College code: 4212
Register num: 421221243032

ASSESSMENT OF MARGINAL WORKERS IN

TAMIL NADU

DATA ANALYTICS WITH

COGNOS:GROUP2PHASE:3

This phase involves in designing of the steps that defining in each phase of the previous documentation this involves importing necessary functions, data processing and so on in this phase we have to begin our project by loading and preprocessing the dataset.

The IBM suggests using the jupyter notebook for loading and preprocess the dataset:

Here for this project title we need to define the loading the libraries, understand the data and visualize the missing values.

For this certain inputs are defined for this project.in this phase each of the input lines of the project is given as follows:

phase3

October 17, 2023

[1]:
```
import pandas as pd
import numpy as np
import missingno as msno
```

[2]:
```
df = pd.read_csv('WA_Fn-UseC_-Telco-Customer-Churn.csv')
```

[3]:
```
df.head()
```

[3]:
```
   customerID  gender  SeniorCitizen Partner Dependents  tenure PhoneService  \
0  7590-VHVEG  Female              0     Yes         No       1           No
1  5575-GNVDE    Male              0      No         No      34          Yes
2  3668-QPYBK    Male              0      No         No       2          Yes
3  7795-CFOCW    Male              0      No         No      45           No
4  9237-HQITU  Female              0      No         No       2          Yes

      MultipleLines InternetService OnlineSecurity  ... DeviceProtection  \
0  No phone service             DSL             No  ...               No
1                No             DSL            Yes  ...              Yes
2                No             DSL            Yes  ...               No
3  No phone service             DSL            Yes  ...              Yes
4                No     Fiber optic             No  ...               No

  TechSupport StreamingTV StreamingMovies        Contract PaperlessBilling  \
0          No          No              No  Month-to-month              Yes
1          No          No              No        One year               No
2          No          No              No  Month-to-month              Yes
3         Yes          No              No        One year               No
4          No          No              No  Month-to-month              Yes

               PaymentMethod MonthlyCharges  TotalCharges Churn
0           Electronic check          29.85         29.85    No
1               Mailed check          56.95        1889.5    No
2               Mailed check          53.85        108.15   Yes
3  Bank transfer (automatic)          42.30       1840.75    No
4           Electronic check          70.70        151.65   Yes

[5 rows x 21 columns]
```

[4]:
```
df.shape
```

[4]:
```
(7043, 21)
```

[5]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 7043 entries, 0 to 7042
Data columns (total 21 columns):
 #   Column            Non-Null Count  Dtype
------------------------------------  ------
 0   customerID        7043 non-null   object
 1   gender            7043 non-null   object
 2   SeniorCitizen     7043 non-null   int64
 3   Partner           7043 non-null   object
 4   Dependents        7043 non-null   object
 5   tenure            7043 non-null   int64
 6   PhoneService      7043 non-null   object
 7   MultipleLines     7043 non-null   object
 8   InternetService   7043 non-null   object
 9   OnlineSecurity    7043 non-null   object
 10  OnlineBackup      7043 non-null   object
 11  DeviceProtection  7043 non-null   object
 12  TechSupport       7043 non-null   object
 13  StreamingTV       7043 non-null   object
 14  StreamingMovies   7043 non-null   object
 15  Contract          7043 non-null   object
 16  PaperlessBilling  7043 non-null   object
 17  PaymentMethod     7043 non-null   object
 18  MonthlyCharges    7043 non-null   float64
 19  TotalCharges      7043 non-null   object
 20  Churn             7043 non-null   object
dtypes: float64(1), int64(2), object(18)
memory usage: 1.1+ MB
```

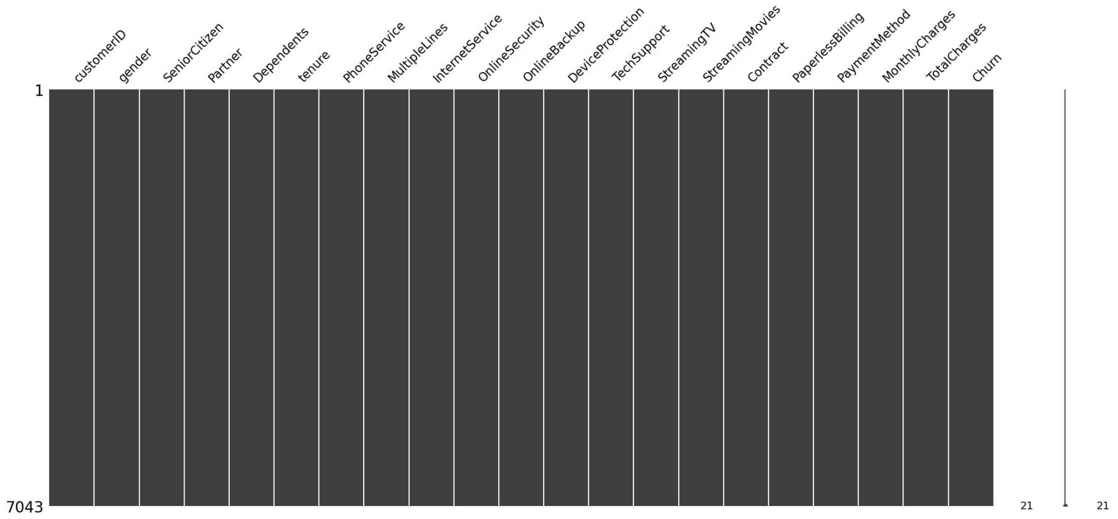
[6]:
```
df.columns.values
```

[6]:
```
array(['customerID', 'gender', 'SeniorCitizen', 'Partner', 'Dependents',
       'tenure', 'PhoneService', 'MultipleLines', 'InternetService',
       'OnlineSecurity', 'OnlineBackup', 'DeviceProtection',
       'TechSupport', 'StreamingTV', 'StreamingMovies', 'Contract',
       'PaperlessBilling', 'PaymentMethod', 'MonthlyCharges',
       'TotalCharges', 'Churn'], dtype=object)
```

[7]:
```
df.dtypes
```

