, annot=True)
plt.show()
```

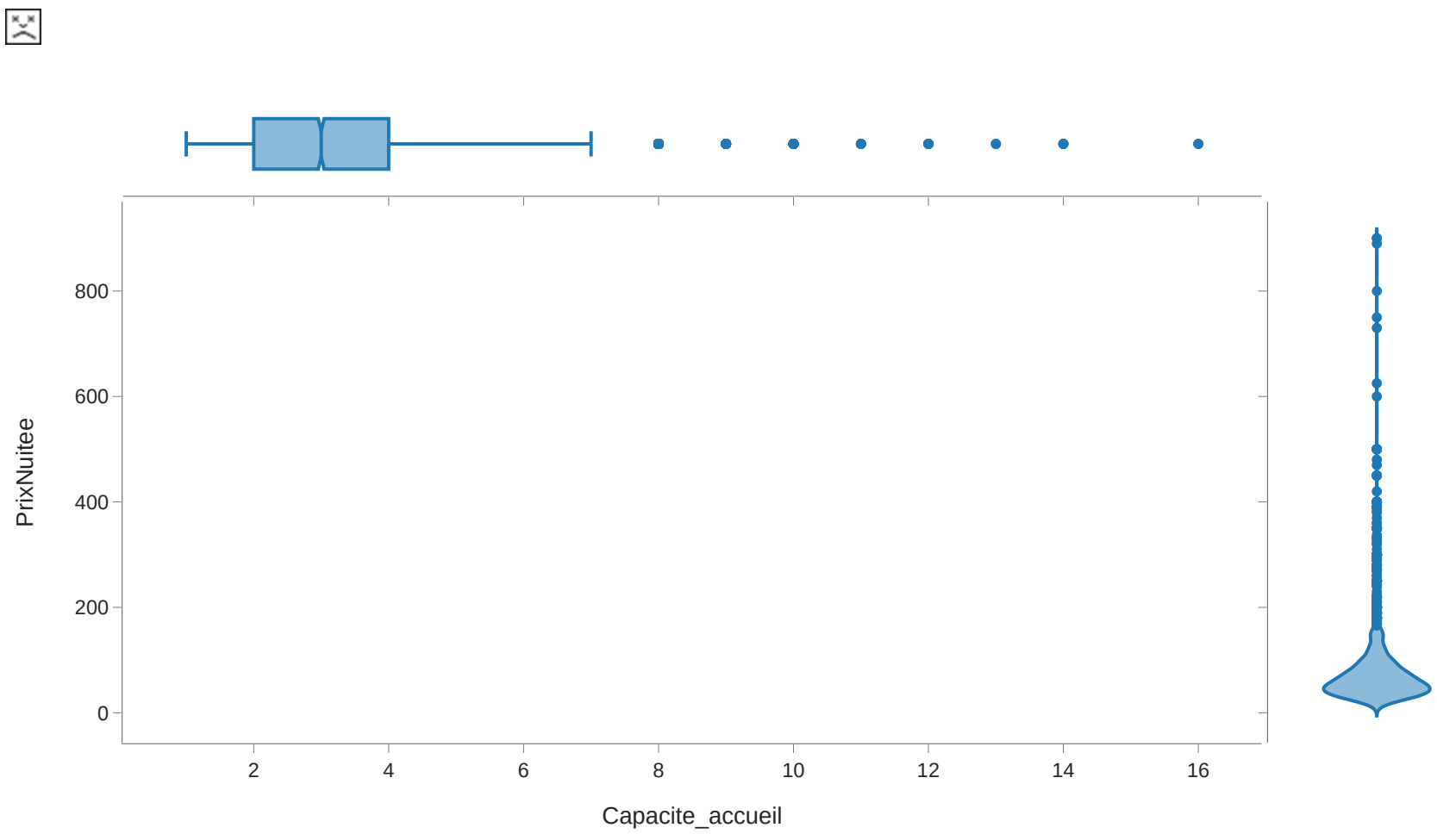


In [25]:
```
#L = ["Caution", "frais_menage", "NbChambres","Capacite_accueil"]

#df_N = remove_outlayers('Capacite_accueil',df_N)
#df_N = remove_outlayers('frais_menage',df_N)
#df_N = remove_outlayers('NbChambres',df_N)
#df_N = remove_outlayers('Caution',df_N)

corr_df_2 = df_N[["Caution", "frais_menage","PrixNuitee", "NbChambres","Capacite_accueil"]].corr(method='pearson')

plt.figure(figsize=(8, 6))
sns.heatmap(corr_df_2, annot=True)
plt.show()
```

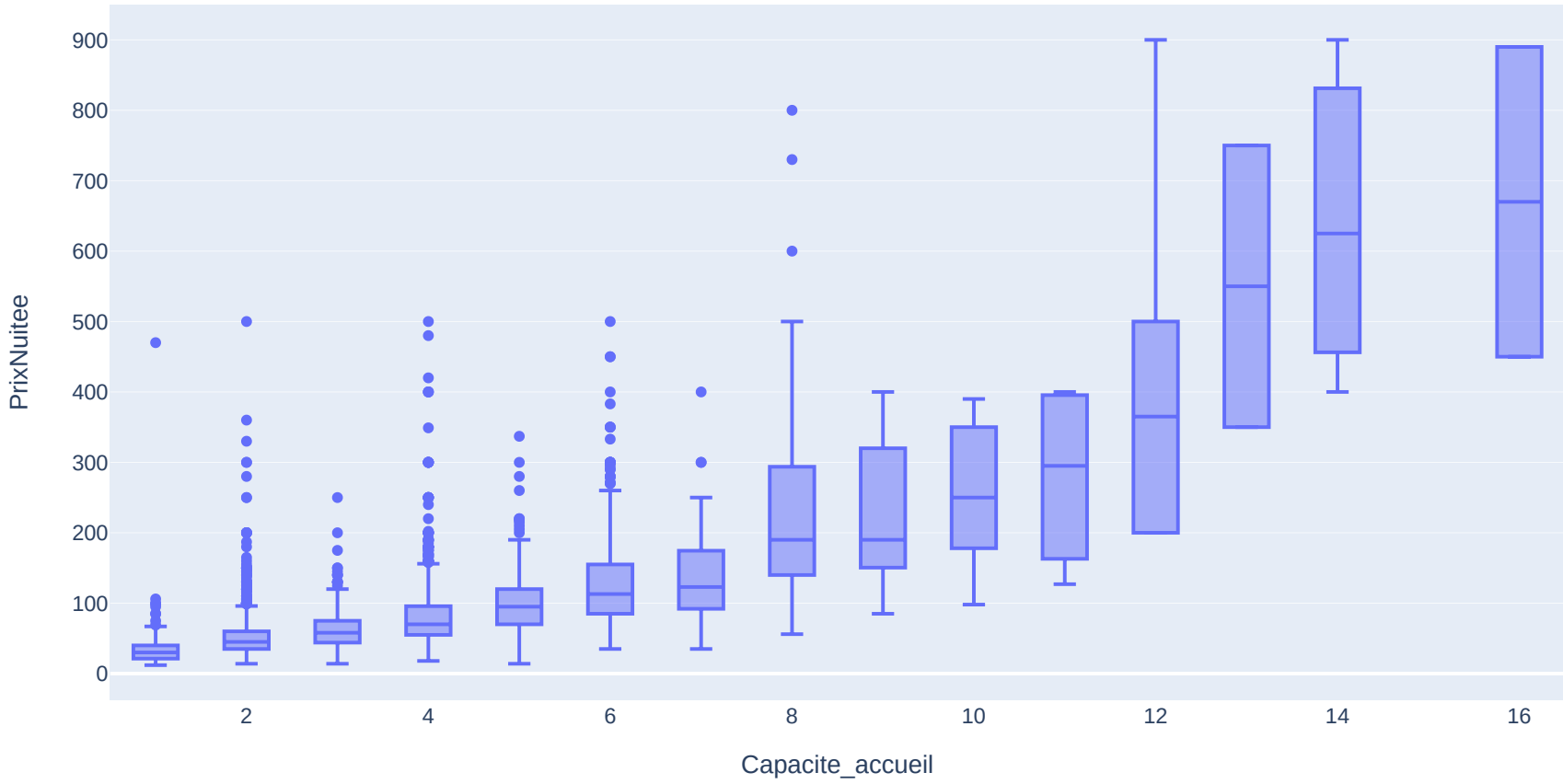


PrixNuitee & Capacite_acceuil

In [26]:
```
fig = px.scatter(df_N, y="PrixNuitee", x="Capacite_accueil", marginal_y="violin",
           marginal_x="box", trendline="ols", template="simple_white")
fig.show()
```

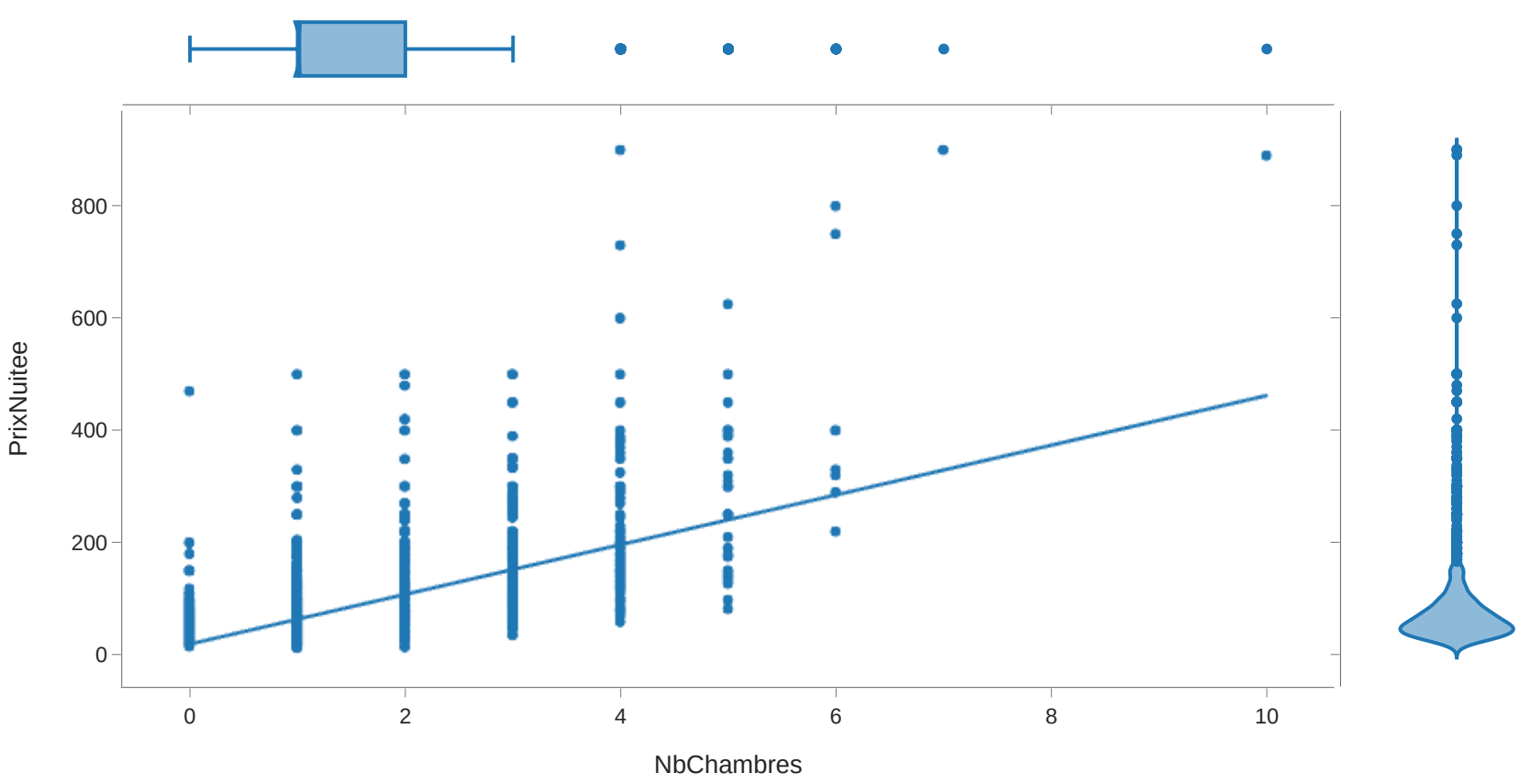


In [27]:
```
fig = px.box(df_N, x="Capacite_accueil", y="PrixNuitee")
fig.show()
```

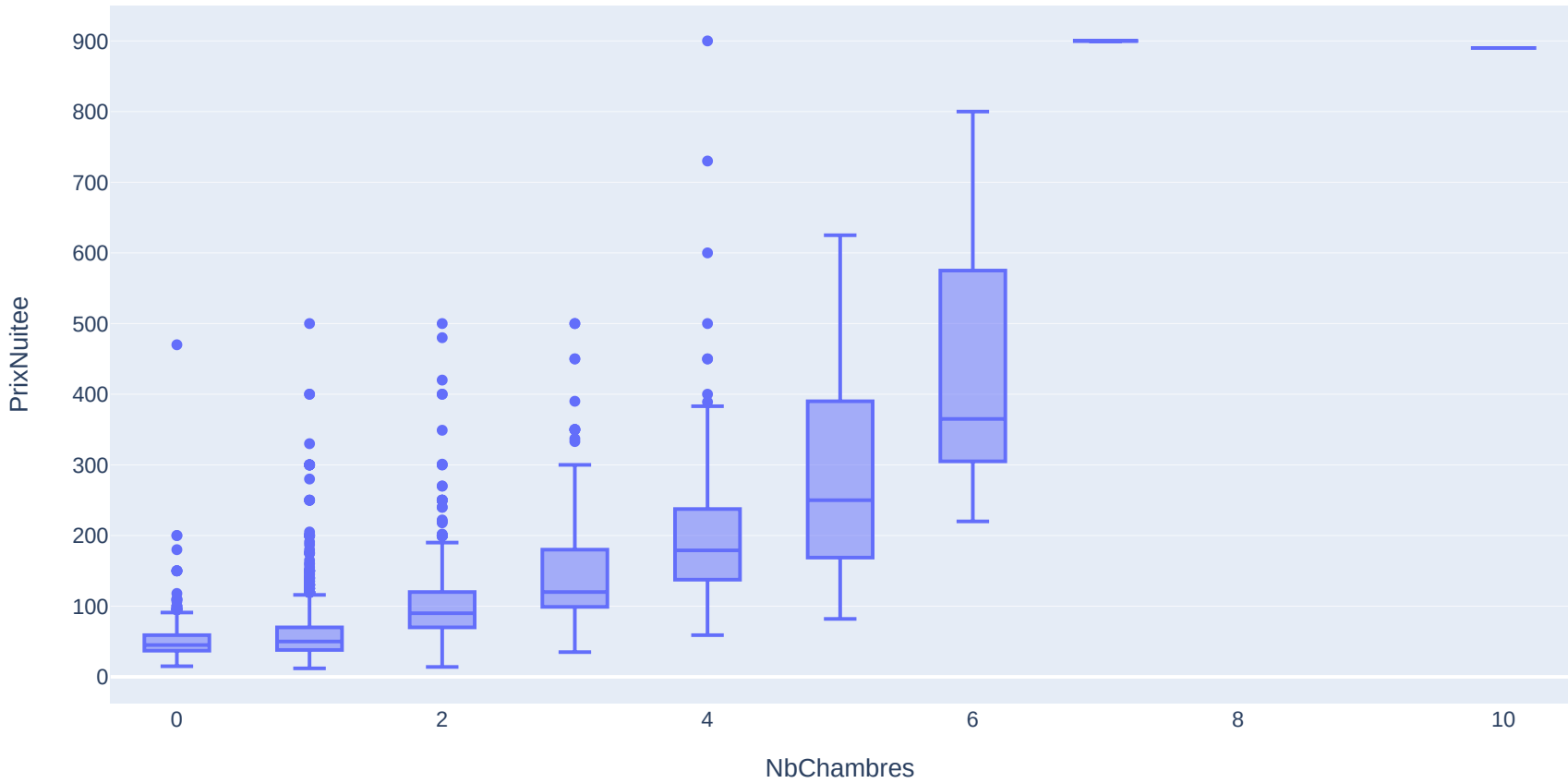


PrixNuitee & NbChambres

In [28]:
```
fig = px.scatter(df_N, y="PrixNuitee", x="NbChambres", marginal_y="violin",
           marginal_x="box", trendline="ols", template="simple_white")
fig.show()
```

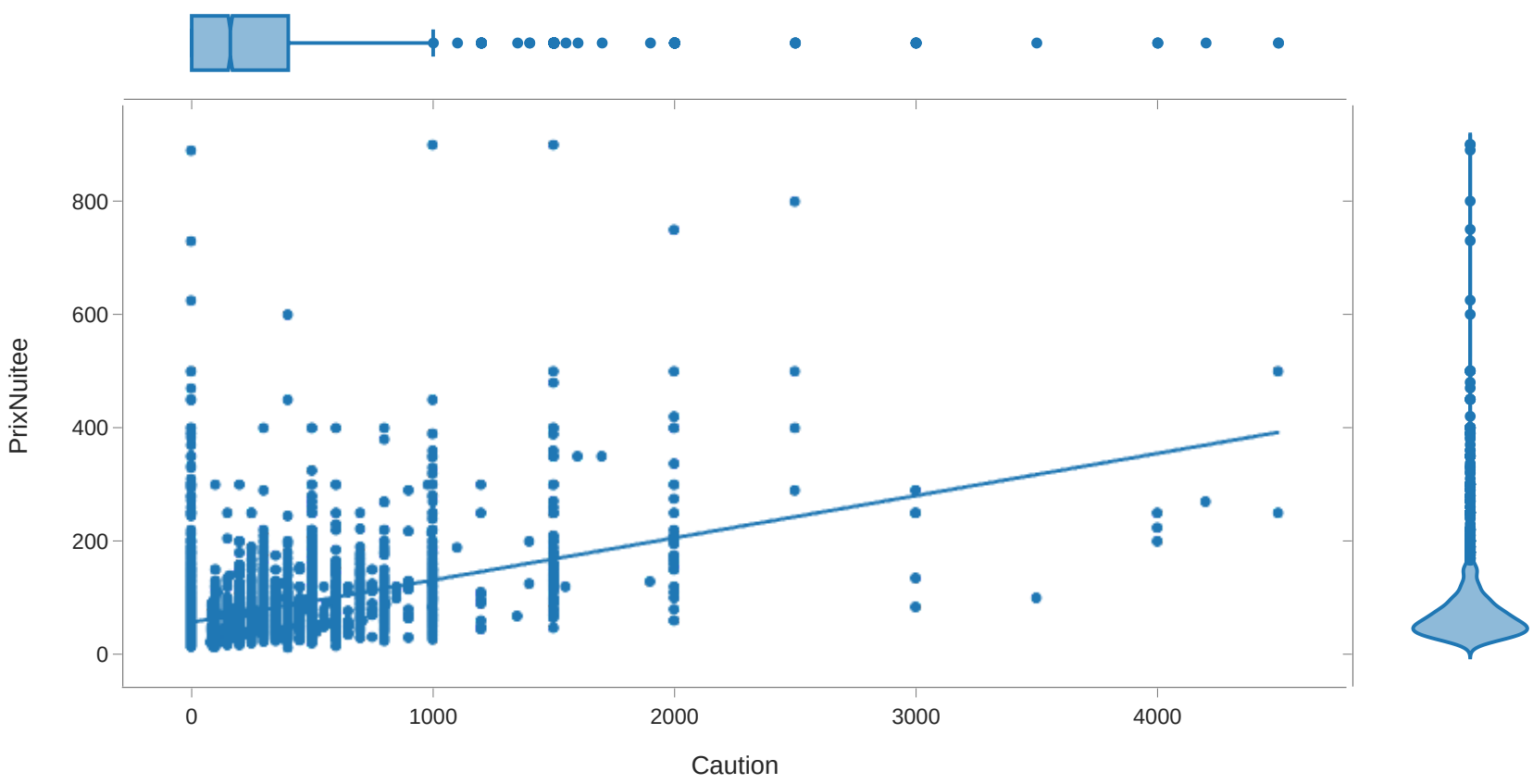


In [29]:
```
fig = px.box(df_N, x="NbChambres", y="PrixNuitee")
fig.show()
```

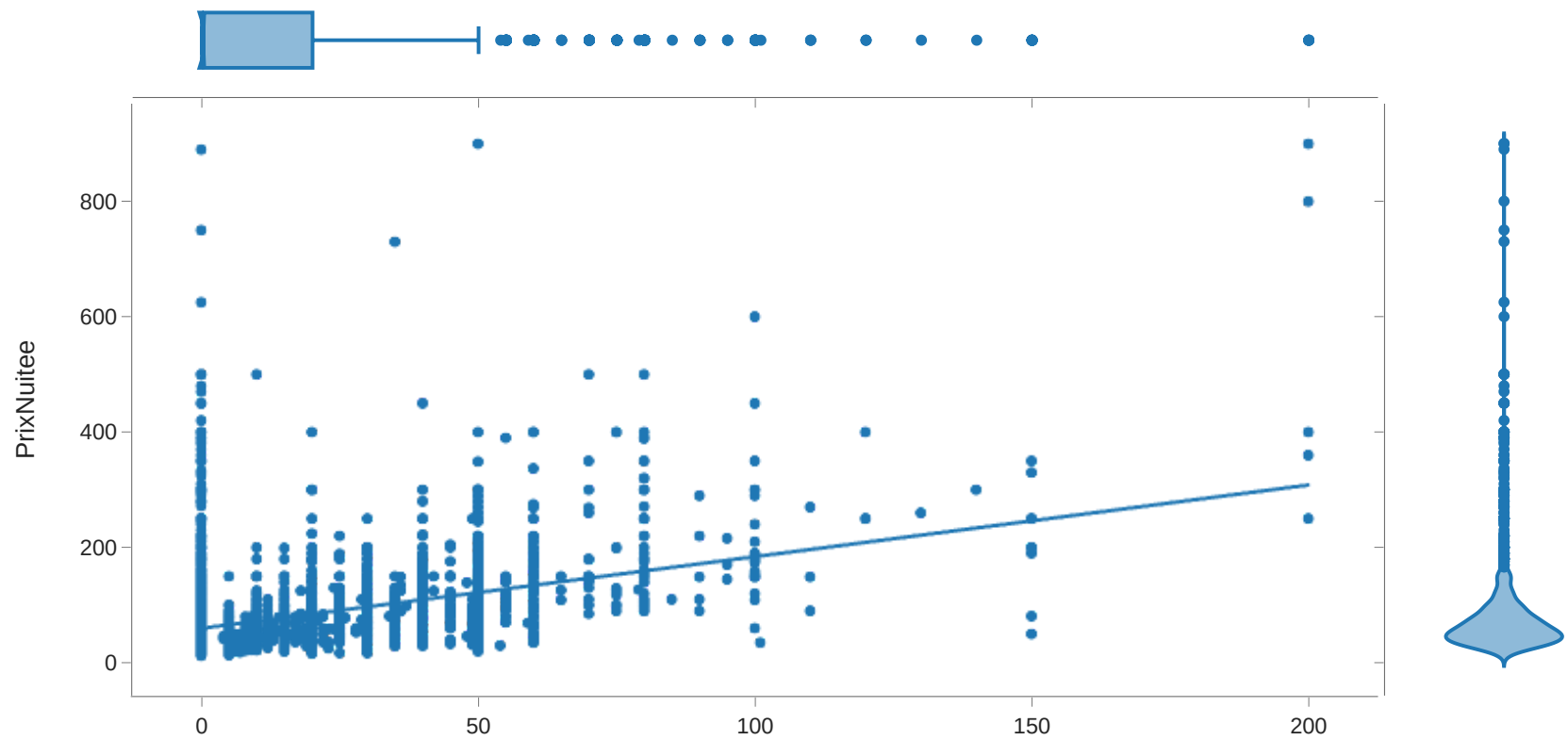


PrixNuitee & Caution / Frais Menage

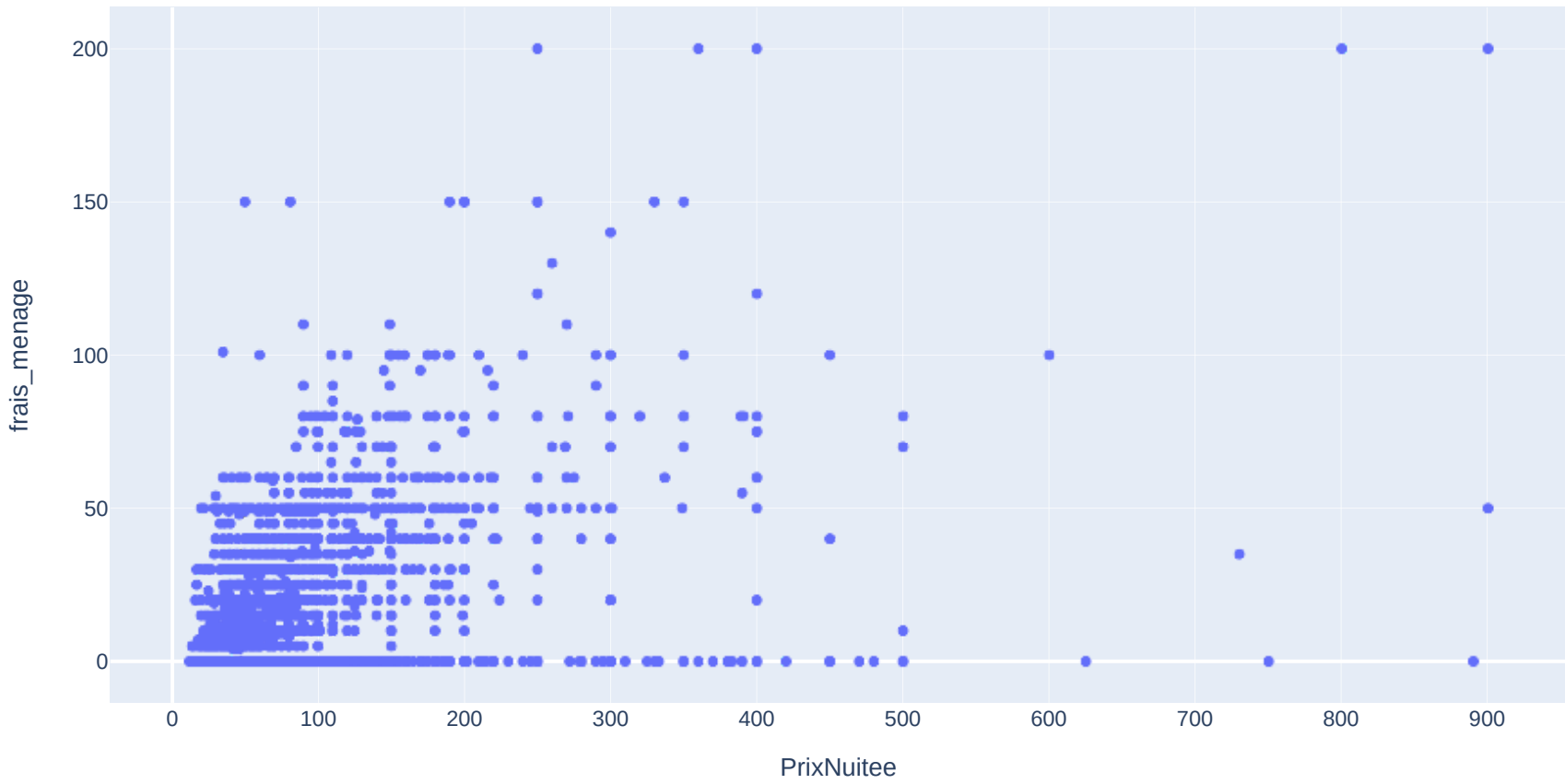
In [30]:
```
fig = px.scatter(df_N, y="PrixNuitee", x="Caution", marginal_y="violin",
           marginal_x="box", trendline="ols", template="simple_white")
fig.show()
```



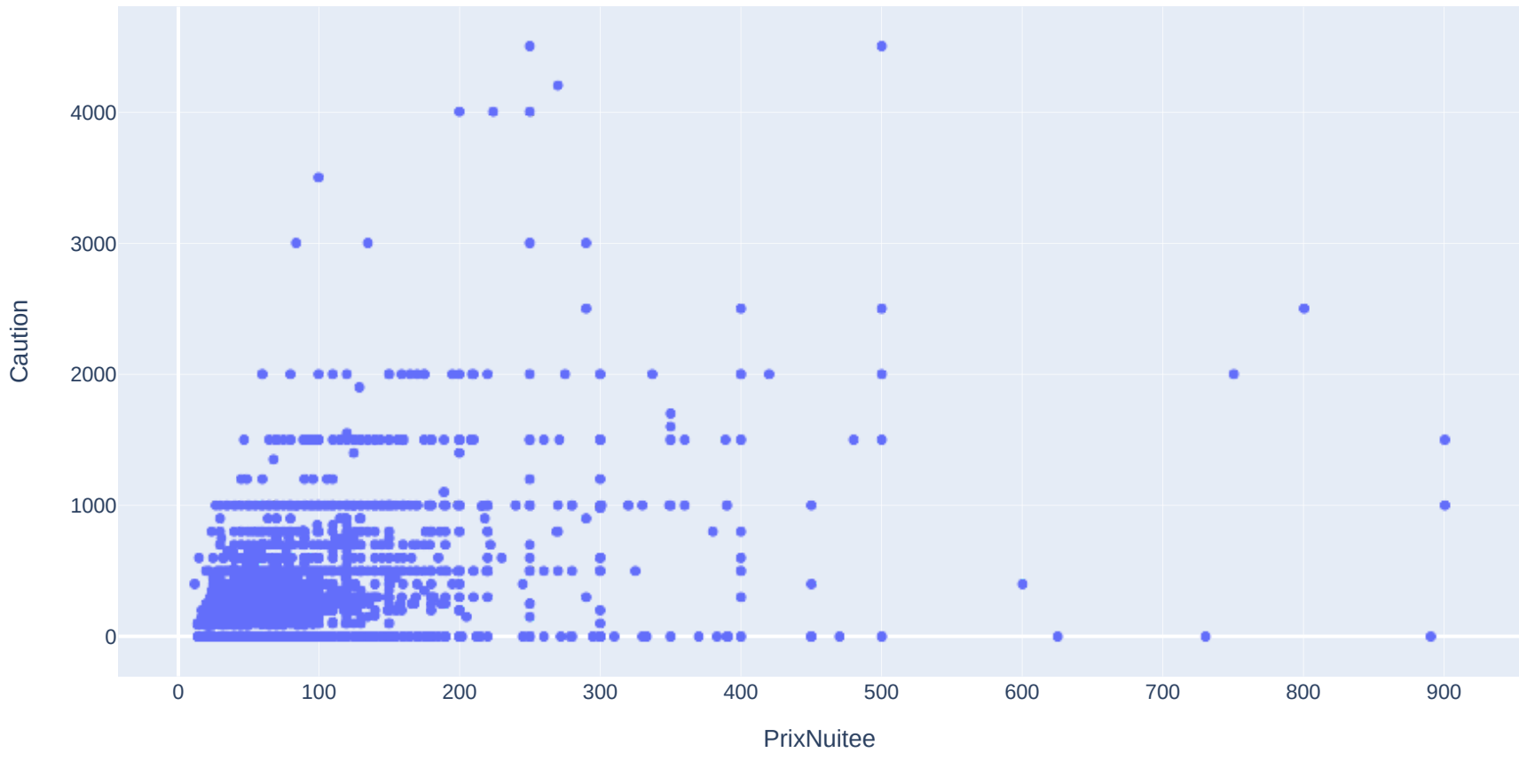
In [31]:
```
fig = px.scatter(df_N, y="PrixNuitee", x="frais_menage", marginal_y="violin",
                 marginal_x="box", trendline="ols", template="simple_white")
fig.show()
```



In [32]:
```
fig = px.scatter(df_N, x="PrixNuitee", y="frais_menage")
fig.show()
```



In [33]:
```
fig = px.scatter(df_N, x="PrixNuitee", y="Caution")
fig.show()
```



PrixNuitee depend on Number of rooms and Capacity (Numeric Variables)

Categorical Data :

In [34]:
```
df_C = df.loc[:,df.dtypes==np.object]
#df_C = df_C[['Type_logement','type_propriete','type_lit','Animal_sur_place','conditions_annulation']]
df_C
```

```
<ipython-input-34-1986af91c844>:1: DeprecationWarning:

`np.object` is a deprecated alias for the builtin `object`. To silence this warning, use `object` by itself. Doing th
is will not modify any behavior and is safe.
Deprecated in NumPy 1.20; for more details and guidance: https://numpy.org/devdocs/release/1.20.0-notes.html#deprecat
ions (https://numpy.org/devdocs/release/1.20.0-notes.html#deprecations)
```

In [35]:
```
df_C['PrixNuitee']= df_N['PrixNuitee']
df_C['NbChambres']= df_N['NbChambres']
df_C['Capacite_accueil']= df_N['Capacite_accueil']
df_C.describe()
```

```
<ipython-input-35-073f9c5ae921>:1: SettingWithCopyWarning:


A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy (https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy)

<ipython-input-35-073f9c5ae921>:2: SettingWithCopyWarning:


A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy (https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy)

<ipython-input-35-073f9c5ae921>:3: SettingWithCopyWarning:


A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy (https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy)
```

Out[35]:

	PrixNuitee	NbChambres	Capacite_accueil
count	5234.000000	5234.000000	5234.000000
mean	76.286779	1.294230	3.327092
std	62.869623	0.897891	1.686947
min	12.000000	0.000000	1.000000
25%	40.000000	1.000000	2.000000
50%	60.000000	1.000000	3.000000
75%	90.000000	2.000000	4.000000
max	900.000000	10.000000	16.000000

In [36]:
```
df_C.Animal_sur_place.unique()
```

Out[36]:
```
array(['Chien(s)', nan, 'Certains animaux', 'Chat(s)', 'Autres animaux',
       'Chien(s) et Chat(s)', 'Chat(s) et Autres animaux',
       'Chien(s) et Autres animaux'], dtype=object)
```

In [37]:
```
df_C['Animal_sur_place']=df_C['Animal_sur_place'].fillna('Aucun')
```

```
<ipython-input-37-7cbd33d8887f>:1: SettingWithCopyWarning:


A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy (https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy)
```

In [38]:
```
df_C.type_lit.unique()
```

Out[38]:
```
array([nan, 'Vrai lit', 'Canapé convertible', 'Canapé'], dtype=object)
```

In [39]:
```
df_C = fill_Nan('type_lit',df_C,'Aucun')
```

```
/home/mouad/Projet_Big_Data/Project Files/utils.py:34: SettingWithCopyWarning:


A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy (https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy)
```

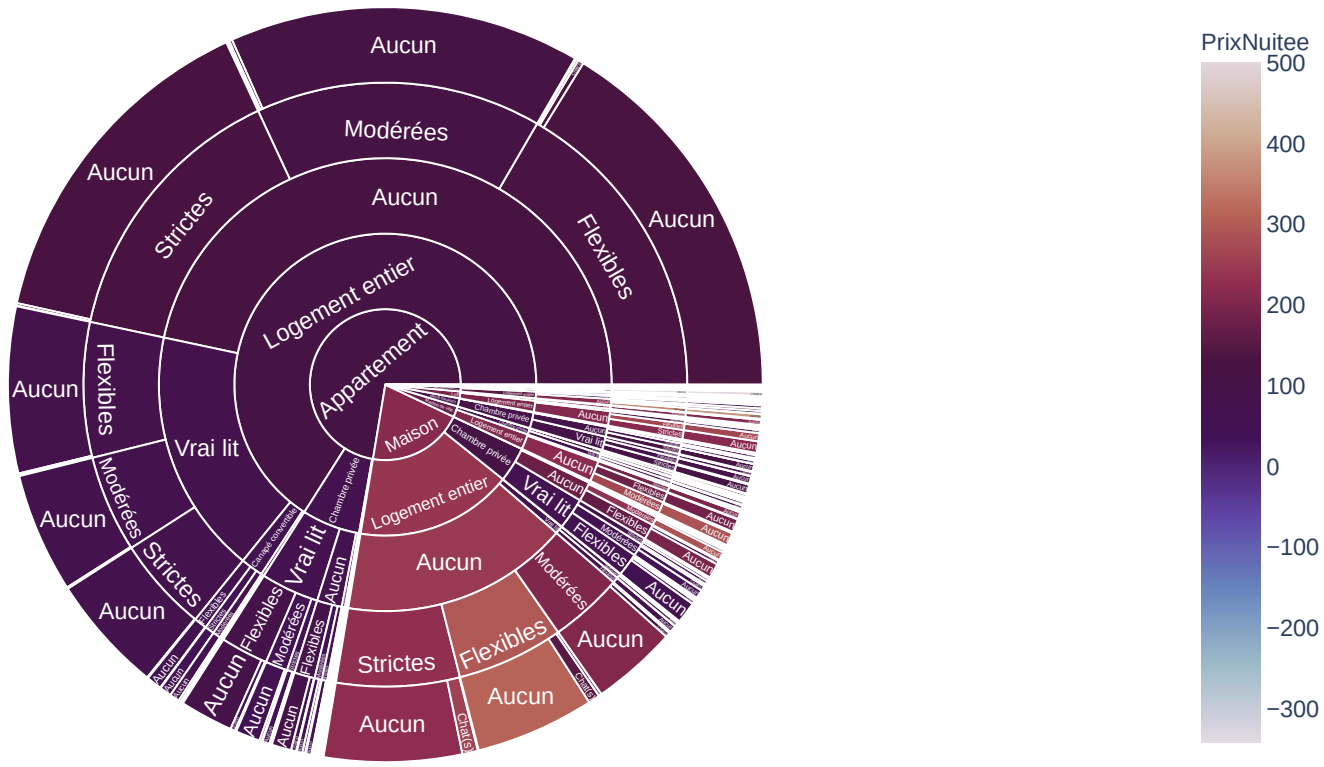
In [40]:
```
df_C = df_C.dropna()
```

In [41]:
```
df_C
```

Out[41]:

	Url	Titre	Resume	Type_logement	type_propriete	type_lit	Animal_sur_place	conditions_annulation
1	https://www.airbnb.fr/rooms/40151	Sunny flat aux Chartrons	Situé dans le quartier des Chartrons, cet appa...	Logement entier	Appartement	Vrai lit	Aucun	Modérées
2	https://www.airbnb.fr/rooms/185534	L'Echoppe des Bouilles	L'Échoppe des Bouilles est une maison typique ...	Chambre privée	Maison	Vrai lit	Aucun	Strictes
3	https://www.airbnb.fr/rooms/222887	Terrace with spectacular view	Bordeaux Terrace is a two bedroom apartment in...	Logement entier	Appartement	Aucun	Aucun	Modérées
4	https://www.airbnb.fr/rooms/286581	Appartement charme bordeaux centre	Appartement avec beaucoup de cachet de 45m2 da...	Logement entier	Appartement	Aucun	Aucun	Modérées

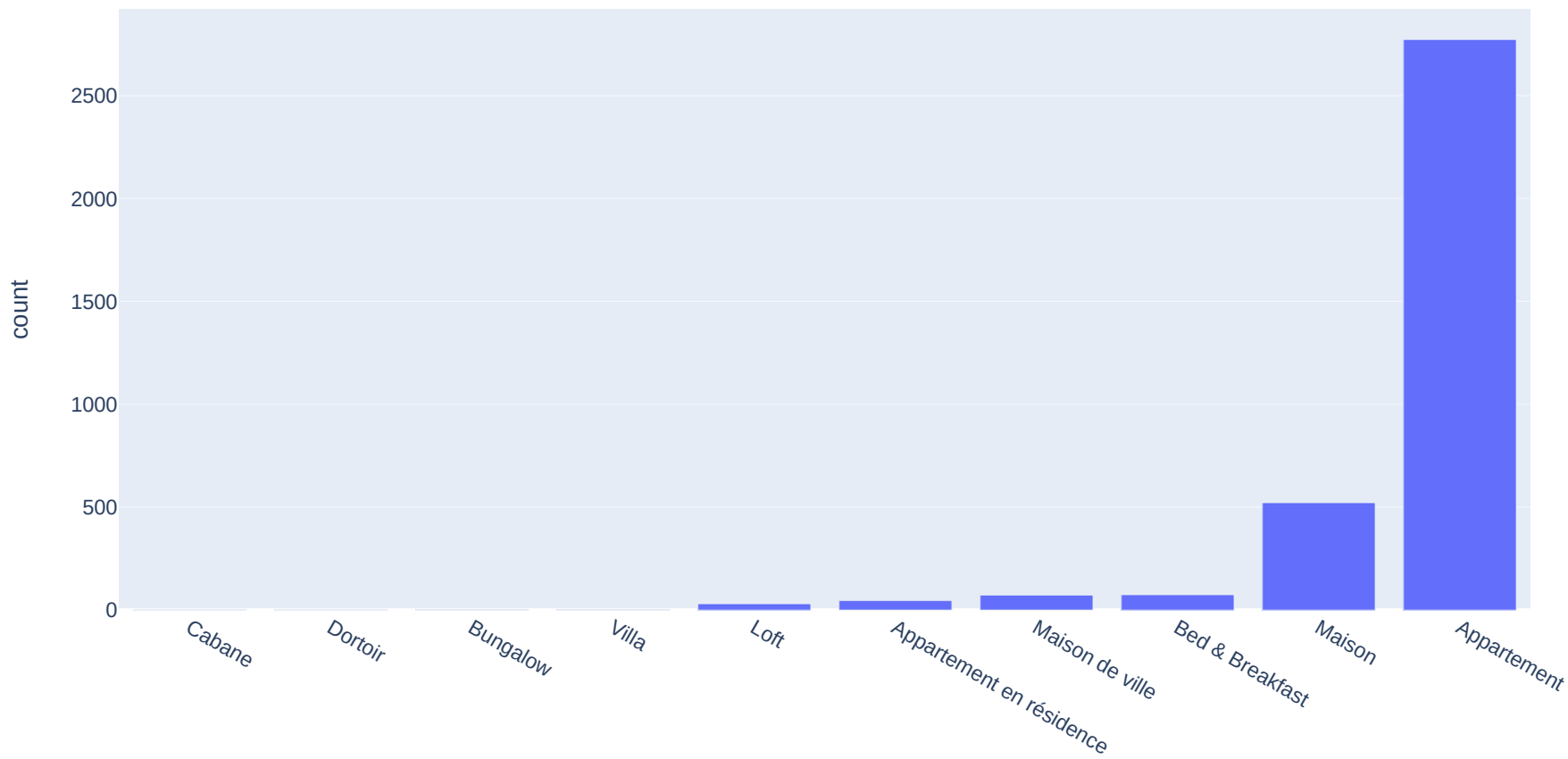
In [42]:
```
fig = px.sunburst(df_C, path=['type_propriete','Type_logement','type_lit','conditions_annulation','Animal_sur_place
                  color='PrixNuitee', hover_data=['PrixNuitee'],
                  color_continuous_scale='twilight',
                  color_continuous_midpoint=np.average(df_C['PrixNuitee']))
fig.show()
```



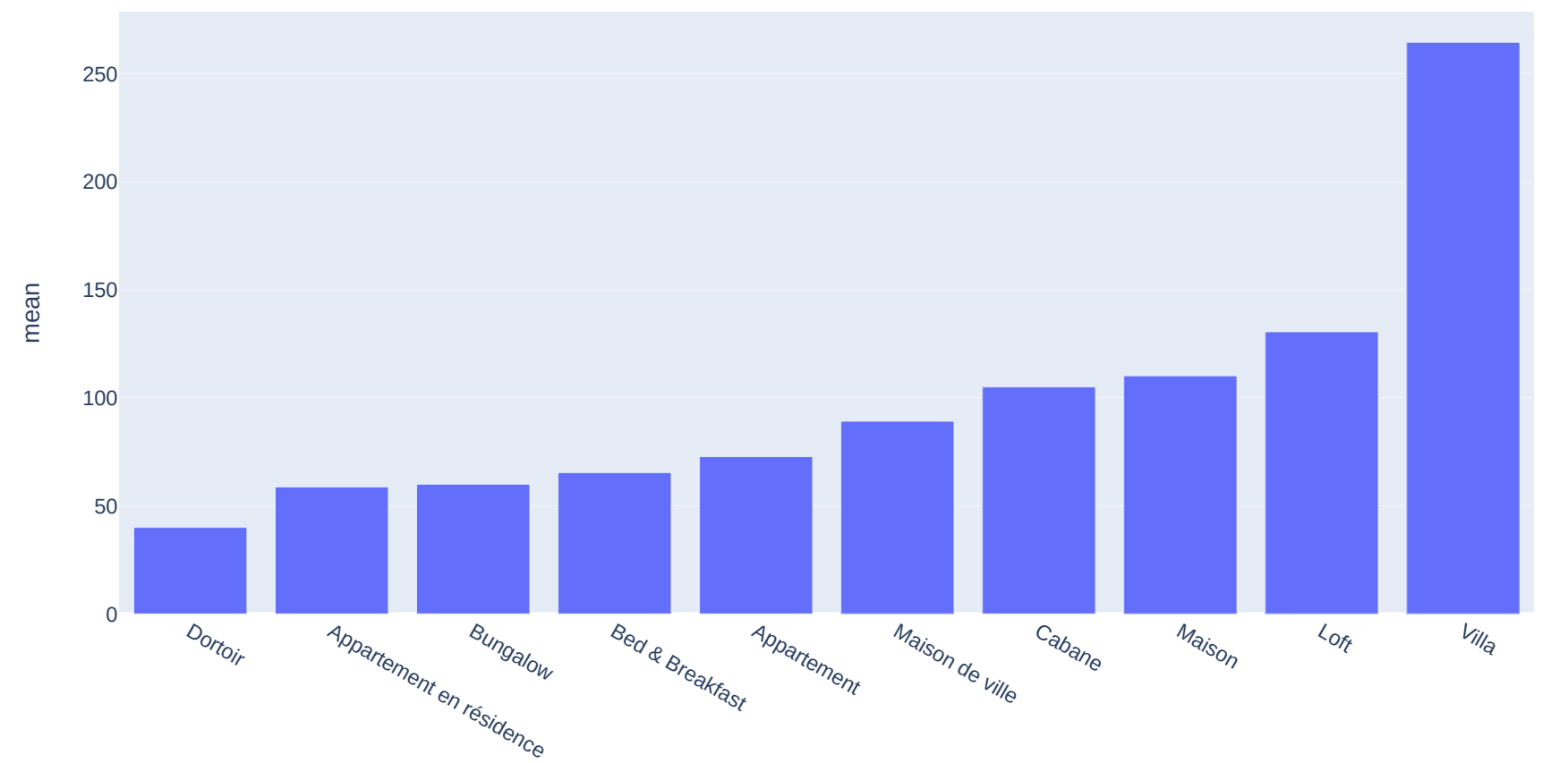
PrixNuitee & Type_Propriete

In [43]:
```
#dfC1
dfC1 = df_C.groupby('type_propriete')['PrixNuitee'].agg(['mean','count'])
dfC1=dfC1.drop(['Autre', 'Inconnue'], axis=0)
```

In [44]:
```
fig = px.bar(dfC1.sort_values(['count']), x=dfC1.sort_values(['count']).index, y='count')
fig.show()
```



In [45]:
```
fig = px.bar(dfC1.sort_values(['mean']), x=dfC1.sort_values(['mean']).index, y='mean')
fig.show()
```



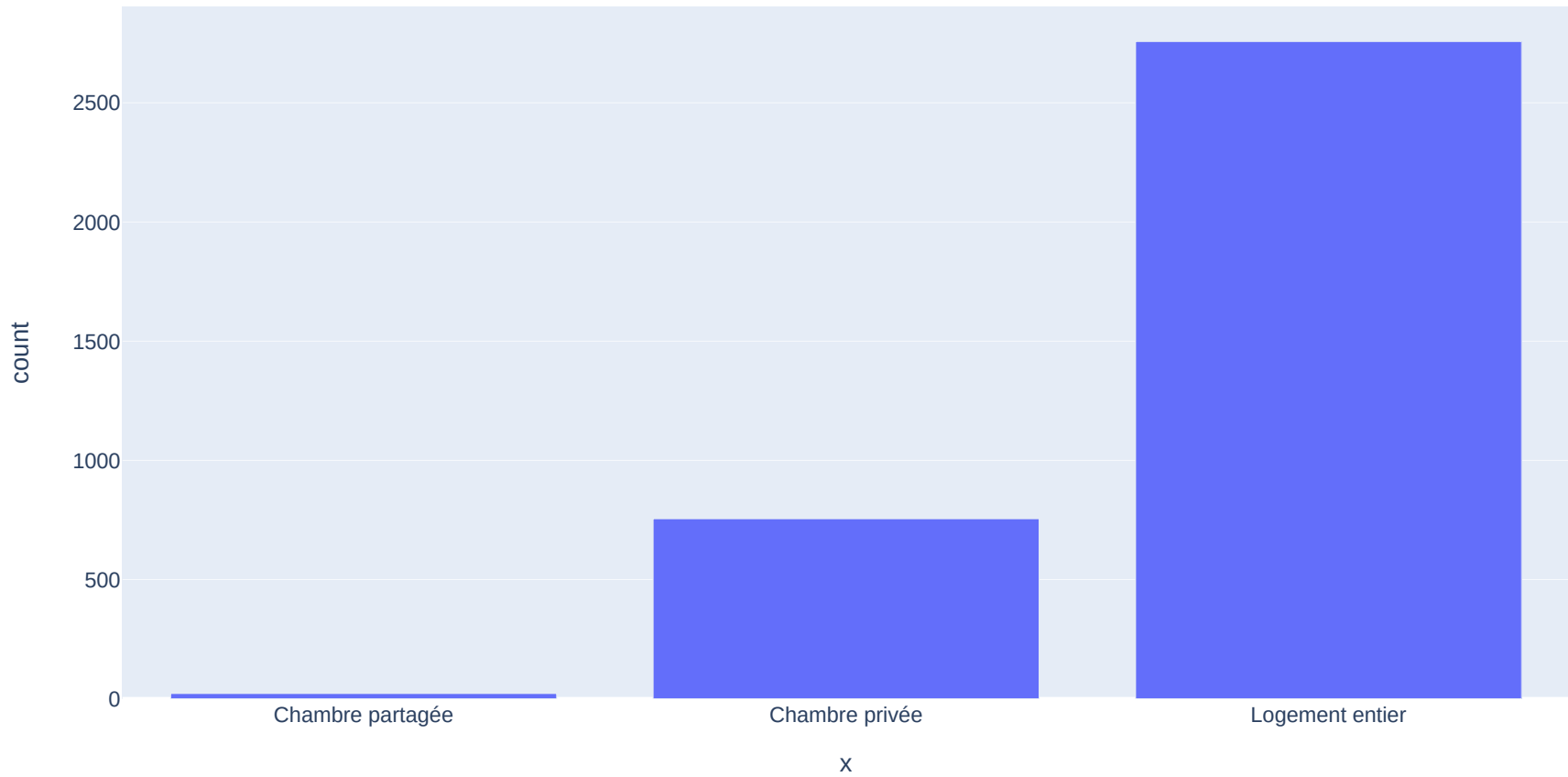
PrixNuitee & Type_Logement

In [46]:
```
dfC1 = df_C.groupby('Type_logement')['PrixNuitee'].agg(['mean','count'])
dfC1
```

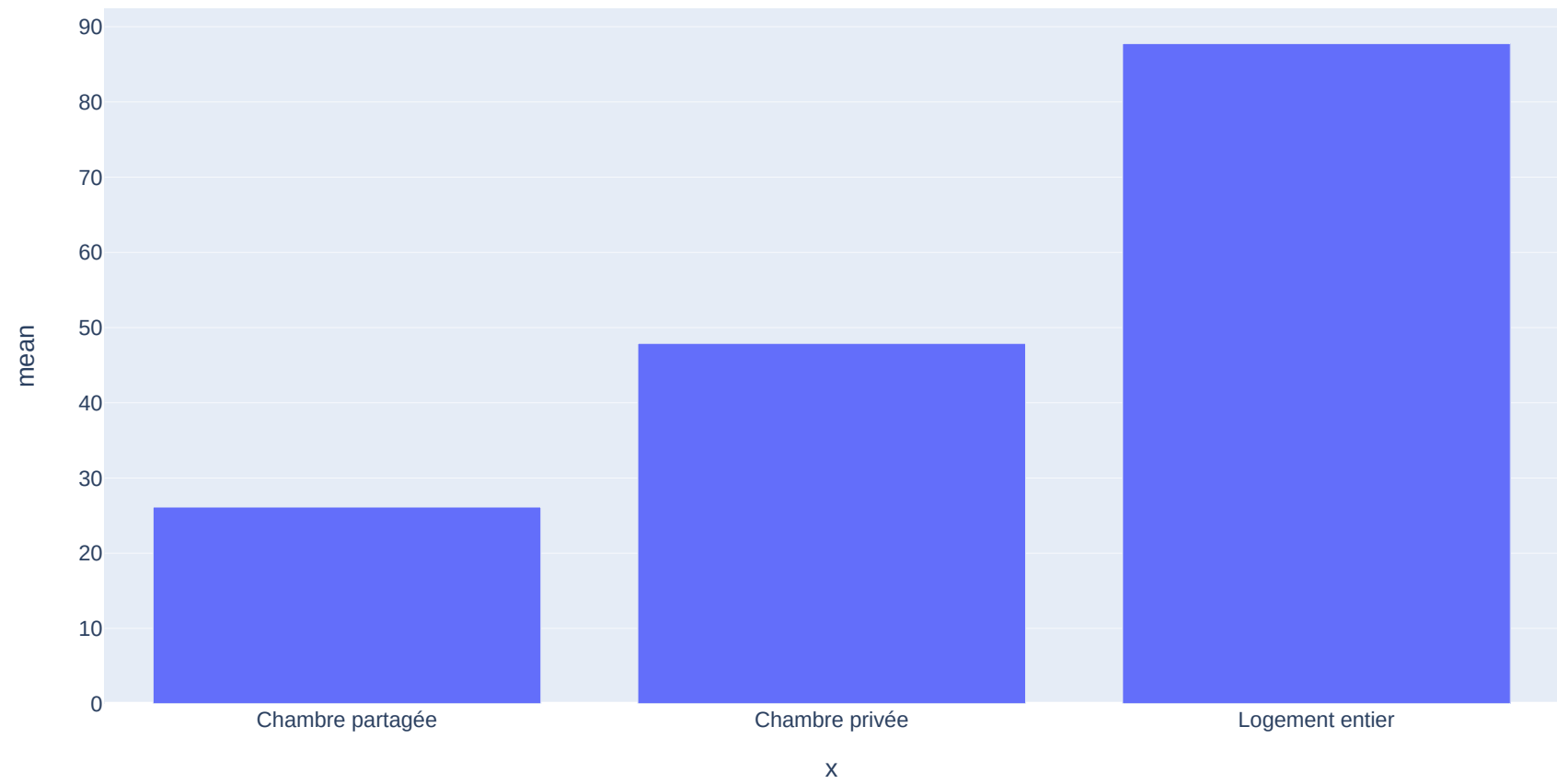
Out[46]:

Type_logement	mean	count
Chambre partagée	26.136364	22
Chambre privée	47.891391	755
Logement entier	87.759884	2757

In [47]:
```
fig = px.bar(dfC1.sort_values(['count']), x=dfC1.sort_values(['count']).index, y='count')
fig.show()
```



In [48]:
```
fig = px.bar(dfC1.sort_values(['mean']), x=dfC1.sort_values(['mean']).index, y='mean')
fig.show()
```



Textual variables :

Description

In [49]:
```
df_C = df_C.drop(['Url'],axis=1)
```

In [50]:
```
df_C
```

Out[50]:

	Titre	Resume	Type_logement	type_propriete	type_lit	Animal_sur_place	conditions_annulation	Description	reglement
1	Sunny flat aux Chartrons	Situé dans le quartier des Chartrons, cet appa...	Logement entier	Appartement	Vrai lit	Aucun	Modérées	Le logement\n\nSitué dans le quartier des Char...	L'appar non fumeu l
2	L'Echoppe des Bouilles	L'Échoppe des Bouilles est une maison typique ...	Chambre privée	Maison	Vrai lit	Aucun	Strictes	Le logement\n\nL'Échoppe des Bouilles est une ...	L'entré lieux se
3	Terrace with spectacular view	Bordeaux Terrace is a two bedroom apartment in...	Logement entier	Appartement	Aucun	Aucun	Modérées	Bordeaux Terrace is a two bedroom apartment in...	L'entré lieux se
4	Appartement charme bordeaux centre	Appartement avec beaucoup de cachet de 45m2 da...	Logement entier	Appartement	Aucun	Aucun	Modérées	Le logement\n\nAppartement avec beaucoup de ca...	Ne convie animaux

In [51]:
```
#df_C.Resume.iloc[0]
```

In [52]:
```
df_C = df_C.drop(['Resume'],axis =1)
```

In [53]:
```
df_T = df_C[['Titre','Description','reglement_interieur','PrixNuitee']]
df_T
```

Out[53]:

	Titre	Description	reglement_interieur	PrixNuitee
1	Sunny flat aux Chartrons	Le logement\n\nSitué dans le quartier des Char...	L'appartement est non fumeur.\n\nVous pouvez n...	71
2	L'Echoppe des Bouilles	Le logement\n\nL'Échoppe des Bouilles est une ...	L'entrée dans les lieux se fait après 16:00\n\n	75
3	Terrace with spectacular view	Bordeaux Terrace is a two bedroom apartment in...	L'entrée dans les lieux se fait après 15:00\n\...	155
4	Appartement charme bordeaux centre	Le logement\n\nAppartement avec beaucoup de ca...	Ne convient pas aux animaux\n\nPas de fête ni ...	80
5	Elegant 1 bd with amazing views	Spacious one bedroom apartment in the historic...	L'entrée dans les lieux se fait après 15:00\n\...	120
6	Large	This spacious one bedroom apartment (1,002 sq ...	L'entrée dans les lieux se fait après 14:00\n\...	140
7	Fairytale view in historic heart - 2 bd + elev...	Situated in the heart of the historic city, wi...	Non fumeur\n\nNe convient pas aux animaux\n\nP...	159
8	STUDIO BORDEAUX TRIANGLE D OR *****	Le logement\n\nVous trouverez vite vos repères...	Non fumeur\n\nPas de fête ni de soirée\n\nNe c...	55
9	Suite New-York	Le logement\n\nBordelais et professionnels de ...	L'entrée dans les lieux se fait après 17:00\n\...	155
10	Suite-Bois Flotté	Le logement\n\nSuite Bois FlottéBordelais et p...	L'entrée dans les lieux se fait après 16:00\n\...	145

In [54]:
```
df_T['Desc_pre']=df_T['Description'].map(lambda s:preprocess(s))
df_T['Reg_pre']=df_T['reglement_interieur'].map(lambda s:preprocess(s))
df_T['Titre_pre']=df_T['Titre'].map(lambda s:preprocess(s))
```

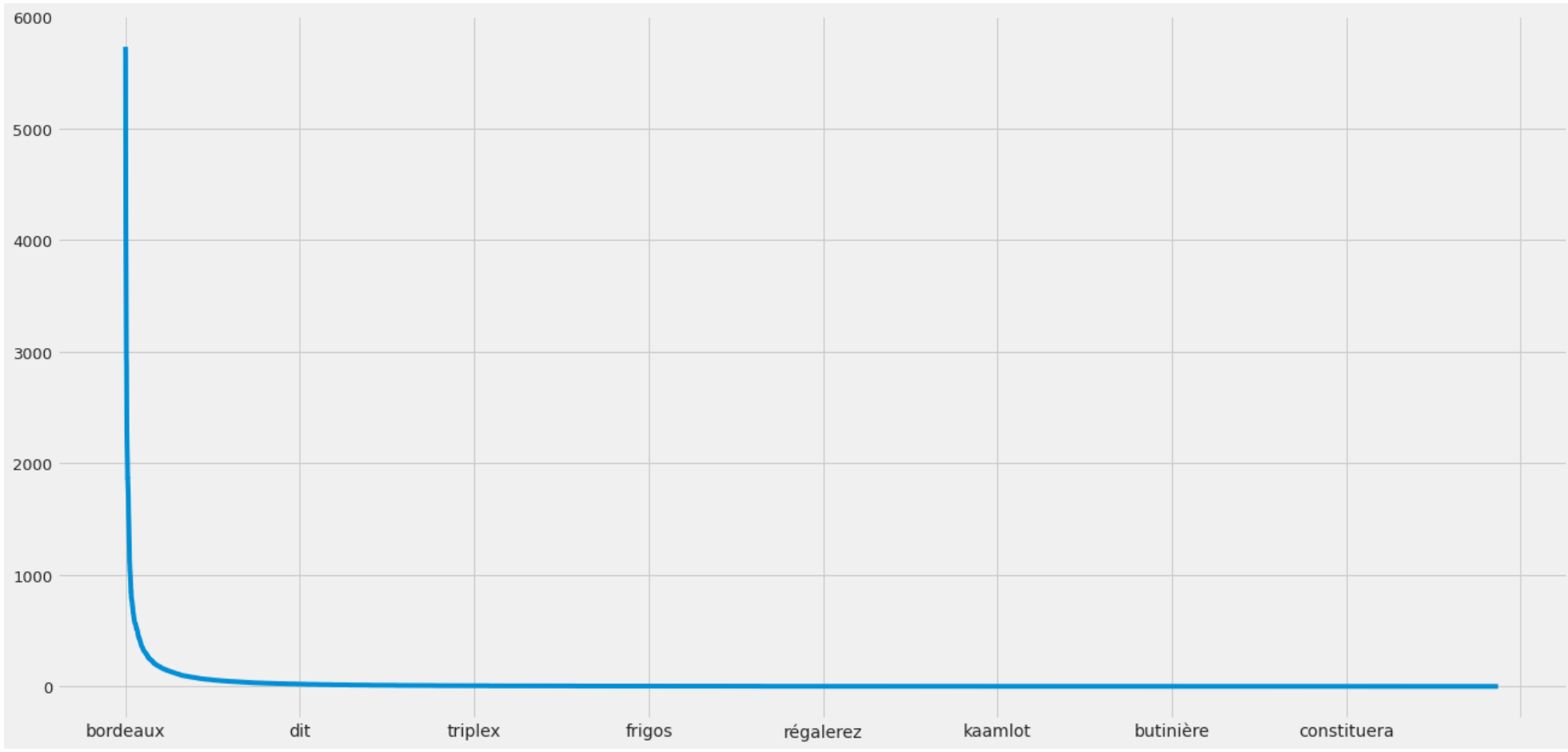
```
<ipython-input-54-e8c7a5cd2b8e>:1: SettingWithCopyWarning:


A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy (https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy)

<ipython-input-54-e8c7a5cd2b8e>:2: SettingWithCopyWarning:


A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy (https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy)
```

In [55]:
```
#df_T['Desc_pre'].iloc[0]
```

In [56]:
```
#df_T.to_csv('Df_T.csv')
#df_T = pd.read_csv('Df_T.csv')
```

In [57]:
```
#Find words spreading (each word frequency)
freq_d = pd.Series(" ".join(df_T['Desc_pre']).split()).value_counts()
#Plot the words distribution
freq_d.plot(kind='line', ax=None, figsize=(20,10), use_index=True,
            title=None, grid=None, legend=False, style=None,
            logx=False, logy=False, loglog=False, xticks=None,
            yticks=None, xlim=None, ylim=None, rot=None,
            fontsize=None, colormap=None, table=False, yerr=None,
            xerr=None, label=None, secondary_y=False)
```

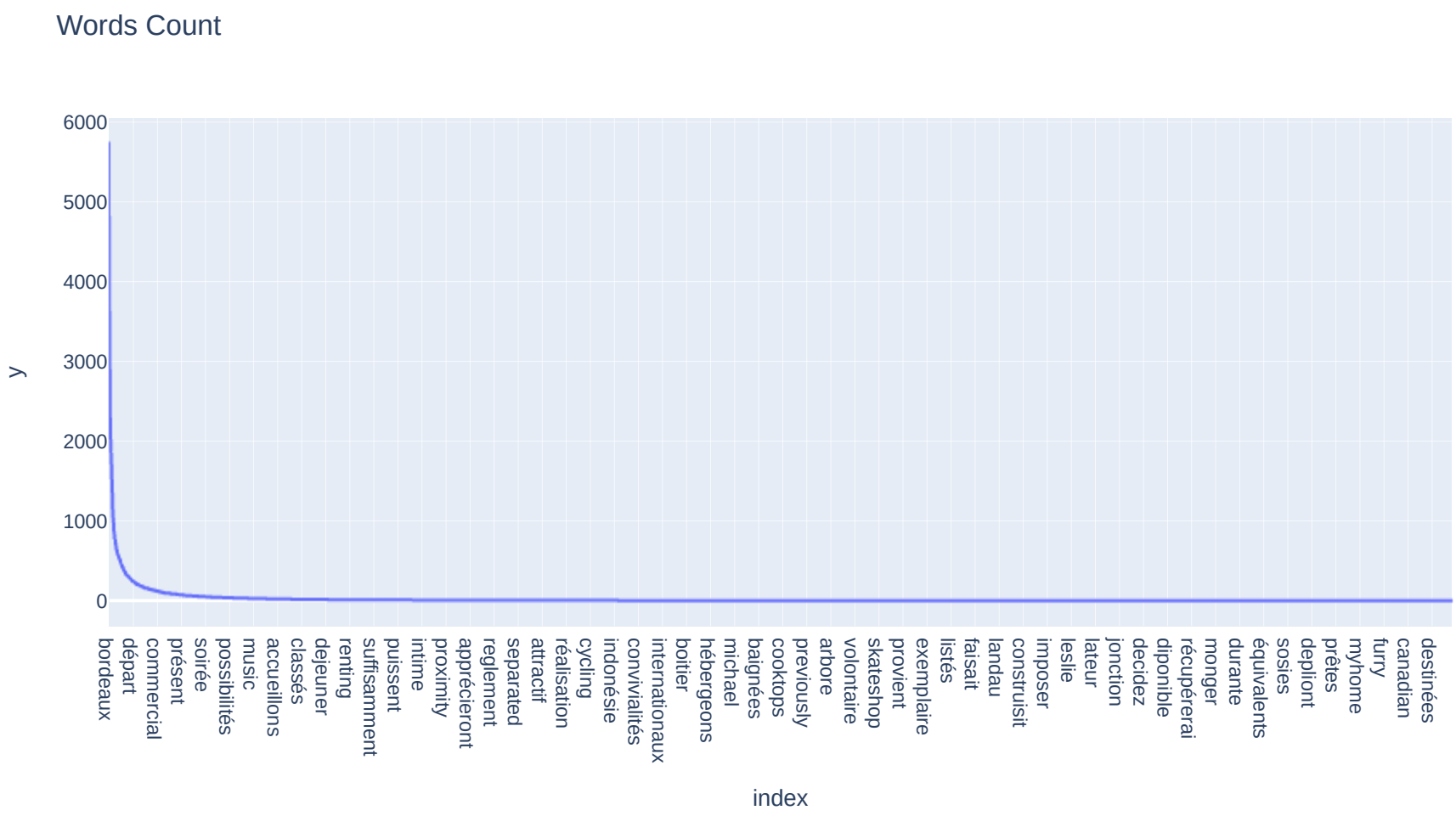
Out[57]: <AxesSubplot:>



In [58]:
```
wordCount = pd.DataFrame(data = {
    'word':freq_d.index,
    'occurence':freq_d.values
})

freq_d[0]
```

Out[58]: 5733

In [59]:
```
fig = px.line(freq_d, x=freq_d.index, y=freq_d.values, title='Words Count')
fig.show()
```



In [ ]:
```
#freq_d
#rare_d
```

In [61]:
```
#15 -> 3000
#Remove the least frequent words
rare_d = list(wordCount['word'].where(wordCount['occurence']<15).dropna().values)
df_T['Desc_pre'] = df_T['Desc_pre'].apply(lambda x: " ".join(x for x in x.split() if x not in rare_d))
#Remove the most frequent words
freq_w = list(wordCount['word'].where(wordCount['occurence']>3000).dropna().values)
df_T['Desc_pre'] = df_T['Desc_pre'].apply(lambda x: " ".join(x for x in x.split() if x not in freq_w))
```

```
<ipython-input-61-e798355976c0>:4: SettingWithCopyWarning:


A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy (https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy)

<ipython-input-61-e798355976c0>:7: SettingWithCopyWarning:


A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy (https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy)
```

In [62]:
```
df_T['Desc_pre'] = [text.split() for text in df_T['Desc_pre']]


dict_d = corpora.Dictionary(df_T['Desc_pre'])
corpus_d = [dict_d.doc2bow(line) for line in df_T['Desc_pre']]
#Transform vectors of texts to scalar values (calculating norms of vectors)
corpus_d_vec_norm = [LA.norm(vec) for vec in corpus_d]
#Replace text descriptions in the database with norms of vectors
df_T['Desc_pre'] = corpus_d_vec_norm
```

```
<ipython-input-62-ac8089d28e9b>:1: SettingWithCopyWarning:


A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy (https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy)

<ipython-input-62-ac8089d28e9b>:9: SettingWithCopyWarning:


A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy (https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy)
```

In [63]:
```
#len(set(df_T['Desc_pre'].iloc[0]))
#df_T.to_csv('df_T2.csv')
#df_T = pd.read_csv('df_T2.csv')
df_T['Desc_pre']
#df_T['Desc_pre'].values[0]
```

Out[63]:

1	900.720822
2	854.767805
3	2823.611163
4	2359.585769
5	3013.361412
6	3951.741009
7	3610.694532
8	3648.065515
9	5121.062097
10	5055.213546
11	5348.889044
12	3895.755382
17	4878.271620
18	4384.148036
19	4399.151054
20	7398.615343
21	9148.561362
22	7187.255944
23	11424.845951
25	10148.700262
26	7248.865635
27	6094.107728
28	7804.617672
29	8752.299127
30	8968.158395
31	8743.129474
32	5816.217327
34	9853.623496
35	11875.134231
36	6391.375126
37	6075.544914
39	7713.671305
40	9890.823120
42	13460.136552
43	10282.084759
44	8182.835755
46	10687.846369
48	11226.980182
49	6838.478559
50	10899.027113
51	9390.464632
52	6107.945809
53	12961.854921
54	11020.429937
55	4714.216584
56	8982.869753
58	10040.307167
59	10370.478436
61	10209.204866
62	11552.276832
...	...
4816	8982.620497
4817	3827.261815
4818	3530.993911
4819	4432.065094
4820	4923.749080
4822	3812.349538
4823	6757.535793
4824	9122.594642
4825	3410.492047
4826	6486.912054
4827	4998.172566
4828	4128.857469
4829	6739.237123
4830	14601.453763
4831	4061.912481
4832	4992.295364
4833	9220.688098
4836	4420.938814
4837	9814.602896
4838	9547.824674
4839	3035.431436
4840	4179.877989
4841	4574.213484
4842	2821.789680
4844	3530.993911
4847	5340.516829
4849	14603.760338
4850	3980.549962
4851	11751.444252
4852	3713.512219
4853	1885.314297
4854	4342.313554
4856	17.029386
4857	5342.660573
4858	867.662953
4859	5824.558782
4860	5740.364100
4861	4560.224117

```
4862     5449.754673
4863     4185.020669
4864     3670.992100
4866     5983.097442
4867     5557.089886
4869     8092.042944
4870     4530.245358
4872     9280.971393
4875     7391.154917
4876    12521.482780
4877     7449.137064
4878     7482.803018
Name: Desc_pre, Length: 3534, dtype: float64
```

In [64]:

```
#df_T['Desc_pre']
#df_T =fill_Nan(df_T,'Reg_pre','void')
df_T
```

Out[64]:

	Titre	Description	reglement_interieur	PrixNuitee	Desc_pre	Reg_pre	Titre_pre
1	Sunny flat aux Chartrons	Le logement\n\nSitué dans le quartier des Char...	L'appartement est non fumeur.\n\nVous pouvez n...	71	900.720822	appartement non fumeur pouvez néanmoins fumer ...	sunny flat chartrons
2	L'Echoppe des Bouilles	Le logement\n\nL'Échoppe des Bouilles est une ...	L'entrée dans les lieux se fait après 16:00\n\n	75	854.767805	entrée lieux fait après	echoppe bouilles
3	Terrace with spectacular view	Bordeaux Terrace is a two bedroom apartment in...	L'entrée dans les lieux se fait après 15:00\n\...	155	2823.611163	entrée lieux fait après please smoke apartment...	terrace spectacular view
4	Appartement charme bordeaux centre	Le logement\n\nAppartement avec beaucoup de ca...	Ne convient pas aux animaux\n\nPas de fête ni ...	80	2359.585769	convient animaux fête soirée entrée lieux fait...	appartement charme bordeaux centre
5	Elegant 1 bd with amazing views	Spacious one bedroom apartment in the historic...	L'entrée dans les lieux se fait après 15:00\n\...	120	3013.361412	entrée lieux fait après please treat beautiful...	elegant amazing view
6	Large	This spacious one bedroom apartment (1 002 sq	L'entrée dans les lieux se fait après 14:00\n\	140	3951.741009	entrée lieux fait après please respect	large

In [65]:

```
df_T['Reg_pre'] = df_T['Reg_pre'].fillna('laA7ad')
df_T['Reg_pre'].values[1971]
```

```
<ipython-input-65-0e8a73b87f95>:1: SettingWithCopyWarning:


A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy (https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy)
```

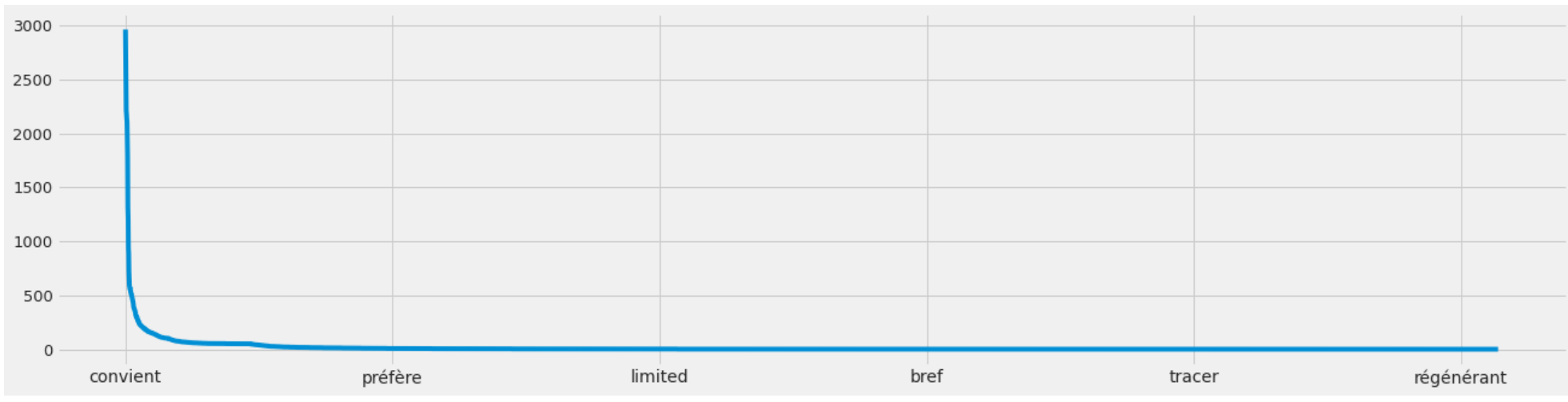
Out[65]: ''

Reglement interieur

In [66]:

```
#df_T['Reg_pre']
#Find words spreading (each word frequency)
freq_d = pd.Series(" ".join(df_T['Reg_pre']).split()).value_counts()
#Plot the words distribution
freq_d.plot(kind='line', ax=None, figsize=(20,5), use_index=True,
            title=None, grid=None, legend=False, style=None,
            logx=False, logy=False, loglog=False, xticks=None,
            yticks=None, xlim=None, ylim=None, rot=None,
            fontsize=None, colormap=None, table=False, yerr=None,
            xerr=None, label=None, secondary_y=False)
```

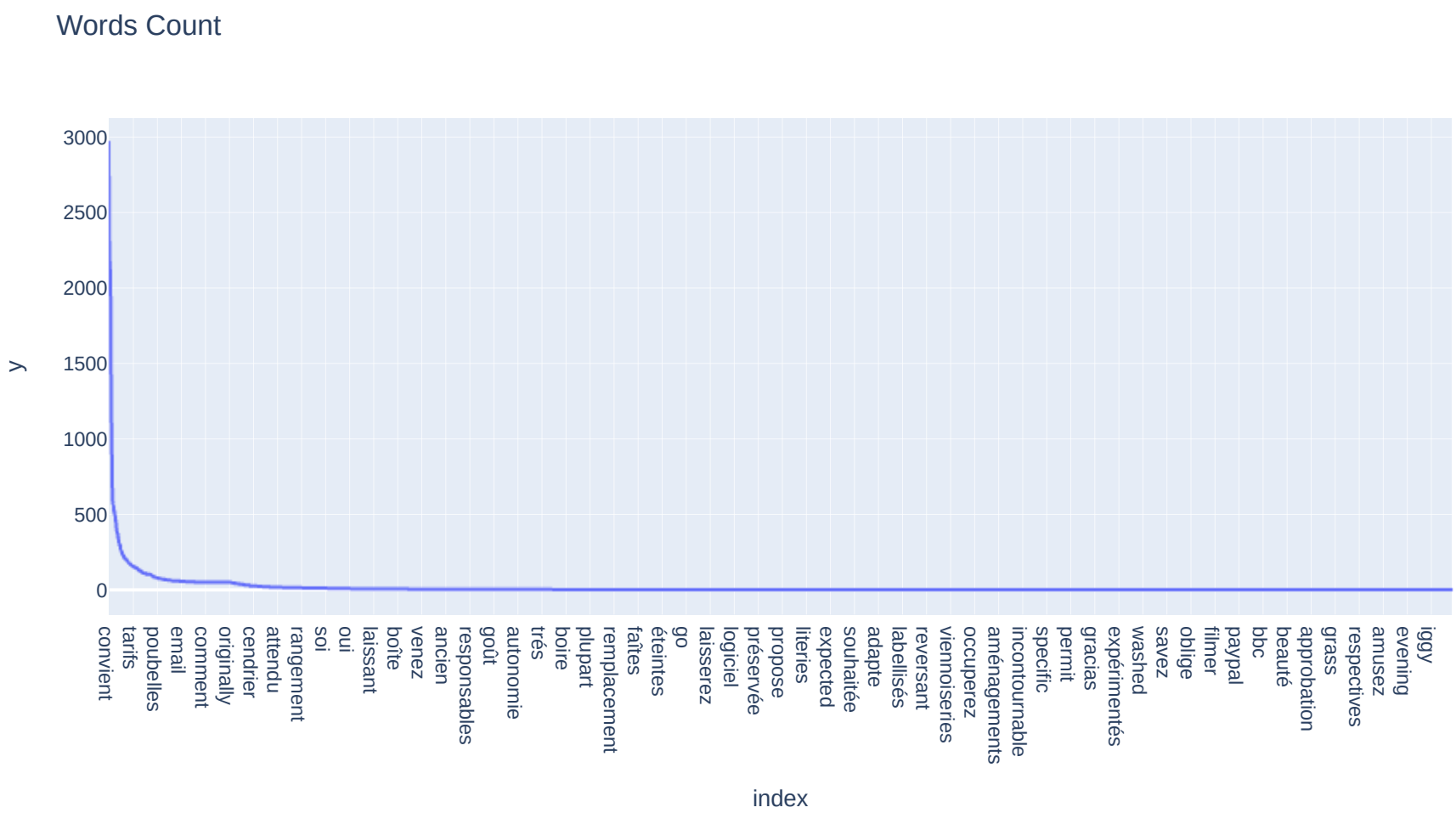
Out[66]: <AxesSubplot:>



In [67]:

```
wordCount = pd.DataFrame(data = {
    'word':freq_d.index,
    'occurence':freq_d.values
})

```

In [68]:
```
fig = px.line(freq_d, x=freq_d.index, y=freq_d.values, title='Words Count')
fig.show()
```



In [69]:
```
#15 -> 2000
#Remove the least frequent words
rare_d = list(wordCount['word'].where(wordCount['occurence']<15).dropna().values)
df_T['Reg_pre'] = df_T['Reg_pre'].apply(lambda x: " ".join(x for x in x.split() if x not in rare_d))
#Remove the most frequent words
freq_w = list(wordCount['word'].where(wordCount['occurence']>2500).dropna().values)
df_T['Reg_pre'] = df_T['Reg_pre'].apply(lambda x: " ".join(x for x in x.split() if x not in freq_w))
```

```
<ipython-input-69-436df296d0b9>:4: SettingWithCopyWarning:


A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy (https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy)

<ipython-input-69-436df296d0b9>:7: SettingWithCopyWarning:


A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy (https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy)
```

In [70]:
```
df_T['Reg_pre'] = [text.split() for text in df_T['Reg_pre']]


dict_d = corpora.Dictionary(df_T['Reg_pre'])
corpus_d = [dict_d.doc2bow(line) for line in df_T['Reg_pre']]
#Transform vectors of texts to scalar values (calculating norms of vectors)
corpus_d_vec_norm = [LA.norm(vec) for vec in corpus_d]
#Replace text descriptions in the database with norms of vectors
df_T['Reg_pre'] = corpus_d_vec_norm
```

```
<ipython-input-70-d141502c0d17>:1: SettingWithCopyWarning:


A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy (https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy)

<ipython-input-70-d141502c0d17>:9: SettingWithCopyWarning:


A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy (https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy)
```

In [71]:
```
#df_T
```

Titre

In [72]:
```
df_T['Titre_pre'] = df_T['Titre_pre'].fillna('laA7ad')
```

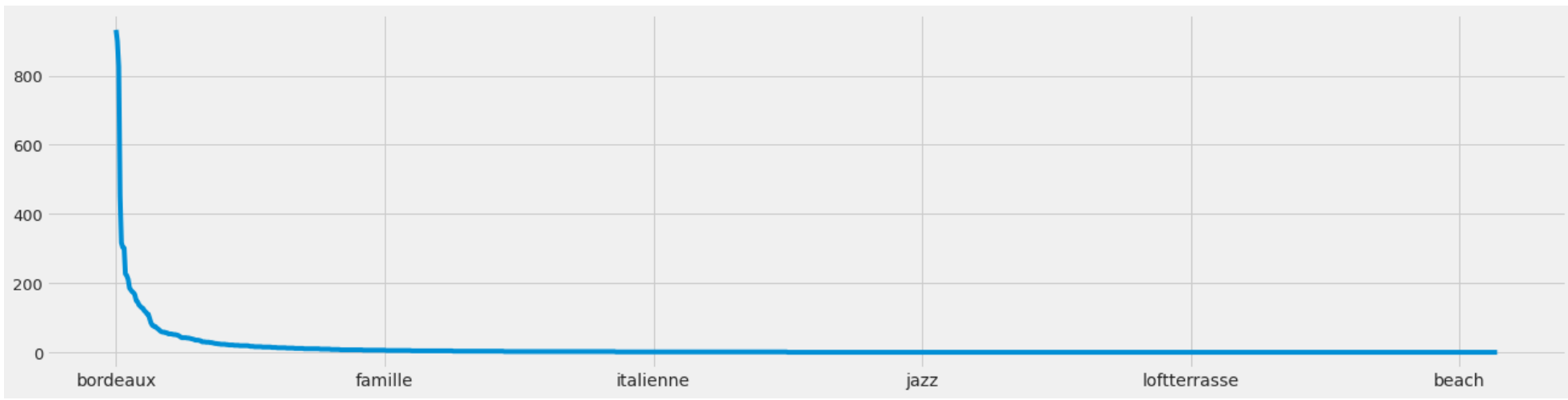
```
<ipython-input-72-85da24a57e45>:1: SettingWithCopyWarning:


A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy (https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy)
```

In [73]:
```
df_T.isnull().sum()
```

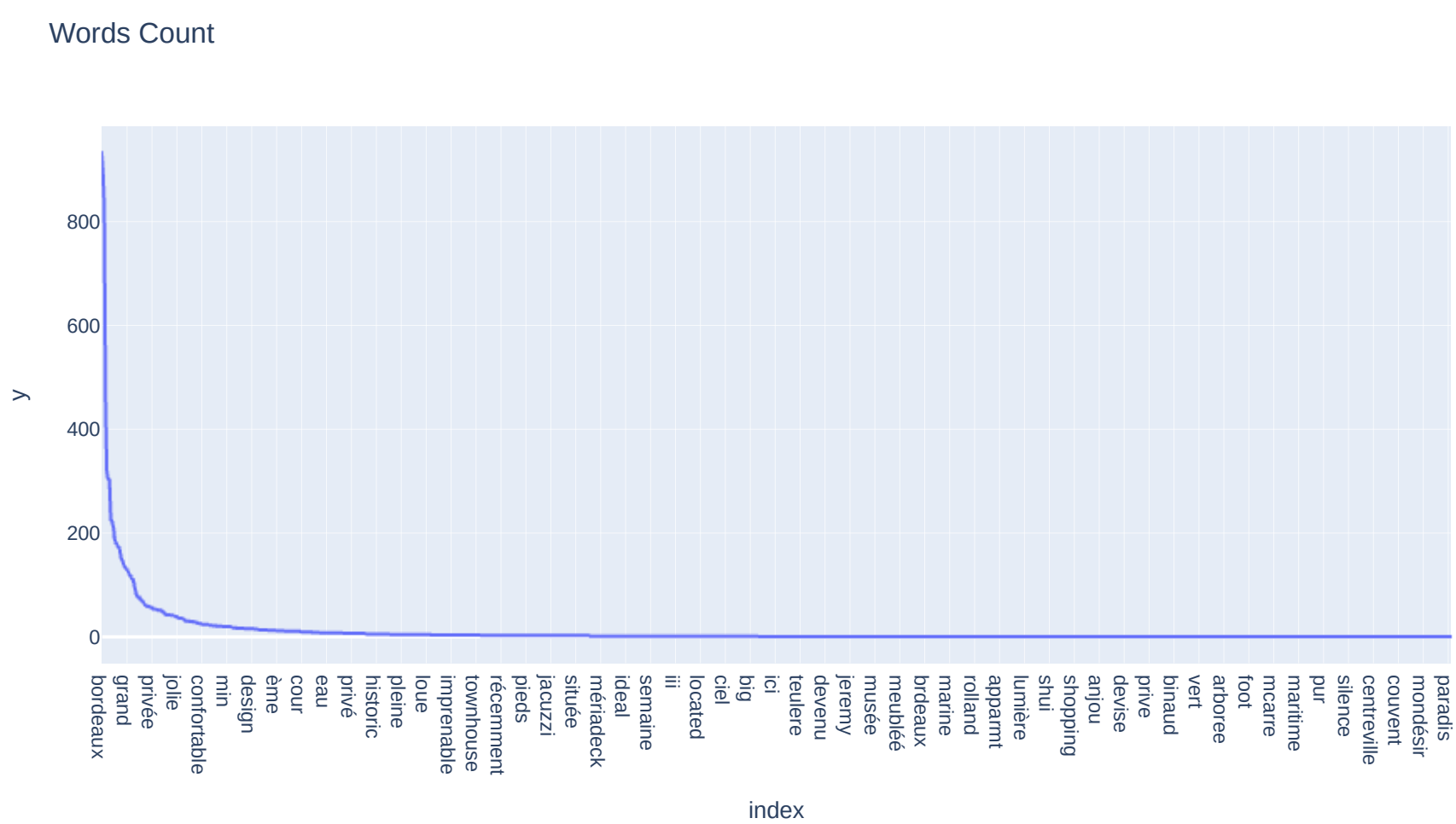
Out[73]:
```
Titre                 0
Description           0
reglement_interieur   0
PrixNuitee            0
Desc_pre              0
Reg_pre               0
Titre_pre             0
dtype: int64
```

In [74]:
```
#Find words spreading (each word frequency)
freq_d = pd.Series(" ".join(df_T['Titre_pre']).split()).value_counts()
#Plot the words distribution
freq_d.plot(kind='line', ax=None, figsize=(20,5), use_index=True,
            title=None, grid=None, legend=False, style=None,
            logx=False, logy=False, loglog=False, xticks=None,
            yticks=None, xlim=None, ylim=None, rot=None,
            fontsize=None, colormap=None, table=False, yerr=None,
            xerr=None, label=None, secondary_y=False)
```

Out[74]:
```
<AxesSubplot:>
```



In [75]:
```
fig = px.line(freq_d, x=freq_d.index, y=freq_d.values, title='Words Count')
fig.show()
```



In [76]:
```
wordCount = pd.DataFrame(data = {
    'word':freq_d.index,
    'occurence':freq_d.values
})

```

In [77]:
```
#15 -> 2000
#Remove the least frequent words
rare_d = list(wordCount['word'].where(wordCount['occurence']<15).dropna().values)
df_T['Titre_pre'] = df_T['Titre_pre'].apply(lambda x: " ".join(x for x in x.split() if x not in rare_d))
#Remove the most frequent words
freq_w = list(wordCount['word'].where(wordCount['occurence']>800).dropna().values)
df_T['Titre_pre'] = df_T['Titre_pre'].apply(lambda x: " ".join(x for x in x.split() if x not in freq_w))
```

```
<ipython-input-77-9af4bee0cb42>:4: SettingWithCopyWarning:


A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy (https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy)

<ipython-input-77-9af4bee0cb42>:7: SettingWithCopyWarning:


A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy (https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy)
```

In [78]:
```
df_T['Titre_pre'] = [text.split() for text in df_T['Titre_pre']]


dict_d = corpora.Dictionary(df_T['Titre_pre'])
corpus_d = [dict_d.doc2bow(line) for line in df_T['Titre_pre']]
#Transform vectors of texts to scalar values (calculating norms of vectors)
corpus_d_vec_norm = [LA.norm(vec) for vec in corpus_d]
#Replace text descriptions in the database with norms of vectors
df_T['Titre_pre'] = corpus_d_vec_norm
```

```
<ipython-input-78-f44c26cea328>:1: SettingWithCopyWarning:


A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy (https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy)

<ipython-input-78-f44c26cea328>:9: SettingWithCopyWarning:


