Characterizing 3-sets in Union-Closed Families

— Dr. Jonad Pulaj
Department of Mathematics
University of the West Indies, Cave Hill

Abstract: Frankl’s conjecture states that for every nonempty, union-closed finite family of finite sets there exists an element that is contained in at least half its sets. Employing classical methods from applied discrete techniques we develop a cutting-plane algorithm that uses exact rational integer programming to compute which families of sets ensure Frankl’s conjecture holds for all union-closed families that contain them. Our computational framework allows us to classify 3-sets in union-closed families (up to isomorphism), improving on all previous results of this nature. Notably we prove the 3-sets conjecture of Morris from 2006, which states that a minimum majority number of 3-sets (with respect to the number of elements in the ground set of 3-sets) ensures Frankl’s conjecture holds for all union-closed families which contain them.

Further Information
For further information, please contact Dr. Yasanthi Kottegoda at the Department of Mathematics and Physics, Office: Maxcy 315, 203-932-1206, YKottegoda@newhaven.edu.