```
[7]: customerID          object
     gender              object
     SeniorCitizen        int64
     Partner             object
     Dependents          object
     tenure               int64
     PhoneService        object
     MultipleLines       object
     InternetService     object
     OnlineSecurity      object
     OnlineBackup        object
     DeviceProtection    object
     TechSupport         object
     StreamingTV         object
     StreamingMovies     object
     Contract            object
     PaperlessBilling    object
     PaymentMethod       object
     MonthlyCharges     float64
     TotalCharges        object
     Churn               object
     dtype: object
```

```
[8]: msno.matrix(df);
```



```
[9]: df = df.drop(['customerID'], axis = 1)
     df.head()
```

```
[9]:    gender  SeniorCitizen Partner Dependents  tenure PhoneService  \
     0  Female              0     Yes         No       1           No
     1    Male              0      No         No      34          Yes
     2    Male              0      No         No       2          Yes
     3    Male              0      No         No      45           No
     4  Female              0      No         No       2          Yes

           MultipleLines InternetService OnlineSecurity OnlineBackup  \
     0  No phone service             DSL             No          Yes
     1                No             DSL            Yes           No
     2                No             DSL            Yes          Yes
     3  No phone service             DSL            Yes           No
     4                No     Fiber optic             No           No

       DeviceProtection TechSupport StreamingTV StreamingMovies        Contract  \
     0               No          No          No              No  Month-to-month
     1              Yes          No          No              No        One year
     2               No          No          No              No  Month-to-month
     3              Yes         Yes          No              No        One year
     4               No          No          No              No  Month-to-month

       PaperlessBilling              PaymentMethod  MonthlyCharges TotalCharges  \
     0              Yes           Electronic check           29.85        29.85
     1               No               Mailed check           56.95       1889.5
     2              Yes               Mailed check           53.85       108.15
     3               No  Bank transfer (automatic)           42.30      1840.75
     4              Yes           Electronic check           70.70       151.65

       Churn
     0    No
     1    No
     2   Yes
     3    No
     4   Yes
```

```
[10]: df['TotalCharges'] = pd.to_numeric(df.TotalCharges, errors='coerce')
      df.isnull().sum()
```

```
[10]: gender              0
      SeniorCitizen       0
      Partner             0
      Dependents          0
      tenure              0
      PhoneService        0
      MultipleLines       0
      InternetService     0
      OnlineSecurity      0
```

```
OnlineBackup         0
DeviceProtection     0
TechSupport          0
StreamingTV          0
StreamingMovies      0
Contract             0
PaperlessBilling     0
PaymentMethod        0
MonthlyCharges       0
TotalCharges        11
Churn                0
dtype: int64
```

[11]:

```
df[np.isnan(df['TotalCharges'])]
```

[11]:

```
      gender  SeniorCitizen Partner Dependents  tenure PhoneService  \
488   Female              0     Yes        Yes       0           No
753     Male              0      No        Yes       0          Yes
936   Female              0     Yes        Yes       0          Yes
1082    Male              0     Yes        Yes       0          Yes
1340  Female              0     Yes        Yes       0           No
3331    Male              0     Yes        Yes       0          Yes
3826    Male              0     Yes        Yes       0          Yes
4380  Female              0     Yes        Yes       0          Yes
5218    Male              0     Yes        Yes       0          Yes
6670  Female              0     Yes        Yes       0          Yes
6754    Male              0      No        Yes       0          Yes

         MultipleLines InternetService       OnlineSecurity  \
488   No phone service             DSL                  Yes
753                 No              No  No internet service
936                 No             DSL                  Yes
1082               Yes              No  No internet service
1340  No phone service             DSL                  Yes
3331                No              No  No internet service
3826               Yes              No  No internet service
4380                No              No  No internet service
5218                No              No  No internet service
6670               Yes             DSL                   No
6754               Yes             DSL                  Yes

             OnlineBackup     DeviceProtection          TechSupport  \
488                    No                  Yes                  Yes
753   No internet service  No internet service  No internet service
936                   Yes                  Yes                   No
1082  No internet service  No internet service  No internet service
1340                  Yes                  Yes                  Yes
```

