

1 The Model

The model is a simple disk+bulge galaxy, with the following parameters:

- R_{disk} , disk half-light radius
- F_{disk} , disk flux
- g_1^{disk} , disk intrinsic alignment
- g_2^{disk} , disk intrinsic alignment
- R_{bulge} , bulge half-light radius
- F_{bulge} , bulge flux
- g_1^{bulge} , bulge intrinsic alignment
- g_2^{bulge} , bulge intrinsic alignment
- g_1^{shear} , lensing shear
- g_2^{shear} , lensing shear
- mu , lensing magnification (this parameter is optional)

g_1^{disk} , g_2^{disk} , g_1^{bulge} , and g_2^{shear} all model intrinsic alignment, but are parameterized like reduced shear in weak lensing formalism because it's easy to apply with galsim. The bulge is drawn with a De Vaucouleurs profile, and the disk is drawn with an $n = 1$ Sersic profile. The image is convolved with a $\sigma = 0.25$ arcsecond Gaussian PSF.

One important aspect of the model is that the disk and bulge can optionally be drawn with different $r - g$ colors such that $(g - r)_{disk} \approx (g - r)_{bulge} - 2$. (n.b. I have to check to ensure that these magnitudes are being calculated correctly.) We have been treating the color difference between the disk and bulge like a prior in that we are interested in how much switching it on affects our fits, but our current treatment presumes perfect knowledge of the color difference between disk and bulge.

2 Priors

Besides the “prior” on disk and bulge color, we are applying two empirically motivated priors.

2.1 The Kormendy Relation

The Kormendy relation essentially a projection of the fundamental plane. It states that for elliptical galaxies, $R_e \propto \langle I \rangle^{0.83}$. We take as a prior on the bulge radius and flux, a distribution that is normally distributed around the line in $\log I - \log R$ space defined by the Kormendy relation.

2.2 Orientation Prior

Assuming