A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy (https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy)
```

In [79]:
```
df_T.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 3534 entries, 1 to 4878
Data columns (total 7 columns):
 #   Column               Non-Null Count  Dtype  
---  ------               --------------  -----  
 0   Titre                3534 non-null   object 
 1   Description          3534 non-null   object 
 2   reglement_interieur  3534 non-null   object 
 3   PrixNuitee           3534 non-null   int64  
 4   Desc_pre             3534 non-null   float64
 5   Reg_pre              3534 non-null   float64
 6   Titre_pre            3534 non-null   float64
dtypes: float64(3), int64(1), object(3)
memory usage: 380.9+ KB
```

In [80]:
```
df_T
```

Out[80]:

	Titre	Description	reglement_interieur	PrixNuitee	Desc_pre	Reg_pre	Titre_pre
1	Sunny flat aux Chartrons	Le logement\n\nSitué dans le quartier des Char...	L'appartement est non fumeur.\n\nVous pouvez n...	71	900.720822	9.899495	1.732051
2	L'Echoppe des Bouilles	Le logement\n\nL'Échoppe des Bouilles est une ...	L'entrée dans les lieux se fait après 16:00\n\n	75	854.767805	17.262677	2.236068
3	Terrace with spectacular view	Bordeaux Terrace is a two bedroom apartment in...	L'entrée dans les lieux se fait après 15:00\n\...	155	2823.611163	65.276336	0.000000
4	Appartement charme bordeaux centre	Le logement\n\nAppartement avec beaucoup de ca...	Ne convient pas aux animaux\n\nPas de fête ni ...	80	2359.585769	50.803543	3.162278
5	Elegant 1 bd with amazing views	Spacious one bedroom apartment in the historic...	L'entrée dans les lieux se fait après 15:00\n\...	120	3013.361412	66.068147	0.000000
6	Large	This spacious one bedroom apartment (1,002 sq ...	L'entrée dans les lieux se fait après 14:00\n\...	140	3951.741009	69.036222	0.000000
7	Fairytale view in historic heart - 2 bd + elev...	Situated in the heart of the historic city, wi...	Non fumeur\n\nNe convient pas aux animaux\n\nP...	159	3610.694532	73.559500	0.000000

In [81]:
```
df_C['Desc_pre'] = df_T['Desc_pre'].values
df_C['Titre_pre'] = df_T['Titre_pre'].values
df_C['Reg_pre'] = df_T['Reg_pre'].values
```

In [82]:
```
df_F = df_C.drop(['Titre','reglement_interieur','Description'],axis=1)
```

In [83]:
```
df_C.info()#isnull().sum()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 3534 entries, 1 to 4878
Data columns (total 14 columns):
 #   Column                 Non-Null Count  Dtype  
---  ------                 --------------  -----  
 0   Titre                  3534 non-null   object 
 1   Type_logement          3534 non-null   object 
 2   type_propriete         3534 non-null   object 
 3   type_lit               3534 non-null   object 
 4   Animal_sur_place       3534 non-null   object 
 5   conditions_annulation  3534 non-null   object 
 6   Description            3534 non-null   object 
 7   reglement_interieur    3534 non-null   object 
 8   PrixNuitee             3534 non-null   int64  
 9   NbChambres             3534 non-null   int64  
 10  Capacite_accueil       3534 non-null   int64  
 11  Desc_pre               3534 non-null   float64
 12  Titre_pre              3534 non-null   float64
 13  Reg_pre                3534 non-null   float64
dtypes: float64(3), int64(3), object(8)
memory usage: 574.1+ KB
```

In [84]:
```
#df_F = pd.read_csv('df_F.csv')
#df_F.to_csv('df_F.csv')
```

Data Encoding

In [85]:
```
df_F = df_F.drop(['Animal_sur_place','conditions_annulation','type_lit'],axis = 1)
```

In [86]:
```
df_F = df_F[['Type_logement','type_propriete','PrixNuitee','NbChambres','Capacite_accueil','Desc_pre','Titre_pre','F
```

In [87]:
```
# creating instance of labelencoder
labelencoder = LabelEncoder()
# Assigning numerical values and storing in another column
df_F['Type_logement_labels'] = labelencoder.fit_transform(df_F['Type_logement'])
df_F['type_propriete_labels'] = labelencoder.fit_transform(df_F['type_propriete'])
df_F
```

Out[87]:

	Type_logement	type_propriete	PrixNuitee	NbChambres	Capacite_accueil	Desc_pre	Titre_pre	Reg_pre	Type_logement_labels	type_propriete_lab
1	Logement entier	Appartement	71	1	2	900.720822	1.732051	9.899495	2	
2	Chambre privée	Maison	75	1	2	854.767805	2.236068	17.262677	1	
3	Logement entier	Appartement	155	2	4	2823.611163	0.000000	65.276336	2	
4	Logement entier	Appartement	80	1	4	2359.585769	3.162278	50.803543	2	
5	Logement entier	Appartement	120	1	2	3013.361412	0.000000	66.068147	2	
6	Logement entier	Appartement	140	1	3	3951.741009	0.000000	69.036222	2	
7	Logement entier	Appartement	159	2	6	3610.694532	0.000000	73.559500	2	
8	Logement entier	Appartement	55	0	3	3648.065515	6.557439	70.256672	2	
9	Chambre privée	Bed & Breakfast	155	1	2	5121.062097	6.082763	51.439285	1	
10	Chambre privée	Bed & Breakfast	145	1	2	5055.213546	6.082763	51.439285	1	
11	Chambre privée	Bed & Breakfast	165	1	2	5348.889044	6.082763	79.874902	1	
12	Logement entier	Appartement	51	1	3	3895.755382	11.489125	164.365446	2	
17	Logement entier	Appartement	60	1	4	4878.271620	13.527749	35.411862	2	
18	Chambre privée	Bed & Breakfast	45	1	2	4384.148036	20.904545	74.899933	1	
19	Chambre privée	Appartement	30	1	1	4399.151054	17.088007	17.262677	1	
20	Logement entier	Maison	170	3	8	7398.615343	14.035669	39.395431	2	
21	Logement entier	Appartement	64	1	4	9148.561362	3.162278	499.222395	2	
22	Logement entier	Appartement	66	0	2	7187.255944	15.905974	412.449997	2	
23	Logement entier	Maison	111	3	6	11424.845951	29.529646	260.641516	2	
25	Logement entier	Appartement	75	2	4	10148.700262	19.026298	301.837705	2	
26	Logement entier	Maison de ville	118	3	6	7248.865635	20.273135	179.055857	2	
27	Logement entier	Appartement	300	2	4	6094.107728	30.446675	122.004098	2	
28	Logement entier	Appartement	80	0	2	7804.617672	33.526109	35.411862	2	
29	Chambre privée	Bed & Breakfast	75	1	2	8752.299127	21.142375	177.595045	1	
30	Logement entier	Loft	218	2	5	8968.158395	48.559242	420.023809	2	
31	Chambre privée	Bed & Breakfast	131	1	2	8743.129474	11.045361	615.994318	1	
32	Logement entier	Appartement	150	3	6	5816.217327	28.017851	59.169249	2	
34	Logement entier	Appartement	90	2	4	9853.623496	52.105662	17.262677	2	
35	Logement entier	Appartement	70	1	4	11875.134231	45.989129	447.005593	2	
36	Logement entier	Appartement	97	1	6	6391.375126	34.014703	408.520501	2	
37	Logement entier	Appartement	90	1	4	6075.544914	33.015148	17.262677	2	
39	Logement entier	Appartement	65	1	4	7713.671305	8.185353	126.423890	2	
40	Logement entier	Appartement	80	2	3	9890.823120	50.229473	421.359704	2	
42	Logement entier	Appartement	65	0	4	13460.136552	4.123106	1294.408359	2	
43	Logement entier	Appartement	80	1	4	10282.084759	53.056574	240.174936	2	
44	Chambre privée	Appartement	30	1	2	8182.835755	13.674794	164.003049	1	
46	Logement entier	Appartement	69	1	3	10687.846369	48.723711	792.088379	2	
48	Logement entier	Appartement	60	1	4	11226.980182	31.080541	456.845707	2	
49	Chambre privée	Maison	60	1	2	6838.478559	21.142375	453.800617	1	
50	Logement entier	Appartement	85	1	2	10899.027113	66.128662	308.483387	2	
51	Logement entier	Maison	119	3	6	9390.464632	49.517674	401.400050	2	
52	Logement entier	Maison	200	4	8	6107.945809	46.636895	17.262677	2	
53	Chambre privée	Maison	45	1	2	12961.854921	59.194594	687.030567	1	
54	Logement entier	Appartement	89	1	2	11020.429937	7.211103	183.757993	2	
55	Logement entier	Appartement	60	1	3	4714.216584	7.071068	256.230365	2	
56	Logement entier	Appartement	190	2	4	8982.869753	5.099020	495.599637	2	
58	Chambre privée	Maison	33	1	2	10040.307167	15.329710	500.886215	1	
59	Logement entier	Appartement	74	2	5	10370.478436	64.366140	379.077828	2	
61	Chambre privée	Bed & Breakfast	90	1	2	10209.204866	24.020824	279.003584	1	
62	Logement entier	Appartement	58	3	6	11552.276832	53.188345	632.308469	2	
...	...	...	...	...	...	...	...	...	...	...
4816	Logement entier	Appartement	80	1	2	8982.620497	35.014283	36.013886	2	

	Type_logement	type_propriete	PrixNuitee	NbChambres	Capacite_accueil	Desc_pre	Titre_pre	Reg_pre	Type_logement_labels	type_propriete_lab
4817	Logement entier	Appartement	60	1	4	3827.261815	24.020824	51.855569	2	
4818	Logement entier	Appartement	70	2	4	3530.993911	32.015621	61.983869	2	
4819	Chambre privée	Inconnue	41	1	2	4432.065094	79.006329	1209.594147	1	
4820	Logement entier	Appartement	100	2	6	4923.749080	86.388657	694.646673	2	
4822	Logement entier	Appartement	69	1	2	3812.349538	70.370448	63.678882	2	
4823	Logement entier	Appartement	59	1	2	6757.535793	105.004762	61.983869	2	
4824	Logement entier	Appartement	170	2	6	9122.594642	137.127678	51.855569	2	
4825	Chambre privée	Appartement	35	1	2	3410.492047	65.092242	1122.964826	1	
4826	Logement entier	Appartement	59	1	3	6486.912054	113.004425	61.983869	2	
4827	Logement entier	Appartement	120	2	6	4998.172566	24.020824	39.395431	2	
4828	Logement entier	Appartement	50	1	2	4128.857469	80.932070	52.924474	2	
4829	Logement entier	Maison	80	3	6	6739.237123	50.009999	36.013886	2	
4830	Logement entier	Appartement	90	3	7	14601.453763	71.637979	756.426467	2	
4831	Chambre partagée	Appartement	20	1	1	4061.912481	112.658777	71.456280	0	
4832	Logement entier	Appartement	80	2	6	4992.295364	122.458156	39.937451	2	
4833	Logement entier	Maison	35	1	3	9220.688098	91.087870	948.301640	2	
4836	Logement entier	Maison	150	4	8	4420.938814	37.616486	255.943353	2	
4837	Logement entier	Appartement	51	1	3	9814.602896	18.027756	1191.411348	2	
4838	Chambre privée	Appartement	50	1	2	9547.824674	67.808554	61.636028	1	
4839	Logement entier	Appartement	40	1	2	3035.431436	86.174242	61.636028	2	
4840	Logement entier	Appartement	50	0	4	4179.877989	92.579695	39.937451	2	
4841	Chambre privée	Appartement	39	1	2	4574.213484	40.755368	63.340350	1	
4842	Logement entier	Appartement	45	2	4	2821.789680	104.244904	39.937451	2	
4844	Chambre privée	Bed & Breakfast	23	1	3	3530.993911	140.879381	50.428167	1	
4847	Chambre privée	Appartement	30	1	2	5340.516829	42.296572	39.937451	1	
4849	Chambre privée	Autre	99	1	2	14603.760338	11.789826	71.756533	1	
4850	Chambre privée	Appartement	99	1	1	3980.549962	11.045361	63.678882	1	
4851	Logement entier	Maison	169	3	5	11751.444252	91.087870	37.309516	2	
4852	Logement entier	Appartement	82	2	6	3713.512219	118.469405	39.937451	2	
4853	Chambre privée	Bed & Breakfast	30	1	1	1885.314297	147.766708	63.678882	1	
4854	Logement entier	Appartement	118	3	7	4342.313554	134.178985	39.937451	2	
4856	Logement entier	Appartement	75	2	7	17.029386	78.625696	35.411862	2	
4857	Logement entier	Appartement	49	1	4	5342.660573	123.012195	63.340350	2	
4858	Logement entier	Appartement	38	1	2	867.662953	15.033296	39.937451	2	
4859	Chambre privée	Appartement	28	1	4	5824.558782	39.076847	90.564894	1	
4860	Chambre privée	Appartement	40	1	2	5740.364100	39.230090	50.447993	1	
4861	Chambre privée	Appartement	30	1	1	4560.224117	101.607086	683.401054	1	
4862	Logement entier	Maison de ville	310	5	9	5449.754673	107.545339	920.236926	2	
4863	Logement entier	Appartement	48	0	2	4185.020669	92.541882	479.989583	2	
4864	Logement entier	Appartement	48	1	2	3670.992100	49.295030	39.937451	2	
4866	Logement entier	Appartement	50	1	4	5983.097442	96.145723	631.696921	2	
4867	Logement entier	Appartement	47	2	3	5557.089886	46.010868	39.937451	2	
4869	Logement entier	Appartement	76	1	4	8092.042944	78.313473	61.294372	2	
4870	Chambre privée	Maison de ville	75	1	2	4530.245358	31.654384	63.678882	1	
4872	Logement entier	Appartement	48	1	3	9280.971393	38.858718	1347.593410	2	
4875	Logement entier	Appartement	30	1	4	7391.154917	32.015621	70.256672	2	
4876	Logement entier	Appartement	69	1	2	12521.482780	95.005263	1078.660280	2	
4877	Logement entier	Appartement	59	1	4	7449.137064	71.589105	70.256672	2	
4878	Logement entier	Appartement	40	1	4	7482.803018	165.562677	36.013886	2	

3534 rows × 10 columns

In [88]:
```
df_train = df_F[['NbChambres','Capacite_accueil','Type_logement_labels','type_propriete_labels','Desc_pre','Reg_pre
```

In [89]:
```
#df_train['Desc_pre'] = df_train['Desc_pre'].fillna('')
df_train.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 3534 entries, 1 to 4878
Data columns (total 8 columns):
 #   Column                 Non-Null Count  Dtype  
---  ------                 --------------  -----  
 0   NbChambres             3534 non-null   int64  
 1   Capacite_accueil       3534 non-null   int64  
 2   Type_logement_labels   3534 non-null   int64  
 3   type_propriete_labels  3534 non-null   int64  
 4   Desc_pre               3534 non-null   float64
 5   Reg_pre                3534 non-null   float64
 6   Titre_pre              3534 non-null   float64
 7   PrixNuitee             3534 non-null   int64  
dtypes: float64(3), int64(5)
memory usage: 408.5 KB
```

In [90]:
```
mlpreg = MLPRegressor(hidden_layer_sizes=(20,), activation='relu',
         solver='adam', alpha=0.1, batch_size='auto',
         learning_rate='adaptive', learning_rate_init=0.00001,
         power_t=0.5, max_iter=100000, shuffle=True, random_state=1,
         tol=0.0001, verbose=False, warm_start=False, momentum=0.9,
         nesterovs_momentum=True, early_stopping=False,
         validation_fraction=0.1, beta_1=0.9, beta_2=0.999,
         epsilon=1e-08)
```

In [91]:
```
X = df_train.drop(['PrixNuitee'],axis=1)
y = df_train['PrixNuitee']
X_train, X_test, y_train, y_test = train_test_split(X, y,random_state=1, test_size=0.05)
```

In [ ]:
```
mlpreg.fit(X_train, y_train)
```

In [ ]:
```
y_pred = mlpreg.predict(X_test)
```

In [ ]:
```
fig = px.scatter(x=y_test, y=y_pred, labels={'x': 'ground truth', 'y': 'prediction'})
fig.add_shape(
    type="line", line=dict(dash='dash'),
    x0=y_test.min(), y0=y_test.min(),
    x1=y_test.max(), y1=y_test.max()
)
fig.show()
```

In [ ]:
```
mlpreg.score(X_train,y_train)
```

In [ ]:
```
mlpreg.score(X_test,y_test)
```

In [ ]:
```
y_pred = list(y_pred)
y_test = list(y_test.values)
```

In [ ]:
```
import sklearn.metrics as sm
print("Mean absolute error =", round(sm.mean_absolute_error(y_test, y_pred), 2))
print("Mean squared error =", round(sm.mean_squared_error(y_test, y_pred), 2))
print("Median absolute error =", round(sm.median_absolute_error(y_test, y_pred), 2))
print("Explain variance score =", round(sm.explained_variance_score(y_test, y_pred), 2))
print("R2 score =", round(sm.r2_score(y_test, y_pred), 2))
```

> Falk and Miller (1992) recommended that R2 values should be equal to or greater than 0.10 in order for the variance explained of a particular endogenous construct to be deemed adequate.

In [283]:
```
import joblib
# save the model to disk
filename = 'finalized_model_1.sav'
joblib.dump(mlpreg, filename)

# some time later...

# load the model from disk
loaded_model = joblib.load(filename)
```

In [17]:
```
from sklearn import svm

```

In [18]:
```
regr = svm.SVR()
regr.fit(X_train, y_train)

```

Out[18]:
```
SVR()
```

In [19]:
```
y_pred = regr.predict(X_test)
y_test = np.array(y_test)
```

In [20]:
```
fig = px.scatter(x=y_test, y=y_pred, labels={'x': 'ground truth', 'y': 'prediction'})
fig.add_shape(
    type="line", line=dict(dash='dash'),
    x0=y_test.min(), y0=y_test.min(),
    x1=y_test.max(), y1=y_test.max()
)
fig.show()
```

In [21]:
```
from sklearn.preprocessing import OneHotEncoder


# creating instance of labelencoder
onhotEncoder = OneHotEncoder()
# Assigning numerical values and storing in another column
onhotEncoder.fit_transform(df_F[['Type_logement','type_propriete']]).toarray()
#df_F1['type_propriete_labels'] = onhotEncoder.fit_transform(df_F['type_propriete'])
#df_F1
onhotEncoder.categories_
```

Out[21]:
```
[array(['Chambre partagée', 'Chambre privée', 'Logement entier'],
       dtype=object),
 array(['Appartement', 'Appartement en résidence', 'Autre',
        'Bed & Breakfast', 'Bungalow', 'Cabane', 'Dortoir', 'Inconnue',
        'Loft', 'Maison', 'Maison de ville', 'Villa'], dtype=object)]
```

In [22]:
```
onhotEncoder
```

Out[22]:
```
OneHotEncoder()
```

In [23]:
```
df_F
```

Out[23]:

	Type_logement	type_propriete	PrixNuitee	NbChambres	Capacite_accueil	Desc_pre	Titre_pre	Reg_pre	Type_logement_labels	type_propriete_l
0	Logement entier	Appartement	71.0	1.0	2.0	910.782082	1.732051	9.899495	2	
1	Chambre privée	Maison	75.0	1.0	2.0	860.016279	2.236068	17.262677	1	
2	Logement entier	Appartement	155.0	2.0	4.0	2818.935792	0.000000	65.276336	2	
3	Logement entier	Appartement	80.0	1.0	4.0	2359.983686	3.162278	50.803543	2	
4	Logement entier	Appartement	120.0	1.0	2.0	2994.063961	0.000000	66.068147	2	
5	Logement entier	Appartement	140.0	1.0	3.0	3950.575907	0.000000	69.036222	2	
6	Logement entier	Appartement	159.0	2.0	6.0	3582.616362	0.000000	73.559500	2	
7	Logement entier	Appartement	55.0	0.0	3.0	3634.640835	6.557439	70.256672	2	
8	Chambre privée	Bed & Breakfast	155.0	1.0	2.0	5104.817137	6.082763	51.439285	1	
9	Chambre privée	Bed & Breakfast	145.0	1.0	2.0	5039.130977	6.082763	51.439285	1	

In [24]:
```
#df_F = df_F.drop(['Desc_pre'],axis = 1)
```

In [25]:
```
df_F
```

Out[25]:

	Type_logement	type_propriete	PrixNuitee	NbChambres	Capacite_accueil	Desc_pre	Titre_pre	Reg_pre	Type_logement_labels	type_propriete_l
0	Logement entier	Appartement	71.0	1.0	2.0	910.782082	1.732051	9.899495	2	
1	Chambre privée	Maison	75.0	1.0	2.0	860.016279	2.236068	17.262677	1	
2	Logement entier	Appartement	155.0	2.0	4.0	2818.935792	0.000000	65.276336	2	
3	Logement entier	Appartement	80.0	1.0	4.0	2359.983686	3.162278	50.803543	2	
4	Logement entier	Appartement	120.0	1.0	2.0	2994.063961	0.000000	66.068147	2	
5	Logement entier	Appartement	140.0	1.0	3.0	3950.575907	0.000000	69.036222	2	
6	Logement entier	Appartement	159.0	2.0	6.0	3582.616362	0.000000	73.559500	2	
7	Logement entier	Appartement	55.0	0.0	3.0	3634.640835	6.557439	70.256672	2	
8	Chambre privée	Bed & Breakfast	155.0	1.0	2.0	5104.817137	6.082763	51.439285	1	
9	Chambre privée	Bed & Breakfast	145.0	1.0	2.0	5039.130977	6.082763	51.439285	1	

In [26]:
```
#df_F = df_F.drop(['Animal_sur_place','conditions_annulation','type_lit'],axis =1)
```

In [27]:
```
df_F
```

Out[27]:

	Type_logement	type_propriete	PrixNuitee	NbChambres	Capacite_accueil	Desc_pre	Titre_pre	Reg_pre	Type_logement_labels	type_propriete_l
0	Logement entier	Appartement	71.0	1.0	2.0	910.782082	1.732051	9.899495	2	
1	Chambre privée	Maison	75.0	1.0	2.0	860.016279	2.236068	17.262677	1	
2	Logement entier	Appartement	155.0	2.0	4.0	2818.935792	0.000000	65.276336	2	
3	Logement entier	Appartement	80.0	1.0	4.0	2359.983686	3.162278	50.803543	2	
4	Logement entier	Appartement	120.0	1.0	2.0	2994.063961	0.000000	66.068147	2	
5	Logement entier	Appartement	140.0	1.0	3.0	3950.575907	0.000000	69.036222	2	
6	Logement entier	Appartement	159.0	2.0	6.0	3582.616362	0.000000	73.559500	2	
7	Logement entier	Appartement	55.0	0.0	3.0	3634.640835	6.557439	70.256672	2	
8	Chambre privée	Bed & Breakfast	155.0	1.0	2.0	5104.817137	6.082763	51.439285	1	
9	Chambre privée	Bed & Breakfast	145.0	1.0	2.0	5039.130977	6.082763	51.439285	1	

In [28]:
```
df_F12 = df_F[['NbChambres','Capacite_accueil','PrixNuitee']]
```

In [29]:
```
df_F12
```

Out[29]:

	NbChambres	Capacite_accueil	PrixNuitee
0	1.0	2.0	71.0
1	1.0	2.0	75.0
2	2.0	4.0	155.0
3	1.0	4.0	80.0
4	1.0	2.0	120.0
5	1.0	3.0	140.0
6	2.0	6.0	159.0
7	0.0	3.0	55.0
8	1.0	2.0	155.0
9	1.0	2.0	145.0
10	1.0	2.0	165.0
11	1.0	3.0	51.0

In [30]:
```
import statsmodels.api as sm
```

In [31]:
```
y = df_F12['PrixNuitee']
X1 = df_F12['NbChambres'].values
X2 = df_F12['Capacite_accueil'].values
X = [X1,X2]
```

In [32]:
```
X
```

Out[32]:
```
[array([1., 1., 2., ..., 1., 1., 1.]), array([2., 2., 4., ..., 2., 4., 4.])]
```

In [33]:
```
def reg_m(y, x):
    ones = np.ones(len(x[0]))
    X = sm.add_constant(np.column_stack((x[0], ones)))
    for ele in x[1:]:
        X = sm.add_constant(np.column_stack((ele, X)))
    results = sm.OLS(y, X).fit()
    return results

print(reg_m(y, X).summary())
```

```
                            OLS Regression Results
==============================================================================
Dep. Variable:             PrixNuitee   R-squared:                       0.442
Model:                            OLS   Adj. R-squared:                  0.442
Method:                 Least Squares   F-statistic:                     1367.
Date:                Wed, 09 Feb 2022   Prob (F-statistic):               0.00
Time:                        14:50:10   Log-Likelihood:                -17215.
No. Observations:                3450   AIC:                         3.444e+04
Df Residuals:                    3447   BIC:                         3.445e+04
Df Model:                           2
Covariance Type:            nonrobust
==============================================================================
                 coef    std err          t      P>|t|      [0.025      0.975]
------------------------------------------------------------------------------
x1             9.9071      0.576     17.212      0.000       8.779      11.036
x2            20.6792      1.057     19.557      0.000      18.606      22.752
const         15.3379      1.419     10.812      0.000      12.556      18.119
==============================================================================
Omnibus:                     1344.269   Durbin-Watson:                   1.885
Prob(Omnibus):                  0.000   Jarque-Bera (JB):             7445.415
Skew:                           1.773   Prob(JB):                         0.00
Kurtosis:                       9.262   Cond. No.                         10.1
==============================================================================

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

In [ ]:
```

```

In [34]:
```
from sklearn.preprocessing import StandardScaler,LabelEncoder
from sklearn.model_selection import GridSearchCV,train_test_split,cross_val_score
from sklearn.decomposition import PCA
from sklearn.pipeline import Pipeline
from sklearn.linear_model import LinearRegression,Lasso,Ridge,ElasticNet
from sklearn.neighbors import KNeighborsRegressor
from sklearn.svm import SVR
from sklearn.tree import DecisionTreeRegressor
from sklearn.ensemble import RandomForestRegressor
from sklearn.metrics import mean_squared_error,mean_absolute_error
```

In [35]:
```
df_F
```

Out[35]:

	Type_logement	type_propriete	PrixNuitee	NbChambres	Capacite_accueil	Desc_pre	Titre_pre	Reg_pre	Type_logement_labels	type_propriete_l
0	Logement entier	Appartement	71.0	1.0	2.0	910.782082	1.732051	9.899495	2	
1	Chambre privée	Maison	75.0	1.0	2.0	860.016279	2.236068	17.262677	1	
2	Logement entier	Appartement	155.0	2.0	4.0	2818.935792	0.000000	65.276336	2	
3	Logement entier	Appartement	80.0	1.0	4.0	2359.983686	3.162278	50.803543	2	
4	Logement entier	Appartement	120.0	1.0	2.0	2994.063961	0.000000	66.068147	2	
5	Logement entier	Appartement	140.0	1.0	3.0	3950.575907	0.000000	69.036222	2	
6	Logement entier	Appartement	159.0	2.0	6.0	3582.616362	0.000000	73.559500	2	
7	Logement entier	Appartement	55.0	0.0	3.0	3634.640835	6.557439	70.256672	2	
8	Chambre privée	Bed & Breakfast	155.0	1.0	2.0	5104.817137	6.082763	51.439285	1	
9	Chambre privée	Bed & Breakfast	145.0	1.0	2.0	5039.130977	6.082763	51.439285	1	

Decission Tree Regressor:

In [36]:
```
from sklearn.tree import DecisionTreeRegressor
from sklearn import tree

