Applied Analysis and Mathematical Physics I

Organizadores:
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Descrição da proposta de sessão paralela: This session brings together distinguished researchers in Applied Analysis working on models coming from Mathematical Physics. The aim is to show some of the latest advances in this area, including topics on quantum mechanics, kinetic theory and fluid dynamics. This session is a continuation of the invited session with the same name.

Orador 1

Lisa Santos, Centro de Matemática, Universidade do Minho,
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Title: Convex sets with obstacle and gradient constraints

Abstract: For $1 < p < \infty$, given g and ψ non-negative functions belonging to $L^\infty(\Omega)$ and $W_0^{1,p}(\Omega)\cap C(\overline{\Omega})$, respectively, we show that there exists a pseudo-metric $\overline{L}_g$ defined in $\overline{\Omega}$ such that $u(x) := \min_{y\in\overline{\Omega}}\{\psi(y)+\overline{L}_g(x,y)\}$ is a subsolution of the Hamilton-Jacobi equation with obstacle $\max\{|\nabla u| - g, u-\psi\} = 0$. Besides, for $K_{g,\psi} = \{v \in W_0^{1,p}(\Omega) : |\nabla v| \leq g, v \leq \psi\}$, we have $u(x) = \bigvee\{v(x) : v \in K_{g,\psi}\}$.

As a consequence, we prove the Mosco convergence of K_{g_n,ψ_n} to $K_{g,\psi}$, as long as g_n converges to g in $L^\infty(\Omega)$ and ψ_n to ψ in $C(\overline{\Omega})$. As an application, we prove a stability result for the solutions u_n of variational inequalities defined in the convex sets K_{g_n,ψ_n}.

(Joint work with Assis Azevedo and Davide Azevedo)

Orador 2

Jean-Claude Zambrini, Grupo de Física Matemática, Universidade de Lisboa,
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Title: The stochastic dynamics of the Schrödinguer's problem

Abstract: Schrödinguer's 1931 variational problem will be summarized, in relation with Feynman's informal path integral approach to quantum mechanics.It reappeared

during the last 20 years in the context of Mass Transportation theory.The stochastic geometric dynamics of the diffusions solving this problem will be described, in the perspective of second-order differential geometry (L. Schwartz, P-A. Meyer).

Joint work with Q. Huang (NTU, Singapore)

Orador 3

Marina A. Ferreira, Centre National de la Recherche Scientifique & Université de Toulouse,
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Title: Localization in multicomponent coagulation systems

Abstract: Smoluchowski coagulation equation is a kinetic model describing the statistics of particle sizes under pairwise coagulation. The rate of coagulation depends on the size of the two merging particles and it can determine the qualitative behaviour of the solutions. I will present recent results showing the rich behaviour of the solutions in multicomponent systems, i.e., where the size variable is a vector. These include the loss of mass-conservation and localization phenomena in which the solution concentrates along a line in the multidimensional composition space, asymptotically for large sizes, for a large class of coagulation kernels and general initial data.

Joint work with: Jani Lukkarinen, Alessia Nota, Sakari Pirnes and Juan Velázquez.