Logistic Regression Review Cheat Sheet

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Interpretation of Coefficients

Beta-0

- log(odds) when X1 = 0..., X-i = 0
- Often not intepretable (outside range of data)
- Sometimes can be thought of as background odds

Beta-1

- Difference in log(odds) for two groups differing in their level of X-1 by one unit, but otherwise similar for all other X-i (same as the log of the OR comparing these two groups)
- Because of the properties of logoarthms, beta-1 is also the log of the odds ratio for two groups differing in their level of X-1 by one unit, but otherwise similar for all other X-i
- (beta-1)(1) is the log odds ratio between two groups differing in X-1 by one unit, while (beta-1)(5) is the log odds ratio between two groups differing in X-1 by five units

e^beta-1

Interpretation of Coefficients (cont)

- Odds ratio for two groups differing in their level of X-1 by one unit, but otherwise agreeing in their level of all other X-i
- Similarly: (beta-1)(5) is the log(odds) between two groups different in their value of X-1 by 5, and e^(beta-1)(5) is the odds ratio between two such groups
- (e^beta-1)(1) is OR comparing one unit apart, while (e^beta-1)*(5) is OR comparing five units apart

Interaction Terms

- Relationship between X and Y is moderated through Z
- This means the OR for Y between two groups that differ on X varies with Z

log(odds(Y|X,Z)) = beta-0 + beta-X(X) + beta-Z(Z) + beta-X-Z(X*Z)

Coefficient Interpretation

- Beta-0 still log(odds) of Y, given all X-i are zero

Interaction Terms (cont)

- Beta-X is difference in log(odds) of Y between two groups differing by one unit of X, when Z = 0
- Beta-Z is difference in log(odds) of Y between two groups differing by one unit of Z, when X = 0
- Possible that X and/or Z = 0 outside of range of data, but still need to include this

Interaction Term

- BetaXZ is change in slope per 1 unit difference in X, comparing 1 unit differences in Z
- e^beta(interaction) is ratio of the OR when interacting variable =1 compared to when interacting variable = 0
- "The interaction term is the difference in log(OR) comparing situations where the interacting variable differs by one unit."
- Note that on the log scale, this is a difference, whereas on the OR scale, it is a ratio

Model Fitting

- Model coefficients estimated by achieving "minimum deviance"
- No general formula exists for this; software is needed to do this
- The beta-hats identified through this process are called the maximum likelihood estimates (MLEs) of the true beta-0 and beta-1

Likelihood Theory

- Provides tools for converting modeling assumptions into SE estimates
- Assumes that in population, Y and X really do have logistic relationship; however, can still get "best estimates" with minimum deviance (just no SEs/CIs)

Estimation Theory

- Use robust estimates to obtain SEs/CIs of coefficients in the model, even when true population is not a logistic relationship
- Point estimates will be same as model-based, but CIs are slightly different