GEOMETRIC ANALYSIS SEMINAR

Topics in Optimal Transportation

Organizational meeting: Friday 9/4, 3:35 PM, HBB102

We're given a pile of sand and a hole we have to fill up with the sand; that costs some effort (always in short supply). The problem is to formulate a transportation strategy that minimizes the work (Gaspard Monge, 1781).

In Kantorovich's formulation (1942): given probability measures μ on X (the sand pile) and ν on Y (the hole) and a cost function $c(x, y)$ on $X \times Y$, one seeks a probability π on $X \times Y$ (projecting to μ and ν) so that the integral of c with respect to π is least possible.

Over the past 20 years the theory has received new impetus, with contributions from L.Ambrosio, Y.Brennier, L.Caffarelli, L.C.Evans, W.Gangbo, R.McCann, F.Otto, C.Villani and many others, and is currently a major area of research in analysis. Connections have been found with research in nonlinear p.d.e, geometric measure theory, Riemannian geometry and atmospheric modeling, among others.

There is a nice introductory text by C.Villani, which will be the basis for the seminar (AMS GSM series vol.58). It is certainly accessible to graduate students, given some background in real analysis **or** partial differential equations **or** probability. If the second paragraph above made sense to you, that's a good sign! At the meeting Fernando Schwartz will give an informal (and brief) general introduction, and then those interested in learning about the area will discuss how to share the work. Quoting Villani:

"Besides its own intrinsic interest, optimal mass transportation sometimes appears as a surprisingly effective tool in problems which do not seem a priori to have any relation to it. For this reason, getting at least partially acquainted with it is a wise investment for any student in probability, analysis or p.d.e" (and we would add differential geometry to the list.)

Credit available to graduate student participants through Math 569.
Initiators: Denzler, Freire, Plaut, Schwartz