Non-uniform degrees and rainbow versions of the Caccetta-Häggkvist conjecture

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Abstract
The famous Caccetta-Häggkvist conjecture states that for any \( n \)-vertex directed graph \( D \), the directed girth of \( D \) (the minimum length of a directed cycle in \( D \)) is at most \( \lceil n/k \rceil \), where \( k \) is the minimum out-degree of \( D \). Aharoni raised a strengthening conjecture: for any \( n \)-vertex graph \( G \) equipped with an edge coloring (not necessarily proper) using \( n \) colors, the rainbow girth of \( G \) (the minimum length of a cycle in \( G \) with distinctly colored edges) is at most \( \lceil n/k \rceil \), where \( k \) is the minimum size of the color class. We will discuss some results in the non-uniform degrees and rainbow versions of the Caccetta-Häggkvist conjecture.

Based on work joint with Ron Aharoni, Eli Berger, Maria Chudnovsky, and Shira Zerbib.