COLLOQUIUM

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Towards a new digital homotopy theory

Mathematics and Statistics

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Abstract: We present recent progress with collaborators Greg Lupton and John Oprea towards developing a digital version of homotopy theory. An n-dimensional digital image is a finite subset of the integer lattice along with an adjacency relation. Although there are many papers on digital homotopy theory, many of the notions do not seem satisfactory from a homotopy point of view. Indeed, some of the constructs most useful in homotopy theory, such as cofibrations and path spaces, are absent from the literature or completely trivial.

Working in the digital setting, we develop some basic ideas of homotopy theory, including cofibrations and path fibrations, in a way that seems more suited to homotopy theory. We will indicate how our approach may be used, for example, to study Lusternik–Schnirelmann category in a digital setting. One future goal is to develop a characterization of a "homotopy circle" (in the digital setting) using the notion of topological complexity. This is with a view towards recognizing circles, and perhaps other features, using these ideas. This talk will introduce some of the basics of digital topology and will not require any specialized background.

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