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| --- | --- | --- | --- |
| **Algorithm** | **Available information** | **Warm-start required** | **Cold-start (no warm-start required)** |
| **BFGS** | * Step size **αk** * Hessian approximation matrix **Hk** * Update factor for Hessian update **ρk** * Optimal solution x**opt** and related fitness value **fopt** * Gradient vector at best point, **gfk** | * Hessian approximation matrix **Hk** | * Initial point **x0**: Can be initialized with best point found by A1 * Gradient norm gnorm: Is calculated based on gradient at **x0** * Update factor for Hessian update **ρk**: Calculated based on step and gradient difference * Step size **αk:** Recalculated before it's being applied for the first time |
| **MLSL** | * Critical distance measure **rk** * Cumulated sample (population) **pop** and related fitness values **f** * Reduced sample **Χr**, consisting of the best 10% from the population, and their fitness values **fr** * Best points found by local search, **Χ\*** and their fitness values **f\*** * Iteration counter **k** * Optimal solution x**opt** and related fitness value **fopt** | * Iteration counter **k** | * Initial population **pop:** Add A1 population to cumulated sample and create additional individuals / neighbourhood of best A1 solution * Critical distance measure **rk**: Calculated based on current population size and iteration number * Reduced sample **Χr**: Determined by taking best 10% from cumulated sample |
| **EA** | * Step size vector **σ** * Population **pop** with fitness values **f** * Optimal solution x**opt** and related fitness value **fopt** | * Step size vector **σ** | * Initial population **pop:** Best individuals from A1 / neighbourhood of best A1 solution |
| **CMA-ES** | * Population **pop** with fitness values **f** * Optimal solution x**opt** and related fitness value **fopt** * Step size **σ** * Current centre of mass **m** * Covariance matrix **C** and its inverse **C-1** * Eigenvectors of the covariance matrix **B** * Eigenvalues of the covariance matrix **D** * Recent evolution paths **pc** and **ps** | * Initial population **pop** * Covariance matrix **C** * Step size **σ** | * Centre of mass **m**: Calculated based on population * eigenvectors, eigenvalues and evolution paths are calculated based on initialized covariance matrix |
| **PSO** | * Swarm with particle objects, each with **position**, **velocity**, **best\_so\_far\_position** and **best\_so\_far\_fitness** * Inertia weight **ω** * Optimal solution **xopt** and related fitness value **fopt** | * Particle **velocities** | * Particle **position**: Initialize with population from A1 / neighbourhood of best A1 solution * Particle **best\_position**: Calculate iteratively * Inertia weight **ω:** Calculated based on number of function evaluations / budget |