Bank3

July 23, 2024

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

[ ]:
```
df = pd.read_csv('F:/Study Material/Prodigy Ifotech Internship/Task 3/
 ↪bank-additional/bank-additional/bank-additional.csv',delimiter=';')
df.head()
```

[ ]:
```
   age          job  marital          education default  housing     loan  \
0   30  blue-collar  married           basic.9y      no      yes       no
1   39     services   single        high.school      no       no       no
2   25     services  married        high.school      no      yes       no
3   38     services  married           basic.9y      no  unknown  unknown
4   47       admin.  married  university.degree      no      yes       no

     contact month day_of_week  …  campaign  pdays  previous     poutcome  \
0   cellular   may         fri  …         2    999         0  nonexistent
1  telephone   may         fri  …         4    999         0  nonexistent
2  telephone   jun         wed  …         1    999         0  nonexistent
3  telephone   jun         fri  …         3    999         0  nonexistent
4   cellular   nov         mon  …         1    999         0  nonexistent

  emp.var.rate  cons.price.idx  cons.conf.idx  euribor3m  nr.employed   y
0         -1.8          92.893          -46.2      1.313       5099.1  no
1          1.1          93.994          -36.4      4.855       5191.0  no
2          1.4          94.465          -41.8      4.962       5228.1  no
3          1.4          94.465          -41.8      4.959       5228.1  no
4         -0.1          93.200          -42.0      4.191       5195.8  no

[5 rows x 21 columns]
```

[ ]:
```
df.tail()
```

[ ]:
```
      age         job  marital    education default housing loan    contact  \
4114   30      admin.  married     basic.6y      no     yes  yes   cellular
4115   39      admin.  married  high.school      no     yes   no  telephone
4116   27     student   single  high.school      no      no   no   cellular
```

```
4117   58      admin.  married  high.school      no      no   no   cellular
4118   34  management   single  high.school      no     yes   no   cellular

     month day_of_week  …  campaign  pdays  previous     poutcome  \
4114   jul         thu  …         1    999         0  nonexistent
4115   jul         fri  …         1    999         0  nonexistent
4116   may         mon  …         2    999         1      failure
4117   aug         fri  …         1    999         0  nonexistent
4118   nov         wed  …         1    999         0  nonexistent

     emp.var.rate  cons.price.idx  cons.conf.idx  euribor3m  nr.employed   y
4114          1.4          93.918          -42.7      4.958       5228.1  no
4115          1.4          93.918          -42.7      4.959       5228.1  no
4116         -1.8          92.893          -46.2      1.354       5099.1  no
4117          1.4          93.444          -36.1      4.966       5228.1  no
4118         -0.1          93.200          -42.0      4.120       5195.8  no

[5 rows x 21 columns]
```

[ ]:
```
df.shape
```

[ ]:
```
(4119, 21)
```

[ ]:
```
df.columns
```

[ ]:
```
Index(['age', 'job', 'marital', 'education', 'default', 'housing', 'loan',
       'contact', 'month', 'day_of_week', 'duration', 'campaign', 'pdays',
       'previous', 'poutcome', 'emp.var.rate', 'cons.price.idx',
       'cons.conf.idx', 'euribor3m', 'nr.employed', 'y'],
      dtype='object')
```

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

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 4119 entries, 0 to 4118
Data columns (total 21 columns):
 #   Column          Non-Null Count  Dtype
---  ------          --------------  -----
 0   age             4119 non-null   int64
 1   job             4119 non-null   object
 2   marital         4119 non-null   object
 3   education       4119 non-null   object
 4   default         4119 non-null   object
 5   housing         4119 non-null   object
 6   loan            4119 non-null   object
 7   contact         4119 non-null   object
 8   month           4119 non-null   object
 9   day_of_week     4119 non-null   object
```

