**Options for patternsearch and paretosearch**

| **Option** | **Description** | **Values** |
| --- | --- | --- |
| ConstraintTolerance | Tolerance on constraints.  For an options structure, use TolCon. | Positive scalar | {1e-6} |
| Display | Level of display. | 'off' | 'iter' | 'diagnose' | {'final'} |
| MaxFunctionEvaluations | Maximum number of objective function evaluations.  For an options structure, use MaxFunEvals. | Positive integer | {'2000\*numberOfVariables'} for patternsearch, {'3000\*(numberOfVariables+numberOfObjectives)'} for paretosearch, where numberOfVariables is the number of problem variables, and numberOfObjectives is the number of objective functions |
| MaxIterations | Maximum number of iterations.  For an options structure, use MaxIter. | Positive integer | {'100\*numberOfVariables'} for patternsearch, {'100\*(numberOfVariables+numberOfObjectives)'} for paretosearch, where numberOfVariables is the number of problem variables, and numberOfObjectives is the number of objective functions |
| MaxTime | Total time (in seconds) allowed for optimization.  For an options structure, use TimeLimit. | Positive scalar | {Inf} |
| MeshTolerance | Tolerance on the mesh size.  For an options structure, use TolMesh. | Positive scalar | {1e-6} |
| OutputFcn | Function that an optimization function calls at each iteration. Specify as a function handle or a cell array of function handles.  For an options structure, use OutputFcns. | [Function handle or cell array of function handles](https://www.mathworks.com/help/releases/R2022a/gads/pattern-search-options.html#f14623) | {[]} |
| PlotFcn | Plots of output from the pattern search. Specify as the name of a built-in plot function, a function handle, or a cell array of names of built-in plot functions or function handles.  For an options structure, use PlotFcns. | {[]} | For both patternsearch and paretosearch: 'psplotfuncount' | 'psplotmaxconstr' | [custom plot function](https://www.mathworks.com/help/releases/R2022a/gads/pattern-search-options.html#f14591)  For paretosearch only with multiple objectives: 'psplotdistance' | 'psplotparetof' | 'psplotparetox' | 'psplotspread' | 'psplotvolume'  For patternsearch only or paretosearch with a single objective: 'psplotbestf' | 'psplotmeshsize' | 'psplotbestx' |
| PollMethod | Polling strategy used in the pattern search.  **Note**  You cannot use MADS polling when the problem has linear equality constraints. | {'GPSPositiveBasis2N'} | 'GPSPositiveBasisNp1' | 'GSSPositiveBasis2N' | 'GSSPositiveBasisNp1' | 'MADSPositiveBasis2N' | 'MADSPositiveBasisNp1'  For paretosearch only: 'GSSPositiveBasis2np2' | {'GPSPositiveBasis2np2'} |
| UseParallel | Compute objective and nonlinear constraint functions in parallel. See [Vectorized and Parallel Options](https://www.mathworks.com/help/releases/R2022a/gads/pattern-search-options.html" \l "f9958) and [How to Use Parallel Processing in Global Optimization Toolbox](https://www.mathworks.com/help/releases/R2022a/gads/how-to-use-parallel-processing.html).  **Note**  You must set UseCompletePoll to true for patternsearch to use vectorized or parallel polling. Similarly, set UseCompleteSearch to true for vectorized or parallel searching.  Beginning in R2019a, when you set the UseParallel option to true, patternsearch internally overrides the UseCompletePoll setting to true so it polls in parallel. | true | {false} |
| UseVectorized | Specifies whether functions are vectorized. See [Vectorized and Parallel Options](https://www.mathworks.com/help/releases/R2022a/gads/pattern-search-options.html" \l "f9958) and [Vectorize the Objective and Constraint Functions](https://www.mathworks.com/help/releases/R2022a/gads/vectorizing-the-objective-and-constraint-functions.html).  **Note**  You must set UseCompletePoll to true for patternsearch to use vectorized or parallel polling. Similarly, set UseCompleteSearch to true for vectorized or parallel searching.  For an options structure, use Vectorized = 'on' or 'off'. | true | {false} |

