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Problem #

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Question

Difficulty: Core 1

You are given the following table for model selection:

Model	Scaled Deviance	Number of parameters ($k+1$)	AIC
Intercept + Age	A	4	225
Intercept + Risk Class	261	8	
Intercept + Age + Vehicle Value	264	X	
Intercept + Age + Risk Class + Vehicle Value	B	Y	307

Monitor Difficulty Level

Calculate Y .

A 16

B 23

C 24

D 17

Helpful Strategies To Get You Started

Comprehensive Solutions with Alternative Solutions When Available

Help Me Start

Recall that the AIC is $AIC = -2\ell + 2p$, where $p = k + 1$ is the number of parameters. What can you infer from the difference between two AICs?

The scaled deviance is $D^* = 2(\ell_{sat} - \ell)$. Can you do the same with scaled deviances?

Solution

The AIC is $AIC = -2\ell + 2p$, where $p = k + 1$ is the number of parameters.

The difference in AICs is

$$AIC_2 - AIC_1 = 2(\ell_1 - \ell_2) + 2(p_2 - p_1) = (D_2^* - D_1^*) + 2(p_2 - p_1).$$

The scaled deviance is $D^* = 2(\ell_{sat} - \ell)$.

Since the saturated model is the same for all four models, the difference in the scaled deviance is,

$$D_2^* - D_1^* = 2(\ell_1 - \ell_2).$$

We can use this relationship to find X , then Y .

Comparing the second and the third model,

$$AIC_3 - AIC_2 = (D_3^* - D_2^*) + 2(p_3 - p_2)$$

$$233 - 214 = (264 - 261) + 2(X - 8).$$

This tells us X is 16.

From the second model alone, we see that Risk Class has 7 parameters.

The fourth model, must have 7 parameter more than the third model.

Therefore, Y is 23.

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