Young Researchers Seminar

Administrator

nov 20, 2019 - feb 19, 2020

martedì gen 14, 2020

Tutto il giorno

Venue - Sapienza

• Calendario Sapienza

10:10am - 11:15am

MIMUN Hlafo Alfie - Probability

• Calendario Sapienza

Percolation theory and applications

In physics the term "percolation" refers to the filtering of fluids through porous media. Many models for random graphs have been introduced to study this physical phenomenon. The main question concerns the "size" of the biggest connected component. In particular many models exhibit a phase transition when studying the probability of the existence of an unbounded connected component.
In this talk we will explain some models in this field and study relevant quantities in different regimes. Moreover we will show some applications.

11:35am - 12:35pm

COLOMA Mattia - Geometry

• Calendario Tor Vergata

The Hirezebruch-Riemann-Roch theorem in the fancy language of Spectra

The category of spectra indubitably is the best of possible worlds for cohomology theories. For instance in spectra one can start with a few basic morphisms, be confident that every natural diagram built from them will commute, and end up with a proof of the Hirzebruch-Riemann-Roch theorem. As in every good story we'll have a deus ex machina: Atiyah's identification of the Spanier-Whitehead dual of a manifold with the Thom spectrum of minus its tangent bundle. I will try to gently introduce all of this tools assuming basic notions of topology, geometry and algebra. Based on joint work with Domenico Fiorenza and Eugenio Landi.

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martedì gen 28, 2020

Tutto il giorno

Venue - Tor Vergata

• Calendario Tor Vergata

10:00am - 11:05am

CAVALLUCCI Nicola - Geometry

• Calendario Sapienza

Packing conditions on CAT(0) spaces

The study of metric spaces satisfying synthetic notions of curvature is an important topic in geometry. The aim of the talk is to motivate why these spaces are interesting using the special case of CAT(0) spaces satisfying a uniform packing condition.

11:25am - 12:30pm

MISQUERO Mauricio - Mathematical Physics

• Calendario Tor Vergata

Some rigorous results on the 1:1 resonance of the spin-orbit problem

Consider the problem of an spinning oblate satellite (e.g. the Moon) with respect to its center of mass when it is moving in a

Keplerian ellipse around a planet (e.g. the Earth). This is the spin-orbit problem and it modeled by a pendulum-like equation. We study

the resonance 1:1 (e.g. the dark side of the Moon) from an analytical point of view, with no requirements of smallness of the orbital eccentricity and taking into account dissipative forces. The problem depends on e, the eccentricity of the orbit, and on Λ, the oblateness of the spinning body. Our main concern is the capture into the 1:1 resonance for points of the (e,Λ)-plane. First, we find a region of uniqueness of the 1:1 resonance, which is the continuation from the solution for $e=0$. Then, a subregion of linear stability is estimated. We also study a separatrix close to the line $e=e_*\approx 0.682$, beyond which the resonance is unstable. Finally, we study the dissipative case by estimating regions of asymptotic stability of the solution (capture into resonance) depending on the strength of the dissipation applied.

martedì feb 11, 2020

Tutto il giorno

Venue - Roma Tre

• **Calendario** Roma Tre

10:00am - 11:05am

QUATTROPANI Matteo - Probability

• **Calendario** Roma Tre

How fast does a PageRank surfer mix?

The PageRank surfer is a simple stochastic process introduced by Brin and Page in their seminal paper [1], in which they present Google.
Roughly, it is a discrete time irreducible Markov chain on an underlying directed graph, G, where the vertices of G can be thought of as web pages, while the directed edges are hyperlinks between the pages. The surfer follows one uniformly random link leaving the page she is currently visiting with some probability \alpha, while with complementary probability she will "teleport" to a random page, sampled accordingly to some fully supported measure \lambda. The stationary distribution of such a Markov Chain, the so-called Generalized PageRank, can be thought of as a centrality measure over the vertex set of G. Numerical approximations of the stationary distribution can be obtained by running several independent copies of the PageRank surfer for "sufficiently long time" and collecting statistics about their locations. The goal of this talk is to quantify how long we should wait in order for the surfer to reach the equilibrium. In particular, we focus on two models of sparse random directed graphs in which the degrees are given, which we analyze in the asymptotic regime in which the number of vertices grows to infinity. We show that, regardless of the particular choice of \lambda, the mixing behavior of the surfer depends on the asymptotic behavior of \alpha=\alpha(n). We exhibit two phase transitions with respect to the value of \alpha. In each regime the convergence to equilibrium occurs in a different fashion.
This is a joint work with P. Caputo.

References:
[1] S. Brin and L. Page, The anatomy of a large-scale hypertextual Web search engine, 1998, https://www.sciencedirect.com/science/article/pii/S016975529800110X
[2] P. Caputo and M. Quattropani, Mixing time of PageRank surfers on sparse random digraphs, 2019, https://arxiv.org/abs/1905.04993

11:25am - 12:30pm

SCHIAVONE Nico Michele - Mathematical Analysis

• **Calendario** Sapienza

Heat versus Wave: blow-up of solutions

It is well known that the solutions to the heat and wave equations show completely different

It is well known that the solutions to the heat and wave equations show completely different properties. We consider the two equations provided of the nonlinearity $|u|^p$ and of small initial data. For large exponents, the solutions to the heat and wave equations exist globally, whereas they explode in finite time if $p>1$ is small. The threshold is the so called critical exponent. We analyze the antagonism of the heat and wave equations studying the blow-up of the solutions, exploiting two techniques: the iteration argument and the test function method. Moreover, we will see how this competition continues in the study of scale-invariant wave equations with damping and mass terms.