In [1]:
```
import tensorflow as tf
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Dense, Dropout
from tensorflow.keras.optimizers.legacy import SGD, Adam, RMSprop # Use legacy optimiz
from tensorflow.keras.activations import relu, sigmoid, tanh
from sklearn.datasets import load_breast_cancer
from sklearn.model_selection import train_test_split
```

```
WARNING:tensorflow:From C:\Users\Student\AppData\Roaming\Python\Python311\site-packages\keras\src\losses.py:2976: The name tf.losses.sparse_softmax_cross_entropy is d
eprecated. Please use tf.compat.v1.losses.sparse_softmax_cross_entropy instead.
```

In [9]:
```
# Load the breast cancer dataset
data= load_breast_cancer()
X_train, X_test, y_train, y_test = train_test_split(data.data, data.target, test_size=0.2, random_state=42)
# Define the model creation function
def create_model (activation_func, optimizer):
    model = Sequential([
        Dense (64, input_dim=X_train.shape[1], activation=activation_func),
        Dropout (0.5),
        Dense (32, activation=activation_func),
        Dropout (0.5),
        Dense (1, activation='sigmoid')
])
    model.compile(loss='binary_crossentropy', optimizer=optimizer, metrics=['accuracy'])
    return model
```

In [10]:
```
# Define the activation functions and optimizers to try
activation_funcs = [relu, sigmoid, tanh]
optimizers = [SGD(learning_rate=0.01), Adam (learning_rate=0.001), RMSprop(learning_rate=0.0001)]
```

In [11]:
```
# Train and test the models with different activation functions and optimizers
for activation_func in activation_funcs:
    for optimizer in optimizers:
        model = create_model(activation_func, optimizer)
        print(f'Training model with activation function {activation_func} and optimizer {optimizer.__class__.__name__}')
        model.fit(X_train, y_train, epochs=50, batch_size=16, verbose=0)
        loss, accuracy = model.evaluate(X_test, y_test)
        print(f'Test loss: {loss:.3f}, Test accuracy: {accuracy:.3f}\n')
```

```
WARNING:tensorflow:From C:\Users\Student\AppData\Roaming\Python\Python311\site-packages\keras\src\backend.py:873: The name tf.get_default_graph is deprecated. Please use tf.compat.v1.get_default_graph instead.

Training model with activation function <function relu at 0x000001A9BF022D40> and optimizer SGD
WARNING:tensorflow:From C:\Users\Student\AppData\Roaming\Python\Python311\site-packages\keras\src\utils\tf_utils.py:492: The name tf.ragged.RaggedTensorValue is deprecated. Please use tf.compat.v1.ragged.RaggedTensorValue instead.

WARNING:tensorflow:From C:\Users\Student\AppData\Roaming\Python\Python311\site-packages\keras\src\engine\base_layer_utils.py:384: The name tf.executing_eagerly_outside_functions is deprecated. Please use tf.compat.v1.executing_eagerly_outside_functions instead.

4/4 [==============================] - 0s 3ms/step - loss: 0.6627 - accuracy: 0.6228
Test loss: 0.663, Test accuracy: 0.623

Training model with activation function <function relu at 0x000001A9BF022D40> and optimizer Adam
4/4 [==============================] - 0s 2ms/step - loss: 0.3532 - accuracy: 0.9123
Test loss: 0.353, Test accuracy: 0.912

Training model with activation function <function relu at 0x000001A9BF022D40> and optimizer RMSprop
4/4 [==============================] - 0s 0s/step - loss: 2.2455 - accuracy: 0.3947
Test loss: 2.245, Test accuracy: 0.395

Training model with activation function <function sigmoid at 0x000001A9BF0232E0> and optimizer SGD
4/4 [==============================] - 0s 4ms/step - loss: 0.6535 - accuracy: 0.6228
Test loss: 0.654, Test accuracy: 0.623

Training model with activation function <function sigmoid at 0x000001A9BF0232E0> and optimizer Adam
4/4 [==============================] - 0s 0s/step - loss: 0.1727 - accuracy: 0.9561
Test loss: 0.173, Test accuracy: 0.956

Training model with activation function <function sigmoid at 0x000001A9BF0232E0> and optimizer RMSprop
4/4 [==============================] - 0s 0s/step - loss: 0.5357 - accuracy: 0.6228
Test loss: 0.536, Test accuracy: 0.623

Training model with activation function <function tanh at 0x000001A9BF023100> and optimizer SGD
4/4 [==============================] - 0s 0s/step - loss: 0.6642 - accuracy: 0.6228
Test loss: 0.664, Test accuracy: 0.623

Training model with activation function <function tanh at 0x000001A9BF023100> and optimizer Adam
4/4 [==============================] - 0s 5ms/step - loss: 0.2508 - accuracy: 0.9386
Test loss: 0.251, Test accuracy: 0.939

Training model with activation function <function tanh at 0x000001A9BF023100> and optimizer RMSprop
4/4 [==============================] - 0s 0s/step - loss: 0.2121 - accuracy: 0.9298
Test loss: 0.212, Test accuracy: 0.930
```

In [ ]: