For the ith instance in our collected samples, let Y_i be an indicator of whether there are multiple characters present in the scene.

$$Y_i \sim \text{Bernoulli}(p_i)$$

$$\log \frac{p_i}{1-p_i} = \beta_0 + \beta_1 \cdot \mathsf{gender}_i + \beta_2 \cdot \mathsf{race}_i + \beta_3 \cdot \mathsf{bible}_i + \beta_{13} \cdot \mathsf{gender}_i : \mathsf{bible}_i + \beta_{23} \cdot \mathsf{race}_i : \mathsf{bible}_i + \gamma_{\mathsf{novel}_i}$$

where

- gender_i is an indicator of the author's gender of the ith instance (0 for female, 1 for memale),
- race_i is an indicator of the race of the ith instance (0 for white, and 1 for black)
- bible_i is an indicator of whether the ith instance is sampled as a context surrounding a Bible citation (0 for no, and 1 for yes),
- β_1, β_2, β_3, β_{13}, β_{23} are the respective coefficients of the corresponding effects,
- novel_i indicates the novel from which the ith instance is sampled; $\gamma_{\mathsf{novel}_i}$ is the random effect for the novel which we assume to be distributed as $N(0, \sigma^2)$.

Here is a summary of the fitted results.

		Estimate	Std. Error	z score	p value
$\hat{\beta}_0$	(intercept)	0.802	0.306	2.626	0.00863
$\hat{\beta}_1$	(gender)	−0.634	0.292	−2.170	0.03001
$\hat{\beta}_2$	(race)	−0.318	0.258	−1.231	0.21826
$\hat{\beta}_3$	(bible)	−2.066	0.448	−4.615	3.93e−06
$\hat{\beta}_{13}$	(gender : bible)	0.833	0.436	1.910	0.05611
$\hat{\beta}_{23}$	(race : bible)	2.011	0.384	5.238	1.62e−07

For this model, the effect of the interaction between gender and bible is marginally significant, and this is also confirmed by a χ^2 test between this model and a model without that interaction term (with a p value of 0.37). For better interpretability and for the purpose of the presentation, we consider the following simpler model

$$Y_i \sim \text{Bernoulli}(p_i)$$

$$\log \frac{p_i}{1-p_i} = \beta_0 + \beta_1 \cdot \mathsf{gender}_i + \beta_2 \cdot \mathsf{race}_i + \beta_3 \cdot \mathsf{bible}_i + \beta_{23} \cdot \mathsf{race}_i : \mathsf{bible}_i + \gamma_{\mathsf{novel}_i}$$

where the only difference is that we lose the interaction term between gender and bible. Here again is a summary of the results.

		Estimate	Std. Error	z score	p value
$\hat{\beta}_0$	(intercept)	0.520	0.265	1.966	0.0494
$\hat{\beta}_1$	(gender)	−0.313	0.237	−1.322	0.1863
$\hat{\beta}_2$	(race)	−0.220	0.252	−0.871	0.3837
$\hat{\beta}_3$	(bible)	−1.328	0.222	−5.994	2.05e−09
$\hat{\beta}_{23}$	(race : bible)	1.742	0.355	4.904	9.41e−07

We see that the fitted coefficients have not changed a lot compared to the previous model, especially the signs of them have not changed. Again, the two variables involving bible have the most significant effects. We are primarily interested in the interaction between the variable bible and race. In particular, we would like to see how the probability/odds of being "social" changes when we compare a passage written by a particular type of writer between the cases where it's either around a Bible citation or not.

Now let's try to interpret the result. First, the *odds for being social* means the ratio between the probabilities of being social and not being social. Our result indicates:

- When a white writer cites the Bible, it is less likely that she/he cites it in a social context, (*decreases* the odds for being social by a factor of $1/e^{-1.328} \approx 3.8$), compared to when she/he writes about general stuff.
- When a black writer cites the Bible, it becomes more likely that she/he cites it in a social context, (*increases* the odds for being social by a factor of $e^{-1.328+1.742} \approx 1.5$), compared to when she/he writes about general stuff.

Therefore, the two types of writers cite the Bible in very different contexts. To understand this better, let's take a look at the fitted probabilities.

race	gender	bible	Pr(being social)	Pr(not being social)	Odds for being social
white	female	no	0.627	0.373	1.68
white	female	yes	0.308	0.692	0.45
white	male	no	0.574	0.426	1.35
white	male	yes	0.264	0.736	0.36
black	female	no	0.552	0.448	1.23
black	female	yes	0.650	0.349	1.86
black	male	no	0.497	0.503	0.99
black	male	yes	0.599	0.401	1.49

We observe clearly that despite the different probabilities of being social, switching to yes for bible decreases the odds for white writers (compare line 1 & 2, 3 & 4), while switching increases the odds for black writers (compare line 5 & 6, 7 & 8).