DS 3010 – Homework 3

Grading Rubric

This rubric explains how **Homework 3** will be graded. Please review it carefully so you understand how points are allocated.

Problem 1: Statistical Inference (63 pts)

(a) Model fitting and hypothesis test (20 pts)

(a)(i) Model fit and summary table (10 pts)

(a)(ii) One coefficient t-test at $\alpha = 0.05$ (10 pts)

- H0 and H1: 2 pts

- Test statistic (t-value): 2 pts

- Null distribution stated (df not required for full credit): 2 pts

- p-value: 2 pts

- Conclusion (in context): 2 pts

(b) PRACTICE

(c) PRACTICE

(d) (6 pts)

(e) RSS values (6 pts)

- RSS for full model: 3 pts

- RSS for reduced model: 3 pts

(f) Overall F-test at $\alpha = 0.05$ (10 pts)

- H0 and H1: 2 pts

- Test statistic: 2 pts

- Null distribution stated (df not required for full credit): 2 pts

- p-value: 2 pts

- Conclusion (in context): 2 pts

(g) Estimate f(X) + interval (6 pts)

- Point estimate of f(X): 3 pts

- Appropriate interval: 3 pts

(h) Predict Y + interval (6 pts)

- Point prediction for Y: 3 pts

- Appropriate interval: 3 pts

(i) PRACTICE

(j) Extrapolation / limitation (6 pts)

- Prediction: 3 pts

- Discussion: 3 pts

(k) Is $\hat{Y}$ an unbiased estimator of Y? (2 pts)

- Correct answer with statistical justification: 2 pts

- If incorrect but includes meaningful statistical reasoning: 1 pt

Problem 2: The Challenge of Multiple Testing (16 pts)

(a) Expected number of false positives (4 pts)

(b) Simulation with varying number of tests (12 pts)

- Results show false positives increase as p increases: 6 pts

- Clear plot/table with labeled axes demonstrating the trend: 6 pts

Problem 3: More Simulations (9 pts)

(a) True parameter values (9 pts)

- β_0: 3 pts

- β_1: 3 pts

- β_2: 3 pts

(b)–(e) PRACTICE (0 pts)

Problem 4: Consulting (12 pts)

(a) (6 pts)

(b) (6 pts)

(c) PRACTICE