Probability Seminar

Organizer: Christian Gromoll & Tai Melcher

Wednesday, 3:30–4:30pm, Kerchof 317

Jan 17 **Adrian P. C. Lim**, Cornell

Path integral quantization

A typical path integral on a manifold M, is an informal expression of the form

$$\frac{1}{Z}\int_{\sigma\in H(M)} f(\sigma)e^{-E(\sigma)}\mathcal{D}\sigma, \tag{1}$$

where $H(M)$ is a space of paths in M with energy $E(\sigma)<\infty$, f is a real valued function on $H(M)$, $\mathcal{D}\sigma$ is a "Lebesgue measure" and Z is a normalization constant. The use of path integrals for "quantizing" classical mechanical systems (whose classical energy is E) started with Feynman in [2] with very early beginnings being traced back to Dirac [1]. In this talk, I will give several rigorous definitions to Equation (1), by reviewing work done by Driver and Andersson and recently by me. The idea is to approximate $H(M)$ by finite dimensional subspaces consisting of broken geodesics and then to pass to the limit of finer and finer approximations.

[1] P. A. M. Dirac, Physikalische Zeitschrift der Sowjetunion **3** (1933), 64.

[2] R. P. Feynman, *Space-time approach to non-relativistic quantum mechanics*, Rev. Modern Physics **20** (1948), 367–387.