In [1]:
```
# data processing
import numpy as np
import pandas as pd
```

In [2]:
```
df = pd.read_csv(r"C:\Users\GS\Desktop\data.csv")
df.head()
```

Out[2]:

	id	diagnosis	radius_mean	texture_mean	perimeter_mean	area_mean	smoothness_mean	compa
0	842302	M	17.99	10.38	122.80	1001.0	0.11840	
1	842517	M	20.57	17.77	132.90	1326.0	0.08474	
2	84300903	M	19.69	21.25	130.00	1203.0	0.10960	
3	84348301	M	11.42	20.38	77.58	386.1	0.14250	
4	84358402	M	20.29	14.34	135.10	1297.0	0.10030	

5 rows × 33 columns

In [3]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 569 entries, 0 to 568
Data columns (total 33 columns):
 #   Column                   Non-Null Count  Dtype
---  ------                   --------------  -----
 0   id                       569 non-null    int64
 1   diagnosis                569 non-null    object
 2   radius_mean              569 non-null    float64
 3   texture_mean             569 non-null    float64
 4   perimeter_mean           569 non-null    float64
 5   area_mean                569 non-null    float64
 6   smoothness_mean          569 non-null    float64
 7   compactness_mean         569 non-null    float64
 8   concavity_mean           569 non-null    float64
 9   concave points_mean      569 non-null    float64
 10  symmetry_mean            569 non-null    float64
 11  fractal_dimension_mean   569 non-null    float64
 12  radius_se                569 non-null    float64
 13  texture_se               569 non-null    float64
 14  perimeter_se             569 non-null    float64
 15  area_se                  569 non-null    float64
 16  smoothness_se            569 non-null    float64
 17  compactness_se           569 non-null    float64
 18  concavity_se             569 non-null    float64
 19  concave points_se        569 non-null    float64
 20  symmetry_se              569 non-null    float64
 21  fractal_dimension_se     569 non-null    float64
 22  radius_worst             569 non-null    float64
 23  texture_worst            569 non-null    float64
 24  perimeter_worst          569 non-null    float64
 25  area_worst               569 non-null    float64
 26  smoothness_worst         569 non-null    float64
 27  compactness_worst        569 non-null    float64
 28  concavity_worst          569 non-null    float64
 29  concave points_worst     569 non-null    float64
 30  symmetry_worst           569 non-null    float64
 31  fractal_dimension_worst  569 non-null    float64
 32  Unnamed: 32              0 non-null      float64
dtypes: float64(31), int64(1), object(1)
memory usage: 146.8+ KB
```

In [4]:
```
import numpy as np
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
from sklearn import metrics
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import StandardScaler
```

In [5]:
```
import tensorflow as tf
from tensorflow import keras
from tensorflow.keras import Sequential
from tensorflow.keras.layers import Flatten,Dense,Dropout,BatchNormalization,Conv1D
from tensorflow.keras.preprocessing.image import ImageDataGenerator

from tensorflow.keras.optimizers import Adam
```

In [6]:
```
from sklearn import preprocessing

# label_encoder object knows how to understand word labels.
label_encoder = preprocessing.LabelEncoder()

# Encode labels in column 'species'.
df['diagnosis']= label_encoder.fit_transform(df['diagnosis'])

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

Out[6]:
```
array([1, 0])
```

In [7]:
```
y=df['diagnosis']
X = df.drop(columns=['diagnosis','id','Unnamed: 32'],axis=1)
```

In [8]:
```
print(X.shape,y.shape)
```

```
(569, 30) (569,)
```

In [9]:
```
X_train,X_test,y_train,y_test = train_test_split(X,y,test_size=0.2,random_state=42)
```

In [10]:
```
scaler = StandardScaler()
X_train = scaler.fit_transform(X_train)
X_test = scaler.transform(X_test)
```

In [11]:
```
print(X_train.shape)
print(X_test.shape)
```

```
(455, 30)
(114, 30)
```

As a CNN accepts only 3Dimensional data , we have to convert both X_train,X_test into 3D layers

In [12]:
```

X_train = X_train.reshape(455,30,1)
X_test = X_test.reshape(114,30,1)
```

In [13]:
```
X_train
```

Out[13]:
```
array([[[-1.44075296],
        [-0.43531947],
        [-1.36208497],
        ...,
        [ 0.9320124 ],
        [ 2.09724217],
        [ 1.88645014]],

       [[ 1.97409619],
        [ 1.73302577],
        [ 2.09167167],
        ...,
        [ 2.6989469 ],
        [ 1.89116053],
        [ 2.49783848]],

       [[-1.39998202],
        [-1.24962228],
        [-1.34520926],
        ...,
        [-0.97023893],
        [ 0.59760192],
        [ 0.0578942 ]],

       ...,

       [[ 0.04880192],
        [-0.55500086],
        [-0.06512547],
        ...,
        [-1.23903365],
        [-0.70863864],
        [-1.27145475]],

       [[-0.03896885],
        [ 0.10207345],
        [-0.03137406],
        ...,
        [ 1.05001236],
        [ 0.43432185],
        [ 1.21336207]],

       [[-0.54860557],
        [ 0.31327591],
        [-0.60350155],
        ...,
        [-0.61102866],
        [-0.3345212 ],
        [-0.84628745]]])
```

In [14]:
```
epochs = 50

model = Sequential()
model.add(Conv1D(filters=32,kernel_size=2,activation='relu',input_shape=(30,1)))
model.add(BatchNormalization())
model.add(Dropout(0.2))

model.add(Conv1D(filters=64,kernel_size=2,activation='relu'))
model.add(BatchNormalization())
model.add(Dropout(0.5))

model.add(Flatten())
model.add(Dense(64,activation='relu'))
model.add(Dropout(0.5))

model.add(Dense(1,activation='sigmoid'))
```

In [15]:
```
1 model.summary()
```

```
Model: "sequential"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 conv1d (Conv1D)             (None, 29, 32)            96

 batch_normalization (BatchN  (None, 29, 32)           128
 ormalization)

 dropout (Dropout)           (None, 29, 32)            0

 conv1d_1 (Conv1D)           (None, 28, 64)            4160

 batch_normalization_1 (Batc  (None, 28, 64)           256
 hNormalization)

 dropout_1 (Dropout)         (None, 28, 64)            0

 flatten (Flatten)           (None, 1792)              0

 dense (Dense)               (None, 64)                114752

 dropout_2 (Dropout)         (None, 64)                0

 dense_1 (Dense)             (None, 1)                 65

=================================================================
Total params: 119,457
Trainable params: 119,265
Non-trainable params: 192
_________________________________________________________________
```

In [16]:
```
1 model.compile(optimizer=Adam(lr=0.00005),loss='binary_crossentropy',metrics=['accur
```

```
WARNING:absl:`lr` is deprecated, please use `learning_rate` instead, or use the legacy
optimizer, e.g.,tf.keras.optimizers.legacy.Adam.
```

In [17]:
```
1 history = model.fit(X_train,y_train,epochs=epochs,validation_data=(X_test,y_test),v
```

```
Epoch 1/50
15/15 [==============================] - 25s 156ms/step - loss: 0.3890 - accuracy:
0.8571 - val_loss: 0.4218 - val_accuracy: 0.9825
Epoch 2/50
15/15 [==============================] - 3s 238ms/step - loss: 0.1816 - accuracy: 0.
9451 - val_loss: 0.3880 - val_accuracy: 0.9561
Epoch 3/50
15/15 [==============================] - 0s 33ms/step - loss: 0.0938 - accuracy: 0.9
692 - val_loss: 0.3900 - val_accuracy: 0.9474
Epoch 4/50
15/15 [==============================] - 0s 34ms/step - loss: 0.0873 - accuracy: 0.9
714 - val_loss: 0.3608 - val_accuracy: 0.9474
Epoch 5/50
15/15 [==============================] - 1s 35ms/step - loss: 0.1094 - accuracy: 0.9
604 - val_loss: 0.3314 - val_accuracy: 0.9649
Epoch 6/50
15/15 [==============================] - 1s 39ms/step - loss: 0.0768 - accuracy: 0.9
626 - val_loss: 0.3166 - val_accuracy: 0.9649
Epoch 7/50
```

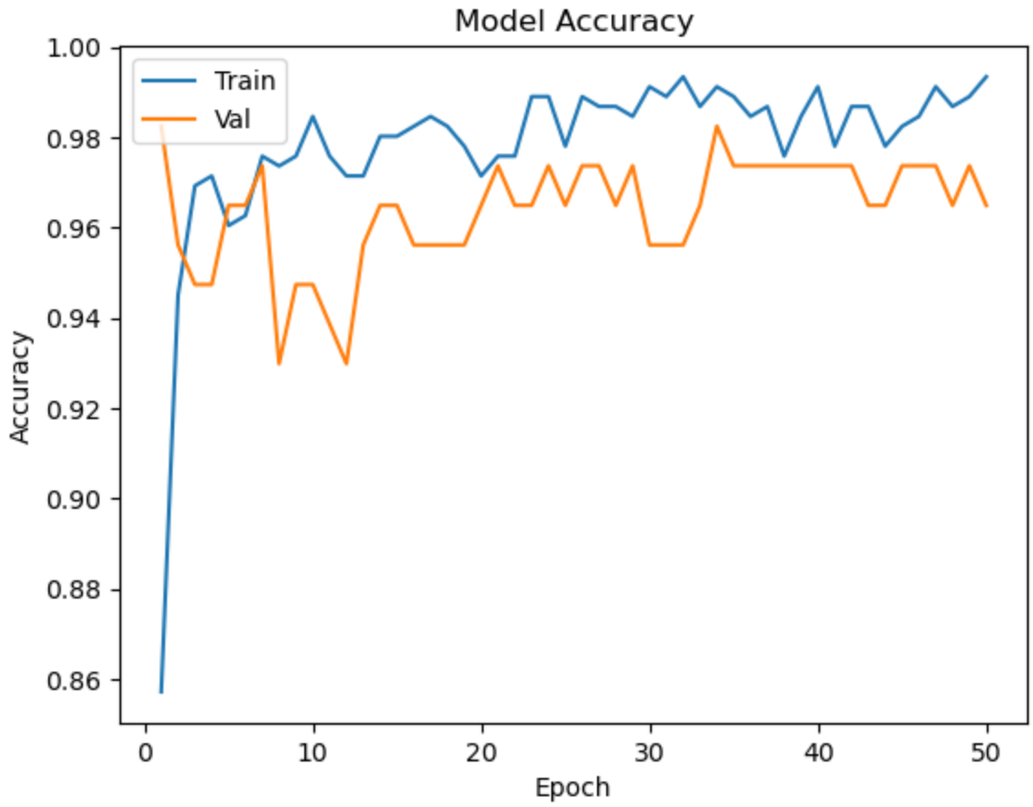
In [18]:

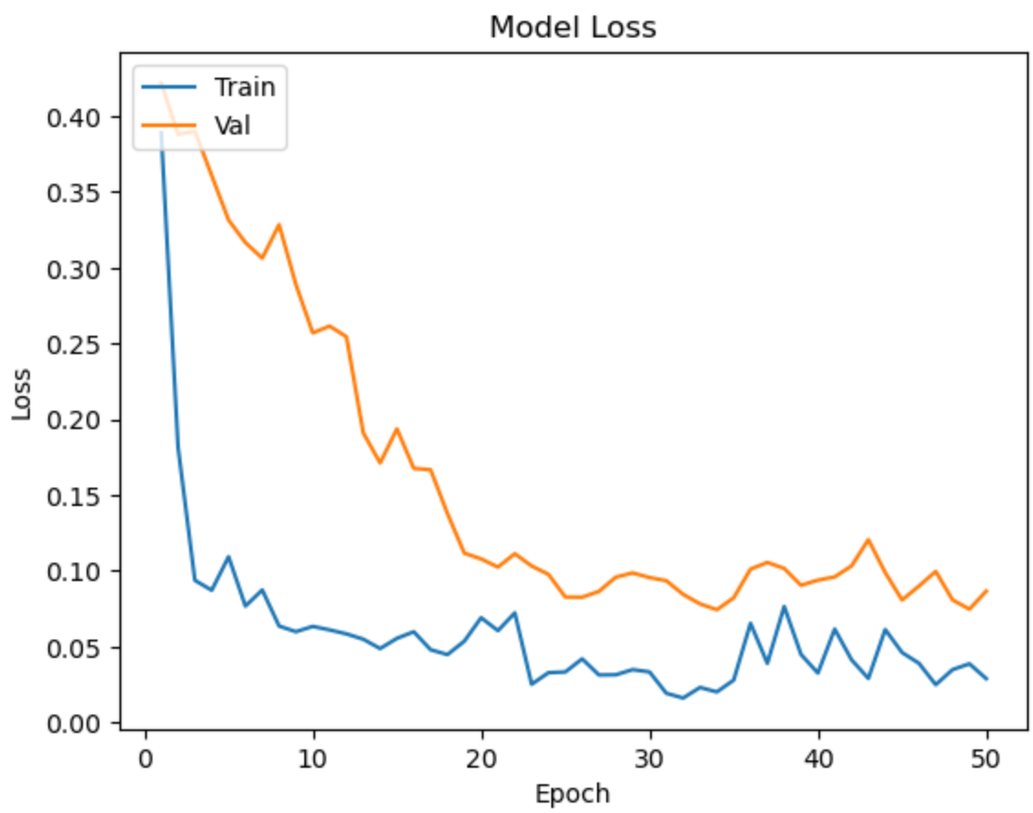
```
def plot_learning(history,epoch):
    epoch_range = range(1,epoch+1)
    plt.plot(epoch_range,history.history['accuracy'])
    plt.plot(epoch_range,history.history['val_accuracy'])
    plt.title('Model Accuracy')
    plt.ylabel('Accuracy')
    plt.xlabel('Epoch')
    plt.legend(['Train','Val'],loc='upper left')
    plt.show()

    plt.plot(epoch_range,history.history['loss'])
    plt.plot(epoch_range,history.history['val_loss'])
    plt.title('Model Loss')
    plt.ylabel('Loss')
    plt.xlabel('Epoch')
    plt.legend(['Train','Val'],loc='upper left')
    plt.show()
```

- If validation accuracy is greater than Training accuracy it means the model isn't overfitting
- unless and untill validation loss goes above the Training loss we can keep on Training our model

In [19]:
```
1 plot_learning(history,epochs)
```





In [20]:
```
1 y_pred = (model.predict(X_test) > 0.5).astype("int32")
```

```
4/4 [==============================] - 4s 49ms/step
```

In [21]:
```
y_pred
```

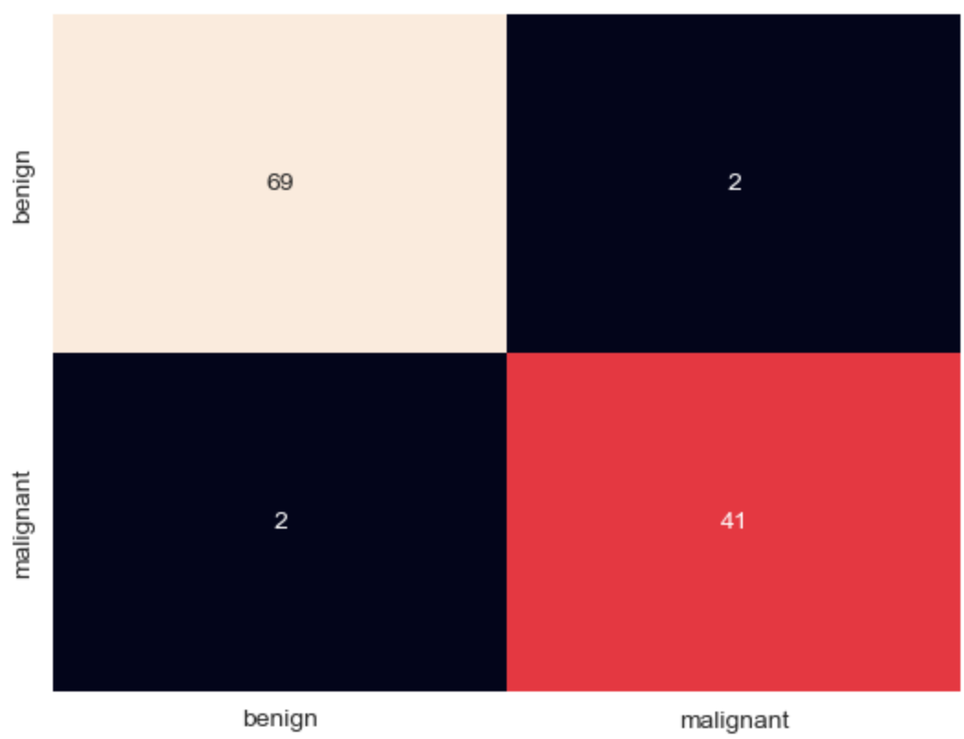
Out[21]:
```
array([[0],
       [1],
       [1],
       [0],
       [0],
       [1],
       [1],
       [1],
       [1],
       [0],
       [1],
       [1],
       [0],
       [1],
       [0],
       [1],
       [0],
       [0],
       [0],
```

In [22]:
```
from sklearn.metrics import accuracy_score,confusion_matrix
accuracy_score(y_test,y_pred)
```

Out[22]:
```
0.9649122807017544
```

In [23]:
```
import seaborn as sns
sns.set_style("white")
cm=confusion_matrix(y_test,y_pred)
sns.heatmap(cm, annot=True, fmt="d", cbar=False, xticklabels=['benign', 'malignant'
```

Out[23]:
```
<AxesSubplot:>
```



In [24]:
```
import gradio as gr
```

In [25]:
```
def Cancer(radius_mean,texture_mean,perimeter_mean,area_mean,smoothness_mean,compac

    x = np.array([radius_mean,texture_mean,perimeter_mean,area_mean,smoothness_mean

]).reshape(1,30,1)

    prediction = model.predict(x)

    if int(prediction[0][0]) == 1:
        return "Malignant"
    else:
        return "Begign"

```

In [26]:
```
outputs = gr.outputs.Textbox()

app = gr.Interface(fn=Cancer, inputs=['number','number','number','number','number',
```

```
C:\Users\GS\anaconda3\lib\site-packages\gradio\outputs.py:22: UserWarning: Usage of gr
adio.outputs is deprecated, and will not be supported in the future, please import you
r components from gradio.components
  warnings.warn(
```

In [27]:
```
app.launch()
```

```
Running on local URL:  http://127.0.0.1:7860 (http://127.0.0.1:7860)

To create a public link, set `share=True` in `launch()`.
```

Out[27]:

```
1/1 [==============================] - 0s 264ms/step
```

In [ ]:

In [ ]: