

1. Use a first principles approach to select appropriate the appropriate model family
 2. Use a first principles approach to select appropriate parameters for a model
 3. Use an empirical approach to select appropriate the appropriate model family
 4. Use an empirical approach to select appropriate parameters for a model
 5. Use SSE and R^2 to assess and compare models
 6. Articulate considerations that should be made in support of responsible and ethical uses of predictive models
 7. Interpret and communicate results appropriately to an audience
 8. Identify and justify modeling decisions and assumptions
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Example Problems:

You've been given three different datasets. Your job is to select and justify the best model for each dataset. You must:

- Try at least two model types per dataset.
- Compare using both numerical fit and contextual interpretation.
- Recommend one model for each dataset and explain why it's the best choice.
- Identify which model represents its specific dataset best.

Problem 1

A product was launched recently, and marketing wants to understand how unit sales are growing over time. You're given sales data from the first 10 days after launch. The units sold are the number of units sold that day. Use the data to model and forecast future sales.

Day from Launch	Units Sold
0	12
1	13
2	21
3	32
4	32
5	46
6	58
7	73
8	92
9	113

Problem 2

A human performance study is tracking how a jogger's heart rate increases in the first 10 minutes of a run. As the body adapts to exertion, heart rate rises quickly at first, then levels off. Develop a model to capture this pattern and predict the rate at minute 15.

Time (min)	Heart Rate (bpm)
1	95
2	108
3	122
4	130
5	136
6	138
7	141
8	144
9	147
10	149

Problem 3

Engineers are analyzing a cyclist's acceleration over a flat road. Time and speed were recorded during a steady-state test run. Your goal is to model how speed increases and predict the speed at 20 seconds.

Time (s)	Speed (m/s)
0	0.5
1	1.9
2	5.0
3	11.4
4	17.5
5	22.6
6	30.0
7	36.1
8	43.1
9	49.6