

**University of California, Irvine  
Statistics Seminar**

***Geometric Means of Positive Definite Matrices and the Matrix-Variate Log-Normal Distribution***

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(Bldg. #314 on campus map)**

Just like a scalar random variable is called lognormal if its logarithm is normally distributed, a random symmetric positive definite (SPD) matrix may be called lognormal if its matrix logarithm, a random symmetric matrix, has a matrix-variate normal distribution. In this talk, I show that two types of SPD-matrix-variate lognormal distributions arise as the limiting distributions of two types of geometric averages of i.i.d. random SPD matrices: the log-Euclidean average and the canonical geometric average. These averages correspond to two different geometries imposed on the set of PD matrices. The limiting distributions of these averages are used to provide large-sample confidence regions for the corresponding population means. These ideas are illustrated on a voxelwise analysis of diffusion tensor imaging data, helping resolve the choice of voxelwise average type for this form of SPD matrix data.