```
 10  duration        4119 non-null   int64
 11  campaign        4119 non-null   int64
 12  pdays           4119 non-null   int64
 13  previous        4119 non-null   int64
 14  poutcome        4119 non-null   object
 15  emp.var.rate    4119 non-null   float64
 16  cons.price.idx  4119 non-null   float64
 17  cons.conf.idx   4119 non-null   float64
 18  euribor3m       4119 non-null   float64
 19  nr.employed     4119 non-null   float64
 20  y               4119 non-null   object
dtypes: float64(5), int64(5), object(11)
memory usage: 675.9+ KB
```

[ ]:
```
df.describe()
```

[ ]:

	age	duration	campaign	pdays	previous
count	4119.000000	4119.000000	4119.000000	4119.000000	4119.000000
mean	40.113620	256.788055	2.537266	960.422190	0.190337
std	10.313362	254.703736	2.568159	191.922786	0.541788
min	18.000000	0.000000	1.000000	0.000000	0.000000
25%	32.000000	103.000000	1.000000	999.000000	0.000000
50%	38.000000	181.000000	2.000000	999.000000	0.000000
75%	47.000000	317.000000	3.000000	999.000000	0.000000
max	88.000000	3643.000000	35.000000	999.000000	6.000000

	emp.var.rate	cons.price.idx	cons.conf.idx	euribor3m	nr.employed
count	4119.000000	4119.000000	4119.000000	4119.000000	4119.000000
mean	0.084972	93.579704	-40.499102	3.621356	5166.481695
std	1.563114	0.579349	4.594578	1.733591	73.667904
min	-3.400000	92.201000	-50.800000	0.635000	4963.600000
25%	-1.800000	93.075000	-42.700000	1.334000	5099.100000
50%	1.100000	93.749000	-41.800000	4.857000	5191.000000
75%	1.400000	93.994000	-36.400000	4.961000	5228.100000
max	1.400000	94.767000	-26.900000	5.045000	5228.100000

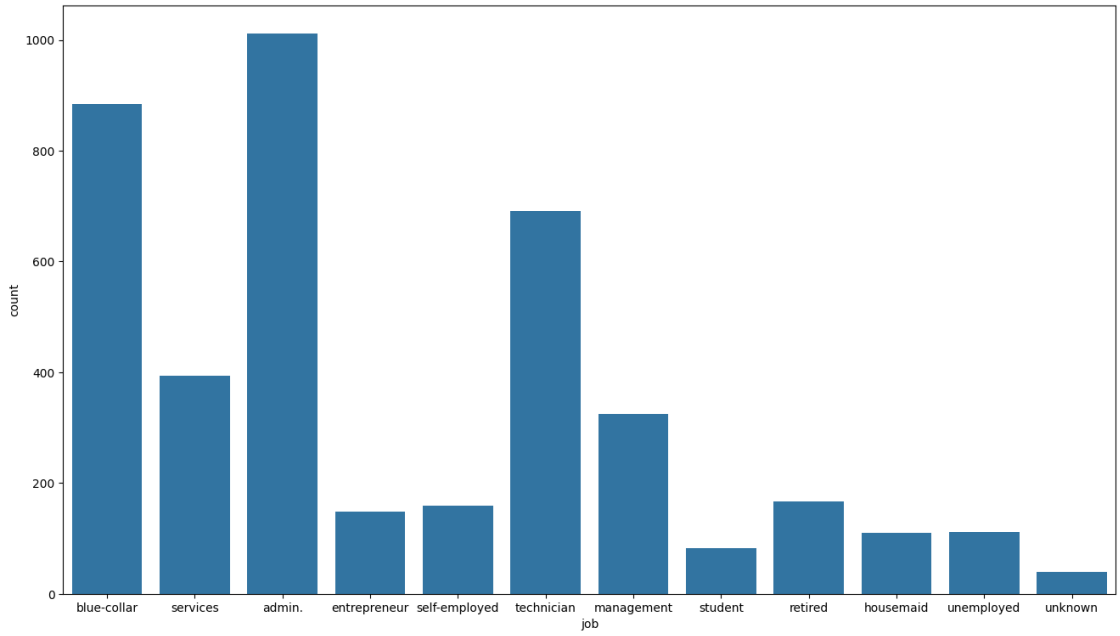
[ ]:
```
df.isnull().sum()
```

[ ]:
```
age             0
job             0
marital         0
education       0
default         0
housing         0
loan            0
contact         0
month           0
day_of_week     0
```