```

In [37]:

```
tree_set = df_train.copy()
tree_set = tree_set.fillna(0)
target = tree_set["PrixNuitee"]
tree_set.drop(["PrixNuitee"], axis=1, inplace=True)

tree_clf = DecisionTreeRegressor(max_depth=5, random_state=1)
tree_clf.fit(tree_set, target)
text_representation = tree.export_text(tree_clf, feature_names=tree_set.columns.tolist())
print(text_representation)
print("accuracy: " + str(tree_clf.score(tree_set, target)))
```

```
|--- NbChambres <= 1.50
|   |--- Capacite_accueil <= 2.50
|   |   |--- Type_logement_labels <= 1.50
|   |   |   |--- type_propriete_labels <= 1.50
|   |   |   |   |--- Desc_pre <= 7935.25
|   |   |   |   |   |--- value: [42.55]
|   |   |   |   |--- Desc_pre >  7935.25
|   |   |   |   |   |--- value: [35.64]
|   |   |   |--- type_propriete_labels >  1.50
|   |   |   |   |--- type_propriete_labels <= 5.00
|   |   |   |   |   |--- value: [68.04]
|   |   |   |   |--- type_propriete_labels >  5.00
|   |   |   |   |   |--- value: [45.34]
|   |   |--- Type_logement_labels >  1.50
|   |   |   |--- NbChambres <= 0.50
|   |   |   |   |--- Reg_pre <= 2714.59
|   |   |   |   |   |--- value: [50.38]
|   |   |   |   |--- Reg_pre >  2714.59
|   |   |   |   |   |--- value: [77.50]
|   |   |   |--- NbChambres >  0.50
|   |   |   |   |--- Reg_pre <= 1947.61
|   |   |   |   |   |--- value: [61.09]
|   |   |   |   |--- Reg_pre >  1947.61
|   |   |   |   |   |--- value: [92.43]
|   |--- Capacite_accueil >  2.50
|   |   |--- Reg_pre <= 6386.76
|   |   |   |--- NbChambres <= 0.50
|   |   |   |   |--- Titre_pre <= 78.78
|   |   |   |   |   |--- value: [58.00]
|   |   |   |   |--- Titre_pre >  78.78
|   |   |   |   |   |--- value: [47.42]
|   |   |   |--- NbChambres >  0.50
|   |   |   |   |--- Reg_pre <= 60.74
|   |   |   |   |   |--- value: [74.28]
|   |   |   |   |--- Reg_pre >  60.74
|   |   |   |   |   |--- value: [65.67]
|   |   |--- Reg_pre >  6386.76
|   |   |   |--- Desc_pre <= 11330.27
|   |   |   |   |--- Reg_pre <= 9255.96
|   |   |   |   |   |--- value: [120.00]
|   |   |   |   |--- Reg_pre >  9255.96
|   |   |   |   |   |--- value: [97.50]
|   |   |   |--- Desc_pre >  11330.27
|   |   |   |   |--- Titre_pre <= 4.53
|   |   |   |   |   |--- value: [135.00]
|   |   |   |   |--- Titre_pre >  4.53
|   |   |   |   |   |--- value: [122.14]
|--- NbChambres >  1.50
|   |--- NbChambres <= 2.50
|   |   |--- Reg_pre <= 6890.08
|   |   |   |--- Capacite_accueil <= 3.50
|   |   |   |   |--- Desc_pre <= 12439.34
|   |   |   |   |   |--- value: [71.10]
|   |   |   |   |--- Desc_pre >  12439.34
|   |   |   |   |   |--- value: [145.00]
|   |   |   |--- Capacite_accueil >  3.50
|   |   |   |   |--- Capacite_accueil <= 5.50
|   |   |   |   |   |--- value: [99.31]
|   |   |   |   |--- Capacite_accueil >  5.50
|   |   |   |   |   |--- value: [114.10]
|   |   |--- Reg_pre >  6890.08
|   |   |   |--- Desc_pre <= 11640.96
|   |   |   |   |--- Reg_pre <= 9245.85
|   |   |   |   |   |--- value: [151.00]
|   |   |   |   |--- Reg_pre >  9245.85
|   |   |   |   |   |--- value: [136.43]
|   |   |   |--- Desc_pre >  11640.96
|   |   |   |   |--- Reg_pre <= 9259.63
|   |   |   |   |   |--- value: [161.50]
|   |   |   |   |--- Reg_pre >  9259.63
|   |   |   |   |   |--- value: [152.50]
|   |--- NbChambres >  2.50
|   |   |--- Capacite_accueil <= 7.50
|   |   |   |--- Desc_pre <= 2634.65
|   |   |   |   |--- Desc_pre <= 1444.57
|   |   |   |   |   |--- value: [337.00]
|   |   |   |   |--- Desc_pre >  1444.57
|   |   |   |   |   |--- value: [197.50]
|   |   |   |--- Desc_pre >  2634.65
|   |   |   |   |--- Capacite_accueil <= 5.50
|   |   |   |   |   |--- value: [120.34]
|   |   |   |   |--- Capacite_accueil >  5.50
|   |   |   |   |   |--- value: [147.74]
|   |   |--- Capacite_accueil >  7.50
```

```
|   |   |   |--- NbChambres <= 5.50
|   |   |   |   |--- NbChambres <= 3.50
|   |   |   |   |   |--- value: [160.21]
|   |   |   |   |--- NbChambres >  3.50
|   |   |   |   |   |--- value: [198.09]
|   |   |   |--- NbChambres >  5.50
|   |   |   |   |--- Reg_pre <= 1062.74
|   |   |   |   |   |--- value: [220.00]
|   |   |   |   |--- Reg_pre >  1062.74
|   |   |   |   |   |--- value: [313.33]
```

```
accuracy: 0.5016390307807873
```

In [38]:
```
y_predict = tree_clf.predict(X_test)

```

In [42]:
```
print(rmsle(y_test, y_predict))
```

```
23.27822428661784
```

In [43]:
```
fig = px.scatter(x=y_test, y=y_predict, labels={'x': 'ground truth', 'y': 'prediction'})
fig.add_shape(
    type="line", line=dict(dash='dash'),
    x0=y_test.min(), y0=y_test.min(),
    x1=y_test.max(), y1=y_test.max()
)
fig.show()
```

Xgboost Regressor

In [44]:
```
import xgboost as xgb

```

In [45]:
```
xgb_param = {'num_leaves': 100,
                'learning_rate': 0.03,
                'min_data_in_leaf': 80,
                'objective': 'reg:linear',      # huber, gamma, reg:linear
                'max_depth': 40,
                'min_child_samples': 100,
                'boosting': 'gbdt',
                'feature_fraction': 0.8,
                'bagging_freq': 20,
                'bagging_fraction': 0.5,
                'bagging_seed': 500,
                'metric': 'rmse',
                'lambda_l1': 0.5,
                'verbosity': 3,
                'nthread': 5,
                'random_state': 0,
                'subsample': 0.7,
                'n_estimators': 5000,
                'colsample_bytree': 0.8
                }
```

In [46]:
```
model_xgb = xgb.XGBRegressor(num_leaves=xgb_param['num_leaves'],
                             learning_rate=xgb_param['learning_rate'],
                             min_data_in_leaf=xgb_param['min_data_in_leaf'],
                             objectivce=xgb_param['objective'],
                             max_depth=xgb_param['max_depth'],
                             min_child_samples=xgb_param['min_child_samples'],
                             boosting=xgb_param['boosting'],
                             feature_fraction=xgb_param['feature_fraction'],
                             bagging_freq=xgb_param['bagging_freq'],
                             bagging_fraction=xgb_param['bagging_fraction'],
                             bagging_seed=xgb_param['bagging_seed'],
                             metric=xgb_param['metric'],
                             lambda_l1=xgb_param['lambda_l1'],
                             verbosity=xgb_param['verbosity'],
                             nthread=xgb_param['nthread'],
                             random_state=xgb_param['random_state'],
                             subsample=xgb_param['subsample'],
                             n_estimators=xgb_param['n_estimators'],
                             colsample_bytree=xgb_param['colsample_bytree'])
```

In [47]:
```
model_xgb.fit(X_train, y_train)
xgb_train_pred = model_xgb.predict(X_train)
xgb_test_pred = model_xgb.predict(X_test)
```

```
[14:52:14] WARNING: ../src/learner.cc:541:
Parameters: { bagging_fraction, bagging_freq, bagging_seed, boosting, feature_fraction, lambda_l1, metric, min_child_
samples, min_data_in_leaf, num_leaves, objectivce } might not be used.

  This may not be accurate due to some parameters are only used in language bindings but
  passed down to XGBoost core.  Or some parameters are not used but slip through this
  verification. Please open an issue if you find above cases.


[14:52:14] DEBUG: ../src/gbm/gbtree.cc:154: Using tree method: 2
[14:52:14] INFO: ../src/tree/updater_prune.cc:101: tree pruning end, 140 extra nodes, 0 pruned nodes, max_depth=18
[14:52:14] INFO: ../src/tree/updater_prune.cc:101: tree pruning end, 88 extra nodes, 0 pruned nodes, max_depth=10
[14:52:14] INFO: ../src/tree/updater_prune.cc:101: tree pruning end, 170 extra nodes, 0 pruned nodes, max_depth=17
[14:52:14] INFO: ../src/tree/updater_prune.cc:101: tree pruning end, 288 extra nodes, 0 pruned nodes, max_depth=17
[14:52:14] INFO: ../src/tree/updater_prune.cc:101: tree pruning end, 98 extra nodes, 0 pruned nodes, max_depth=13
[14:52:14] INFO: ../src/tree/updater_prune.cc:101: tree pruning end, 148 extra nodes, 0 pruned nodes, max_depth=14
[14:52:14] INFO: ../src/tree/updater_prune.cc:101: tree pruning end, 108 extra nodes, 0 pruned nodes, max_depth=13
[14:52:14] INFO: ../src/tree/updater_prune.cc:101: tree pruning end, 164 extra nodes, 0 pruned nodes, max_depth=12
[14:52:14] INFO: ../src/tree/updater_prune.cc:101: tree pruning end, 280 extra nodes, 0 pruned nodes, max_depth=18
```

In [48]:
```
def rmsle(y, y_pred):
    return (mean_absolute_error(y, y_pred))
```

In [49]:
```
print(rmsle(y_train, xgb_train_pred))
```

```
0.006588780738101851
```

In [50]:
```
print(rmsle(y_test, xgb_test_pred))
```

```
23.476545708716948
```

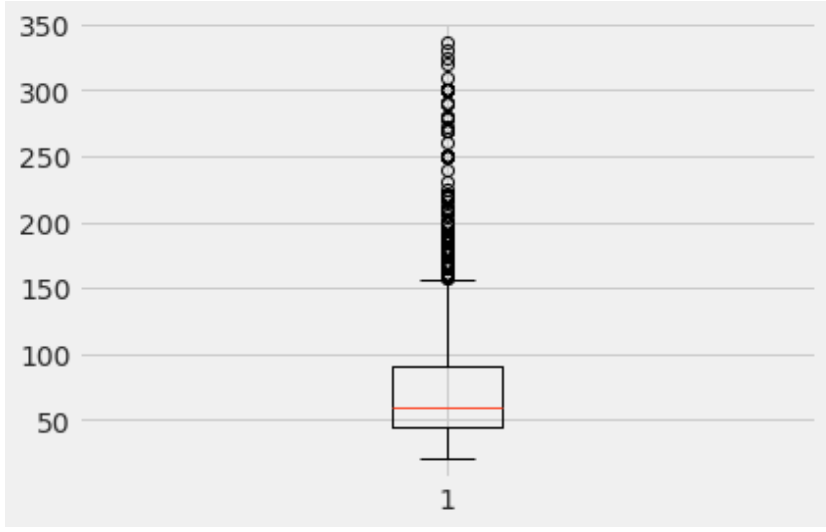
In [51]:
```
fig = px.scatter(x=y_test, y=xgb_test_pred, labels={'x': 'ground truth', 'y': 'prediction'})
fig.add_shape(
    type="line", line=dict(dash='dash'),
    x0=y_test.min(), y0=y_test.min(),
    x1=y_test.max(), y1=y_test.max()
)
fig.show()
```

In [52]:
```
df_train['PrixNuitee'].describe()
```

Out[52]:
```
count    3450.000000
mean       75.716812
std        47.607693
min        21.000000
25%        45.000000
50%        60.000000
75%        90.000000
max       337.000000
Name: PrixNuitee, dtype: float64
```

In [53]:
```
plt.boxplot(y_train)
```

Out[53]:
```
{'whiskers': [<matplotlib.lines.Line2D at 0x7fb9e85bd8b0>,
  <matplotlib.lines.Line2D at 0x7fb9e85bdc10>],
 'caps': [<matplotlib.lines.Line2D at 0x7fb9e85bdf70>,
  <matplotlib.lines.Line2D at 0x7fb9e85cd310>],
 'boxes': [<matplotlib.lines.Line2D at 0x7fb9e85bd550>],
 'medians': [<matplotlib.lines.Line2D at 0x7fb9e85cd670>],
 'fliers': [<matplotlib.lines.Line2D at 0x7fb9e85cd9d0>],
 'means': []}
```



In [54]:
```
yui= y_test.copy()
```

In [55]:
```
fig = px.scatter(x=y_train, y=xgb_train_pred, labels={'x': 'ground truth', 'y': 'prediction'})
fig.add_shape(
    type="line", line=dict(dash='dash'),
    x0=y_test.min(), y0=y_test.min(),
    x1=y_test.max(), y1=y_test.max()
)
fig.show()
```

RandomForestRegressor

In [56]:
```
model = RandomForestRegressor()
#transforming target variable through quantile transformer
ttr = TransformedTargetRegressor(regressor=model, transformer=QuantileTransformer(output_distribution='normal'))
ttr.fit(X_train, y_train)
yhat = ttr.predict(X_test)
```

In [57]:
```
fig = px.scatter(x=y_test, y=yhat, labels={'x': 'ground truth', 'y': 'prediction'})
fig.add_shape(
    type="line", line=dict(dash='dash'),
    x0=y_test.min(), y0=y_test.min(),
    x1=y_test.max(), y1=y_test.max()
)
fig.show()
```

CLASSIFICATEUR ----> REGRESSION NON LINEAIRE

Classificateur

In [58]:
```
df_train
```

Out[58]:

	NbChambres	Capacite_accueil	Type_logement_labels	type_propriete_labels	Desc_pre	Reg_pre	Titre_pre	PrixNuitee
0	1.0	2.0	2	0	910.782082	9.899495	1.732051	71.0
1	1.0	2.0	1	9	860.016279	17.262677	2.236068	75.0
2	2.0	4.0	2	0	2818.935792	65.276336	0.000000	155.0
3	1.0	4.0	2	0	2359.983686	50.803543	3.162278	80.0
4	1.0	2.0	2	0	2994.063961	66.068147	0.000000	120.0
5	1.0	3.0	2	0	3950.575907	69.036222	0.000000	140.0
6	2.0	6.0	2	0	3582.616362	73.559500	0.000000	159.0
7	0.0	3.0	2	0	3634.640835	70.256672	6.557439	55.0
8	1.0	2.0	1	3	5104.817137	51.439285	6.082763	155.0
9	1.0	2.0	1	3	5039.130977	51.439285	6.082763	145.0
10	1.0	2.0	1	3	5331.959396	79.874902	6.082763	165.0
11	1.0	3.0	2	0	3838.617199	164.365446	11.489125	51.0

In [62]:
```
# 2 classes <100 , >100

df_train['classes'] = (df['PrixNuitee']>100)
```

```
<ipython-input-62-816e826096cc>:3: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy (https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy)
```

In [63]:
```
df_train
```

Out[63]:

	NbChambres	Capacite_accueil	Type_logement_labels	type_propriete_labels	Desc_pre	Reg_pre	Titre_pre	PrixNuitee	classes
0	1.0	2.0	2	0	910.782082	9.899495	1.732051	71.0	False
1	1.0	2.0	1	9	860.016279	17.262677	2.236068	75.0	False
2	2.0	4.0	2	0	2818.935792	65.276336	0.000000	155.0	False
3	1.0	4.0	2	0	2359.983686	50.803543	3.162278	80.0	True
4	1.0	2.0	2	0	2994.063961	66.068147	0.000000	120.0	False
5	1.0	3.0	2	0	3950.575907	69.036222	0.000000	140.0	True
6	2.0	6.0	2	0	3582.616362	73.559500	0.000000	159.0	True
7	0.0	3.0	2	0	3634.640835	70.256672	6.557439	55.0	True
8	1.0	2.0	1	3	5104.817137	51.439285	6.082763	155.0	False
9	1.0	2.0	1	3	5039.130977	51.439285	6.082763	145.0	True
10	1.0	2.0	1	3	5331.959396	79.874902	6.082763	165.0	True
11	1.0	3.0	2	0	3838.617199	164.365446	11.489125	51.0	True

In [64]:
```
clf_model = DecisionTreeClassifier(criterion="gini", random_state=42,max_depth=5, min_samples_leaf=5)

```

In [65]:
```
X_class = df_train.drop(['PrixNuitee','classes'],axis=1)
y_class = df_train['classes']
X_train_class, X_test_class, y_train_class, y_test_class = train_test_split(X_class, y_class,random_state=1, test_s
```

In [66]:
```
clf_model.fit(X_train_class,y_train_class)
```

Out[66]:
```
DecisionTreeClassifier(max_depth=5, min_samples_leaf=5, random_state=42)
```

In [67]:
```
y_predict_class = clf_model.predict(X_test_class)
```

In [68]:
```
accuracy_score(y_test_class,y_predict_class)
```

Out[68]:
```
0.7803468208092486
```

In [69]:
```
y_class_pre = clf_model.predict(X_class)
```

In [70]:
```
accuracy_score(y_class,y_class_pre)
```

Out[70]:
```
0.8240579710144927
```

In [71]:
```
y_class_pre
df_train['predictedClass'] = y_class_pre
```

Regressor One: <100

In [72]:
```
df_train_1 = df_train[df_train['predictedClass']==False]
```

In [73]:
```
accuracy_score(df_train_1.classes,df_train_1.predictedClass)
```

Out[73]: 0.8239743962758219

In [74]:
```
df_train_1
```

...

