Week-6 in class activities / Lab.

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Task-1(a): Interpreting Logistic Regression model.

Here, Given a Logistic regression model

$$\ln\left(\frac{p}{1-p}\right) = -3 + 0.8 * \text{Hours\_studied} + 1.5 * \text{Review\_session}.$$

(a) Here, Hours_studied = 2.

Review_session = 0.

(1) Log odds $\ln\left(\frac{p}{1-p}\right) = -3 + 0.8 \times 2 + 1.5 \times 0.$

$\ln\left(\frac{p}{1-p}\right) = -1.4$	= Log odds

(2) odds $\left(\frac{p}{1-p}\right) = e^{-1.4}$

$\left(\frac{p}{1-p}\right) = 0.2466$	= odds

(3) Likelihood (P)

$$P = 0.2466 \times (1-P)$$

$$P = 0.2466 - 0.2466P$$

$$\therefore P(1+0.2466) = 0.2466$$

$$\therefore P = \frac{0.2466}{1.2466} = 0.1978$$

$\therefore$ $P = 0.1978$ = likelyhood

(b) Here, Hours_Studied = 2.

Review_Session = 1.

(1) log odds $\ln\left(\frac{p}{1-p}\right) = -3 + 0.8 \times 2 + 1.5 \times 1$

$\ln\left(\frac{p}{1-p}\right) = 0.1$	= log odds

(2) odds $\left(\frac{p}{1-p}\right) = e^{0.1}$

$\left(\frac{p}{1-p}\right) = 1.1052$	= odds

(3) likelihood (p)

$$p = 1.1052 \times (1-p)$$

$$p = 1.1052 - 1.1052p$$

$$p(1 + 1.1052) = 1.1052$$

$$p = \frac{1.1052}{2.1052} = 0.52498.$$

$p = 0.52498$	= likelihood

(c) Yes, Based on the given regression model, and plot, if Thomas studied more or less hours then answer would change.

(d) Here, for interpretation

$$\frac{\text{odds(Review\_session\_1)}}{\text{odds(Review\_session\_0)}} = e^{1.5} = 4.4817.$$

Hence, if Thomas go to the Review_session then his odds are 4.4817 times than the odds, if he does not go to Review_session.

(e) Here, the co-efficient of Hours_studied (0.8) signifies that for each additional hour of study, there is an 0.8 increase in the log odds of passing the exam. In simple words, studying for more hours is associated (associated) with a higher likelihood of passing the exam, as it positively influences the log odds.

(f) The intercept (-3) represents the log odds of passing the exam when both "Hours_studied" and "Review_session" are zero. It serves as a starting point for log odds. And it shows the expected outcome in the absence of these factors. In simple words, the intercept suggest that without any study hours and without attending the review session, the log odds of passing the exam is/"-3".

(are).

(g) For someone who studied 8 hours, I would recommend him/her to attend the review session because I can see from the plot that if he/she attend the review session then there is a little amount of increase in the likelihood of passing the exam. So, definitely I would recommed him/her to attend the review session.

(h) Based on this given logistic regression model, the students who studied for a moderate amount of time and attend the review sessions seems to benefit most.