```
duration          0
campaign          0
pdays             0
previous          0
poutcome          0
emp.var.rate      0
cons.price.idx    0
cons.conf.idx     0
euribor3m         0
nr.employed       0
y                 0
dtype: int64
```

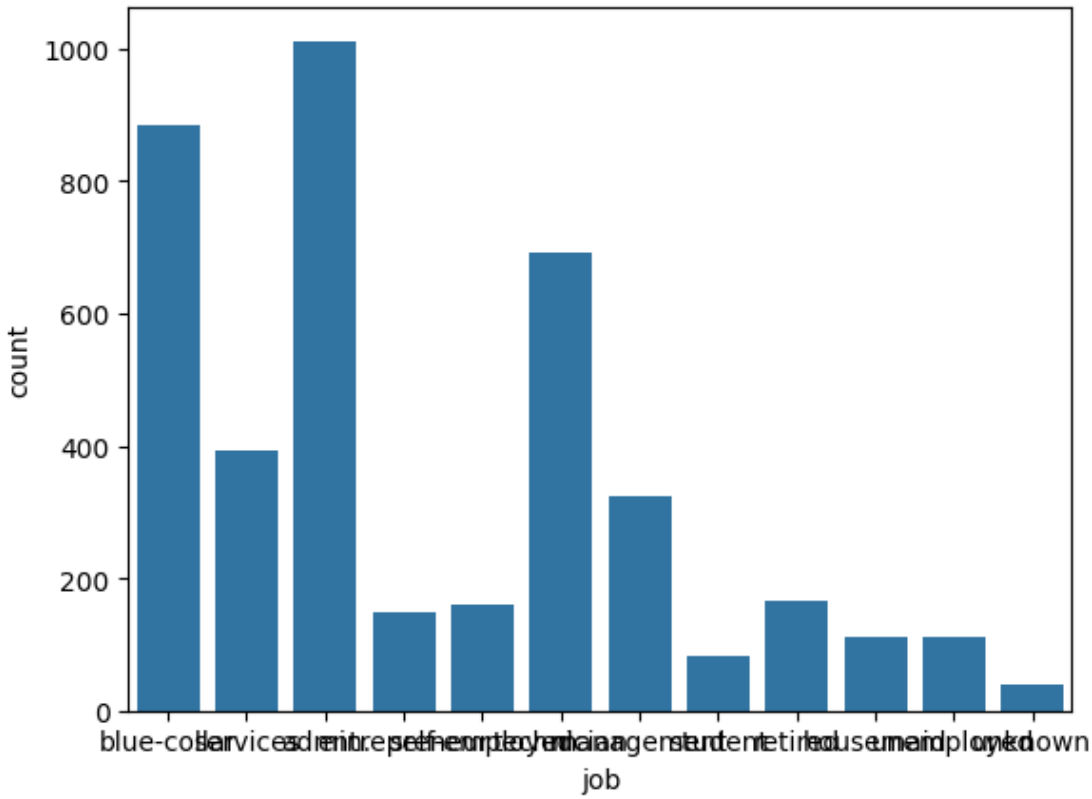
[ ]:
```
plt.figure(figsize = (16,9))
sns.countplot(x = "job",data = df)
```

[ ]:
```
<Axes: xlabel='job', ylabel='count'>
```



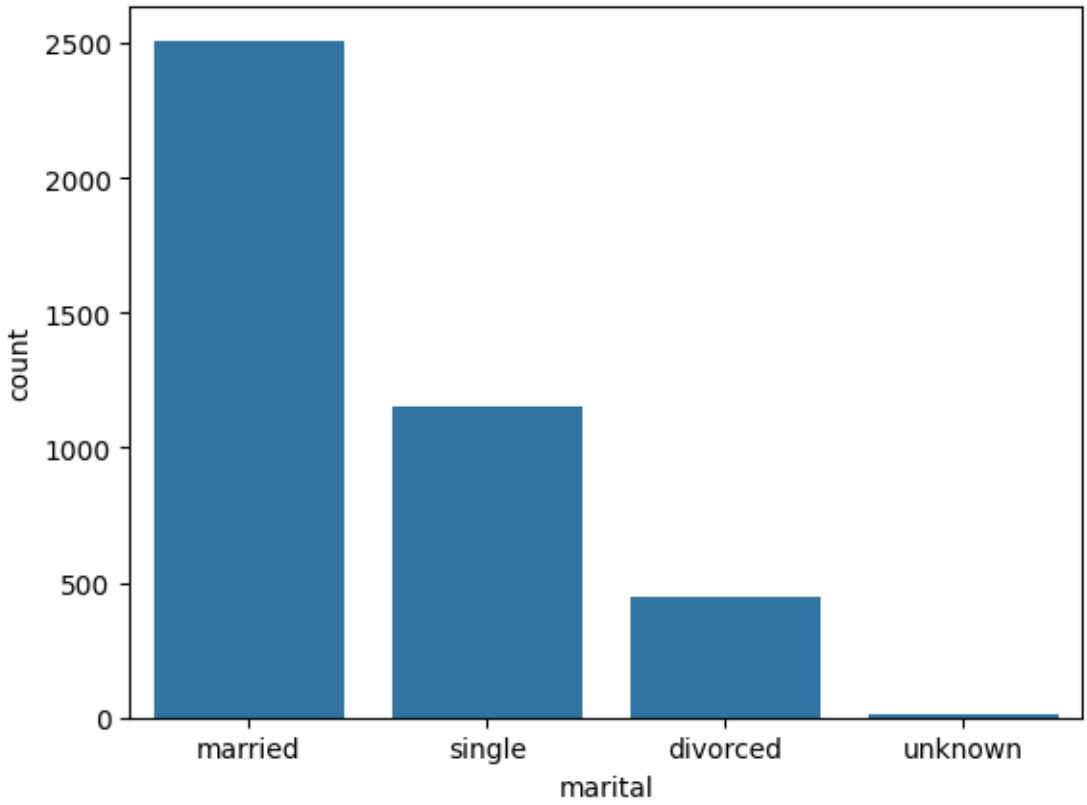
[ ]:
```
sns.countplot(x = "job",data = df)
```

[ ]:
```
<Axes: xlabel='job', ylabel='count'>
```



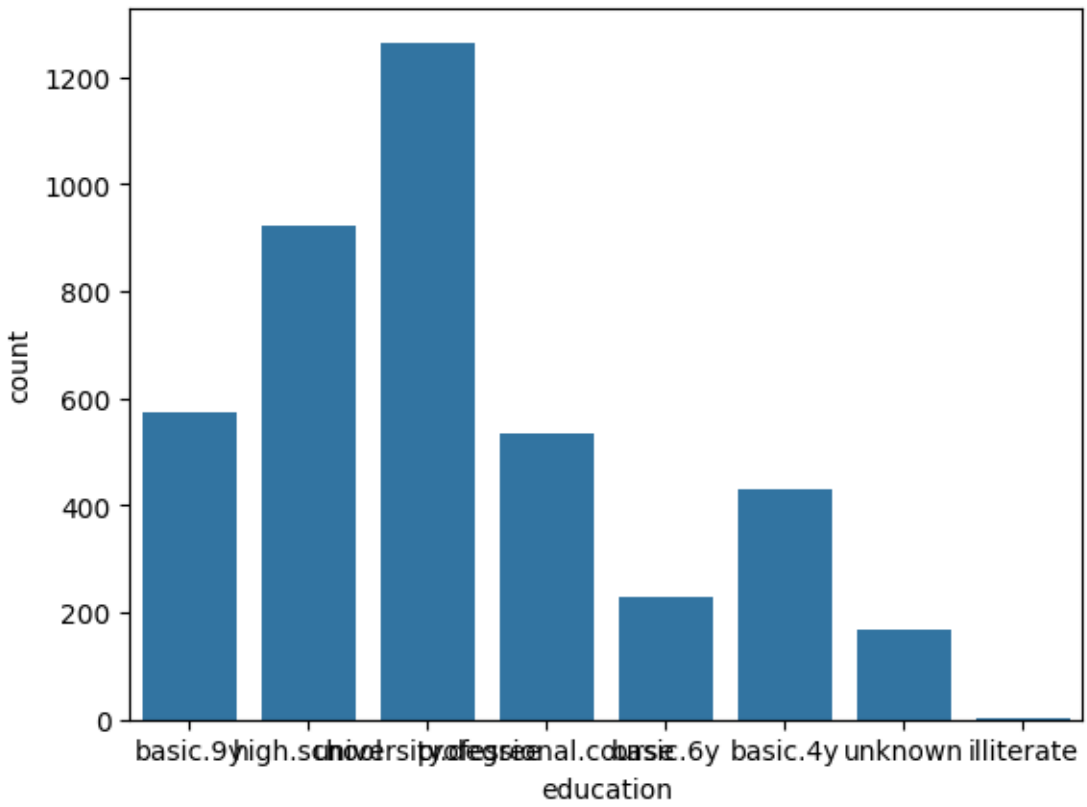
[ ]:
```
sns.countplot(x = "marital",data = df)
```

[ ]:
```
<Axes: xlabel='marital', ylabel='count'>
```



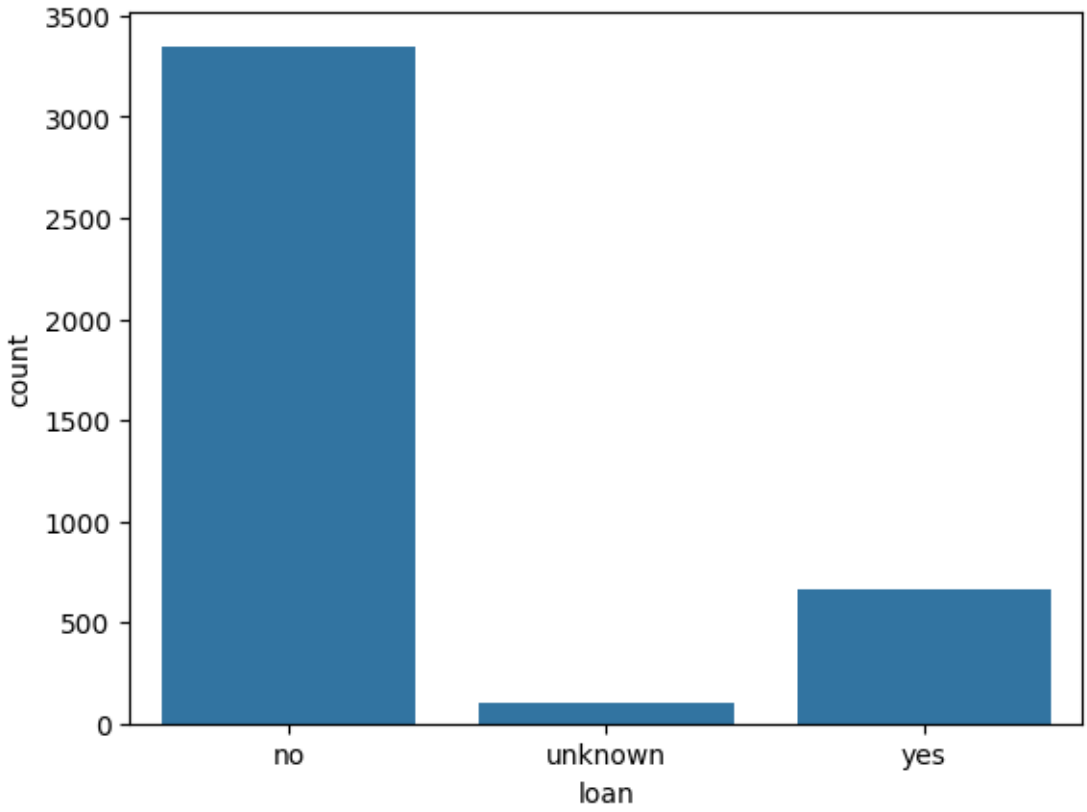
[ ]:
```
sns.countplot(x = "education",data = df)
```

[ ]:
```
<Axes: xlabel='education', ylabel='count'>
```