In [75]:
```
X_1 = df_train_1.drop(['PrixNuitee','classes','predictedClass'],axis=1)
y_1 = df_train_1['PrixNuitee']
X_train_1, X_test_1, y_train_1, y_test_1 = train_test_split(X_1, y_1,random_state=1, test_size=0.05)
```

In [76]:
```
model_xgb.fit(X_train_1, y_train_1)
xgb_train_pred_1 = model_xgb.predict(X_train_1)
xgb_test_pred_1 = model_xgb.predict(X_test_1)

```

```
[14:56:07] WARNING: ../src/learner.cc:541:
Parameters: { bagging_fraction, bagging_freq, bagging_seed, boosting, feature_fraction, lambda_l1, metric, min_child_
samples, min_data_in_leaf, num_leaves, objectivce } might not be used.

  This may not be accurate due to some parameters are only used in language bindings but
  passed down to XGBoost core.  Or some parameters are not used but slip through this
  verification. Please open an issue if you find above cases.


[14:56:07] INFO: ../src/tree/updater_prune.cc:101: tree pruning end, 90 extra nodes, 0 pruned nodes, max_depth=12
[14:56:07] INFO: ../src/tree/updater_prune.cc:101: tree pruning end, 78 extra nodes, 0 pruned nodes, max_depth=10
[14:56:07] INFO: ../src/tree/updater_prune.cc:101: tree pruning end, 138 extra nodes, 0 pruned nodes, max_depth=18
[14:56:07] INFO: ../src/tree/updater_prune.cc:101: tree pruning end, 134 extra nodes, 0 pruned nodes, max_depth=13
[14:56:07] INFO: ../src/tree/updater_prune.cc:101: tree pruning end, 186 extra nodes, 0 pruned nodes, max_depth=16
[14:56:07] INFO: ../src/tree/updater_prune.cc:101: tree pruning end, 148 extra nodes, 0 pruned nodes, max_depth=14
[14:56:07] INFO: ../src/tree/updater_prune.cc:101: tree pruning end, 188 extra nodes, 0 pruned nodes, max_depth=14
[14:56:07] INFO: ../src/tree/updater_prune.cc:101: tree pruning end, 144 extra nodes, 0 pruned nodes, max_depth=11
[14:56:07] INFO: ../src/tree/updater_prune.cc:101: tree pruning end, 142 extra nodes, 0 pruned nodes, max_depth=15
[14:56:07] INFO: ../src/tree/updater_prune.cc:101: tree pruning end, 128 extra nodes, 0 pruned nodes, max_depth=14
```

In [77]:
```
fig = px.scatter(x=y_test_1, y=xgb_test_pred_1, labels={'x': 'ground truth', 'y': 'prediction'})
fig.add_shape(
    type="line", line=dict(dash='dash'),
    x0=y_test.min(), y0=y_test.min(),
    x1=y_test.max(), y1=y_test.max()
)
fig.show()
```

Regressor >100:

In [78]:
```
df_train_2 = df_train[df_train['predictedClass']==True]
```

In [79]:
```
X_2 = df_train_2.drop(['PrixNuitee','classes','predictedClass'],axis=1)
y_2 = df_train_2['PrixNuitee']
X_train_2, X_test_2, y_train_2, y_test_2 = train_test_split(X_2, y_2,random_state=1, test_size=0.05)
```

In [80]:
```
model_xgb.fit(X_train_2, y_train_2)
xgb_train_pred_2 = model_xgb.predict(X_train_2)
xgb_test_pred_2 = model_xgb.predict(X_test_2)

```

```
[14:57:20] WARNING: ../src/learner.cc:541:
Parameters: { bagging_fraction, bagging_freq, bagging_seed, boosting, feature_fraction, lambda_l1, metric, min_child_
samples, min_data_in_leaf, num_leaves, objectivce } might not be used.

  This may not be accurate due to some parameters are only used in language bindings but
  passed down to XGBoost core.  Or some parameters are not used but slip through this
  verification. Please open an issue if you find above cases.


[14:57:20] INFO: ../src/tree/updater_prune.cc:101: tree pruning end, 2 extra nodes, 0 pruned nodes, max_depth=1
[14:57:20] INFO: ../src/tree/updater_prune.cc:101: tree pruning end, 2 extra nodes, 0 pruned nodes, max_depth=1
[14:57:20] INFO: ../src/tree/updater_prune.cc:101: tree pruning end, 2 extra nodes, 0 pruned nodes, max_depth=1
[14:57:20] INFO: ../src/tree/updater_prune.cc:101: tree pruning end, 0 extra nodes, 0 pruned nodes, max_depth=0
[14:57:20] INFO: ../src/tree/updater_prune.cc:101: tree pruning end, 2 extra nodes, 0 pruned nodes, max_depth=1
[14:57:20] INFO: ../src/tree/updater_prune.cc:101: tree pruning end, 2 extra nodes, 0 pruned nodes, max_depth=1
[14:57:20] INFO: ../src/tree/updater_prune.cc:101: tree pruning end, 4 extra nodes, 0 pruned nodes, max_depth=2
[14:57:20] INFO: ../src/tree/updater_prune.cc:101: tree pruning end, 2 extra nodes, 0 pruned nodes, max_depth=1
[14:57:20] INFO: ../src/tree/updater_prune.cc:101: tree pruning end, 2 extra nodes, 0 pruned nodes, max_depth=1
[14:57:20] INFO: ../src/tree/updater_prune.cc:101: tree pruning end, 2 extra nodes, 0 pruned nodes, max_depth=1
```

In [81]:
```
fig = px.scatter(x=y_test_2, y=xgb_test_pred_2, labels={'x': 'ground truth', 'y': 'prediction'})
fig.add_shape(
    type="line", line=dict(dash='dash'),
    x0=y_test.min(), y0=y_test.min(),
    x1=y_test.max(), y1=y_test.max()
)
fig.show()
```

In [ ]:
```

```

In [82]:
```
rmsle(y_test_1, xgb_test_pred_1)
```

Out[82]:
```
24.366191298462624
```

In [83]:
```
y_test_all = np.array(list(y_test_1)+list(y_test_2))
y_pre_all= np.array(list(xgb_test_pred_1)+list(xgb_test_pred_2))
```

In [84]:
```
rmsle(y_test_all, y_pre_all)
```

Out[84]:
```
24.68354388330713
```

In [85]:
```
fig = px.scatter(x=y_test_all, y=y_pre_all, labels={'x': 'ground truth', 'y': 'prediction'})
fig.add_shape(
    type="line", line=dict(dash='dash'),
    x0=y_test.min(), y0=y_test.min(),
    x1=y_test.max(), y1=y_test.max()
)
fig.show()
```

Clasiication II (0.001->100)(100->200)(200->400)

In [86]:
```
df_train
```

Out[86]:

	NbChambres	Capacite_accueil	Type_logement_labels	type_propriete_labels	Desc_pre	Reg_pre	Titre_pre	PrixNuitee	classes	predictedClass
0	1.0	2.0	2	0	910.782082	9.899495	1.732051	71.0	False	False
1	1.0	2.0	1	9	860.016279	17.262677	2.236068	75.0	False	False
2	2.0	4.0	2	0	2818.935792	65.276336	0.000000	155.0	False	False
3	1.0	4.0	2	0	2359.983686	50.803543	3.162278	80.0	True	False
4	1.0	2.0	2	0	2994.063961	66.068147	0.000000	120.0	False	False
5	1.0	3.0	2	0	3950.575907	69.036222	0.000000	140.0	True	False
6	2.0	6.0	2	0	3582.616362	73.559500	0.000000	159.0	True	False
7	0.0	3.0	2	0	3634.640835	70.256672	6.557439	55.0	True	False
8	1.0	2.0	1	3	5104.817137	51.439285	6.082763	155.0	False	False
9	1.0	2.0	1	3	5039.130977	51.439285	6.082763	145.0	True	False
10	1.0	2.0	1	3	5331.959396	79.874902	6.082763	165.0	True	False
11	1.0	3.0	2	0	3838.617199	164.365446	11.489125	51.0	True	False

In [87]:
```
df_train_3 = df_train.copy()
```

In [90]:
```
df_train_3.where(df_train_3['PrixNuitee']<100)['classes']=1
```

In [109]:
```
df_train_3.loc[df_train_3['PrixNuitee'] < 100,'classes']=1
df_train_3.loc[((df_train_3.PrixNuitee >= 100)) & ((df_train_3.PrixNuitee <200)),['classes']]=2
df_train_3.loc[((df_train_3.PrixNuitee >= 200)) & ((df_train_3.PrixNuitee <400)),['classes']]=3
df_train_3.loc[((df_train_3.PrixNuitee >= 400)) & ((df_train_3.PrixNuitee <600)),['classes']]=4
df_train_3.loc[((df_train_3.PrixNuitee >= 600)) & ((df_train_3.PrixNuitee <800)),['classes']]=5
df_train_3.loc[df_train_3['PrixNuitee'] >= 800,'classes']=6
```

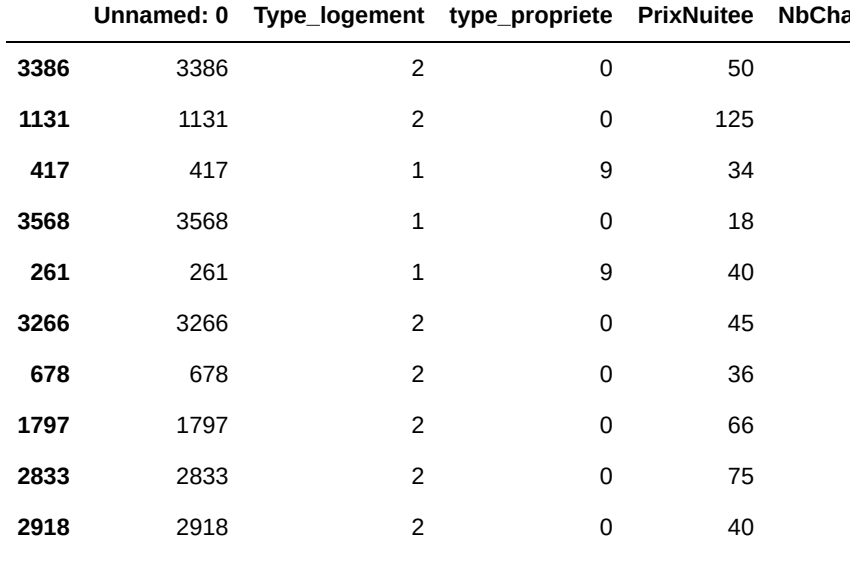
In [110]:
```
df_train_3
```

Out[110]:

	NbChambres	Capacite_accueil	Type_logement_labels	type_propriete_labels	Desc_pre	Reg_pre	Titre_pre	PrixNuitee	classes	predictedClass
0	1.0	2.0	2	0	910.782082	9.899495	1.732051	71.0	1	False
1	1.0	2.0	1	9	860.016279	17.262677	2.236068	75.0	1	False
2	2.0	4.0	2	0	2818.935792	65.276336	0.000000	155.0	2	False
3	1.0	4.0	2	0	2359.983686	50.803543	3.162278	80.0	1	False
4	1.0	2.0	2	0	2994.063961	66.068147	0.000000	120.0	2	False
5	1.0	3.0	2	0	3950.575907	69.036222	0.000000	140.0	2	False
6	2.0	6.0	2	0	3582.616362	73.559500	0.000000	159.0	2	False
7	0.0	3.0	2	0	3634.640835	70.256672	6.557439	55.0	1	False
8	1.0	2.0	1	3	5104.817137	51.439285	6.082763	155.0	2	False
9	1.0	2.0	1	3	5039.130977	51.439285	6.082763	145.0	2	False
10	1.0	2.0	1	3	5331.959396	79.874902	6.082763	165.0	2	False

In [111]:
```
plt.hist(df_train_3.classes)
```

Out[111]:
```
(array([2700.,    0.,    0.,    0.,    0.,  637.,    0.,    0.,    0.,
         113.]),
 array([1.0, 1.2, 1.4, 1.6, 1.8, 2.0, 2.2, 2.4000000000000004, 2.6, 2.8,
        3.0], dtype=object),
 <BarContainer object of 10 artists>)
```



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In [20]:
```
df_train = pd.read_csv('Modeles/trained_Data.csv')

df_train.loc[df_train['PrixNuitee'] < 100,'classes']=1
df_train.loc[(df_train.PrixNuitee >= 100),['classes']]=0
X = df_train.drop('PrixNuitee', axis=1)
y = df_train.PrixNuitee.astype(int)
display(df_train.sample(10))
display(X.sample(5))
display(y.sample(5))
```

	Unnamed: 0	Type_logement	type_propriete	PrixNuitee	NbChambres	Capacite_accueil	Desc_pre	Titre_pre	Reg_pre	classes
3386	3386	2	0	50	2	4	2126.833797	43.954522	267.652760	1.0
1131	1131	2	0	125	2	4	4019.865669	103.237590	146.003425	0.0
417	417	1	9	34	1	2	12245.071172	193.126901	405.020987	1.0
3568	3568	1	0	18	1	2	9384.077845	113.863954	796.308985	1.0
261	261	1	9	40	1	2	5921.975093	126.336851	522.301637	1.0
3266	3266	2	0	45	1	2	9129.382619	170.842032	0.000000	1.0
678	678	2	0	36	0	2	15342.217115	61.749494	748.213873	1.0
1797	1797	2	0	66	2	4	3116.371287	80.473598	146.003425	1.0
2833	2833	2	0	75	1	4	6239.035502	0.000000	97.154516	1.0
2918	2918	2	0	40	1	2	8839.475041	65.855903	1311.394677	1.0

	Unnamed: 0	Type_logement	type_propriete	NbChambres	Capacite_accueil	Desc_pre	Titre_pre	Reg_pre	classes
1175	1175	2	8	1	3	24634.602859	115.425301	990.193920	1.0
2139	2139	1	9	1	2	14328.714457	119.582607	2498.547178	1.0
1069	1069	2	0	3	6	6212.764924	95.535334	146.003425	0.0
2783	2783	2	0	2	2	3084.983468	63.427124	52.009614	1.0
3569	3569	2	0	2	4	3875.339856	77.129761	272.472017	1.0

```
5217    45
1685    55
5016    50
2289    60
4646    60
Name: PrixNuitee, dtype: int64
```

In [21]:
```
#df_train = pd.read_csv('./trained_Data.csv')
df_train = df_train.drop(['Unnamed: 0'],axis =1)
print(df_train.columns)
print(df_train.shape)
display(df_train.sample(10))
```

```
Index(['Type_logement', 'type_propriete', 'PrixNuitee', 'NbChambres',
       'Capacite_accueil', 'Desc_pre', 'Titre_pre', 'Reg_pre', 'classes'],
      dtype='object')
(5234, 9)
```

	Type_logement	type_propriete	PrixNuitee	NbChambres	Capacite_accueil	Desc_pre	Titre_pre	Reg_pre	classes
1314	2	9	800	6	8	12895.899891	57.271284	10239.184831	0.0
1024	2	0	40	2	4	7945.445928	135.066650	765.346980	1.0
4306	1	0	30	1	2	5543.005051	40.730824	78.409183	1.0
1493	2	0	72	1	3	4850.309784	144.003472	329.686214	1.0
2917	1	9	50	1	2	10567.363153	17.320508	663.437262	1.0
3110	2	0	60	1	3	322.001553	17.029386	146.003425	1.0
506	2	0	70	1	3	5539.680406	90.575935	52.009614	1.0
2578	2	0	75	1	4	7532.216805	100.314505	52.009614	1.0
1834	2	0	55	1	4	3852.446885	17.029386	146.003425	1.0
2952	1	0	40	1	2	6075.346986	162.058631	1353.197694	1.0

In [22]:
```
X = df_train.drop('PrixNuitee', axis=1)
y = df_train.PrixNuitee.astype(int)
display(df_train.sample(10))
display(X.sample(5))
display(y.sample(5))
```

	Type_logement	type_propriete	PrixNuitee	NbChambres	Capacite_accueil	Desc_pre	Titre_pre	Reg_pre	classes
780	2	0	200	2	4	2252.575859	36.013886	52.009614	0.0
2142	2	0	90	2	6	6059.475142	54.009258	238.075618	1.0
4572	2	0	150	2	5	12597.959835	49.497475	65.848311	0.0
2472	2	9	70	2	5	9518.726963	173.600115	599.945831	1.0
3920	2	0	110	2	4	5656.778147	44.124823	27.018512	0.0
4792	2	0	80	1	4	4048.434389	95.220796	58.608873	1.0
5008	2	0	40	1	4	13199.080006	165.704556	0.000000	1.0
3352	2	0	100	2	3	3817.374359	1.414214	27.018512	0.0
4226	2	0	40	1	2	6433.239542	37.013511	92.401299	1.0
1057	2	0	87	2	4	7995.960418	0.000000	146.003425	1.0

	Type_logement	type_propriete	NbChambres	Capacite_accueil	Desc_pre	Titre_pre	Reg_pre	classes
1752	2	0	1	2	3912.474025	90.620086	351.690205	1.0
4813	2	0	0	2	6303.493634	178.087057	0.000000	1.0
4004	2	0	1	3	6227.343976	38.091994	73.607065	1.0
3909	2	0	1	2	3145.890971	38.013156	1515.025412	1.0
4660	2	0	2	4	6517.375469	4.123106	78.409183	1.0

```
538     135
1647     99
1803     35
2017     49
3726     80
Name: PrixNuitee, dtype: int64
```

In [23]:
```
scaler = preprocessing.StandardScaler()
X[["Type_logement"]] = scaler.fit_transform(X[["Type_logement"]])
X[["type_propriete"]] = scaler.fit_transform(X[["type_propriete"]])
X[["NbChambres"]] = scaler.fit_transform(X[["NbChambres"]])
X[["Capacite_accueil"]] = scaler.fit_transform(X[["Capacite_accueil"]])
X[["Desc_pre"]] = scaler.fit_transform(X[["Desc_pre"]])
X[["Titre_pre"]] = scaler.fit_transform(X[["Titre_pre"]])
X[["Reg_pre"]] = scaler.fit_transform(X[["Reg_pre"]])
display(X.sample(10))
X.describe()
```

	Type_logement	type_propriete	NbChambres	Capacite_accueil	Desc_pre	Titre_pre	Reg_pre	classes
267	0.548460	2.131614	0.786106	0.991773	0.674638	-0.174606	-0.243281	0.0
1702	0.548460	-0.483277	-0.327722	0.398929	1.317669	0.366784	-0.490794	1.0
2769	0.548460	-0.483277	0.786106	0.398929	-0.724014	0.912861	-0.434619	1.0
2139	-1.663126	2.131614	-0.327722	-0.786758	1.734253	0.801857	1.640686	1.0
2448	0.548460	-0.483277	-0.327722	0.398929	-0.690715	-0.747332	-0.366240	1.0
419	0.548460	-0.483277	0.786106	1.584616	0.305471	-1.469289	0.261134	0.0
649	0.548460	-0.483277	-0.327722	0.398929	2.457459	0.752970	1.712972	1.0
4410	0.548460	2.131614	0.786106	0.398929	0.515376	1.306054	0.226717	1.0
281	-1.663126	-0.483277	-0.327722	-0.786758	-1.664349	-0.777438	-0.446425	1.0
2191	-1.663126	0.388353	-0.327722	0.398929	0.170795	0.240965	0.608851	1.0

Out[23]:

	Type_logement	type_propriete	NbChambres	Capacite_accueil	Desc_pre	Titre_pre	Reg_pre	classes
count	5.234000e+03	5.234000e+03	5.234000e+03	5.234000e+03	5.234000e+03	5.234000e+03	5.234000e+03	5234.000000
mean	1.900573e-17	3.801146e-17	-4.887187e-17	5.973229e-17	8.688333e-17	-2.009177e-16	-4.344167e-17	0.797478
std	1.000096e+00	1.000096e+00	1.000096e+00	1.000096e+00	1.000096e+00	1.000096e+00	1.000096e+00	0.401918
min	-3.874713e+00	-4.832769e-01	-1.441549e+00	-1.379601e+00	-1.946782e+00	-1.469289e+00	-4.907938e-01	0.000000
25%	5.484599e-01	-4.832769e-01	-3.277215e-01	-7.867579e-01	-7.869324e-01	-7.596788e-01	-4.279556e-01	1.000000
50%	5.484599e-01	-4.832769e-01	-3.277215e-01	-1.939144e-01	-1.640961e-01	-1.201018e-01	-3.662400e-01	1.000000
75%	5.484599e-01	-4.832769e-01	7.861061e-01	3.989291e-01	6.782417e-01	7.338971e-01	1.645326e-01	1.000000
max	5.484599e-01	3.003245e+00	9.696727e+00	7.513051e+00	4.867480e+00	3.688644e+00	8.244130e+00	1.000000

In [24]:
```
from sklearn.decomposition import PCA
pca2 = PCA(n_components=2)
principalComponents2 = pca2.fit_transform(X)
principalDf2 = pd.DataFrame(data = principalComponents2, columns = ['PC 1', 'PC 2'])
display(principalDf2)

pca3 = PCA(n_components=3)
principalComponents3 = pca3.fit_transform(X)
principalDf3 = pd.DataFrame(data = principalComponents3, columns = ['PC 1', 'PC 2', 'PC 3'])
display(principalDf3)
```

	PC 1	PC 2
0	-1.017129	-2.421697
1	-0.994611	-0.284685
2	-0.988978	-2.349532
3	0.696334	-0.256100
4	-0.199304	-0.193386
5	-0.716290	0.045773
6	-0.286459	0.182090
7	1.480213	-0.198059
8	-1.173843	0.266787
9	-1.058523	-0.901434
10	-1.064130	-0.917134
11	-1.044654	-0.857930

In [25]:
```
X_train_class, X_test_class, y_train_class, y_test_class = train_test_split(X, X['classes'].values,random_state=1, t
```

In [26]:
```
clf_model = DecisionTreeClassifier(criterion="gini", random_state=42,max_depth=5, min_samples_leaf=5)
clf_model.fit(X_train_class,y_train_class)
y_predict_class = clf_model.predict(X_test_class)
accuracy_score(y_test_class,y_predict_class)
```

Out[26]: 1.0

In [ ]:
```

```