

Particle Swarm Optimization

A parallelized approach

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Particle Swarm Optimization is an optimization algorithm for nonlinear functions based on bird swarms.

A particle is characterized by a position x , a velocity component v and a performance measure $f(x)$. Each particle needs to perceive the neighbors position, where z is the position of the best neighboring particle, while y is the particle personal best.

At each step, each particle updates:

$$v' = w \cdot v + \phi_1 U_1 \cdot (y - x) + \phi_2 U_2 \cdot (z - x)$$
$$x' = x + v'$$

Double column slide

- abhi4578. 2019. "Parallelization-of-PSO."
<https://github.com/abhi4578/Parallelization-of-PSO>.
- fisherling. 2020. "Pso." <https://github.com/fisherling/ps0>.
- Kennedy, J., and R. Eberhart. 1995. "Particle Swarm Optimization."
In *Proceedings of ICNN'95 - International Conference on Neural Networks*, 4:1942–1948 vol.4.
<https://doi.org/10.1109/ICNN.1995.488968>.
- kkentzo. 2020. "Pso." <https://github.com/kkentzo/ps0>.
- LaSEEB. 2020. "Openpso." <https://github.com/abhi4578/openpso>.
- Moraes, Antonio O. S., João F. Mitre, Paulo L. C. Lage, and
Argimiro R. Secchi. 2015. "A Robust Parallel Algorithm of the
Particle Swarm Optimization Method for Large Dimensional
Engineering Problems." *Applied Mathematical Modelling* 39
(14): 4223–41.
<https://doi.org/https://doi.org/10.1016/j.apm.2014.12.034>.

- Nedjah, Nadia, Rogério de Moraes Calazan, and Luiza de Macedo Mourelle. 2017. "A Fine-Grained Parallel Particle Swarm Optimization on Many-Core and Multi-Core Architectures." In *Parallel Computing Technologies*, edited by Victor Malyskin, 215–24. Cham: Springer International Publishing.
- pg443. 2021. "Particle-Swarm-Optimization-OpenMP." <https://github.com/pg443/Particle-Swarm-Optimization-OpenMP>.
- sousouho. 2019. "Succing PSO." <https://github.com/sousouhou/succinctPSO>.
- toddguant. 2019. "PSO Library for c." <https://github.com/toddgaunt/cpso>.