```
3331  No internet service  No internet service  No internet service
3826  No internet service  No internet service  No internet service
4380  No internet service  No internet service  No internet service
5218  No internet service  No internet service  No internet service
6670                  Yes                  Yes                  Yes
6754                  Yes                   No                  Yes

              StreamingTV      StreamingMovies  Contract PaperlessBilling  \
488                   Yes                   No  Two year              Yes
753   No internet service  No internet service  Two year               No
936                   Yes                  Yes  Two year               No
1082  No internet service  No internet service  Two year               No
1340                  Yes                   No  Two year               No
3331  No internet service  No internet service  Two year               No
3826  No internet service  No internet service  Two year               No
4380  No internet service  No internet service  Two year               No
5218  No internet service  No internet service  One year              Yes
6670                  Yes                   No  Two year               No
6754                   No                   No  Two year              Yes

                  PaymentMethod  MonthlyCharges  TotalCharges Churn
488   Bank transfer (automatic)           52.55          NaN    No
753                Mailed check           20.25          NaN    No
936                Mailed check           80.85          NaN    No
1082               Mailed check           25.75          NaN    No
1340    Credit card (automatic)           56.05          NaN    No
3331               Mailed check           19.85          NaN    No
3826               Mailed check           25.35          NaN    No
4380               Mailed check           20.00          NaN    No
5218               Mailed check           19.70          NaN    No
6670               Mailed check           73.35          NaN    No
6754  Bank transfer (automatic)           61.90          NaN    No
```

[12]:

```
df[df['tenure'] == 0].index
```

[12]:

```
Int64Index([488, 753, 936, 1082, 1340, 3331, 3826, 4380, 5218, 6670, 6754],
dtype='int64')
```

[13]:

```
df.drop(labels=df[df['tenure'] == 0].index, axis=0, inplace=True)
df[df['tenure'] == 0].index
```

[13]:

```
Int64Index([], dtype='int64')
```

[14]:

```
df.fillna(df["TotalCharges"].mean())
```

[14]:

```
      gender  SeniorCitizen Partner Dependents  tenure PhoneService  \
0     Female              0     Yes         No       1           No
```

```
1       Male              0      No         No       34          Yes
2       Male              0      No         No        2          Yes
3       Male              0      No         No       45           No
4     Female              0      No         No        2          Yes
…      …            …     …        …     …          …
7038    Male              0     Yes        Yes       24          Yes
7039  Female              0     Yes        Yes       72          Yes
7040  Female              0     Yes        Yes       11           No
7041    Male              1     Yes         No        4          Yes
7042    Male              0      No         No       66          Yes

         MultipleLines InternetService OnlineSecurity OnlineBackup  \
0     No phone service             DSL             No          Yes
1                   No             DSL            Yes           No
2                   No             DSL            Yes          Yes
3     No phone service             DSL            Yes           No
4                   No     Fiber optic             No           No
…                …             …            …          …
7038               Yes             DSL            Yes           No
7039               Yes     Fiber optic             No          Yes
7040  No phone service             DSL            Yes           No
7041               Yes     Fiber optic             No           No
7042                No     Fiber optic            Yes           No

     DeviceProtection  TechSupport StreamingTV StreamingMovies        Contract  \
0                  No          No          No               No  Month-to-month
1                 Yes          No          No               No        One year
2                  No          No          No               No  Month-to-month
3                 Yes         Yes          No               No        One year
4                  No          No          No               No  Month-to-month
…               …         …         …             …             …
7038              Yes         Yes         Yes              Yes        One year
7039              Yes          No         Yes              Yes        One year
7040               No          No          No               No  Month-to-month
7041               No          No          No               No  Month-to-month
7042              Yes         Yes         Yes              Yes        Two year

     PaperlessBilling              PaymentMethod  MonthlyCharges  \
0                 Yes           Electronic check           29.85
1                  No               Mailed check           56.95
2                 Yes               Mailed check           53.85
3                  No  Bank transfer (automatic)           42.30
4                 Yes           Electronic check           70.70
…               …                        …             …
7038              Yes               Mailed check           84.80
7039              Yes    Credit card (automatic)          103.20
7040              Yes           Electronic check           29.60
```

```
7041              Yes              Mailed check            74.40
7042              Yes  Bank transfer (automatic)          105.65

      TotalCharges Churn
0            29.85    No
1          1889.50    No
2           108.15   Yes
3          1840.75    No
4           151.65   Yes
…              …   …
7038       1990.50    No
7039       7362.90    No
7040        346.45    No
7041        306.60   Yes
7042       6844.50    No

[7032 rows x 20 columns]
```

[15]:

```
df.isnull().sum()
```

[15]:

```
gender              0
SeniorCitizen       0
Partner             0
Dependents          0
tenure              0
PhoneService        0
MultipleLines       0
InternetService     0
OnlineSecurity      0
OnlineBackup        0
DeviceProtection    0
TechSupport         0
StreamingTV         0
StreamingMovies     0
Contract            0
PaperlessBilling    0
PaymentMethod       0
MonthlyCharges      0
TotalCharges        0
Churn               0
dtype: int64
```

[16]:

