Department of Mathematics, Statistics and Computer Science
St. Francis Xavier University
Presents

Particle Swarm Optimization in the Presence of Multiple Global Optima

by

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Particle Swarm Optimization (PSO) is an evolutionary algorithm for the solution of optimization problems: solving $\min_x S(\vec{x})$. PSO is based loosely on the behavior of swarms of animals such as birds, bees or fish. The particle swarm explores the search space, and adapts to the environment by returning to previously successful search areas.

Some practical optimization problems have multiple global optima, of which any one optimum is a satisfactory solution of the problem. The canonical form of the particle swarm optimization (PSO) algorithm with the most frequently used parameter values ($j_{\max} = 4.1$ and constriction coefficient $c = 0.729$) was investigated. Dynamic analyses based on a simplified model have concluded that these parameter values prevent swarm explosion and ensure convergence. It is shown by example that this algorithm can still allow the swarm to explode, that is, to increase indefinitely in size and individual particle velocity. In other examples, we show that even when not exploding, the canonical PSO algorithm can fail to converge indefinitely. This behavior cannot be explained by a simple dynamic model with fixed centers of attraction. A fully probabilistic model will be needed.

Refreshments will be served before the talk in AX24A