Week 4 Quiz

6/10 points earned (60%)

You haven't passed yet. You need at least 80% to pass.
Review the material and try again! You have 3 attempts every 8 hours.

Back to Week 4

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1 / 1 points

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

Correct
This question refers to the following learning objective(s):

- Understand the basics of Bayesian linear regression and how it relates to Frequentist regression.

- False

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1 / 1 points

2.

A linear model was estimated using Bayesian methods to predict the height of a male based on his age. All males used in the data are between the ages of 3 to 9 years old. Is it appropriate to use this model to predict the height of a 21 year old man?

- [x] No, since extrapolating outside the range of age observed in the data set may result in a nonsensical prediction.

Correct
This question refers to the following learning objective(s):

- Identify the assumptions of linear regression and assess when a model may need to be improved.

- [ ] No, since heights may be skewed right, which violates the assumption of normality.
- [ ] Yes, as long as proper priors are given to the parameters to ensure that the posterior is proper.
- [ ] Yes, an advantage of Bayesian statistics is its ability to generate predictions and express uncertainty in terms of probabilities.

✔ 1 / 1 points

3.
Suppose we want to set a level k such that if we observe a data point more than k standard deviations away from the mean, we deem it an outlier. If the number of observations is 1000, what is the probability that we observe an outlier at least 4 standard deviations away from its prediction value?

- [ ] 0.03
- [x] 0.06

Correct
This question refers to the following learning objective(s):

- Check the assumptions of a linear model
- Identify outliers and high leverage points in a linear model.

- [ ] 0.12
- [ ]

0.24

0 / 1 points

4.

Suppose we use Bayesian methods (with a prior distribution) to fit a linear model in order to predict the final sale price of a home based on quantifiable attributes of the home. If the 95% posterior predictive interval of a new home (not in the data set) is (312,096, 392,097), which of the following statements represents a correct interpretation of this interval?

- This house would be sold for between 312,096 and 392,097 95% of the time.
- 95% of houses with the same attributes as this house have will be sold for prices between 312.096 and 392,097.

This should not be selected

A 95% posterior predictive interval in a Bayesian context can be interpreted as an interval such that the probability of the actual (unobserved) value lying in the interval is 0.95.

This question refers to the following learning objective(s):

- Interpret Bayesian credible and predictive intervals in the context of multiple linear regression.

- The probability that the house will sell for between 312,096 and 392,097 is 0.95.
- 95% of houses with the same attributes as this house have historically sold for prices between 312.096 and 392,097.

0 / 1 points

5.

Which of the following goes into the calculation of the Bayesian Information Criterion (BIC)?

- The maximum value of the log-likelihood under the current model, a constant penalty, and the number of parameters in the model.
- The maximum value of the log-likelihood under the current model

The maximum value of the log-likelihood under the current model.

This should not be selected

The formula for the BIC is $-2L + \log(n)k$, where L corresponds to the maxmimum value of the log-likelihood, n is the sample size, and k is the number of parameters in the model.

This question refers to the following learning objective(s):

- Use principled statistical methods to select a single parsimonious model.

- The maximum value of the log-likelihood under the current model and the number of parameters in the model.
- The maximum value of the log-likelihood under the current model, the sample size, and the number of parameters in the model.

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1 / 1 points

6.

In a linear model with an intercept term (that is always included) and 4 potential predictors, how many possible models are there?

- 4
- 5
- 16

Correct

This question refers to the following learning objective(s):

- Implement Bayesian model averaging for both prediction and variable selection.

- 32

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1 / 1 points

7

7.

Can Bayesian model averaging be done with a large amount of predictors?

- No, since it will take forever to average over 2^k possible models when k is large.
- Yes, but Monte Carlo sampling techniques will need to be done to approximate the posterior distribution

Correct

This question refers to the following learning objective(s):

- Understand the importance and use of MCMC within Bayesian model averaging.

- Yes, it is possible to find the posterior model probabilities in closed form by using the conjugate Zellner g-prior.

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0 / 1 points

8.

Which of the following is not an assumption made in Bayesian multiple regression?

- The errors have constant variance.
- The errors are independent.

This should not be selected

If the errors have positive autocorrelation, then the observations are not independent, which we assume in Bayesian multiple regression.

This question refers to the following learning objective(s):

- Deduce how wrong model assumptions affect model results.

- The errors have positive autocorrelation.
- The errors are normally distributed.

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1 / 1 points

9.

Which of the following is an advantage of using the Zellner-Siow-Cauchy prior in Bayesian model averaging?

- a. It helps shrink the coefficients towards 0, which is important if the variables are highly correlated.
- b. It prevents BMA from disproportionately favoring the null model as a result of the Bartlett-Lindley paradox.
- c. It allows for uncertainty in the prior variance parameter g.
- d. Both b and c.

Correct

This question refers to the following learning objective(s):

- Understand the purpose of prior distributions within Bayesian model averaging.

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0 / 1 points

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"?

- 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.

This should not be selected

The median probability model includes only the coefficients with posterior model inclusion probabilities above 0.5. Refer to lecture 5.4.4.

This question refers to the following learning objective(s):

- Implement Bayesian model averaging for both prediction and variable selection.

- Including only the coefficients with posterior model inclusion

probability above 0.5.