Title:	Enhancement of the HILOMOT Algorithm with Modified EM and Modified PSO Algorithms for Nonlinear Systems Identification
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Abstract:
Developing a mathematical model has become an inevitable need in studies of all disciplines. With advancements in technology, there is an emerging need to develop complex mathematical models. System identification is a popular way of constructing mathematical models of highly complex processes when an analytical model is not feasible. One of the many model architectures of system identification is to utilize a Local Model Network (LMN). Hierarchical Local Model Tree (HILOMOT) is an iterative LMN training algorithm that uses the axis-oblique split method to divide the input space hierarchically. The split positions of the local models directly influence the accuracy of the entire model. However, finding the best split positions of the local models presents a nonlinear optimization problem. This paper presents an optimized HILOMOT algorithm with enhanced Expectation–Maximization (EM) and Particle Swarm Optimization (PSO) algorithms which includes the normalization parameter and utilizes the reduced-parameter vector. Finally, the performance of the improved HILOMOT algorithm is compared with the existing algorithm by modeling the NO_x emission model of a gas turbine and multiple nonlinear test functions of different orders and structures.

Keywords: System identification; nonlinear systems; nonlinear systems identification; optimization; expectation maximization; particle swarm optimization; local model network; HILOMOT