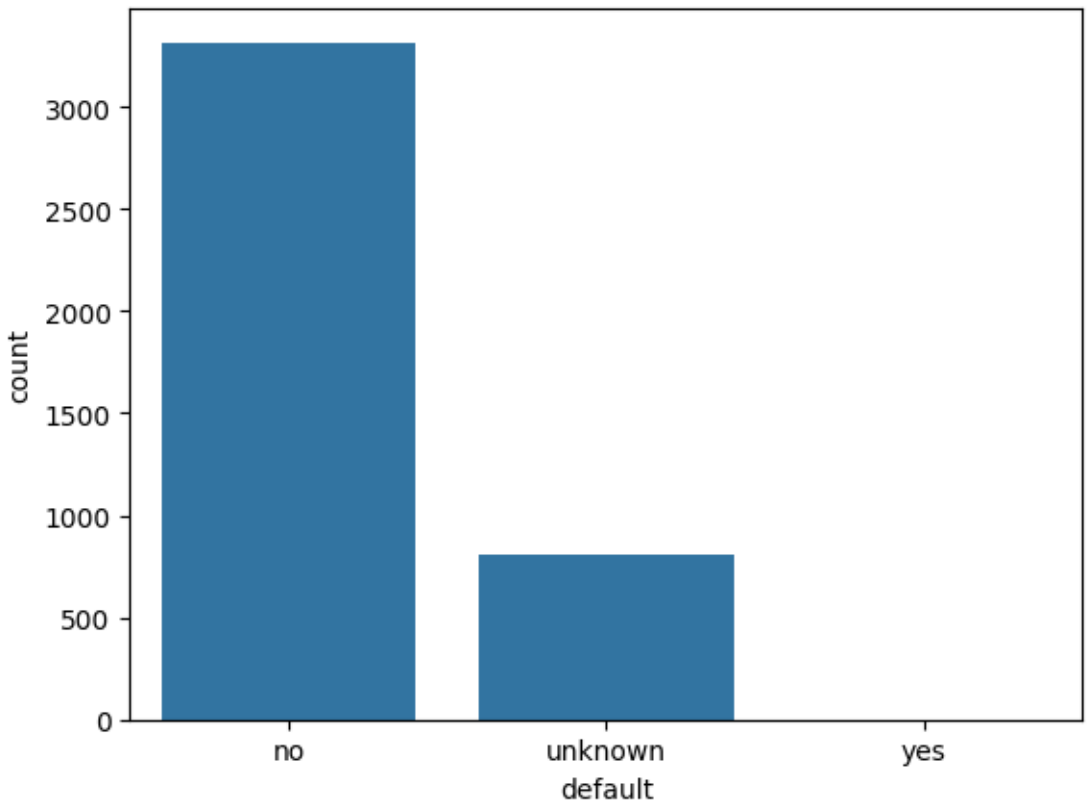
[ ]:
```
sns.countplot(x = "loan",data = df)
```

[ ]:
```
<Axes: xlabel='loan', ylabel='count'>
```



[ ]:
```
sns.countplot(x = "default",data = df)
```

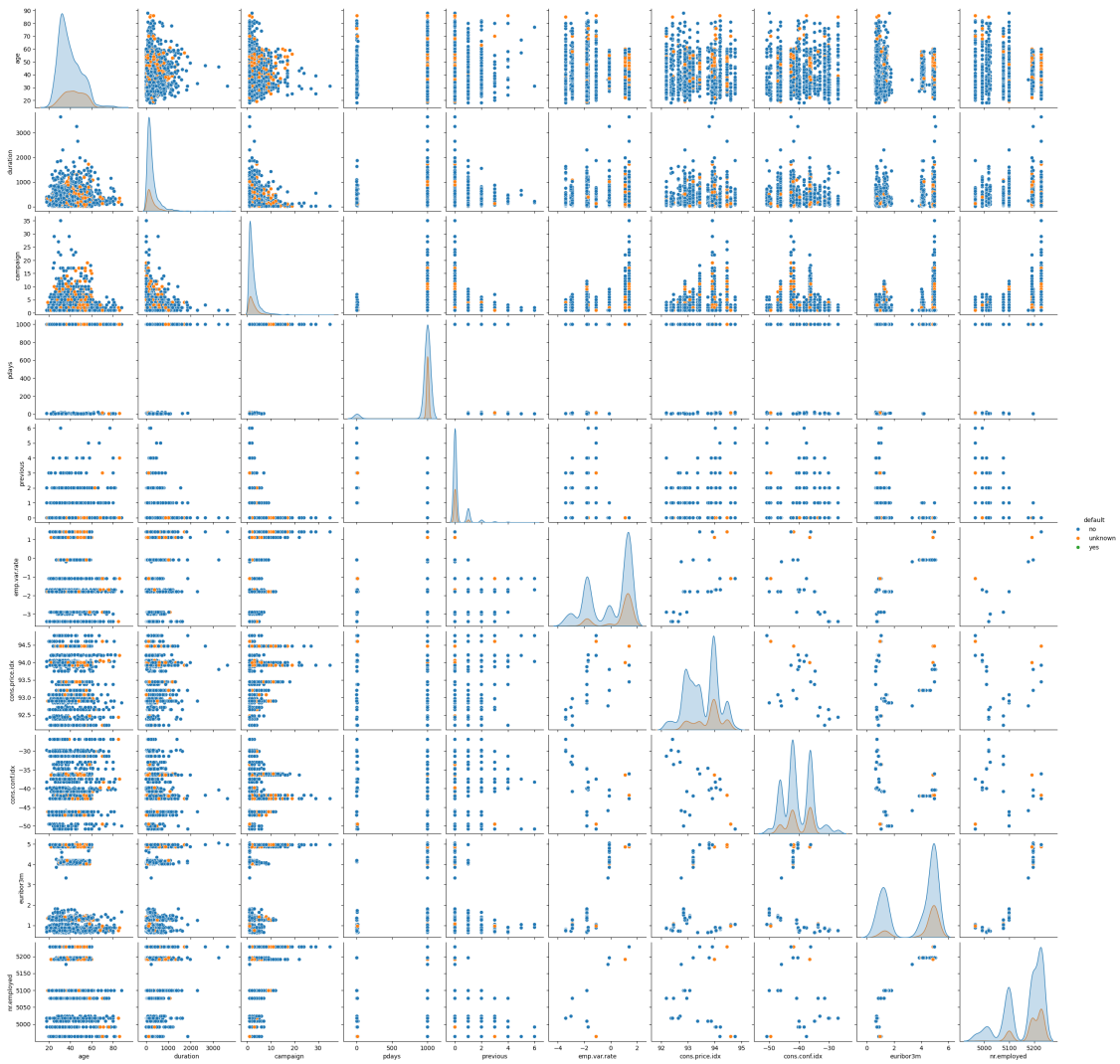
[ ]:
```
<Axes: xlabel='default', ylabel='count'>
```



[ ]:
```
plt.figure(figsize = (16,9))
sns.pairplot(data = df,hue = "default")
```

[ ]:
```
<seaborn.axisgrid.PairGrid at 0x28936261bd0>

<Figure size 1600x900 with 0 Axes>
```



[ ]:
```
my_df=df.select_dtypes(exclude=[object])
my_df.corr()
```

[ ]:

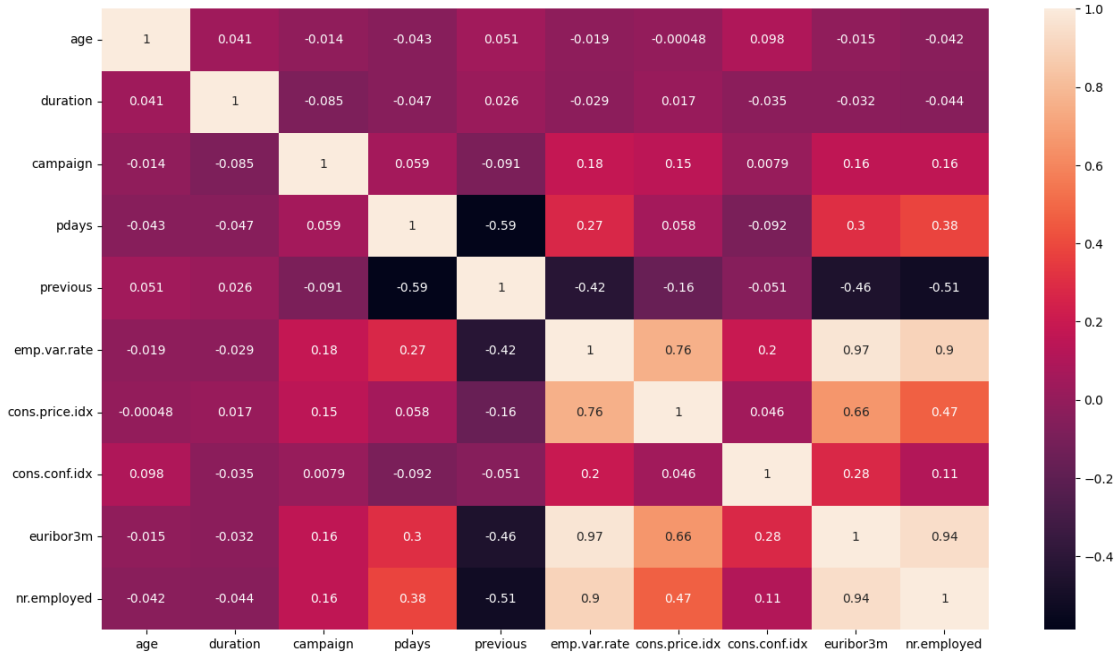
	age	duration	campaign	pdays	previous
age	1.000000	0.041299	-0.014169	-0.043425	0.050931
duration	0.041299	1.000000	-0.085348	-0.046998	0.025724
campaign	-0.014169	-0.085348	1.000000	0.058742	-0.091490
pdays	-0.043425	-0.046998	0.058742	1.000000	-0.587941
previous	0.050931	0.025724	-0.091490	-0.587941	1.000000
emp.var.rate	-0.019192	-0.028848	0.176079	0.270684	-0.415238
cons.price.idx	-0.000482	0.016672	0.145021	0.058472	-0.164922
cons.conf.idx	0.098135	-0.034745	0.007882	-0.092090	-0.051420
euribor3m	-0.015033	-0.032329	0.159435	0.301478	-0.458851
nr.employed	-0.041936	-0.044218	0.161037	0.381983	-0.514853

```
                emp.var.rate  cons.price.idx  cons.conf.idx  euribor3m  \
age                -0.019192       -0.000482       0.098135  -0.015033
duration           -0.028848        0.016672      -0.034745  -0.032329
campaign            0.176079        0.145021       0.007882   0.159435
pdays               0.270684        0.058472      -0.092090   0.301478
previous           -0.415238       -0.164922      -0.051420  -0.458851
emp.var.rate        1.000000        0.755155       0.195022   0.970308
cons.price.idx      0.755155        1.000000       0.045835   0.657159
cons.conf.idx       0.195022        0.045835       1.000000   0.276595
euribor3m           0.970308        0.657159       0.276595   1.000000
nr.employed         0.897173        0.472560       0.107054   0.942589

                nr.employed
age               -0.041936
duration          -0.044218
campaign           0.161037
pdays              0.381983
previous          -0.514853
emp.var.rate       0.897173
cons.price.idx     0.472560
cons.conf.idx      0.107054
euribor3m          0.942589
nr.employed        1.000000
```

[ ]:
```
plt.figure(figsize = (16,9))
sns.heatmap(my_df.corr(),annot = True)
```

[ ]:
```
<Axes: >
```



[ ]:
```
from sklearn.preprocessing import LabelEncoder
le = LabelEncoder()
```

[ ]:
```
df["job"] = le.fit_transform(df["job"])
df["marital"] = le.fit_transform(df["marital"])
df["education"] = le.fit_transform(df["education"])
df["default"] = le.fit_transform(df["default"])
df["loan"] = le.fit_transform(df["loan"])
df["contact"] = le.fit_transform(df["contact"])
df["poutcome"] = le.fit_transform(df["poutcome"])
df["housing"] = le.fit_transform(df["housing"])
df["month"] = le.fit_transform(df["month"])
```

[ ]:
```
df.head()
```

[ ]:

	age	job	marital	education	default	housing	loan	contact	month	\
0	30	1	1	2	0	2	0	0	6	
1	39	7	2	3	0	0	0	1	6	
2	25	7	1	3	0	2	0	1	4	
3	38	7	1	2	0	1	1	1	4	
4	47	0	1	6	0	2	0	0	7	

	day_of_week	…	campaign	pdays	previous	poutcome	emp.var.rate	\
0	fri	…	2	999	0	1	-1.8	
1	fri	…	4	999	0	1	1.1	
2	wed	…	1	999	0	1	1.4	

```
3         fri  …         3    999         0         1           1.4
4         mon  …         1    999         0         1          -0.1

   cons.price.idx  cons.conf.idx  euribor3m  nr.employed   y
0          92.893          -46.2      1.313       5099.1  no
1          93.994          -36.4      4.855       5191.0  no
2          94.465          -41.8      4.962       5228.1  no
3          94.465          -41.8      4.959       5228.1  no
4          93.200          -42.0      4.191       5195.8  no

[5 rows x 21 columns]
```

[ ]:
```
df.drop(["pdays","previous","poutcome"],axis = 1)
df.head()
```

[ ]:
```
   age  job  marital  education  default  housing  loan  contact  month  \
0   30    1        1          2        0        2     0        0      6
1   39    7        2          3        0        0     0        1      6
2   25    7        1          3        0        2     0        1      4
3   38    7        1          2        0        1     1        1      4
4   47    0        1          6        0        2     0        0      7

  day_of_week  …  campaign  pdays  previous  poutcome  emp.var.rate  \
0         fri  …         2    999         0         1          -1.8
1         fri  …         4    999         0         1           1.1
2         wed  …         1    999         0         1           1.4
3         fri  …         3    999         0         1           1.4
4         mon  …         1    999         0         1          -0.1

   cons.price.idx  cons.conf.idx  euribor3m  nr.employed   y
0          92.893          -46.2      1.313       5099.1  no
1          93.994          -36.4      4.855       5191.0  no
2          94.465          -41.8      4.962       5228.1  no
3          94.465          -41.8      4.959       5228.1  no
4          93.200          -42.0      4.191       5195.8  no

[5 rows x 21 columns]
```

[ ]: