

Algebraic Concepts in Machine Learning and Signal Processing

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Linear algebra, multivariate calculus, applied probability, statistics and convex optimization are long-established mathematical tools that have been used extensively and successfully in designing many intelligent engineering systems involving data mining and machine learning. These traditional tools are very effective in processing numbers and manipulating basic mathematical objects including numbers, vectors, and functions. However, as intelligent systems are becoming much more sophisticated, they demand radically different approaches and going beyond traditional calculus. In particular, there is a great need to work with more advanced mathematical structures and abstractions to design or just describe the functionality of contemporary intelligent systems.

This talk will outline modern algebraic concepts to an engineering audience including the tools for abstract modeling and manipulating complex mathematical structures beyond common numerical objects. Understanding algebras can expand the existing engineering tool-sets and open up new research avenues in data mining, statistical learning, complex system modeling and AI (Artificial Intelligence).