

Assignment 5 - Stat\*3240  
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dir = "C:\\Users\\graha\\Google Drive\\1 Math Undergrad\\1 UoGuelph\\2_Fall_19\\Applied  
Regression Analysis\\Assignment 5\\"  
file1 = "3240_F19_sparrows.csv"  
dfSparrow = read.table(file=paste(dir,file1, sep=""), header=TRUE, sep=',')
```

```
SURVIVED = ifelse(dfSparrow$STATUS=="Survived",1,0)  
logitSparrow = glm(SURVIVED~TL+WT+HL+SK+KL, family=binomial, data=dfSparrow)  
summary(logitSparrow)
```

Call:

```
glm(formula = SURVIVED ~ TL + WT + HL + SK + KL, family = binomial,  
    data = dfSparrow)
```

Deviance Residuals:

Min	1Q	Median	3Q	Max
-2.4118	-0.5565	0.1696	0.6338	2.1049

Coefficients:

	Estimate	Std. Error	z value	Pr(> z )	
(Intercept)	35.0000	22.1617	1.579	0.114267	
TL	-0.6001	0.1752	-3.426	0.000613	***
WT	-0.8881	0.3363	-2.640	0.008284	**
HL	69.8966	22.0797	3.166	0.001547	**
SK	17.5061	26.1186	0.670	0.502696	
KL	26.9066	12.1527	2.214	0.026826	*

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Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

(Dispersion parameter for binomial family taken to be 1)

Null deviance: 104.539 on 76 degrees of freedom  
Residual deviance: 61.722 on 71 degrees of freedom  
AIC: 73.722

Number of Fisher Scoring iterations: 6

Using the backwards selection procedure and a Wald's test at an  $\alpha = 0.1$  threshold, we see that SK is above the threshold and can be eliminated from the model.

```
Call:
glm(formula = SURVIVED ~ TL + WT + HL + KL, family = binomial,
    data = dfSparrow)
```

Deviance Residuals:

Min	1Q	Median	3Q	Max
-2.3013	-0.5742	0.1593	0.6214	2.2932

Coefficients:

	Estimate	Std. Error	z value	Pr(> z )	
(Intercept)	41.4340	19.9022	2.082	0.037353	*
TL	-0.5968	0.1763	-3.385	0.000711	***
WT	-0.8919	0.3315	-2.691	0.007124	**
HL	73.4637	21.5024	3.417	0.000634	***
KL	28.1772	12.2447	2.301	0.021382	*

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Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

(Dispersion parameter for binomial family taken to be 1)

Null deviance: 104.539 on 76 degrees of freedom  
 Residual deviance: 62.177 on 72 degrees of freedom  
 AIC: 72.177

Number of Fisher Scoring iterations: 6

All values are under the alpha = 0.1 threshold and so we have our final model.

a)

Our estimated model equation:

$$\ln(\pi/\hat{1}-\pi/\hat{1}) = 41.4340 - 0.5968\text{TL} - 0.8919\text{WT} + 73.4637\text{HL} + 28.1772\text{KL}$$

b)

The estimate of the parameter on Total Length (TL) is -0.5968. From this we can infer that as the total length of the sparrow increases, the predicted odds of the sparrow surviving the winter tends to decrease.

c)