

# FOUR-CYCLED GRAPHS WITH TOPOLOGICAL APPLICATIONS

**Yusuf Civan**

Department of Mathematics  
Süleyman Demirel University  
Isparta, 32260  
ycivan@fef.sdu.edu.tr

(joint work with T. Bıyıkoğlu)

This will be an introductory talk about a newly invented graph class, the *four-cycled graphs*, and their use to determine the topology of some simplicial complexes associated to simple graphs.

By a definition, a 4-cycled graph is a simple graph  $G$  such that either  $G$  has no edges or every edge of it is contained in an induced 4-cycle of  $G$ . Clearly, being a 4-cycled graph is not a hereditary graph property. Perhaps, for this reason, the problems of efficient characterization and recognition of 4-graphs are difficult and remain open. In this talk I only give some necessary and some sufficient conditions for the 4-cycled property to hold.

I will first outline the basics of Whitehead's simple-homotopy theory, and explain our motivation to introduce these graphs. The second half will mainly be on the structural properties, constructions and examples of 4-cycled graphs, where I will also describe the homotopy types of the independence complexes of external-extensions of trees.