In [15]:
```
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
```

In [16]:
```
# Load the dataset
data = pd.read_csv(r"C:\Users\Bhawana gupta\Downloads\breast cancer prediction dataset\data.csv")
```

In [17]:
```
data
```

Out[17]:

	id	diagnosis	radius_mean	texture_mean	perimeter_mean	area_mean	smoothness_mean	compactness_mean	concavity_mean
0	842302	M	17.99	10.38	122.80	1001.0	0.11840	0.27760	0.30010
1	842517	M	20.57	17.77	132.90	1326.0	0.08474	0.07864	0.08690
2	84300903	M	19.69	21.25	130.00	1203.0	0.10960	0.15990	0.19740
3	84348301	M	11.42	20.38	77.58	386.1	0.14250	0.28390	0.24140
4	84358402	M	20.29	14.34	135.10	1297.0	0.10030	0.13280	0.19800
...	...	...	...	...	...	...	...	...	...
564	926424	M	21.56	22.39	142.00	1479.0	0.11100	0.11590	0.24390
565	926682	M	20.13	28.25	131.20	1261.0	0.09780	0.10340	0.14400
566	926954	M	16.60	28.08	108.30	858.1	0.08455	0.10230	0.09251
567	927241	M	20.60	29.33	140.10	1265.0	0.11780	0.27700	0.35140
568	92751	B	7.76	24.54	47.92	181.0	0.05263	0.04362	0.00000

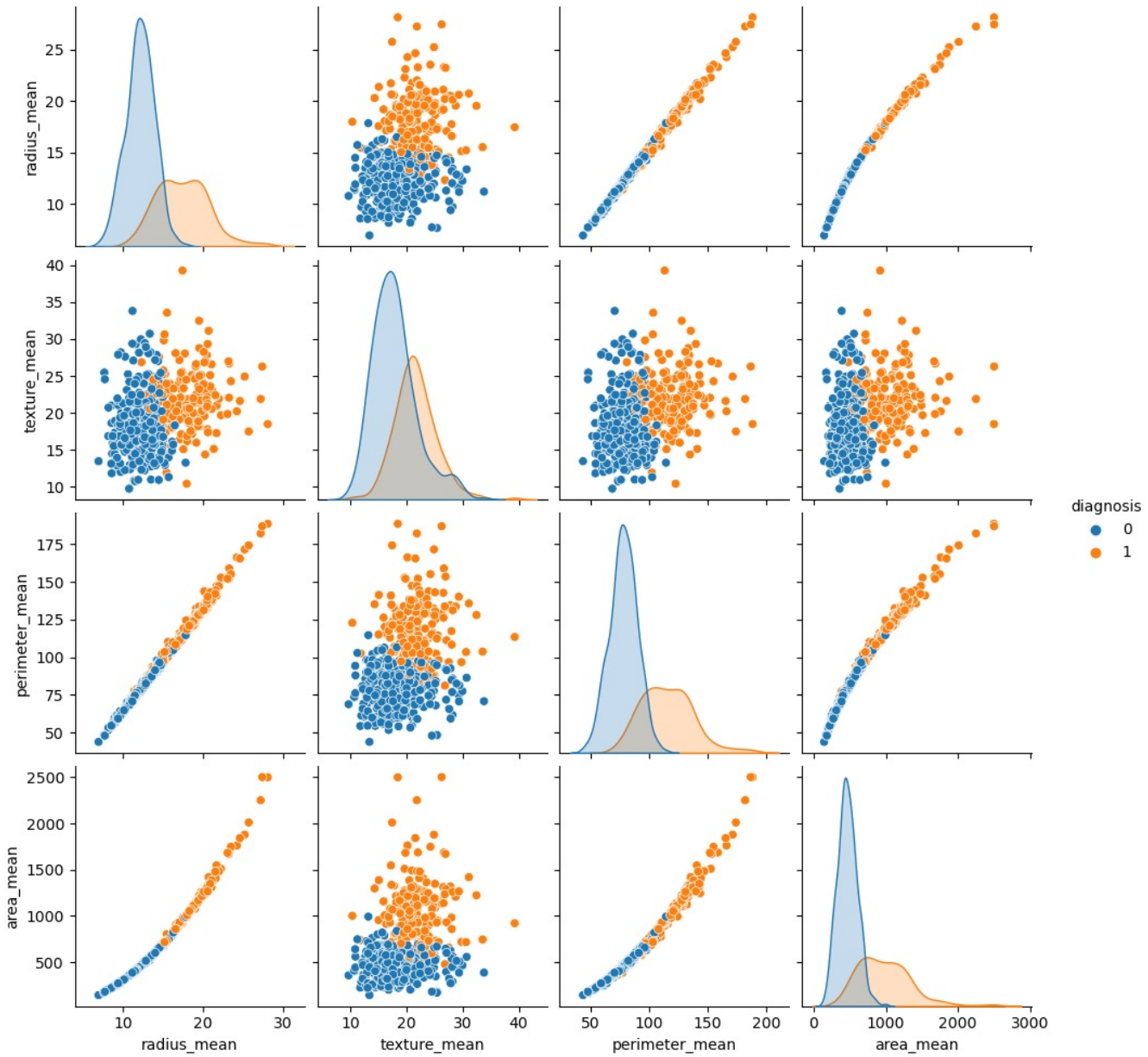
569 rows × 33 columns

In [18]:
```
# Encode the target variable
data['diagnosis'] = data['diagnosis'].map({'M':1,'B':0})
```

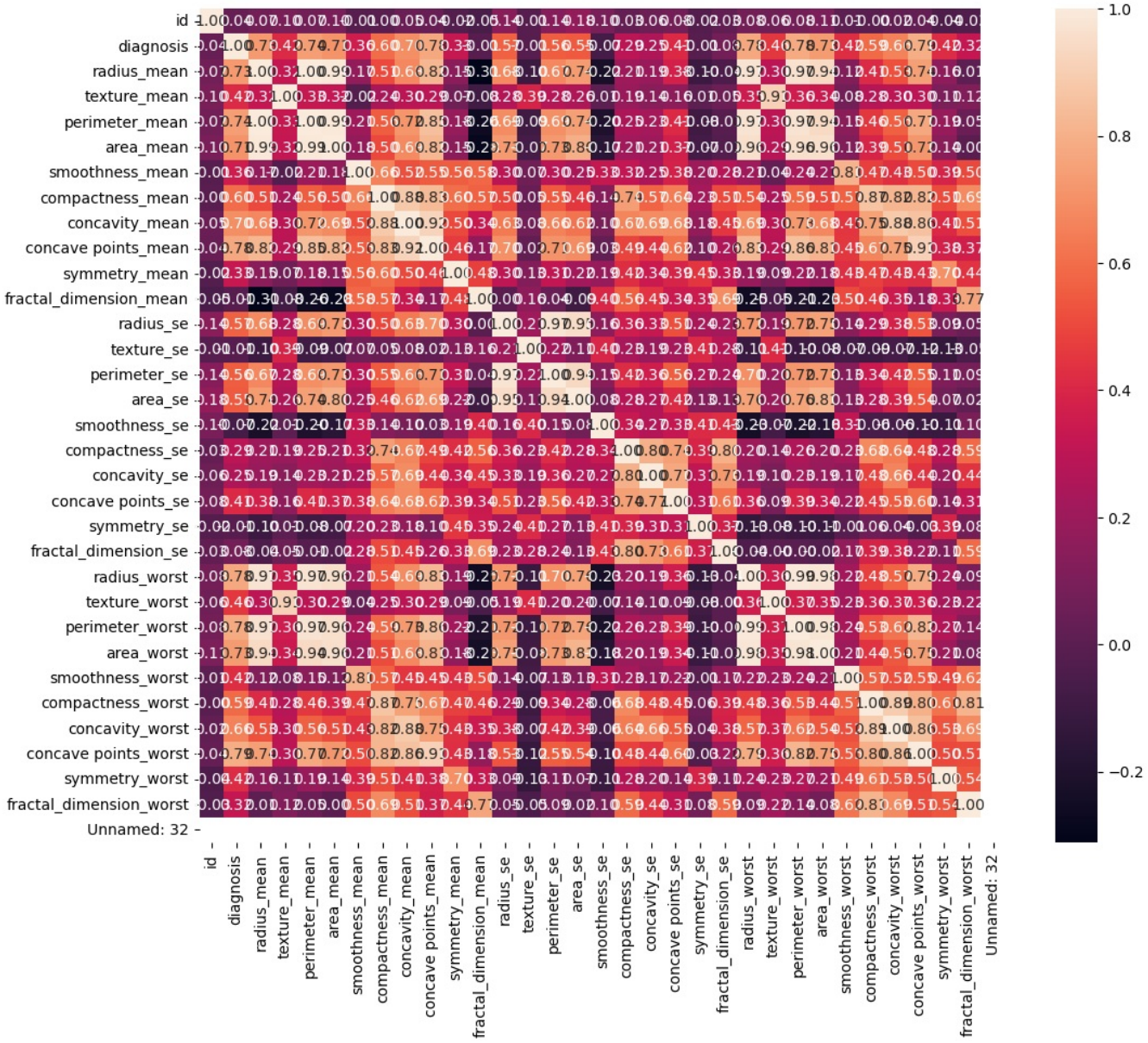
In [19]:
```
# Display the first few rows of the dataset
print(data.head())
```

```
         id  diagnosis  radius_mean  texture_mean  perimeter_mean  area_mean  \
0    842302          1        17.99         10.38          122.80     1001.0
1    842517          1        20.57         17.77          132.90     1326.0
2  84300903          1        19.69         21.25          130.00     1203.0
3  84348301          1        11.42         20.38           77.58      386.1
4  84358402          1        20.29         14.34          135.10     1297.0

   smoothness_mean  compactness_mean  concavity_mean  concave points_mean  \
0          0.11840           0.27760          0.3001              0.14710
1          0.08474           0.07864          0.0869              0.07017
2          0.10960           0.15990          0.1974              0.12790
3          0.14250           0.28390          0.2414              0.10520
4          0.10030           0.13280          0.1980              0.10430

   ...  texture_worst  perimeter_worst  area_worst  smoothness_worst  \
0  ...          17.33           184.60      2019.0            0.1622
1  ...          23.41           158.80      1956.0            0.1238
2  ...          25.53           152.50      1709.0            0.1444
3  ...          26.50            98.87       567.7            0.2098
4  ...          16.67           152.20      1575.0            0.1374

   compactness_worst  concavity_worst  concave points_worst  symmetry_worst  \
0             0.6656           0.7119                0.2654          0.4601
1             0.1866           0.2416                0.1860          0.2750
2             0.4245           0.4504                0.2430          0.3613
3             0.8663           0.6869                0.2575          0.6638
4             0.2050           0.4000                0.1625          0.2364

   fractal_dimension_worst  Unnamed: 32
0                  0.11890          NaN
1                  0.08902          NaN
2                  0.08758          NaN
3                  0.17300          NaN
4                  0.07678          NaN

[5 rows x 33 columns]
```

In [20]:
```
# Pairplot to visualize relationships between features
sns.pairplot(data, hue='diagnosis', vars=['radius_mean', 'texture_mean', 'perimeter_mean', 'area_mean'])
plt.show()
```



In [21]:
```
# Heatmap to visualize correlations between features
plt.figure(figsize=(12, 10))
sns.heatmap(data.corr(), annot=True, fmt='.2f')
plt.show()
```



In [22]:

```
# Check for missing values
print(data.isnull().sum())

# Replace missing values with the mean of the respective columns
data.fillna(data.mean(), inplace=True)

# Verify that there are no more missing values
print(data.isnull().sum())
```

```
id                         0
diagnosis                  0
radius_mean                0
texture_mean               0
perimeter_mean             0
area_mean                  0
smoothness_mean            0
compactness_mean           0
concavity_mean             0
concave points_mean        0
symmetry_mean              0
fractal_dimension_mean     0
radius_se                  0
texture_se                 0
perimeter_se               0
area_se                    0
smoothness_se              0
compactness_se             0
concavity_se               0
concave points_se          0
symmetry_se                0
fractal_dimension_se       0
radius_worst               0
texture_worst              0
perimeter_worst            0
area_worst                 0
smoothness_worst           0
compactness_worst          0
concavity_worst            0
concave points_worst       0
symmetry_worst             0
fractal_dimension_worst    0
Unnamed: 32              569
dtype: int64
id                         0
diagnosis                  0
radius_mean                0
texture_mean               0
perimeter_mean             0
area_mean                  0
smoothness_mean            0
compactness_mean           0
concavity_mean             0
concave points_mean        0
symmetry_mean              0
fractal_dimension_mean     0
radius_se                  0
texture_se                 0
perimeter_se               0
area_se                    0
smoothness_se              0
compactness_se             0
concavity_se               0
concave points_se          0
symmetry_se                0
fractal_dimension_se       0
radius_worst               0
texture_worst              0
perimeter_worst            0
area_worst                 0
smoothness_worst           0
compactness_worst          0
concavity_worst            0
concave points_worst       0
symmetry_worst             0
fractal_dimension_worst    0
Unnamed: 32              569
dtype: int64
```

In [23]:
```
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import StandardScaler
```

In [24]:
```
# Split the data into features and target
X = data.drop(['id', 'diagnosis', 'Unnamed: 32'], axis=1)
y = data['diagnosis']
```

In [25]:
```
# Split the data into training and testing sets
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)
```

In [26]:
```
# Standardize the features
scaler = StandardScaler()
X_train = scaler.fit_transform(X_train)
X_test = scaler.transform(X_test)
```

In [27]:
```
from sklearn.ensemble import RandomForestClassifier
from sklearn.metrics import accuracy_score, classification_report, confusion_matrix
```

In [28]:
```
# Initialize the model
model = RandomForestClassifier(n_estimators=100, random_state=42)

# Train the model
model.fit(X_train, y_train)
```

Out[28]:
```
RandomForestClassifier(random_state=42)
```

In [29]:
```
# Make predictions
y_pred = model.predict(X_test)
```

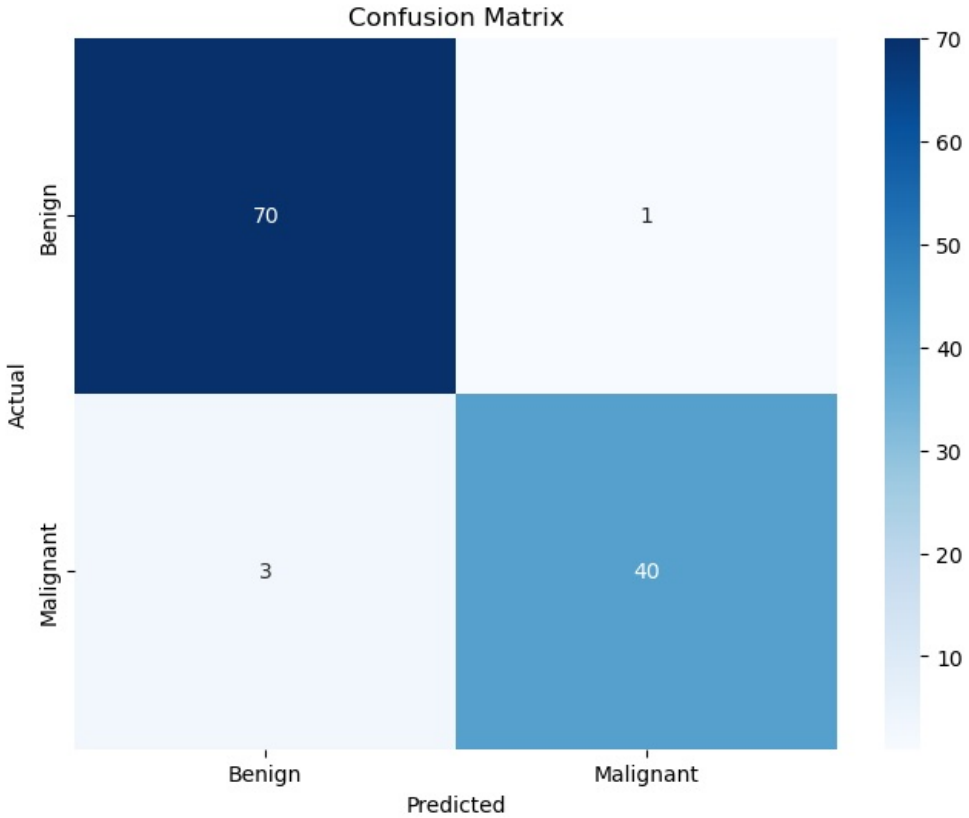
In [30]:
```
# Evaluate the model
print("Accuracy:", accuracy_score(y_test, y_pred))
print("Classification Report:\n", classification_report(y_test, y_pred))
print("Confusion Matrix:\n", confusion_matrix(y_test, y_pred))
```

```
Accuracy: 0.9649122807017544
Classification Report:
               precision    recall  f1-score   support

           0       0.96      0.99      0.97        71
           1       0.98      0.93      0.95        43

    accuracy                           0.96       114
   macro avg       0.97      0.96      0.96       114
weighted avg       0.97      0.96      0.96       114

Confusion Matrix:
 [[70  1]
 [ 3 40]]
```

In [31]:
```
import seaborn as sns
import matplotlib.pyplot as plt
from sklearn.metrics import confusion_matrix
```

In [32]:
```
# Confusion matrix
cm = confusion_matrix(y_test, y_pred)
```

In [33]:
```
plt.figure(figsize=(8, 6))
sns.heatmap(cm, annot=True, fmt='d', cmap='Blues', xticklabels=['Benign', 'Malignant'], yticklabels=['Benign',
plt.xlabel('Predicted')
plt.ylabel('Actual')
plt.title('Confusion Matrix')
plt.show()
```



In [ ]: