CSP 571 Data Preparation and Analysis

Quiz - 3

Question 1

The estimate of test error from leave-one-out cross-validation will have a lower bias than k-fold cross-validation, but will also have a higher variance due to all trained models being highly

- a. optimal.
- b. diversified.
- c. correlated. ✓
- d. biased.

Question 2

OLS is unlike to estimate coefficient values equal to 0, thus models containing many predictors is likely to have poor model interpretation due to many

- a. funny variables.
- b. volatile variables.
- c. irrelevant variables. ✓
- d. unknown variables.

Question 3

The use of partial residuals for estimation of a Generalized Additive Model (GAM) involves fitting a non-linear f_j to each X_j while holding other terms constant - and is referred to as

- a. partial least squares
- b. weighted least squares
- c. backfitting ✓
- d. regularization

Question 4

Best subset selection for a set of n observations with d dimensions leads to optimal model selection from a set of

- a. 2^d models. ✓
- b. d^2 models.
- c. nd models.
- d. 2^n models.

Question 5

Given a polynomial regression with polynomial terms of degree d, the following number of coefficients would need to be estimated via least squares

- a. $n-d-1$
- b. d
- c. $d-1$
- d. $d+1$ ✓

Question 6

A smoothing spline function can be expressed as a combination of a loss function and a

- a. optimization term
- b. polynomial term
- c. penalty term
- d. integer term

Question 7

What additional constraints are applied to cubic splines in order to obtain natural splines

- a. minimum-value constraints
- b. maximum-value constraints
- c. zero-value constraints
- d. boundary constraints

Question 8

The use of a family of functions to transform predictor variables, with polynomial regression and piecewise regression being special cases of this approach, is accomplish via the following types of functions

- a. basis
- b. spline
- c. indicator
- d. error

Question 9

Lasso not only performs shrinkage on coefficient values, by setting certain coefficients to 0 for a sparse result, it also perform

- a. model validation.
- b. variable selection.
- c. bias reduction.
- d. density estimation.

Question 10

A non-parametric approach to non-linear regression where regression is performed in a neighborhood of a given point x_0 is referred to as

- a. cut-point regression
- b. truncated regression
- c. local regression
- d. polynomial regression

Question 11

Unconstrained regression splines of degree d with k knots results in an estimation with the following number of degrees of freedom

- a. $(k+1)(d+1)$
- b. kd
- c. $k+d$
- d. $(k-1)(d-1)$

Question 12

10 points

When comparing models containing a different number of predictors in the estimation, we may obtain an estimate of test error using C_p, AIC, BIC, or $Adjusted\ R^2$ which apply a penalty based on the number of used predictors d, to

- a. test error using MSE.
- b. sample error using $\frac{n-1}{n}$.
- c. training error using RSS.
- d. training error using μ_y.

Question 13

Which of the below is not one of the constraints applied to cublic splines

- a. continuity of first-derivative at knot point
- b. continuity of third-derivative at knot point
- c. continuity of second-derivative at knot point
- d. continuity at knot point

Question 14

Ridge regression applies a constraint to the RSS objective function via the

- a. L_∞ norm.
- b. L_0 norm.
- c. L_2 norm.
- d. L_1 norm.

Question 15

When performing piecewise regression using step functions, the creation of K cut points divides the range of the predictor into regions of the following number of interval

- a. $K-1$
- b. K
- c. $K+2$
- d. $K+1$