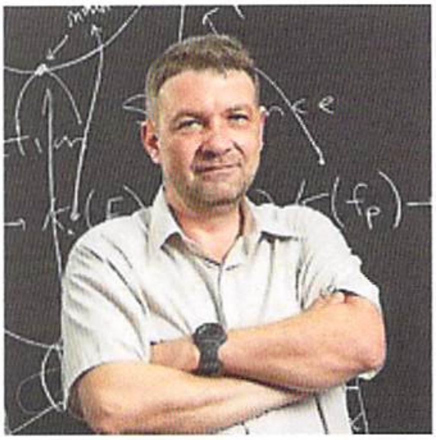
Department of Mathematics
University of Notre Dame

Liviu Nicolaescu - University of Notre Dame

GRADUATE STUDENT SEMINAR

Guest Speaker: Liviu Nicolaescu

University of Notre Dame



Date: Monday, October 7, 2019

Time: 4:00 PM

Location: 117 Hayes-Healy Hall

Lecture Title:
The probabilistic nature of the Gauss-Bonnet formula

Abstract

Take a smooth compact oriented surface $S \subset \mathbb{R}^3$. A unit vector $N \in \mathbb{R}^3$ defines a linear function L_N that restricts to a smooth function on S. Given an open subset $D \subset S$, we denote by $\mu(N, D)$ the signed number of critical points of L_N on D. Now let the unit vector N vary along the unit sphere and ask yourself: what is the average/mean value of the function $N \mapsto \mu(N, D)$. Surprisingly, this mean value is given by the the integral over D of the Gaussian curvature of M. The Gauss-Bonnet formula is then a special case since for $D = S$, the function $N \mapsto \mu(N, S)$ is constant, equal to $\chi(S)$. Is this a freak low dimensional accident, or there is more to it? In my talk I hope to convince you that there is much more to it, and probability can add a bit more precision to the venerable Gauss-Bonnet theorem.