

Progressive Sampling Surrogate Assisted Particle Swarm Optimization

In this paper they worked on a particle swarm optimization approach an advanced methodology for Particle Swarm Optimization (PSO). They have observed that for expensive optimization problems which are of low and medium scale, surrogate assisted particle swarm optimization worked well, but for large scale expensive optimization problems, they have proposed an idea of progressive sampling approach for surrogate assisted particle swarm optimization. They want to restrict the Functional evaluation on expensive optimization, to make it more efficient.

They want Evolutionary algorithms to give data to surrogate to train and then sample the swarm around the surrogate, here they took references of normal swarm optimization, where they understood they can add surrogate agents for better learning by the swarm, now they brought social learning PSO where it choses best historical data to be fed to the particles around this agent, which will make swarm to learn optimal data. They understood that social learning particle swarm optimization has potential to solve the large-scale expensive optimization in terms of having a surrogate to efficiently optimize the swarm.

Here the data around this agent in the space of particles will be different at each time. In the proposed approach, they wanted to take a basic swarm, evolve it through multiple generation using social learning PSO and then they will provide the best swarm for that evolution, they will again send this best for updating to SL PSO until they run out of functional evaluations in the list. They used RBFN for this strategy as it works better with the use of Decision trees, RBFN here is the surrogate. They basically had this algorithm compared to other Surrogate Assisted Evolutionary Algorithms, and proved their approach is better in terms of other algorithms too.

They performed experiments to compare PS-SAPSO and some other state-of-the-art SAEAs. Here they choose 4 different SAEAs including SACOSO, ESAO, SAMSO and CALLSO. These algorithms have shown promising performance to solve large-scale EOPs. Comparisons between PS-SAPSO and multiple state-of-the-art SAEAs for large-scale EOPs are done, this made them understand how better their approach and performance is towards the large-scale expensive optimization problem.

In the experiment conducted, they dynamically changed the location of the surrogate so that they can get reliable solutions for their swarm optimization problem. They concluded that their approach has given state of art performance over the compared models, further studies include threshold, parameter adjustments can also be considered or controlled for further enhancement for their approach to solve Surrogate Assisted particle Swarm Optimization problem.