```
import tensorflow as tf
```

```
# tips data set which is present in seaborn
```

```
import seaborn
```

```
df = seaborn.load_dataset('tips')
```

```
df
```

	total_bill	tip	sex	smoker	day	time	size
0	16.99	1.01	Female	No	Sun	Dinner	2
1	10.34	1.66	Male	No	Sun	Dinner	3
2	21.01	3.50	Male	No	Sun	Dinner	3
3	23.68	3.31	Male	No	Sun	Dinner	2
4	24.59	3.61	Female	No	Sun	Dinner	4
...	...	...	...	...	...	...	...
239	29.03	5.92	Male	No	Sat	Dinner	3
240	27.18	2.00	Female	Yes	Sat	Dinner	2
241	22.67	2.00	Male	Yes	Sat	Dinner	2
242	17.82	1.75	Male	No	Sat	Dinner	2
243	18.78	3.00	Female	No	Thur	Dinner	2

244 rows × 7 columns

```
df.dtypes
```

```
total_bill      float64
tip             float64
sex            category
smoker         category
day            category
time           category
size              int64
dtype: object
```

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

```
total_bill     0
tip            0
sex            0
smoker         0
day            0
```

```
        time           0
        size           0
        dtype: int64
```

```python
df['sex'].unique()  # female - 1 and male  - 0
```

```
        ['Female', 'Male']
        Categories (2, object): ['Female', 'Male']
```

```python
gender_dict = {
    'Female':1,
    'Male':0
}
```

```python
df['sex'] = df['sex'].map(gender_dict)
```

```python
df.dtypes
```

```
        total_bill      float64
        tip             float64
        sex             category
        smoker          category
        day             category
        time            category
        size              int64
        dtype: object
```

```python
df['smoker'].unique()  # no - 0 , yes - 1
```

```
        ['No', 'Yes']
        Categories (2, object): ['No', 'Yes']
```

```python
smoker_dict = {
    'Yes':1,
    'No':0
}
```

```python
df['smoker'] = df['smoker'].map(smoker_dict)
```

```python
df.dtypes
```

```
        total_bill      float64
        tip             float64
        sex             category
        smoker          category
        day             category
        time            category
        size              int64
        dtype: object
```

```python
df['day'].unique()  # Sun - 0 ,  Sat - 1, Thur - 2 , Fri - 3
```

```
        ['Sun', 'Sat', 'Thur', 'Fri']
        Categories (4, object): ['Sun', 'Sat', 'Thur', 'Fri']
```

```
day_dict = {
    'Sun' : 0 ,  'Sat' : 1, 'Thur' : 2 , 'Fri' : 3
}
```

```
time_dict = {
    'Dinner':0,
    'Lunch':1
}
```

```
df['time'].unique()
```

```
        ['Dinner', 'Lunch']
        Categories (2, object): ['Dinner', 'Lunch']
```

```
df['day'] = df['day'].map(day_dict)
df['time'] = df['time'].map(time_dict)
```

```
df.dtypes
```

```
        total_bill      float64
        tip             float64
        sex            category
        smoker         category
        day            category
        time           category
        size              int64
        dtype: object
```

```
df.head()
```

	total_bill	tip	sex	smoker	day	time	size
0	16.99	1.01	1	0	0	0	2
1	10.34	1.66	0	0	0	0	3
2	21.01	3.50	0	0	0	0	3
3	23.68	3.31	0	0	0	0	2
4	24.59	3.61	1	0	0	0	4

```
type(df['smoker'][0])
```

```
        numpy.int64
```

```
input_col = df.drop('tip',axis=1)
```

```
out_col = df['tip']
```

```
input_col.head()
```

	total_bill	sex	smoker	day	time	size
0	16.99	1	0	0	0	2
1	10.34	0	0	0	0	3
2	21.01	0	0	0	0	3
3	23.68	0	0	0	0	2
4	24.59	1	0	0	0	4

```
from tensorflow.keras.models import Sequential
```

```
from tensorflow.keras.layers import Dense
```

```
model = Sequential()
```

```
l1 = Dense(100)
l2 = Dense(200)
l3 = Dense(400)
l4 = Dense(200)
l5 = Dense(400)
l6 = Dense(200)
l7 = Dense(400)
l8 = Dense(1)
```

```
model.add(l1)
model.add(l2)
model.add(l3)
model.add(l4)
model.add(l5)
model.add(l6)
model.add(l7)
model.add(l8)
```

```
model.compile(loss="mean_squared_error")
```

```
model.fit(input_col,out_col,epochs=300)
    Epoch 272/300
    8/8 [==============================] - 0s 8ms/step - loss: 1.2098
    Epoch 273/300
    8/8 [==============================] - 0s 9ms/step - loss: 1.4274
    Epoch 274/300
    8/8 [==============================] - 0s 8ms/step - loss: 2.0304
    Epoch 275/300
    8/8 [==============================] - 0s 8ms/step - loss: 1.7679
```

```
Epoch 276/300
8/8 [==============================] - 0s 10ms/step - loss: 2.0996
Epoch 277/300
8/8 [==============================] - 0s 8ms/step - loss: 1.8352
Epoch 278/300
8/8 [==============================] - 0s 8ms/step - loss: 1.7595

Epoch 279/300
8/8 [==============================] - 0s 9ms/step - loss: 1.6575
Epoch 280/300
8/8 [==============================] - 0s 8ms/step - loss: 2.3686
Epoch 281/300
8/8 [==============================] - 0s 9ms/step - loss: 1.5812
Epoch 282/300
8/8 [==============================] - 0s 10ms/step - loss: 1.9161
Epoch 283/300
8/8 [==============================] - 0s 10ms/step - loss: 1.7227
Epoch 284/300
8/8 [==============================] - 0s 9ms/step - loss: 1.6080
Epoch 285/300
8/8 [==============================] - 0s 12ms/step - loss: 1.7913
Epoch 286/300
8/8 [==============================] - 0s 8ms/step - loss: 1.5799
Epoch 287/300
8/8 [==============================] - 0s 10ms/step - loss: 1.5780
Epoch 288/300
8/8 [==============================] - 0s 9ms/step - loss: 1.4464
Epoch 289/300
8/8 [==============================] - 0s 9ms/step - loss: 1.7073
Epoch 290/300
8/8 [==============================] - 0s 10ms/step - loss: 1.4617
Epoch 291/300
8/8 [==============================] - 0s 8ms/step - loss: 2.4447
Epoch 292/300
8/8 [==============================] - 0s 9ms/step - loss: 1.8142
Epoch 293/300
8/8 [==============================] - 0s 9ms/step - loss: 1.2579
Epoch 294/300
8/8 [==============================] - 0s 9ms/step - loss: 1.7009
Epoch 295/300
8/8 [==============================] - 0s 12ms/step - loss: 1.6702
Epoch 296/300
8/8 [==============================] - 0s 10ms/step - loss: 1.3717
Epoch 297/300
8/8 [==============================] - 0s 10ms/step - loss: 1.4569
Epoch 298/300
8/8 [==============================] - 0s 8ms/step - loss: 1.4757
Epoch 299/300
8/8 [==============================] - 0s 9ms/step - loss: 1.8484
Epoch 300/300
8/8 [==============================] - 0s 10ms/step - loss: 2.0072
<tensorflow.python.keras.callbacks.History at 0x7f74a05e8b10>
```

```
# l1.get_weights()
```

```
# l4.get_weights()
```

```
model.predict([[16.99,1,0,0,0,2]])
```

```
array([[3.0693078]], dtype=float32)
```

```
df.head()
```

	total_bill	tip	sex	smoker	day	time	size
0	16.99	1.01	1	0	0	0	2
1	10.34	1.66	0	0	0	0	3
2	21.01	3.50	0	0	0	0	3
3	23.68	3.31	0	0	0	0	2
4	24.59	3.61	1	0	0	0	4

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