

Computational Astrophysics Maximum Likelihood

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The angular distribution of electron scattering experiments show a probability distribution function of the form: $p(\cos \theta) = N(1 + \alpha \cos^2 \theta)$, where θ is the angle between incident and scattered direction.

An experiment measures scattering events and finds the following values of $\cos\theta$:

-.999, -.983, -.956, -.946, -.933, -.925, -.916, -.910,
-.881, -.739, -.734, -.717, -.715, -.675, -.665, -.649,
-.621, -.537, -.522, -.508, -.499, -.471, -.460, -.419,
-.403, -.311, -.305, -.281, -.170, -.162, -.063, 0.214,
0.438, .444, .508, .586, .638, .677, .721, .730,
0.438, .444, .508, .586, .638, .677, .721, .730,
0.768, .785, .790, .793, .877, .896, .931, .938,
0.948, 0.999

We wish to calculate the value of α using the Maximum Likelihood Method.

- (a) Calculate N from normalized probability
- (b) Write down the Likelihood Function for this problem.
- (c) Make a plot of the relative Likelihood Function vs. α . Maximizes the Likelihood Function to estimate α . (Use this plot to find the guess value)