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The shear eastimator:  $G_1$ ,  $G_2$ , N, U, V.

Spin-0:

Spin-2:

$$G_1' + iG_2' = (G_1 + iG_2) \exp(2i heta) \ G_1' = G_1 \cos(2 heta) - G_2 \sin(2 heta) \ G_2' = G_1 \sin(2 heta) + G_2 \cos(2 heta)$$

Spin-4:

$$U' + iV' = (U + iV) \exp(4i\theta)$$
  
 $U' = U \cos(4\theta) - V \sin(4\theta)$   
 $V' = U \sin(4\theta) + V \cos(4\theta)$ 

Two points:  $(\alpha_1, \beta_1)$ ,  $(\alpha_2, \beta_2)$ .

$$\Gamma:=(lpha_2-lpha_1)/(eta_2-eta_1)$$

$$\cos(\theta) = \frac{\alpha_2 - \alpha_1}{\sqrt{(\alpha_2 - \alpha_1)^2 + (\beta_2 - \beta_1)^2}} \qquad \sin(\theta) = \frac{\beta_2 - \beta_1}{\sqrt{(\alpha_2 - \alpha_1)^2 + (\beta_2 - \beta_1)^2}}$$

$$= \frac{(\alpha_2 - \alpha_1)/(\beta_2 - \beta_1)}{\sqrt{[(\alpha_2 - \alpha_1)/(\beta_2 - \beta_1)]^2 + 1}} \qquad = \frac{1}{\sqrt{[(\alpha_2 - \alpha_1)/(\beta_2 - \beta_1)]^2 + 1}}$$

$$= \frac{\Gamma}{\sqrt{\Gamma^2 + 1}} \qquad = \frac{1}{\sqrt{\Gamma^2 + 1}}$$

$$egin{align} \cos(2 heta) &= \cos^2( heta) - \sin^2( heta) & \sin(2 heta) &= 2\cos( heta)\sin( heta) \ &= rac{(lpha_2 - lpha_1)^2 - (eta_2 - eta_1)^2}{(lpha_2 - lpha_1)^2 + (eta_2 - eta_1)^2} &= rac{2(lpha_2 - lpha_1)(eta_2 - eta_1)}{(lpha_2 - lpha_1)^2 + (eta_2 - eta_1)^2} \ &= rac{\Gamma^2 - 1}{\Gamma^2 + 1} &= rac{2\Gamma}{\Gamma^2 + 1} \end{split}$$

$$\begin{split} \cos(4\theta) &= \cos^2(2\theta) - \sin^2(2\theta) \\ &= \frac{[(\alpha_2 - \alpha_1)^2 - (\beta_2 - \beta_1)^2]^2 - 4(\alpha_2 - \alpha_1)^2(\beta_2 - \beta_1)^2}{[(\alpha_2 - \alpha_1)^2 + (\beta_2 - \beta_1)^2]^2} \\ &= \frac{(\Gamma^2 - 1)^2 - 4\Gamma^2}{(\Gamma^2 + 1)^2} \end{split}$$

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$$egin{aligned} \sin(4 heta) &= 2\cos(2 heta)\sin(2 heta) \ &= rac{4[(lpha_2-lpha_1)^2-(eta_2-eta_1)^2](lpha_2-lpha_1)(eta_2-eta_1)}{[(lpha_2-lpha_1)^2+(eta_2-eta_1)^2]^2} \ &= rac{4\Gamma(\Gamma^2-1)}{(\Gamma^2+1)^2} \end{aligned}$$

## Data structure for correlation function calculation

The data is organized by Python in hdf5 format

