

Week #11: Logistic Regression Models

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1 Introduction

Linear regression models are used to assess the association between the continuous response variable and other predictor variables. If the response variable is a binary categorical variable, the linear regression model is not appropriate. We need a new model, logistic regression models, to assess the association between the binary response variable and other predictor variables.

This module focuses on the regression model with a binary response.

2 Motivational Examples and Practical Question

Example 1. Suzuki et al. (2006) measured sand grain size on 28 beaches in Japan and observed the presence or absence of the burrowing wolf spider *Lycosa ishikariana* on each beach. Sand grain size is a measurement variable, and spider presence or absence is a nominal variable. Spider presence or absence is the dependent variable; if there is a relationship between the two variables, it would be sand grain size affecting spiders, not the presence of spiders affecting the sand.

Grain Size (mm)	Status	Numerical Status	Grain Size (mm)	status	Numerical Status
0.245	absent	0	0.432	absent	0
0.247	absent	0	0.473	present	1
0.285	present	1	0.509	present	1
0.299	present	1	0.529	present	1
0.327	present	1	0.561	absent	0
0.347	present	1	0.569	absent	0
0.356	absent	0	0.594	present	1
0.36	present	1	0.638	present	1
0.363	absent	0	0.656	present	1
0.364	present	1	0.816	present	1
0.398	absent	0	0.853	present	1
0.4	present	1	0.938	present	1
0.409	absent	0	1.036	present	1
0.421	present	1	1.045	present	1

Figure 1: Spider Data Table

```
grainsize=c(0.245, 0.247, 0.285, 0.299, 0.327, 0.347, 0.356, 0.360, 0.363, 0.364, 0.398,  
            0.400, 0.409, 0.421, 0.432, 0.473, 0.509, 0.529, 0.561, 0.569, 0.594, 0.638,
```



```
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1)
fruitflies = as.data.frame(cbind(Longevity= Longevity,
                                ThxLength = ThxLength,
                                IndReprod = IndReprod))
```