1 (Simple)Logistic Regression

1.1 Question of the Day

Y - Accepted to Medical School or Not
X - GPA

1.2 The model

$logit(\pi) = log(\frac{\pi}{(1-\pi)}) = \beta_o + \beta_1 X_i$

$Y \sim \text{Binom}(n, \pi)$

1.3 Logistic Regression - Frequentist Refresher

```r
library(Stat2Data)
data("MedGPA")
```

```r
freq_model <- glm(Acceptance ~ GPA,
                  data = MedGPA,
                  family = "binomial")

summary(freq_model)
```

```
##
## Call:
## glm(formula = Acceptance ~ GPA, family = "binomial", data = MedGPA)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -1.7805  -0.8522   0.4407   0.7819   2.0967
##
## Coefficients:
##             Estimate Std. Error z value Pr(>|z|)
## (Intercept)  -19.207      5.629  -3.412 0.000644 ***
## GPA            5.454      1.579   3.454 0.000553 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 75.791  on 54  degrees of freedom
## Residual deviance: 56.839  on 53  degrees of freedom
## AIC: 60.839
##
## Number of Fisher Scoring iterations: 4
```

1.4 Logistic Regression Bayesian Way

Below is the code we had written for a simple linear regression model in `rstan`. How would you modify this code for logistic regression? You do not necessarily need to know exact functions or notation but you can write pseudocode.

```
normal_regression_model <- "
  data{
  int <lower =0> n;
  vector[n] Y;
  vector[n] X;
  }

  parameters{
   real beta_0;
   real beta_1;
   real <lower=0> sigma;
  }

  model{
  Y ~ normal(beta_0 +beta_1*X, sigma);
  beta_0 ~ normal(0, 2500);
  beta_1 ~ normal(100, 250);
  sigma ~ exponential(0.00065);

  }

"
```