Interpolation/extrapolation

6 questions | 18 marks

Equivalent correct methods earn the corresponding marks.

1. Data were collected for x from 5 to 20. Classify predictions at $x = 12$ and $x = 25$. [3 marks]

Compare each input with the observed explanatory range.

Answer: 12: interpolation; 25: extrapolation.

2. The observed x-values are 1,3,5,7. Is a prediction at $x = 4$ interpolation even though $x = 4$ was not observed? [3 marks]

Four is inside the range 1-7.

Interpolation does not require an existing observation at that exact input.

Answer: Yes.

3. A fitted line is $\hat{y} = 8 + 1.5x$. Predict at $x = 10$ and state why the equation alone is insufficient to judge reliability. [3 marks]

Substitute: $8 + 15 = 23$.

Arithmetic does not reveal whether this is extrapolation or whether residual scatter is small.

Answer: 23; the observed x-range and fit information are also needed.

4. A model predicts 112% attendance. Explain the appropriate response. [3 marks]

Do not report the impossible value uncritically.

Answer: Attendance cannot exceed 100%; check the model, data and prediction domain.

5. A model from one machine type is applied to a newer machine. What assumption needs checking? [3 marks]

Being inside the numerical x-range does not guarantee the same population/model.

Answer: The relationship and operating conditions must transfer to the new machine type.

6. Why might a prediction inside a range containing only two distant observations be unreliable? [3 marks]

Numerical interpolation classification does not measure evidence density.

Answer: The unobserved interior form is poorly supported; the relationship may curve or vary substantially.