Hypertopes

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In 2014, during a research visit to the Auckland University in New Zealand, Fernandes, Leemans and Ivić Weiss created the concept of a hypertope which generalizes the concept of a polytope while retaining its combinatorial structure.

The heart of the theory of (abstract) polytopes is its correspondence with groups. Abstract polytopes can be built from quotients of Coxeter groups with linear diagrams. The ideia was to consider other geometric structures covering all other Coxeter groups. The natural way to do this was to consider thin residually connected incidence geometries, which became known as *hypertopes*.

Hypertopes is a result of a joint work of researchers from three universities, Maria Elisa Fernandes from the University of Aveiro, Asia Ivić Weiss from the York University of Toronto and Dimitri Leemans from the Auckland University in New Zealand, and presently from Université Libre de Bruxelles.

The first publication on this subject, *Highly Symmetric Hypertopes*, was in 2016. While abstract polytopes had been thoroughly studied and much data is available in the literature, of course, very little is known about their extensions, the hypertopes. A lot of open problems emerged sparking the interest of other researchers. Since 2016 various authors decided to study this structures showing that this became an attractive line of research, especially for those interested in the study of highly symmetric geometric structures, one of the areas in the intersection of algebra, geometry and combinatorics.

In 2020, Fernandes, Leemans and Ivić Weiss gave a classification of the locally spherical regular hypertopes of spherical and euclidean type and investigate finite hypertopes of hyperbolic type. We consider that this is another remarkable contribution to Theory of Hypertopes which we believe makes the area even more interesting and shows how rich this subject is.

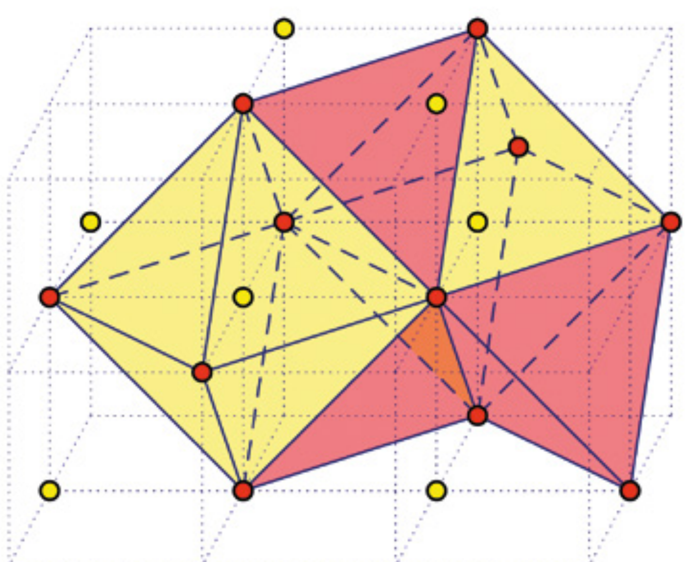

FIGURE 1
Hypertope of type $\left\{\begin{smallmatrix}3\\3\end{smallmatrix}, 4\right\}$