

Common distributions with typical uses and canonical link functions					
Distribution	Support of distribution	Typical uses	Link name	Link function, $\mathbf{X}\beta = g(\mu)$	Mean function
Normal	real: $(-\infty, +\infty)$	Linear-response data	Identity	$\mathbf{X}\beta = \mu$	$\mu = \mathbf{X}\beta$
Exponential	real: $(0, +\infty)$	Exponential-response data, scale parameters	Negative inverse	$\mathbf{X}\beta = -\mu^{-1}$	$\mu = -(\mathbf{X}\beta)^{-1}$
Gamma					
Inverse Gaussian	real: $(0, +\infty)$		Inverse squared	$\mathbf{X}\beta = \mu^{-2}$	$\mu = (\mathbf{X}\beta)^{-1/2}$
Poisson	integer: $0, 1, 2, \dots$	count of occurrences in fixed amount of time/space	Log	$\mathbf{X}\beta = \ln(\mu)$	$\mu = \exp(\mathbf{X}\beta)$
Bernoulli	integer: $\{0, 1\}$	outcome of single yes/no occurrence		$\mathbf{X}\beta = \ln\left(\frac{\mu}{1 - \mu}\right)$	$\mu = \frac{\exp(\mathbf{X}\beta)}{1 + \exp(\mathbf{X}\beta)} = \frac{1}{1 + \exp(-\mathbf{X}\beta)}$
Binomial	integer: $0, 1, \dots, N$	count of # of "yes" occurrences out of N yes/no occurrences	Logit	$\mathbf{X}\beta = \ln\left(\frac{\mu}{n - \mu}\right)$	
Categorical	integer: $[0, K)$	outcome of single $K$ -way occurrence		$\mathbf{X}\beta = \ln\left(\frac{\mu}{1 - \mu}\right)$	
	$K$ -vector of integer: $[0, 1]$ , where exactly one element in the vector has the value 1				
Multinomial	$K$ -vector of integer: $[0, N]$	count of occurrences of different types (1, ..., $K$ ) out of $N$ total $K$ -way occurrences			

# Interpreting Logistic Regression Models

- we want to create a spam filter based on 3921 observations/emails
- simple model, one predictor: 'to\_multiple'

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Call:
glm(formula = spam ~ to_multiple, family = binomial, data = email)

Deviance Residuals:
    Min       1Q   Median       3Q      Max
-0.477  -0.477  -0.477  -0.477   2.809

Coefficients:
              Estimate Std. Error z value Pr(>|z|)
(Intercept)  -2.11609    0.05618  -37.665  < 2e-16 ***
to_multipleyes -1.80918    0.29685   -6.095  1.1e-09 ***
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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: 2437.2  on 3920  degrees of freedom
Residual deviance: 2372.0  on 3919  degrees of freedom
AIC: 2376

Number of Fisher Scoring iterations: 6
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