Numerical Invariants of Topological Spaces and Continuous Mappings

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(Tea 3:30 pm Math Lounge)

Abstract

Can one assign an integer $n(X)$ to a topological space X with the following properties: (1) $n(X)$ captures a geometric or topological property of X (2) $n(X)$ is computable (3) $n(X)$ is a topological invariant, i.e., if X is homeomorphic to Y, then $n(X) = n(Y)$? In the first half of the talk we survey several classical ways of doing this. These are (1) dimension theory which deals with the dimension of a space X (2) the Euler characteristic of X (3) the category of X which is the minimum number of contractible spaces needed to construct X. In each case we define the invariant, work out examples and present some illustrative theorems. In the second half of the talk we generalize to continuous mappings $f : X \to Y$ of spaces. We discuss two distinct ways to assign an integer to f: (1) the Lefschetz number of f which is a generalization of the Euler characteristic and is used to determine if f has a fixed point (2) the category of f which generalizes the category of a space.

This talk is meant to be elementary and expository.

This talk should be accessible to graduate students.