



Dipartimento di Scienze Matematiche  
“G. L. Lagrange”



Politecnico di Torino

## Colloquium

Il giorno martedì 28 novembre 2017, alle ore 14.30, in aula Buzano, il Professor

**Ernesto Estrada**

della University of Strathclyde - Glasgow, terrà la conferenza dal titolo

*Long-range influences and dynamics on networks*

**Abstract.** I will start with a motivation for the necessity of including long-range influences on the study of dynamical processes on networks. I will provide some experimental evidences supporting the existence of long-range hops in the diffusion of atoms and molecules adsorbed on metallic surfaces. Then, I will generalise the Laplacian operator of a network to account for long-range hops in graphs. I will define this operator on a Hilbert space and prove that it is bounded and self-adjoint. At this point I will make a generalisation of the diffusion equation by using Laplace and Mellin transformations of the  $d$ -path Laplacian operators. I will prove analytically that this generalised diffusion equation produces super-diffusive processes when certain parameters in the Mellin transform are used. Finally, I will illustrate the generalisation of other well-known equations for networks, which includes the Kuramoto model, and the epidemic spreading models. In this last case I will show how epidemic propagating on plants are subject to long-range dispersals and how this influences dramatically the epidemic threshold and spatial patterns of the disease.