Speaker: **Gomez-Larranaga, Jose-Carlos**
Title: *Invariants of the Lusternik-Schnirelmann type for 3-manifolds*
Authors: José-Carlos Gómez-Larrañaga, Francisco González-Acuña, Wolfgang Heil
Affiliations: CIMAT, UNAM, Florida State University

Abstract: The *Lusternik-Schnirelmann category* of a space X, denoted $cat\,(X)$, is defined to be the minimal integer k such that there exists an open covering $\{A_0, \ldots, A_k\}$ of X with each A_i contractible to a point in X. The motivation for introducing this concept was that for a closed differentiable manifold M, $cat\,(M) + 1$ gives a lower bound for the number of critical points of a differentiable real function f on M.

In 1986, M. Clapp and D. Puppe proposed the following generalization: If $\mathcal{A}$ is any class of spaces they replace the condition that $A_j \subset X$ is nulhomotopic by requiring that it factors throught some $A \in \mathcal{A}$ up to homotopy and they obtain the notion of $\mathcal{A}$-*category*. Roughly, they show that the $\mathcal{A}$-category, under certain conditions, gives new information on the topological structure of the critical set.

In this talk, for a closed 3-manifold M, we relate the $\mathcal{A}$-$cat\,(M)$ with classical 3-manifold theory and give an overview of what is known about these invariants.