In [65]:
```
import pandas as pd
from sklearn.neighbors import KNeighborsClassifier
```

In [145]:
```
df =pd.read_csv('life.csv')
df
```

Out[145]:

	Age	Income	Spending	Insurance
0	25	72	40	Life
1	54	35	20	Health
2	23	40	28	Life
3	36	58	30	Health
4	41	61	41	Health

In [185]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 15 entries, 0 to 14
Data columns (total 4 columns):
 #   Column     Non-Null Count  Dtype 
---  ------     --------------  ----- 
 0   Age        15 non-null     int64 
 1   Income     15 non-null     int64 
 2   Insurance  15 non-null     object
 3   pred       15 non-null     object
dtypes: int64(2), object(2)
memory usage: 612.0+ bytes
```

In [183]:
```
df.describe()
```

Out[183]:

	Age	Income
count	15.000000	15.000000
mean	40.266667	44603.266667
std	15.082945	12722.377234
min	20.000000	29638.000000
25%	29.000000	34541.500000
50%	40.000000	39425.000000
75%	47.500000	51427.500000
max	72.000000	70282.000000

In [148]:
```
# features = ['Age', 'Income','Spending']
```

In [149]:
```
# x = df[features]
```

In [150]:
```
x = df.drop('Insurance', axis='columns')
```

In [151]:
```
y =df['Insurance']
```

In [152]:
```
model = KNeighborsClassifier(n_neighbors =3)
```

In [153]:
```
model.fit(x,y)
```

Out[153]:
```
KNeighborsClassifier(n_neighbors=3)
```
In a Jupyter environment, please rerun this cell to show the HTML representation or trust the notebook.
On GitHub, the HTML representation is unable to render, please try loading this page with nbviewer.org.

In [154]:
```
model.predict([[28,60,29]])
```

```
C:\Users\Administrator\AppData\Local\Programs\Python\Python311\Lib\site-packages\sklearn\base.py:465: UserWarning: X does not have valid feature names, but KNeighborsClassifier was fitted with feature names
  warnings.warn(
```

Out[154]:
```
array(['Health'], dtype=object)
```

In [156]:
```
df['pred'] = model.predict(x)
df
```

Out[156]:

	Age	Income	Spending	Insurance	pred
0	25	72	40	Life	Health
1	54	35	20	Health	Health
2	23	40	28	Life	Health
3	36	58	30	Health	Health
4	41	61	41	Health	Health

In [157]:
```
# N(3,6)
# (x,y)
# A(1,1)-Life
# B(2,1)-Health
# C(2,1)-Life
# D(3,5)-Life
# E(5,2)-Health
# F(7,3) -Health
# N- Neighbors =1

# Euclidean Distance-->
# NA--> ((3-1)^2+(6-1)^2)^(1/2)
# NB--> ((3-3)^2+(6-2)^2)^(1/2)
```

In [158]:
```
df = pd.read_csv('health.csv')
df
```

Out[158]:

	Age	Income	Insurance
0	25	35197	Life
1	54	33886	Health
2	23	38593	Life
3	36	53349	Health
4	41	64870	Health
5	72	70282	Life
6	35	29638	Health
7	40	30856	Life
8	58	39425	Health
9	61	49506	Health
10	40	48299	Life
11	20	39190	Health

In [159]:
```
x =df.drop('Insurance', axis='columns')
y = df['Insurance']
```

In [160]:
```
from sklearn.neighbors import KNeighborsClassifier
```

In [161]:
```
knn= KNeighborsClassifier(n_neighbors =5)
```

In [162]:
```
knn.fit(x,y)
```

Out[162]:
```
KNeighborsClassifier()
```
In a Jupyter environment, please rerun this cell to show the HTML representation or trust the notebook.
On GitHub, the HTML representation is unable to render, please try loading this page with nbviewer.org.

In [163]:
```
knn.predict([[29,63258]])
```

```
C:\Users\Administrator\AppData\Local\Programs\Python\Python311\Lib\site-packa
ges\sklearn\base.py:465: UserWarning: X does not have valid feature names, bu
t KNeighborsClassifier was fitted with feature names
  warnings.warn(
```

Out[163]:
```
array(['Health '], dtype=object)
```

In [164]:
```
df['pred'] =  knn.predict(x)
df.sample()
```

Out[164]:

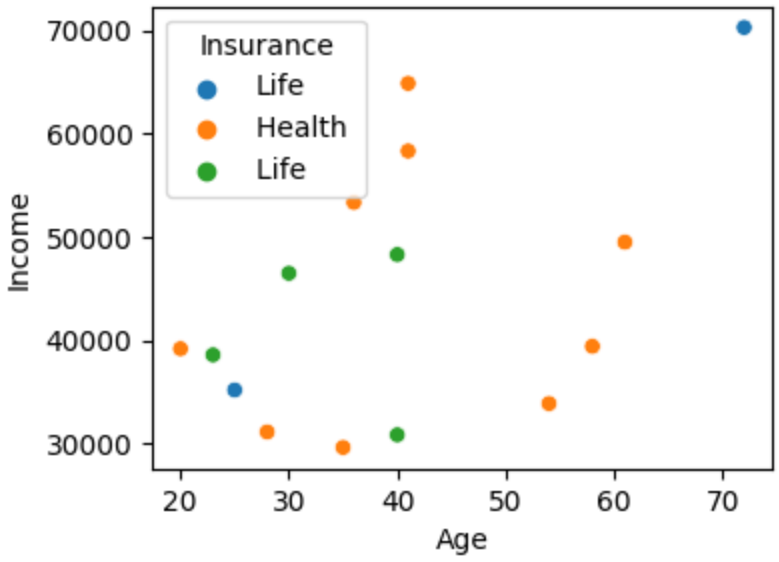
	Age	Income	Insurance	pred
14	41	58325	Health	Health

In [165]:
```
from sklearn.metrics import accuracy_score
accuracy_score(df['pred'], df['Insurance'])
```

Out[165]:
```
0.6
```

In [166]:
```
import seaborn as sns
import matplotlib.pyplot as plt
plt.figure(figsize=(4,3))
sns.scatterplot(x ='Age', y='Income', data=df, hue='Insurance')
```

Out[166]:
```
<Axes: xlabel='Age', ylabel='Income'>
```

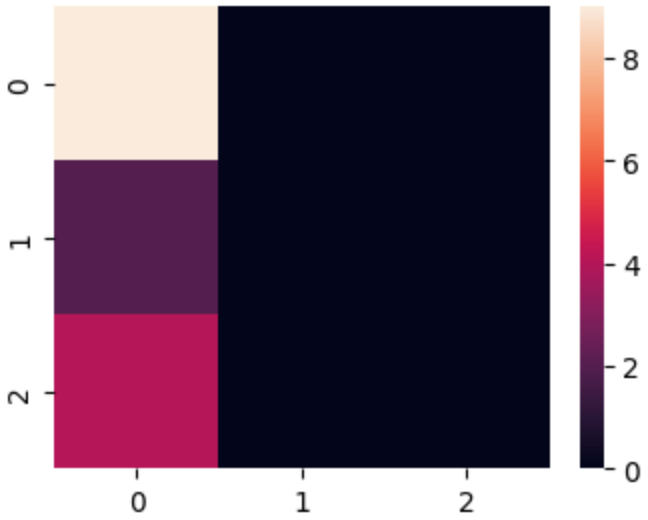


In [186]:
```
from sklearn.metrics import confusion_matrix
cm = confusion_matrix(df['Insurance'], df['pred'])
cm
```

Out[186]:
```
array([[9, 0, 0],
       [2, 0, 0],
       [4, 0, 0]], dtype=int64)
```

In [187]:
```
plt.figure(figsize=(4,3))
sns.heatmap(cm)
```

Out[187]: <Axes: >



In [208]:
```
x.shape
```

Out[208]: (5,)

In [209]:
```
# Normalization
from sklearn.preprocessing import MinMaxScaler
scal = MinMaxScaler()
```

In [210]:
```
df1 = df.drop(['Insurance' , 'pred'], axis = 'columns')
```

In [211]:
```
a = scal.fit_transform(df1)
```

In [212]:
```
a_d = pd.DataFrame(a, columns =df1.columns)
a_d.sample()
```

Out[212]:

	Age	Income
2	0.057692	0.220328

In [213]:
```
# standardization - >ML  (regression , classification)

from sklearn.preprocessing import StandardScaler
```

In [214]:
```
s =StandardScaler()
```

In [215]:
```
b =s.fit_transform(df1)
```

In [216]:
```
pd.DataFrame(b,columns = df1.columns).sample()
```

Out[216]:

	Age	Income
11	-1.390842	-0.440426

In [217]:
```
df1
```

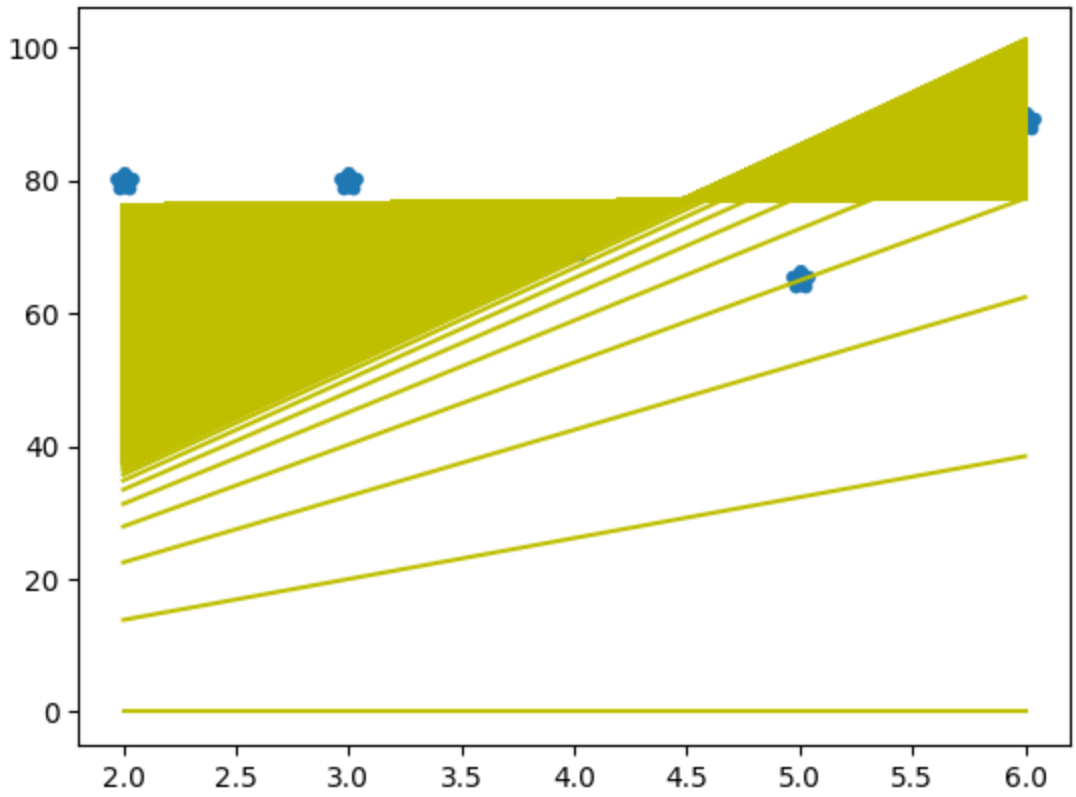
Out[217]:

	Age	Income
0	25	35197
1	54	33886
2	23	38593
3	36	53349
4	41	64870
5	72	70282
6	35	29638
7	40	30856
8	58	39425
9	61	49506
10	40	48299
11	20	39190
12	28	31138
13	30	46495
14	41	58325

In [218]:
```
import matplotlib.pyplot as plt
import numpy as np
```

In [219]:
```
def gradie(x,y):
    m_curr = c_curr = 0
    rate = 0.01
    n = len(x)
    plt.scatter(x,y, marker='*', linewidth=5)
    for i in range(10000):
        y_pred = m_curr*x +c_curr
        plt.plot(x,y_pred, color='y')
        md = -(2/n)*sum(x*(y-y_pred))
        cd = -(2/n)*sum(y-y_pred)
        m_curr = m_curr-rate*md
        c_curr= c_curr-rate*cd
```

In [220]:
```
x = np.array([2,3,4,5,6])
y =np.array([80,80,70,65,89])
gradie(x,y)
```



SVM

In [296]:
```
import pandas as pd
from sklearn.datasets import load_iris
```

In [224]:
```
iris = load_iris()
```

In [227]:
```
iris.feature_names
```

Out[227]:
```
['sepal length (cm)',
 'sepal width (cm)',
 'petal length (cm)',
 'petal width (cm)']
```

In [228]:
```
iris.target_names
```

Out[228]:
```
array(['setosa', 'versicolor', 'virginica'], dtype='<U10')
```

In [229]:
```
df = pd.DataFrame(iris.data, columns=iris.feature_names)
```

In [230]:
```
df.head()
```

Out[230]:

	sepal length (cm)	sepal width (cm)	petal length (cm)	petal width (cm)
0	5.1	3.5	1.4	0.2
1	4.9	3.0	1.4	0.2
2	4.7	3.2	1.3	0.2
3	4.6	3.1	1.5	0.2
4	5.0	3.6	1.4	0.2

In [234]:
```
df['target']=iris.target
df.head()
```

Out[234]:

	sepal length (cm)	sepal width (cm)	petal length (cm)	petal width (cm)	target
0	5.1	3.5	1.4	0.2	0
1	4.9	3.0	1.4	0.2	0
2	4.7	3.2	1.3	0.2	0
3	4.6	3.1	1.5	0.2	0
4	5.0	3.6	1.4	0.2	0

In [235]:
```
df[df.target== 1].head()
```

Out[235]:

	sepal length (cm)	sepal width (cm)	petal length (cm)	petal width (cm)	target
50	7.0	3.2	4.7	1.4	1
51	6.4	3.2	4.5	1.5	1
52	6.9	3.1	4.9	1.5	1
53	5.5	2.3	4.0	1.3	1
54	6.5	2.8	4.6	1.5	1

In [236]:
```
df[df.target== 2].head()
```

Out[236]:

	sepal length (cm)	sepal width (cm)	petal length (cm)	petal width (cm)	target
100	6.3	3.3	6.0	2.5	2
101	5.8	2.7	5.1	1.9	2
102	7.1	3.0	5.9	2.1	2
103	6.3	2.9	5.6	1.8	2
104	6.5	3.0	5.8	2.2	2

In [298]:
```
df['flower_names']=df.target.apply(lambda x:iris.target_names[x])
```

In [299]:
```
df[df.target== 1].head()
```

Out[299]:

	sepal length (cm)	sepal width (cm)	petal length (cm)	petal width (cm)	target	flower_names
50	7.0	3.2	4.7	1.4	1	versicolor
51	6.4	3.2	4.5	1.5	1	versicolor
52	6.9	3.1	4.9	1.5	1	versicolor
53	5.5	2.3	4.0	1.3	1	versicolor
54	6.5	2.8	4.6	1.5	1	versicolor

In [300]:
```
df[df.target== 2].head()
```

Out[300]:

	sepal length (cm)	sepal width (cm)	petal length (cm)	petal width (cm)	target	flower_names
100	6.3	3.3	6.0	2.5	2	virginica
101	5.8	2.7	5.1	1.9	2	virginica
102	7.1	3.0	5.9	2.1	2	virginica
103	6.3	2.9	5.6	1.8	2	virginica
104	6.5	3.0	5.8	2.2	2	virginica

In [301]:
```
df[df.target== 0].head()
```

Out[301]:

	sepal length (cm)	sepal width (cm)	petal length (cm)	petal width (cm)	target	flower_names
0	5.1	3.5	1.4	0.2	0	setosa
1	4.9	3.0	1.4	0.2	0	setosa
2	4.7	3.2	1.3	0.2	0	setosa
3	4.6	3.1	1.5	0.2	0	setosa
4	5.0	3.6	1.4	0.2	0	setosa

In [302]:
```
df[45:50]
```

Out[302]:

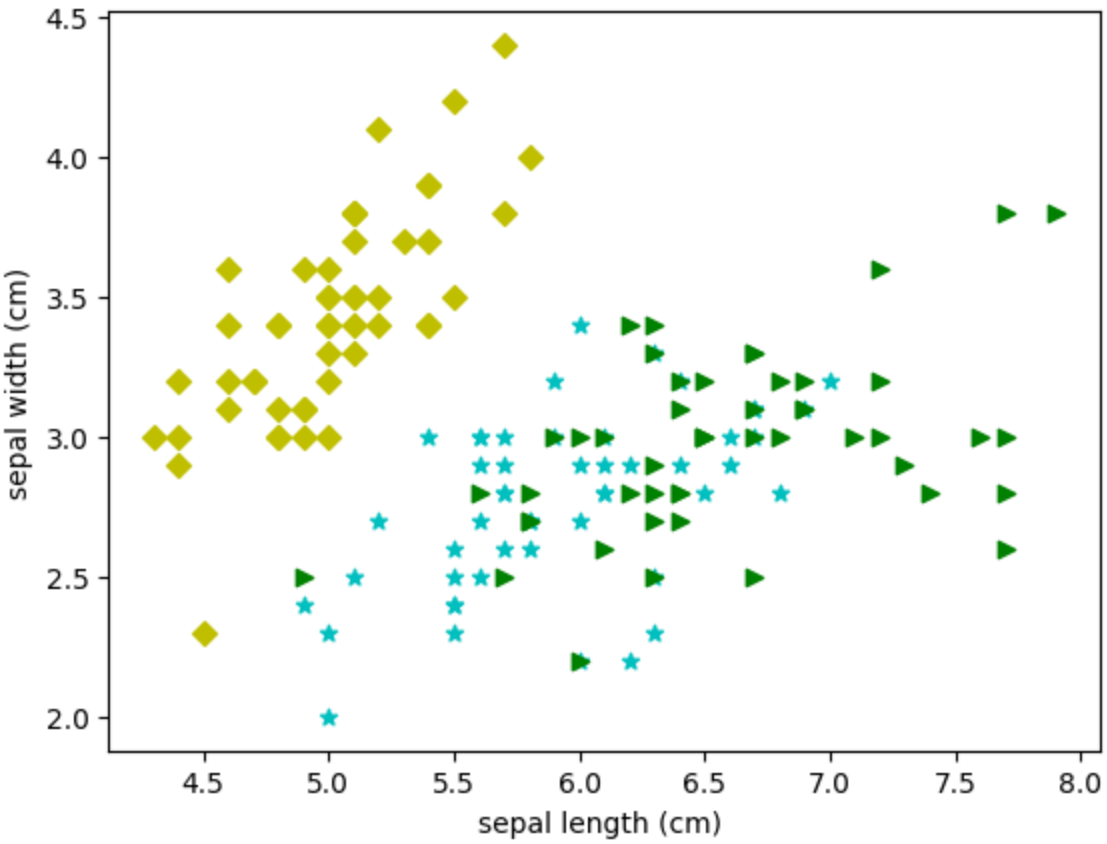
	sepal length (cm)	sepal width (cm)	petal length (cm)	petal width (cm)	target	flower_names
45	4.8	3.0	1.4	0.3	0	setosa
46	5.1	3.8	1.6	0.2	0	setosa
47	4.6	3.2	1.4	0.2	0	setosa
48	5.3	3.7	1.5	0.2	0	setosa
49	5.0	3.3	1.4	0.2	0	setosa

In [303]:
```
df1 = df[:50]
df2 = df[50:100]
df3 = df[100:]
```

In [304]:
```
import matplotlib.pyplot as plt
```

In [305]:
```
plt.xlabel('sepal length (cm) ')
plt.ylabel('sepal width (cm)')
plt.scatter(df1['sepal length (cm)'],df1['sepal width (cm)'], marker='D',color=
plt.scatter(df2['sepal length (cm)'],df2['sepal width (cm)'], marker='*',color=
plt.scatter(df3['sepal length (cm)'],df3['sepal width (cm)'], marker='>',color=
```

Out[305]: <matplotlib.collections.PathCollection at 0x1a6764a71d0>



In [306]:
```
from sklearn.model_selection import train_test_split
```

In [307]:
```
x =df.drop(['target', 'flower_names'], axis='columns')
y =df.target
```

In [308]:
```
x_train, x_test, y_train, y_test = train_test_split(x,y)
```

In [309]:
```
len(x_train)
```

Out[309]: 112

In [310]:
```
len(x_test)
```

Out[310]: 38

In [311]:
```
from sklearn.svm import SVC
```

In [312]:
```
model = SVC()
```

In [313]:
```
model.fit(x_train, y_train)
```

Out[313]:
```
SVC
SVC()
```

In [314]:
```
model.score(x_test, y_test)
```

Out[314]:
```
0.9736842105263158
```

In [315]:
```
model.predict([[5.3,3.7,1.2,0.2]])
```

```
C:\Users\Administrator\AppData\Local\Programs\Python\Python311\Lib\site-packages\sklearn\base.py:465: UserWarning: X does not have valid feature names, but SVC was fitted with feature names
  warnings.warn(
```

Out[315]:
```
array([0])
```

In [ ]:
```
https://forms.office.com/r/4he0XH7LMS
```