

The background is a dark blue gradient with faint, light blue geometric patterns. On the left side, there is a large, semi-circular scale with degree markings from 150 to 260. Several concentric circles and arcs are scattered across the image, some with arrows indicating a clockwise direction. The overall aesthetic is technical and scientific.

BASIC STATISTICS III

CHI SQUARED AND LIKELIHOOD

Individual values of Chi squared – comparison of observed residuals from a model to expected residuals (uncertainties)

$$\chi^2 = \sum_i \frac{(O_i - E_i)^2}{\sigma_i^2}$$

These individual values come from an underlying Chi squared probability distribution.

The likelihood of a model given a data set is proportional to $e^{-\chi^2/2}$ because we assume the residuals follow normal distributions.

FITTING

- traditional maximum likelihood:
“best fit” models/parameters
- the right fit for the question
- the Bayesian approach:
probability *distributions* for models/parameters