1023-60-457 **Evarist - Giné***, Dept. Mathematics, U-3009, University of Connecticut, Storrs, CT 06269, and **Vlaadimir Koltchinskii**. *Empirical graph Laplacian approximation of Laplace-Beltrami operators.*

Let $M$ be a compact Riemannian submanifold of $\mathbf{R}^m$ of dimension $d$ and let $X_1, \ldots, X_n$ be a sample of i.i.d. points in $M$ with uniform distribution. The random operators

$$\Delta_{h_n,n} f(p) := \frac{1}{n h_n^{d+2}} \sum_{i=1}^{n} K(\frac{p - X_i}{h_n})(f(X_i) - f(p)),\ p \in M$$

are studied, where $K(u)$ is the Gaussian kernel and $h_n \to 0$. Such operators can be viewed as graph laplacians (for a weighted graph with vertices at data points) and they have been used in the machine learning literature to approximate the Laplace-Beltrami operator of $M$, $\Delta_M f$ (divided by the Riemannian volume of the manifold). Several results are proved on a.s. and distributional convergence of the deviations $\Delta_{h_n,n} f(p) - \frac{1}{|\mu|}\Delta_M f(p)$ for smooth functions $f$ both pointwise and uniformly in $f$ and $p$. (Received September 13, 2006)