SEMINARIO DI GEOMETRIA

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SYMMETRIZATION IN TROPICAL ALGEBRA

Tropicalization involves passing to an ordered group M, usually taken to be $(\mathbb{R}, +)$ or $(\mathbb{Q}, +)$ and viewed as a semifield. Although there is a rich theory arising from this viewpoint, idempotent semirings possess a restricted algebraic structure theory, and also do not reflect important valuation-theoretic properties, thereby forcing researchers to rely often on combinatoric techniques.

Our research in tropical algebra has focused on coping with the fact that the max-plus algebra lacks negation, which is used throughout the classical structure theory of modules. At the outset one is confronted with the obstacle that different cosets need not be disjoint, which plays havoc with the traditional structure theory.

Building on an idea of Gaubert and his group (including work of Akian and Guterman), we introduce a general way of artificially providing negation, in a manner similar to the construction of $\mathbb{Z}$ from $\mathbb{N}$, but with one crucial difference necessitated by the fact that the max-plus algebra is not additively cancelative! This leads to the possibility of defining many auxiliary tropical structures, such as Lie algebras and exterior algebras, and also providing a key ingredient for a module theory that could enable one to use standard tools such as homology.