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39 plt.figure(figsize=(10,5))
40 plt.scatter(X_test_s, y_test_s, color='blue', label='Actual')
41 plt.plot(X_test_s, y_pred_s, color='red', linewidth=3, label='Prediction')
42 plt.title('Simple Linear Regression\n(petal_length → petal_width)')
43 plt.xlabel('Petal Length (cm)')
44 plt.ylabel('Petal Width (cm)')
45 plt.legend()
46 plt.grid(True, alpha=0.3)
47 plt.show()
48
49 # 2. MULTIPLE LINEAR REGRESSION (All 3 numeric features)
50 X_multiple = df[['sepal_length', 'sepal_width', 'petal_length']]
51
52 X_train_m, X_test_m, y_train_m, y_test_m = train_test_split(X_multiple, y,
53     ↪ test_size=0.2, random_state=42)
54
55 model_multiple = LinearRegression()
56 model_multiple.fit(X_train_m, y_train_m)
57 y_pred_m = model_multiple.predict(X_test_m)
58
59 print("\n" + "="*60)
60 print("2. MULTIPLE LINEAR REGRESSION (3 features → petal_width)")
61 print("="*60)
62 print(f"Coefficients : {model_multiple.coef_.round(4)}")
63 print(f"Intercept: {model_multiple.intercept_:.4f}")
64 print(f"R2 Score: {r2_score(y_test_m, y_pred_m):.4f}")
65
66 # Feature importance (coefficient magnitude)
67 features = X_multiple.columns
68 coefs = np.abs(model_multiple.coef_)
69 plt.figure(figsize=(8,5))
70 sns.barplot(x=coefs, y=features, palette='magma')
71 plt.title('Feature Importance in Multiple Regression')
72 plt.xlabel('Absolute Coefficient Value')
73 plt.show()
74
75 # Actual vs Predicted (Multiple)
76 plt.figure(figsize=(8,6))
77 plt.scatter(y_test_m, y_pred_m, color='green', alpha=0.7)
78 plt.plot([y.min(), y.max()], [y.min(), y.max()], 'r--')
79 plt.xlabel('Actual Petal Width')
80 plt.ylabel('Predicted Petal Width')
81 plt.title('Multiple Linear Regression: Actual vs Predicted')
82 plt.grid(True, alpha=0.3)
83 plt.show()
84
85 # FINAL COMPARISON
86 print("\n" + "="*60)

```