

Given four unit vectors ($\mathbf{a}, \mathbf{b}, \mathbf{c}, \mathbf{d}$) in 4-space defining a spherical tetrahedron, the volume of the tetrahedron can be estimated using a Monte Carlo method:

- Generate N random points within the unit 4-ball.
- Determine the number of points N_{inside} that lie inside the spherical tetrahedron. A point \mathbf{x} is inside the tetrahedron if $\mathbf{x} \cdot \mathbf{a} \geq 0$, $\mathbf{x} \cdot \mathbf{b} \geq 0$, $\mathbf{x} \cdot \mathbf{c} \geq 0$, and $\mathbf{x} \cdot \mathbf{d} \geq 0$.
- Estimate the volume V of the tetrahedron as:

$$V = \frac{N_{\text{inside}}}{N} \cdot V_{\text{4-ball}}$$

where $V_{\text{4-ball}}$ is the volume of the unit 4-ball.