LAB WEEK-06

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Task1a: Interpreting Logistic Regression model

Given a logistic regression model

$$\ln\left(\frac{p}{1-p}\right) = -3 + 0.8 \times \text{Hours\_Studied} + 1.5 \times \text{Review\_Session}$$

Answer the following questions:
(you may use the provided "logistic regression" notebook and AI assistant.)

a. Thomas studied for two hours and did not attend the review session.

```
log_odds_thomas = log_odds(2, 0)
odds_thomas = np.exp(log_odds_thomas)
probability_thomas = logistic_function(log_odds_thomas)
```

```
Log Odds for Thomas: -1.4
Odds for Thomas: 0.2465969639416065
Probability of Passing for Thomas: 0.19781611144141825
```

b. If Thomas goes to the review session, what is the updated 1) log_odds, (2) odds, and (3) likelihood of passing the exam?

```
log_odds_thomas = log_odds(2, 1)
odds_thomas = np.exp(log_odds_thomas)
probability_thomas = logistic_function(log_odds_thomas)
```

```
Log Odds for Thomas: 0.10000000000000009
Odds for Thomas: 1.1051709180756477
Probability of Passing for Thomas: 0.52497918747894
```

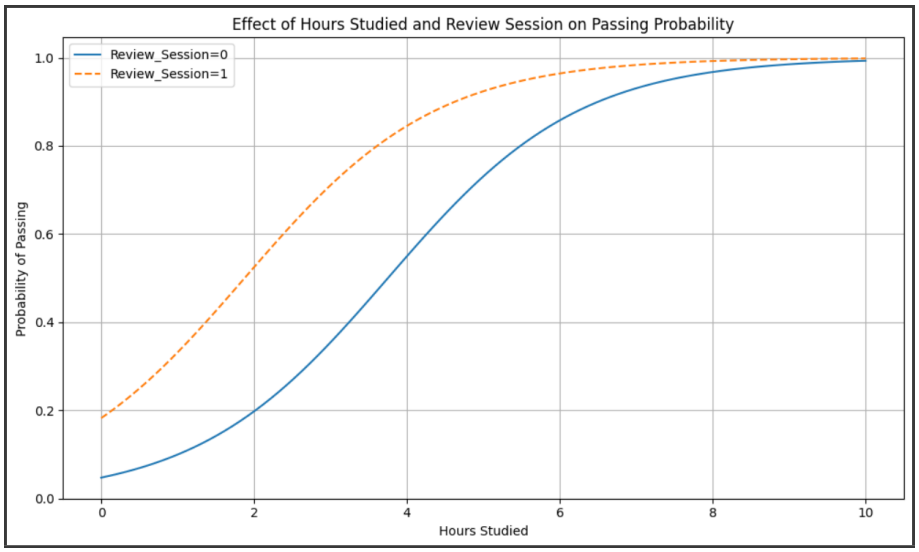
c. If Thomas studied more or less hours, would the answer change?
Yes, according to the model, each additional hour studied increases the log odds of passing by 0.8. This increase suggests that more study hours would lead to higher log odds of passing. Since the logistic function, which shapes like an S-curve, maps these higher log odds to a higher probability of success, more hours of studying would likely improve the chances of passing. Conversely, reducing the hours of study would decrease the probability of passing.

d. How would you interpret the coefficient of review session (1.5) from the above experiment?
   Ans: The coefficient of 1.5 for attending a review session indicates that attendance increases the log odds of passing the exam by 1.5 units compared to not attending. When translated into odds using the exponential function, e1.5e^{1.5}e1.5, this results in approximately 4.48 times higher odds of passing for students who attend review sessions compared to those who don't. Essentially, attending the review session makes a student over four times more likely to pass the exam than if they did not attend.

e. Using similar reasoning, how would you interpret the coefficient of hours studied (0.8)
   Ans: Expressed in terms of odds, each additional hour of study increases the odds of passing by a factor of e^0.8, which is approximately 2.23. This means that every additional hour spent studying more than doubles the odds of passing compared to not studying that additional hour.

f. How would you interpret the intercept?
   Ans: The intercept of -3 in this logistic regression model indicates the log odds of passing the exam when both independent variables—hours studied and review session attendance—are zero. In other words, if a student does not study or attend any review sessions, the log odds of passing the exam are -3. Converting these log odds to probability gives us approximately 4.7%, signifying a very low likelihood of passing the exam without any preparation.

g. For someone who studied 8 hours, would you recommend him/her to attend the review session?
   Ans: Below is the graph of the students attending review session and not attending review session we can see the gap between two line if there is a gap between the two lines then the student should take the review session it will help him increasing the probability of passing exam. For student studying for 8 hours, we can see still there is small gap. So, I would recommend him to attend review session



h. What type of students seems to benefit most from the review session?
Ans: Same as above question in the graph you can see generally the students studying for less hours are benefitted more from the review session. Where the gap is the biggest that student will be benefitted the most.