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## **SEMINÁRIO DE ANÁLISE E EQUAÇÕES DIFERENCIAIS**

**Dia 20 de Junho (terça-feira), às 13h30, sala 6.2.33**

# **SIR-Network model : epidemics dynamics in a city & climate variations**

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### **Abstract:**

The SIR-network mode deals with the propagation of disease epidemics in highly populated cities. The nodes, or vertices, are the city's neighborhoods, in which the local populations are assumed to be well-mixed. The directed edges represent the fractions of people moving from their neighborhoods of residence to those of daily activities. First, we present some fundamental properties of the basic reproduction number ( $R_0$ ) for this model. In particular, we focus on how  $R_0$  depends upon the geometry and the heterogeneity (different infection rates in each vertex) of the network. This allows us to conclude whether an epidemic outbreak can be expected or not. Second, we submit the SIR-network model to data fitting, using data collected during the 2008 Rio de Janeiro dengue fever epidemic. Important conclusions are drawn from the fitted parameters, and we show that improved results are found when a time-dependent infection parameter is introduced.

This work is in collaboration with Lucas Stoleran (UFRJ/IMPA, Brazil) and Daniel Coombs (UBC, Canada).

Finally we can show some recent results, in collaboration with Catherine Bonnet (INRIA-CentraleSupelec), Bernard Cazelles (UPMC) and Frederic Mazenc (INRIA-CentraleSupelec), about existence and approximation of attractors in the case of a periodic or bounded time dependent infectious parameter.

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