

Cruz-Orive, L. M.; Hoppeler, H.; Mathieu, O.; Weibel, E. R.

Stereological analysis of anisotropic structures using directional statistics. (English)

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Stereological methods are developed to estimate the total length of a set of curves of the total surface area of a set of surfaces in a sample exhibiting directional preference. The linear elements or the normals to surface elements are assumed to follow a Dimroth-Watson distribution on the sphere with known axis of symmetry but with unknown concentration parameter, though of course different elements will not be independent of one another.

Several sections are taken through the sample at known angles to the axis of symmetry and suitable summary statistics are calculated. Estimation is then carried out using an approximate nonlinear regression model of the summary statistics on the section angle. An example is given involving the length and surface area of capillaries in a muscle fibre.

Reviewer: [J.Kent](#)

MSC:

[62H12](#) Estimation in multivariate analysis

[62P10](#) Applications of statistics to biology and medical sciences; meta analysis

Cited in 4 Documents

Keywords:

stereology; directional statistics; axial data; anisotropy; maximum likelihood; weighted nonlinear least squares; curve length; surface area; Dimroth-Watson distribution; unknown concentration parameter; approximate nonlinear regression model; section angle; capillaries in a muscle fibre

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