Fisher-Bingham distribution

$$z(\Theta, \theta) = \int_{S^n} \exp(t^T \Theta t + \theta t)|dt| \tag{1}$$

$|dt|$: the Haar measure on the sphere. Θ: $(n+1) \times (n+1)$ real symmetric matrix. θ: real vector of the length $n+1$.

Fisher distribution

X, Θ: 3×3 real matrices. $\Theta^\top$: the transpose of Θ. μ: the invariant measure on $SO(3)$.

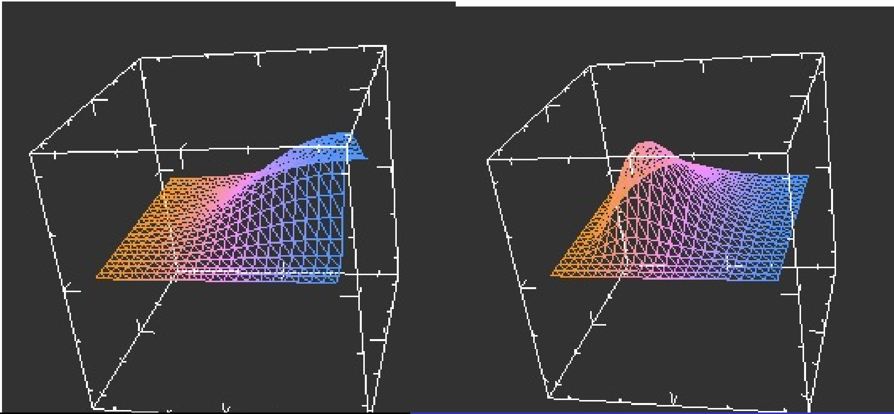
$$z(\Theta) = \int_{SO(3)} \exp(\mathrm{Tr}\,(\Theta^\top X))\, d\mu(X).$$

Matrix hypergeometric integral associated to the Wishart distribution

X : $m \times m$ real matrix.

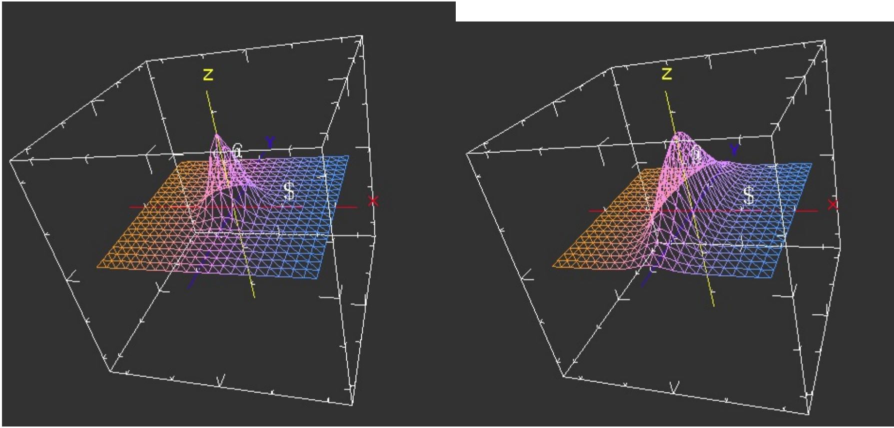
$$\int_{0<X<I_m} \exp(\mathrm{Tr}\, XY)|X|^{a-(m+1)/2}|I_m - X|^{c-a-(m+1)/2} dX,$$

$0 < X < I_m$ means that X and $I_m - X$ are positive definite symmetric matrix. $dX = \prod_{i \le j} dx_{ij}$.



Orthant probability

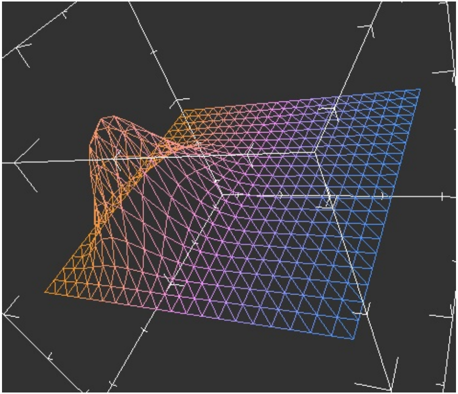
$$z(\tau,\theta) = \int_0^\infty \cdots \int_0^\infty \exp\left(\sum_{i=1}^m \theta_i x_i + \sum_{i,j=1}^m x_i x_j \tau_{ij}\right) dx$$



A-distribution

$$z(\theta) = \int_C \exp(\sum_{j=1}^{n} \theta_j t^{a_j}) \prod_{i=1}^{d} t_i^{-b_i - 1} dt$$

$A = (a_{ij})$: $n \times d$ integer matrix. b_i: real number. a_j: the j-th column vector of the matrix A. $t^{a_j} = \prod_{i=1}^{d} t_i^{a_{ij}}$.



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@s/2013/07/20-exp-dist
01, wishart, diagonal X and V, mtg.plot3d(exp(-x-2*y)*(x*y)^5 | domain=
02, wishart, diagonal X and V, mtg.plot3d(exp(-x-2*y)*(x*y)^5 | domain=
03, wishart, diagonal X and V, change V.
   mtg.plot3d(exp(-3*x-2*y)*(x*y)^5 | domain=[[0,5],[0,5]]);
04, normal
   mtg.plot3d(exp(-x^2-y^2) | domain=[[-5,5],[-5,5]]);
05, normal
   mtg.plot3d(exp(-x^2-y^2/10) | domain=[[-5,5],[-5,5]]);
06, A-dist
   mtg.plot3d(exp(-x^2-y^2/2)*(x*y)^3 | domain=[[0,5],[0,5]]);
```