ALM-1

1. Model Performance Evaluation

- **Leading Question**: How does the model's performance on the training data compare to its performance on the validation or test data?
    - **Explanation**: This question helps you assess whether your model is overfitting, underfitting, or performing well. If your model performs significantly better on the training data compared to the validation/test data, it might be overfitting (high variance). Conversely, if the model performs poorly on both, it could be underfitting (high bias).

2. Error Analysis

- **Leading Question**: What are the sources of error in your model?
    - **Explanation**: Identifying whether the errors are due to bias (errors due to assumptions made by the model) or variance (errors due to model sensitivity to small fluctuations in the training set) is crucial. This understanding will guide you in making necessary adjustments to your model.

3. Model Complexity

- **Leading Question**: How does changing the complexity of the model (e.g., increasing/decreasing the number of features, adjusting the depth of a neural network) affect its performance?
    - **Explanation**: This question aims to explore how model complexity affects the tradeoff between bias and variance. More complex models may have lower bias but higher variance, while simpler models might have higher bias and lower variance. Observing performance changes with varying complexity will help in finding a good balance.

4. Training vs. Validation Error

- **Leading Question**: How do the training and validation errors change as you adjust model parameters or training duration?
    - **Explanation**: This is about monitoring the relationship between training and validation errors over different training phases or model configurations. A high training error with a low validation error might indicate underfitting, whereas a low training error with a high validation error often indicates overfitting.

5. Regularization Techniques

- **Leading Question**: How do different regularization techniques (e.g., L1, L2 regularization, dropout) affect your model's bias and variance?
    - **Explanation**: Regularization techniques are used to prevent overfitting. L1 regularization can lead to sparsity, L2 regularization can smooth the model, and dropout can prevent co-adaptation of neurons in neural networks. Analyzing how

these techniques affect bias and variance in your model will help in fine-tuning your approach to achieve better generalization.

By systematically addressing these questions, you can gain deeper insights into your model's behavior and improve its performance by balancing bias and variance effectively.