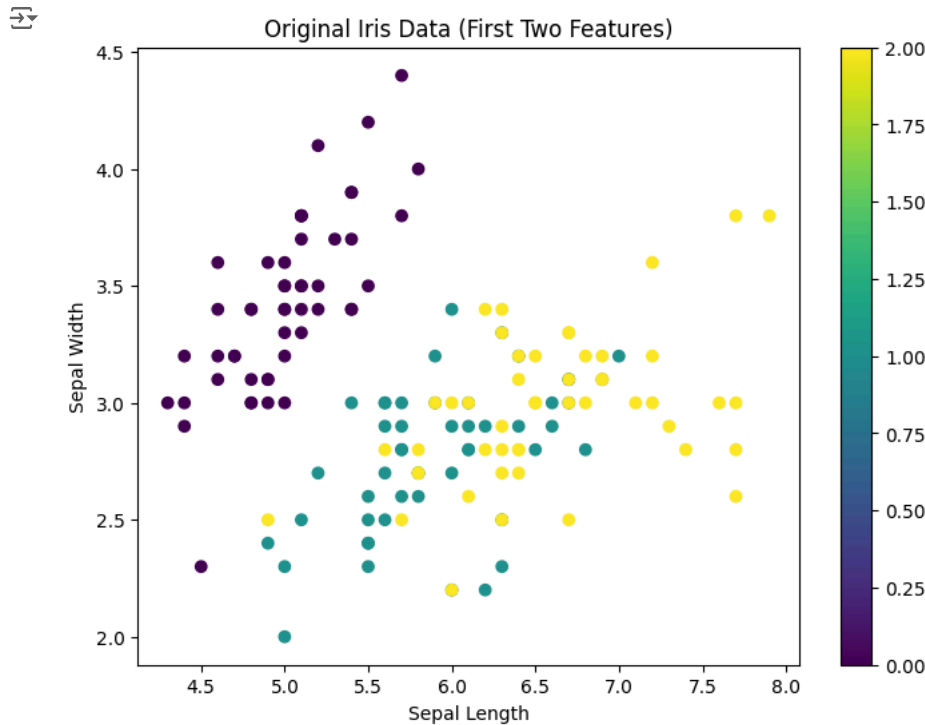Part 1: Visualizing the First Two Features of the Iris Dataset

```python
import matplotlib.pyplot as plt
from sklearn import datasets


iris = datasets.load_iris()
data = iris.data


plt.figure(figsize=(8, 6))
plt.scatter(data[:, 0], data[:, 1], c=iris.target)
plt.colorbar()
plt.xlabel('Sepal Length')
plt.ylabel('Sepal Width')
plt.title('Original Iris Data (First Two Features)')
plt.show()
```


Part 2: Autoencoder for Dimensionality Reduction and Visualization

```python
import numpy as np
import tensorflow as tf
from tensorflow.keras.layers import Input, Dense
from tensorflow.keras.models import Model


data -= np.mean(data, axis=0)
data /= np.std(data, axis=0)


encoding_dim = 2  # 2D representation
input_data = Input(shape=(4,))
encoded = Dense(encoding_dim, activation='relu')(input_data)
decoded = Dense(4, activation='sigmoid')(encoded)
autoencoder = Model(input_data, decoded)


autoencoder.compile(optimizer='adam', loss='mean_squared_error')
autoencoder.fit(data, data, epochs=100, batch_size=10, shuffle=True)
```

```
Epoch 1/100
15/15 ——————————————— 1s 2ms/step - loss: 1.2130
Epoch 2/100
15/15 ——————————————— 0s 1ms/step - loss: 1.3535
Epoch 3/100
15/15 ——————————————— 0s 1ms/step - loss: 1.2160
Epoch 4/100
15/15 ——————————————— 0s 2ms/step - loss: 1.2328
Epoch 5/100
15/15 ——————————————— 0s 1ms/step - loss: 1.3358
Epoch 6/100
```

```
15/15 ─────────────── 0s 1ms/step – loss: 1.2543
Epoch 7/100
15/15 ─────────────── 0s 1ms/step – loss: 1.2823
Epoch 8/100
15/15 ─────────────── 0s 1ms/step – loss: 1.2606
Epoch 9/100
15/15 ─────────────── 0s 2ms/step – loss: 1.2007
Epoch 10/100
15/15 ─────────────── 0s 1ms/step – loss: 1.1082
Epoch 11/100
15/15 ─────────────── 0s 1ms/step – loss: 1.1715
Epoch 12/100
15/15 ─────────────── 0s 2ms/step – loss: 1.1740
Epoch 13/100
15/15 ─────────────── 0s 2ms/step – loss: 1.2564
Epoch 14/100
15/15 ─────────────── 0s 2ms/step – loss: 1.1458
Epoch 15/100
15/15 ─────────────── 0s 1ms/step – loss: 1.0860
Epoch 16/100
15/15 ─────────────── 0s 1ms/step – loss: 1.0246
Epoch 17/100
15/15 ─────────────── 0s 1ms/step – loss: 1.0886
Epoch 18/100
15/15 ─────────────── 0s 1ms/step – loss: 1.0578
Epoch 19/100
15/15 ─────────────── 0s 1ms/step – loss: 1.1280
Epoch 20/100
15/15 ─────────────── 0s 1ms/step – loss: 1.0721
Epoch 21/100
15/15 ─────────────── 0s 2ms/step – loss: 1.0786
Epoch 22/100
15/15 ─────────────── 0s 4ms/step – loss: 1.0697
Epoch 23/100
15/15 ─────────────── 0s 3ms/step – loss: 1.0766
Epoch 24/100
15/15 ─────────────── 0s 3ms/step – loss: 0.9914
Epoch 25/100
15/15 ─────────────── 0s 2ms/step – loss: 1.0116
Epoch 26/100
15/15 ─────────────── 0s 5ms/step – loss: 1.0439
Epoch 27/100
15/15 ─────────────── 0s 3ms/step – loss: 0.9620
Epoch 28/100
15/15 ─────────────── 0s 3ms/step – loss: 0.8991
Epoch 29/100
15/15 ─────────────── 0s 2ms/step – loss: 0.9640
```

```python
encoder = Model(input_data, encoded)
encoded_data = encoder.predict(data)
```

```
5/5 ─────────────── 0s 6ms/step
```

```python
plt.figure(figsize=(8, 6))
plt.scatter(encoded_data[:, 0], encoded_data[:, 1], c=iris.target)
plt.colorbar()
plt.xlabel('Encoded Feature 1')
plt.ylabel('Encoded Feature 2')
plt.title('2D Visualization of Encoded Iris Data')
plt.show()
```

2D Visualization of Encoded Iris Data