```
df["SeniorCitizen"]= df["SeniorCitizen"].map({0: "No", 1: "Yes"})
df.head()
```

[16]:

```
   gender SeniorCitizen Partner Dependents  tenure PhoneService  \
0  Female            No     Yes         No       1           No
```

```
1    Male            No      No         No      34          Yes
2    Male            No      No         No       2          Yes
3    Male            No      No         No      45           No
4  Female            No      No         No       2          Yes

      MultipleLines InternetService OnlineSecurity OnlineBackup  \
0  No phone service             DSL             No          Yes
1                No             DSL            Yes           No
2                No             DSL            Yes          Yes
3  No phone service             DSL            Yes           No
4                No     Fiber optic             No           No

  DeviceProtection TechSupport StreamingTV StreamingMovies        Contract  \
0               No          No          No              No  Month-to-month
1              Yes          No          No              No        One year
2               No          No          No              No  Month-to-month
3              Yes         Yes          No              No        One year
4               No          No          No              No  Month-to-month

  PaperlessBilling              PaymentMethod  MonthlyCharges  TotalCharges  \
0              Yes           Electronic check           29.85         29.85
1               No               Mailed check           56.95       1889.50
2              Yes               Mailed check           53.85        108.15
3               No  Bank transfer (automatic)           42.30       1840.75
4              Yes           Electronic check           70.70        151.65

  Churn
0    No
1    No
2   Yes
3    No
4   Yes
```

[17]:
```
df["InternetService"].describe(include=['object',  'bool'])
```

[17]:
```
count            7032
unique              3
top       Fiber optic
freq             3096
Name: InternetService, dtype: object
```

[18]:
```
numerical_cols = ['tenure', 'MonthlyCharges', 'TotalCharges']
df[numerical_cols].describe()
```

[18]:
```
            tenure  MonthlyCharges  TotalCharges
count  7032.000000     7032.000000   7032.000000
mean     32.421786       64.798208   2283.300441
```

```
std      24.545260    30.085974  2266.771362
min       1.000000    18.250000    18.800000
25%       9.000000    35.587500   401.450000
50%      29.000000    70.350000  1397.475000
75%      55.000000    89.862500  3794.737500
max      72.000000   118.750000  8684.800000
```

phase-3

October 18, 2023

[2]:
```
import pandas as pd
import numpy as np
import missingno as msno
```

[4]:
```
df = pd.read_csv("C:/Users/BALAJI/Downloads/
 ↪DDW_B06SC_3300_State_TAMIL_NADU-2011.csv")
```

[5]:
```
df.head()
```

[5]:
```
  Table Code State Code District Code           Area Name Total/ Rural/ Urban  \
0    B0806SC        `33           `000  State - TAMIL NADU               Total
1    B0806SC        `33           `000  State - TAMIL NADU               Total
2    B0806SC        `33           `000  State - TAMIL NADU               Total
3    B0806SC        `33           `000  State - TAMIL NADU               Total
4    B0806SC        `33           `000  State - TAMIL NADU               Total

  Age group  Worked for 3 months or more but less than 6 months -  Persons  \
0     Total                                            1200828
1     `5-14                                              27791
2     15-34                                             514340
3     35-59                                             542581
4       60+                                             115103

   Worked for 3 months or more but less than 6 months - Males  \
0                                             589003
1                                              14125
2                                             259560
3                                             251957
4                                              62833

   Worked for 3 months or more but less than 6 months - Females  \
0                                             611825
1                                              13666
2                                             254780
3                                             290624
4                                              52270
```

```
   Worked for less than 3 months - Persons  …  \
0                                   221386  …
1                                     2447  …
2                                    92423  …
3                                    99202  …
4                                    27165  …

   Industrial Category - N to O - Females  \
0                                    3565
1                                      11
2                                    1754
3                                    1619
4                                     175

   Industrial Category - P to Q - Persons  \
0                                   11080
1                                     122
2                                    7536
3                                    3205
4                                     211

   Industrial Category - P to Q - Males  \
0                                  4019
1                                    71
2                                  2718
3                                  1131
4                                    93

   Industrial Category - P to Q - Females  \
0                                    7061
1                                      51
2                                    4818
3                                    2074
4                                     118

   Industrial Category - R to U - HHI - Persons  \
0                                         16833
1                                           427
2                                          8346
3                                          6591
4                                          1457

   Industrial Category - R to U - HHI - Males  \
0                                        4266
1                                         169
2                                        2127
3                                        1487
```

```
4                                        483

   Industrial Category - R to U - HHI - Females  \
0                                        12567
1                                          258
2                                         6219
3                                         5104
4                                          974

   Industrial Category - R to U - Non HHI - Persons  \
0                                           122088
1                                            19305
2                                            68929
3                                            26498
4                                             7065

   Industrial Category - R to U - Non HHI - Males  \
0                                          55801
1                                           9774
2                                          32803
3                                           9675
4                                           3394

   Industrial Category - R to U - Non HHI - Females
0                                            66287
1                                             9531
2                                            36126
3                                            16823
4                                             3671

[5 rows x 69 columns]
```

[6]:
```
df.shape
```

[6]:
```
(594, 69)
```

[7]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 594 entries, 0 to 593
Data columns (total 69 columns):
 #   Column
Non-Null Count  Dtype
---  ------
--------------  -----
 0   Table Code
594 non-null    object
```

```
 1   State Code
594 non-null    object
 2   District Code
594 non-null    object
 3   Area Name
594 non-null    object
 4   Total/ Rural/ Urban
594 non-null    object
 5   Age group
594 non-null    object
 6   Worked for 3 months or more but less than 6 months -  Persons
594 non-null    int64
 7   Worked for 3 months or more but less than 6 months - Males
594 non-null    int64
 8   Worked for 3 months or more but less than 6 months - Females
594 non-null    int64
 9   Worked for less than 3 months - Persons
594 non-null    int64
 10  Worked for less than 3 months - Males
594 non-null    int64
 11  Worked for less than 3 months - Females
594 non-null    int64
 12  Industrial Category - A - Cultivators - Persons
594 non-null    int64
 13  Industrial Category - A - Cultivators - Males
594 non-null    int64
 14  Industrial Category - A - Cultivators - Females
594 non-null    int64
 15  Industrial Category - A - Agricultural labourers - Persons
594 non-null    int64
 16  Industrial Category - A - Agricultural labourers - Males
594 non-null    int64
 17  Industrial Category - A - Agricultural labourers - Females
594 non-null    int64
 18  Industrial Category - A - Plantation, Livestock, Forestry, Fishing, Hunting
and allied activities - Persons  594 non-null    int64
 19  Industrial Category - A - Plantation, Livestock, Forestry, Fishing, Hunting
and allied activities - Males    594 non-null    int64
 20  Industrial Category - A - Plantation, Livestock, Forestry, Fishing, Hunting
and allied activities - Females  594 non-null    int64
 21  Industrial Category - B - Persons
594 non-null    int64
 22  Industrial Category - B - Males
594 non-null    int64
 23  Industrial Category - B - Females
594 non-null    int64
 24  Industrial Category - C - HHI - Persons
594 non-null    int64
```

```
 25  Industrial Category - C - HHI - Males
594 non-null    int64
 26  Industrial Category - C - HHI - Females
594 non-null    int64
 27  Industrial Category - C - Non HHI - Persons
594 non-null    int64
 28  Industrial Category - C - Non HHI - Males
594 non-null    int64
 29  Industrial Category - C - Non HHI - Females
594 non-null    int64
 30  Industrial Category - D & E - Persons
594 non-null    int64
 31  Industrial Category - D & E - Males
594 non-null    int64
 32  Industrial Category - D & E - Females
594 non-null    int64
 33  Industrial Category - F - Persons
594 non-null    int64
 34  Industrial Category - F - Males
594 non-null    int64
 35  Industrial Category - F - Females
594 non-null    int64
 36  Industrial Category - G - HHI - Persons
594 non-null    int64
 37  Industrial Category - G - HHI - Males
594 non-null    int64
 38  Industrial Category - G - HHI - Females
594 non-null    int64
 39  Industrial Category - G - Non HHI - Persons
594 non-null    int64
 40  Industrial Category - G - Non HHI - Males
594 non-null    int64
 41  Industrial Category - G - Non HHI - Females
594 non-null    int64
 42  Industrial Category - H - Persons
594 non-null    int64
 43  Industrial Category - H - Males
594 non-null    int64
 44  Industrial Category - H - Females
594 non-null    int64
 45  Industrial Category - I - Persons
594 non-null    int64
 46  Industrial Category - I - Males
594 non-null    int64
 47  Industrial Category - I - Females
594 non-null    int64
 48  Industrial Category - J - HHI - Persons
594 non-null    int64
```

```
 49  Industrial Category - J - HHI - Males
594 non-null    int64
 50  Industrial Category - J - HHI - Females
594 non-null    int64
 51  Industrial Category - J - Non HHI - Persons
594 non-null    int64
 52  Industrial Category - J - Non HHI - Males
594 non-null    int64
 53  Industrial Category - J - Non HHI - Females
594 non-null    int64
 54  Industrial Category - K to M - Persons
594 non-null    int64
 55  Industrial Category - K to M - Males
594 non-null    int64
 56  Industrial Category - K to M - Females
594 non-null    int64
 57  Industrial Category - N to O - Persons
594 non-null    int64
 58  Industrial Category - N to O - Males
594 non-null    int64
 59  Industrial Category - N to O - Females
594 non-null    int64
 60  Industrial Category - P to Q - Persons
594 non-null    int64
 61  Industrial Category - P to Q - Males
594 non-null    int64
 62  Industrial Category - P to Q - Females
594 non-null    int64
 63  Industrial Category - R to U - HHI - Persons
594 non-null    int64
 64  Industrial Category - R to U - HHI - Males
594 non-null    int64
 65  Industrial Category - R to U - HHI - Females
594 non-null    int64
 66  Industrial Category - R to U - Non HHI - Persons
594 non-null    int64
 67  Industrial Category - R to U - Non HHI - Males
594 non-null    int64
 68  Industrial Category - R to U - Non HHI - Females
594 non-null    int64
dtypes: int64(63), object(6)
memory usage: 320.3+ KB
```

[8]:

```
df.columns.values
```

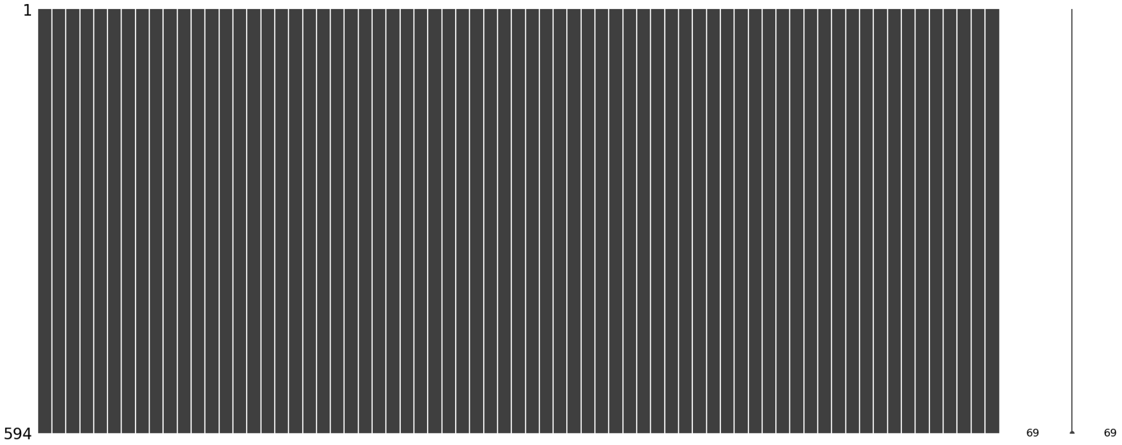
[8]:

```
array(['Table Code', 'State Code', 'District Code', 'Area Name',
       'Total/ Rural/ Urban', 'Age group',
       'Worked for 3 months or more but less than 6 months -  Persons',
       'Worked for 3 months or more but less than 6 months - Males',
       'Worked for 3 months or more but less than 6 months - Females',
       'Worked for less than 3 months - Persons',
       'Worked for less than 3 months - Males',
       'Worked for less than 3 months - Females',
       'Industrial Category - A - Cultivators - Persons',
       'Industrial Category - A - Cultivators - Males',
       'Industrial Category - A - Cultivators - Females',
       'Industrial Category - A - Agricultural labourers - Persons',
       'Industrial Category - A - Agricultural labourers - Males',
       'Industrial Category - A - Agricultural labourers - Females',
       'Industrial Category - A - Plantation, Livestock, Forestry, Fishing,
Hunting and allied activities - Persons',
       'Industrial Category - A - Plantation, Livestock, Forestry, Fishing,
Hunting and allied activities - Males',
       'Industrial Category - A - Plantation, Livestock, Forestry, Fishing,
Hunting and allied activities - Females',
       'Industrial Category - B - Persons',
       'Industrial Category - B - Males',
       'Industrial Category - B - Females',
       'Industrial Category - C - HHI - Persons',
       'Industrial Category - C - HHI - Males',
       'Industrial Category - C - HHI - Females',
       'Industrial Category - C - Non HHI - Persons',
       'Industrial Category - C - Non HHI - Males',
       'Industrial Category - C - Non HHI - Females',
       'Industrial Category - D & E - Persons',
       'Industrial Category - D & E - Males',
       'Industrial Category - D & E - Females',
       'Industrial Category - F - Persons',
       'Industrial Category - F - Males',
       'Industrial Category - F - Females',
       'Industrial Category - G - HHI - Persons',
       'Industrial Category - G - HHI - Males',
       'Industrial Category - G - HHI - Females',
       'Industrial Category - G - Non HHI - Persons',
       'Industrial Category - G - Non HHI - Males',
       'Industrial Category - G - Non HHI - Females',
       'Industrial Category - H - Persons',
       'Industrial Category - H - Males',
       'Industrial Category - H - Females',
       'Industrial Category - I - Persons',
       'Industrial Category - I - Males',
       'Industrial Category - I - Females',
       'Industrial Category - J - HHI - Persons',
       'Industrial Category - J - HHI - Males',
       'Industrial Category - J - HHI - Females',
       'Industrial Category - J - Non HHI - Persons',
       'Industrial Category - J - Non HHI - Males',
       'Industrial Category - J - Non HHI - Females',
       'Industrial Category - K to M - Persons',
       'Industrial Category - K to M - Males',
       'Industrial Category - K to M - Females',
       'Industrial Category - N to O - Persons',
       'Industrial Category - N to O - Males',
       'Industrial Category - N to O - Females',
       'Industrial Category - P to Q - Persons',
       'Industrial Category - P to Q - Males',
       'Industrial Category - P to Q - Females',
       'Industrial Category - R to U - HHI - Persons',
       'Industrial Category - R to U - HHI - Males',
       'Industrial Category - R to U - HHI - Females',
       'Industrial Category - R to U - Non HHI - Persons',
       'Industrial Category - R to U - Non HHI - Males',
       'Industrial Category - R to U - Non HHI - Females'], dtype=object)
```

```
[9]: df.dtypes
```

```
[9]: Table Code                                          object
     State Code                                          object
     District Code                                       object
     Area Name                                           object
     Total/ Rural/ Urban                                 object
                                                          …
     Industrial Category - R to U - HHI - Males           int64
     Industrial Category - R to U - HHI - Females         int64
     Industrial Category - R to U - Non HHI - Persons     int64
     Industrial Category - R to U - Non HHI - Males       int64
     Industrial Category - R to U - Non HHI - Females     int64
     Length: 69, dtype: object
```

```
[10]: msno.matrix(df);
```



[12]:
```
df = df.drop(['Table Code'], axis = 1)
df.head()
```

[12]:
```
  State Code District Code           Area Name Total/ Rural/ Urban Age group  \
0        `33          `000  State - TAMIL NADU               Total     Total
1        `33          `000  State - TAMIL NADU               Total     `5-14
2        `33          `000  State - TAMIL NADU               Total     15-34
3        `33          `000  State - TAMIL NADU               Total     35-59
4        `33          `000  State - TAMIL NADU               Total       60+

   Worked for 3 months or more but less than 6 months -  Persons   \
0                                            1200828
1                                              27791
2                                             514340
3                                             542581
4                                             115103

   Worked for 3 months or more but less than 6 months - Males  \
0                                             589003
1                                              14125
2                                             259560
3                                             251957
4                                              62833

   Worked for 3 months or more but less than 6 months - Females  \
0                                             611825
1                                              13666
2                                             254780
3                                             290624
4                                              52270
```

```
   Worked for less than 3 months - Persons  \
0                                   221386   
1                                     2447   
2                                    92423   
3                                    99202   
4                                    27165   

   Worked for less than 3 months - Males  …  \
0                                  99368  …   
1                                   1247  …   
2                                  43892  …   
3                                  40691  …   
4                                  13465  …   

   Industrial Category - N to O - Females  \
0                                    3565   
1                                      11   
2                                    1754   
3                                    1619   
4                                     175   

   Industrial Category - P to Q - Persons  \
0                                   11080   
1                                     122   
2                                    7536   
3                                    3205   
4                                     211   

   Industrial Category - P to Q - Males  \
0                                  4019   
1                                    71   
2                                  2718   
3                                  1131   
4                                    93   

   Industrial Category - P to Q - Females  \
0                                    7061   
1                                      51   
2                                    4818   
3                                    2074   
4                                     118   

   Industrial Category - R to U - HHI - Persons  \
0                                          16833   
1                                            427   
2                                           8346   
3                                           6591   
```

```
4                                          1457

   Industrial Category - R to U - HHI - Males  \
0                                        4266
1                                         169
2                                        2127
3                                        1487
4                                         483

   Industrial Category - R to U - HHI - Females  \
0                                         12567
1                                           258
2                                          6219
3                                          5104
4                                           974

   Industrial Category - R to U - Non HHI - Persons  \
0                                            122088
1                                             19305
2                                             68929
3                                             26498
4                                              7065

   Industrial Category - R to U - Non HHI - Males  \
0                                           55801
1                                            9774
2                                           32803
3                                            9675
4                                            3394

   Industrial Category - R to U - Non HHI - Females
0                                             66287
1                                              9531
2                                             36126
3                                             16823
4                                              3671

[5 rows x 68 columns]
```

```
[20]: df[df['Age group'] == 0].index
```

```
[20]: Index([], dtype='int64')
```

```
[21]: df.drop(labels=df[df['Age group'] == 0].index, axis=0, inplace=True)
      df[df['Age group'] == 0].index
```

```
[21]: Index([], dtype='int64')
```

[26]:

```
df.fillna(df["Industrial Category - R to U - HHI - Persons"].mean())
```

[26]:

```
    State Code District Code            Area Name Total/ Rural/ Urban  \
0          `33          `000   State - TAMIL NADU               Total
1          `33          `000   State - TAMIL NADU               Total
2          `33          `000   State - TAMIL NADU               Total
3          `33          `000   State - TAMIL NADU               Total
4          `33          `000   State - TAMIL NADU               Total
..          …           …                   …                 …
589        `33          `633  District - Tiruppur               Urban
590        `33          `633  District - Tiruppur               Urban
591        `33          `633  District - Tiruppur               Urban
592        `33          `633  District - Tiruppur               Urban
593        `33          `633  District - Tiruppur               Urban

          Age group  \
0             Total
1             `5-14
2             15-34
3             35-59
4               60+
..              …
589           `5-14
590           15-34
591           35-59
592             60+
593  Age not stated

     Worked for 3 months or more but less than 6 months -  Persons  \
0                                              1200828
1                                                27791
2                                               514340
3                                               542581
4                                               115103
..                                                 …
589                                                272
590                                               3285
591                                               3672
592                                                696
593                                                  2

     Worked for 3 months or more but less than 6 months - Males  \
0                                               589003
1                                                14125
2                                               259560
3                                               251957
4                                                62833
```

```
..                                                 …
589                                                129
590                                               1654
591                                               1769
592                                                399
593                                                  1

     Worked for 3 months or more but less than 6 months - Females  \
0                                               611825
1                                                13666
2                                               254780
3                                               290624
4                                                52270
..                                                 …
589                                                143
590                                               1631
591                                               1903
592                                                297
593                                                  1

     Worked for less than 3 months - Persons  \
0                                     221386
1                                       2447
2                                      92423
3                                      99202
4                                      27165
..                                      …
589                                       18
590                                      473
591                                      522
592                                      111
593                                        0

     Worked for less than 3 months - Males  …  \
0                                    99368  …
1                                     1247  …
2                                    43892  …
3                                    40691  …
4                                    13465  …
..                                    …  …
589                                      6  …
590                                    238  …
591                                    247  …
592                                     50  …
593                                      0  …

     Industrial Category - N to O - Females  \
0                                       3565
1                                         11
2                                       1754
3                                       1619
4                                        175
..                                      …
589                                        0
590                                       20
591                                       33
592                                        0
593                                        0

     Industrial Category - P to Q - Persons  \
0                                      11080
1                                        122
2                                       7536
3                                       3205
4                                        211
..                                      …
589                                        0
590                                       44
591                                       35
592                                        3
593                                        0

     Industrial Category - P to Q - Males  \
0                                    4019
1                                      71
2                                    2718
3                                    1131
4                                      93
..                                    …
589                                      0
590                                     15
591                                     12
592                                      0
593                                      0

     Industrial Category - P to Q - Females  \
0                                       7061
1                                         51
2                                       4818
3                                       2074
4                                        118
..                                      …
589                                        0
590                                       29
```

```
591                                      23
592                                       3
593                                       0

     Industrial Category - R to U - HHI - Persons  \
0                                           16833
1                                             427
2                                            8346
3                                            6591
4                                            1457
..                                            …
589                                             0
590                                            62
591                                            36
592                                            10
593                                             0

     Industrial Category - R to U - HHI - Males  \
0                                         4266
1                                          169
2                                         2127
3                                         1487
4                                          483
..                                          …
589                                          0
590                                          6
591                                          9
592                                          3
593                                          0

     Industrial Category - R to U - HHI - Females  \
0                                           12567
1                                             258
2                                            6219
3                                            5104
4                                             974
..                                            …
589                                             0
590                                            56
591                                            27
592                                             7
593                                             0

     Industrial Category - R to U - Non HHI - Persons  \
0                                              122088
1                                               19305
2                                               68929
```

```
3                                               26498
4                                                7065
..                                                 …
589                                               228
590                                               675
591                                               279
592                                                81
593                                                 0

     Industrial Category - R to U - Non HHI - Males  \
0                                             55801
1                                              9774
2                                             32803
3                                              9675
4                                              3394
..                                               …
589                                             104
590                                             247
591                                             103
592                                              35
593                                               0

     Industrial Category - R to U - Non HHI - Females
0                                               66287
1                                                9531
2                                               36126
3                                               16823
4                                                3671
..                                                 …
589                                               124
590                                               428
591                                               176
592                                                46
593                                                 0

[594 rows x 68 columns]
```

[27]:

```
df.isnull().sum()
```

[27]:

```
State Code                                          0
District Code                                       0
Area Name                                           0
Total/ Rural/ Urban                                 0
Age group                                           0
                                                   ..
Industrial Category - R to U - HHI - Males          0
Industrial Category - R to U - HHI - Females        0
Industrial Category - R to U - Non HHI - Persons    0
Industrial Category - R to U - Non HHI - Males      0
Industrial Category - R to U - Non HHI - Females    0
Length: 68, dtype: int64
```

```
[29]: df["Worked for less than 3 months - Persons"].describe(include=['object',␣
        ↪'bool'])
```

```
[29]: count       594.000000
      mean       2981.629630
      std       13909.621137
      min           0.000000
      25%          27.000000
      50%         430.000000
      75%        1775.250000
      max      221386.000000
      Name: Worked for less than 3 months - Persons, dtype: float64
```

```
[31]: numerical_cols = ['Industrial Category - R to U - HHI - Persons', 'Age group',␣
        ↪'Industrial Category - R to U - HHI - Males']
      df[numerical_cols].describe()
```

```
[31]:        Industrial Category - R to U - HHI - Persons  \
      count                                    594.000000
      mean                                     226.707071
      std                                     1039.953069
      min                                        0.000000
      25%                                        0.000000
      50%                                       27.000000
      75%                                      126.750000
      max                                    16833.000000

             Industrial Category - R to U - HHI - Males
      count                                  594.000000
      mean                                    57.454545
      std                                    265.230865
      min                                      0.000000
      25%                                      0.000000
      50%                                      7.500000
      75%                                     32.000000
      max                                   4266.000000
```

```
[ ]:
```