1 point

1.

True or False: The mean and standard deviation of the posterior distribution of a slope or intercept parameter in Bayesian linear regression is equal to the least squares estimate and corresponding standard error if the reference prior is used and normally distributed errors are assumed.

- True
- False

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1 point

2.

A simple linear model (either Bayesian or frequentist) that tries to predict an individual's height from his/her age is unlikely to perform well, since human growth rates are non-linear with regard to age. Specifically, humans tend to grow quickly early in life, stop growing at through most of adulthood, and sometimes shrink somewhat when they get old. Which of the following modifications to a simple linear regression model should you prefer?

- Imposing strong prior distributions on the parameters in a Bayesian analysis.
- Including terms of age^2 and or $\log(age)$ as covariates in the model.
- Log-transforming the dependent variable (height) to account for skewness.

- Including other relevant covariates such as weight or income.

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1 point

3.

You fit a linear model on 1000 data points and identify a point that lies 3 standard deviations above its predicted value. Should you worry about this potential outlier? Why or why not?

- No, because the probability that all 1000 points will be within 3 standard deviations of their predicted values is 0.07, so it is unsurprising to observe a point 3 standard deviations away from its predicted value.
- Yes, because outliers can have high leverage and result in a poorly fit model.
- No, because the probability that all 1000 points will be within 3 standard deviations of their predicted values is 0.74, so it is not implausible to observe a point 3 standard deviations away from its predicted value.
- Yes, since the probability of a point deviating from its predicted value by at least 3 standard deviations is roughly 0.003, which suggests that the point is an outlier.

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1 point

4.

Suppose a researcher is using Bayesian multiple regression to quantify the effect of vitamin C on cancer patient mortality. The central 95% posterior credible interval of the coefficient of vitamin C dosage is (-0.19, -0.07). Assuming the model assumptions are valid, what can we say about the effect of vitamin C on cancer patient mortality?

- The posterior probability that the coefficient of vitamin C is greater than zero is low, so there is a high posterior probability of a negative association between vitamin C and cancer patient

mortality.

- We reject the null hypothesis of no difference, since the 95% credible interval does not include zero.
- There is not enough information to quantify the effect of vitamin C on cancer patient mortality.

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1 point

5.

Which of the following is not a principled way to select a model?

- Select the model with the lowest BIC.
- Pick the model with the highest Adjusted R^2.
- Pick the model with the highest R^2
- Use Bayesian Model Averaging and select the model with the highest posterior probability.

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1 point

6.

In a linear model with an intercept term (that is always included) and 3 potential predictors, how many possible models are there?

- 3
- 4
- 8
- 16

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1 point

7.

Suppose that a MCMC sampler is currently visiting model B. Model A has a higher posterior probability than model B and Model C has a lower posterior probability than model B. Which of the following statements is true in the MCMC algorithm?

- If a jump to Model C is proposed, this jump is always accepted.
- If a jump to Model A is proposed, this jump is never accepted.
- If a jump to Model A is proposed, this jump is always accepted.
- If a jump to Model C is proposed, this jump is never accepted.

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1 point

8.

Which of the following is **not** a useful method of checking a linear model after it is fit?

- Comparing the distribution of fitted values to the distribution of observed data.
- Ensuring that R^2 is as close to 1 as possible.
- Examining the influence of potential outliers on the parameters of the model.
- Plotting the residuals to check for non-normally distributed residuals.

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1 point

9.

Why is the Zellner g-prior useful in Bayesian model averaging?

- It simplifies prior elicitation down to two components, the prior mean and g.
- It prevents BMA from disproportionately favoring the null model as a result of the Bartlett-Lindley paradox.
- It helps shrink the coefficients towards 0, which is important if the variables are highly correlated.

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1 point

10.

When selecting a single model from an ensemble of models in the case of Bayesian model averaging, which of the following selection procedures corresponds to choosing the "median probability model"?

- Including only the coefficients with posterior model inclusion probability above 0.5.
- Selecting the model that generates predictions most similar to those obtained from averaging over the model space.
- Selecting the model with the highest posterior model probability.

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