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Cook, Kannan and Schrijver's example revisited

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Abstract

In 1990, Cook, Kannan and Schrijver proved that the split closure (the 1st 1-branch split closure) of a polyhedron is again a polyhedron. They also gave an example of a 3-dimensional mixed-integer polytope whose 1-branch split rank is infinite. We generalize this example to a family of high-dimensional polytopes and present a closed-form description of the kth 1-branch split closure of these polytopes for any $k \geq 1$. Despite the fact that the m-branch split rank of the $(m+1)$-dimensional polytope in this family is 1, we show that the 2-branch split rank of the $(m+1)$-dimensional polytope is infinite when $m \geq 3$. We discuss whether the $(m-1)$-branch split rank of the $(m+1)$-dimensional polytope of the family is infinite for any $m \geq 2$.

Join work with Jean-Philippe Richard.