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# Max-plus and Min-plus Projection Autoassociative Morphological Memories and Their Compositions for Pattern Classification

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## Abstract

Autoassociative morphological memories (AMMs) are robust and computationally efficient memory models with unlimited storage capacity. In this paper, we present the max-plus and min-plus projection autoassociative morphological memories (PAMMs) as well as their compositions. Briefly, the max-plus PAMM yields the largest max-plus combination of the stored vectors which is less than or equal to the input. Dually, the vector recalled by the min-plus PAMM corresponds to the smallest min-plus combination which is larger than or equal to the input. Apart from unlimited absolute storage capacity and one step retrieval, PAMMs and their compositions exhibit an excellent noise tolerance. Furthermore, the new memories yielded quite promising results in classification problems with a large number of features and classes.

*Keywords:* Associative memory, lattice computing, minimax algebra, morphological neural network, pattern classification.

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## 1. Introduction

Associative memories (AMs), which are models inspired by the human brain ability to store and recall information by associations, have been extensively investigated since the advent of Hopfield network in the early 1980s [16, 10]. Besides the biological motivation, associative memory models have been applied, for instance, for pattern classification [55, 6, 3, 50], time-series prediction [40, 52], image processing and analysis [9, 24, 47, 49], and optimization [15, 35].

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