**Options for paretosearch Only**

| **Option** | **Description** | **Values** |
| --- | --- | --- |
| InitialPoints | Initial points for paretosearch. Use one of these data types:   * Matrix with nvars columns, where each row represents one initial point. * Structure containing the following fields (all fields are optional except X0):   + X0 — Matrix with nvars columns, where each row represents one initial point.   + Fvals — Matrix with numObjectives columns, where each row represents the objective function values at the corresponding point in X0.   + Cineq — Matrix with numIneq columns, where each row represents the nonlinear inequality constraint values at the corresponding point in X0.   paretosearch computes any missing values in the Fvals and Cineq fields. | Matrix with nvars columns | structure | {[]} |
| MinPollFraction | Minimum fraction of the pattern to poll. | Scalar from 0 through 1 | {0} |
| ParetoSetSize | Number of points in the Pareto set. | Positive integer | {'max(numberOfObjectives, 60)'}, where numberOfObjectives is the number of objective functions |
| ParetoSetChangeTolerance | The solver stops when the relative change in a stopping measure over a window of iterations is less than or equal to ParetoSetChangeTolerance.   * For three or fewer objectives, paretosearch uses the volume and spread measures. * For four or more objectives, paretosearch uses the spread and distance measures.   See [Definitions for paretosearch Algorithm](https://www.mathworks.com/help/releases/R2022a/gads/paretosearch-algorithm.html#mw_74483c1d-e10d-4a4d-a2f9-47e46791ce06).  The solver stops when the relative change in any applicable measure is less than ParetoSetChangeTolerance, or the maximum of the squared Fourier transforms of the time series of these measures is relatively small. See [paretosearch Algorithm](https://www.mathworks.com/help/releases/R2022a/gads/paretosearch-algorithm.html).  **Note**  Setting ParetoSetChangeTolerance < sqrt(eps) ~ 1.5e-8 is not recommended. | Positive scalar | {1e-4} |

**Options for patternsearch Only**

| **Option** | **Description** | **Values** |
| --- | --- | --- |
| *Cache* | With Cache set to 'on', patternsearch keeps a history of the mesh points it polls. At subsequent iterations, patternsearch does not poll points close to those already polled. Use this option if patternsearch runs slowly while computing the objective function. If the objective function is stochastic, do not use this option.  **Note**  Cache does not work when you run the solver in parallel. | 'on' | {'off'} |
| *CacheSize* | Size of the history. | Positive scalar | {1e4} |
| *CacheTol* | Largest distance from the current mesh point to any point in the history in order for patternsearch to avoid polling the current point. Use if Cache option is set to 'on'. | Positive scalar | {eps} |
| FunctionTolerance | Tolerance on the function. Iterations stop if the change in function value is less than FunctionTolerance and the mesh size is less than StepTolerance. This option does not apply to MADS polling.  For an options structure, use TolFun. | Positive scalar | {1e-6} |
| InitialMeshSize | Initial mesh size for the algorithm. See [How Pattern Search Polling Works](https://www.mathworks.com/help/releases/R2022a/gads/how-pattern-search-polling-works.html). | Positive scalar | {1.0} |
| *InitialPenalty* | Initial value of the penalty parameter. See [Nonlinear Constraint Solver Algorithm](https://www.mathworks.com/help/releases/R2022a/gads/description-of-nonlinear-constraint-solver.html). | Positive scalar | {10} |
| *MaxMeshSize* | Maximum mesh size used in a poll or search step. See [How Pattern Search Polling Works](https://www.mathworks.com/help/releases/R2022a/gads/how-pattern-search-polling-works.html). | Positive scalar | {Inf} |
| MeshContractionFactor | Mesh contraction factor for unsuccessful iteration.  For an options structure, use MeshContraction. | Positive scalar | {0.5} |
| MeshExpansionFactor | Mesh expansion factor for successful iteration.  For an options structure, use MeshExpansion. | Positive scalar | {2.0} |
| *MeshRotate* | Rotate the pattern before declaring a point to be optimum. See [Mesh Options](https://www.mathworks.com/help/releases/R2022a/gads/pattern-search-options.html#f9937). | 'off' | {'on'} |
| *PenaltyFactor* | Penalty update parameter. See [Nonlinear Constraint Solver Algorithm](https://www.mathworks.com/help/releases/R2022a/gads/description-of-nonlinear-constraint-solver.html). | Positive scalar | {100} |
| *PlotInterval* | Specifies that plot functions are called at every interval. | positive integer | {1} |
| PollOrderAlgorithm | Order of poll directions in pattern search.  For an options structure, use PollingOrder. | 'Random' | 'Success' | {'Consecutive'} |
| ScaleMesh | Automatic scaling of variables.  For an options structure, use ScaleMesh = 'on' or 'off'. | {true}| false |
| SearchFcn | Type of search used in pattern search. Specify as a name or a function handle.  For an options structure, use SearchMethod. | 'GPSPositiveBasis2N' | 'GPSPositiveBasisNp1' | 'GSSPositiveBasis2N' | 'GSSPositiveBasisNp1' | 'MADSPositiveBasis2N' | 'MADSPositiveBasisNp1' | 'searchga' | 'searchlhs' | 'searchneldermead' | {[]} | [custom search function](https://www.mathworks.com/help/releases/R2022a/gads/pattern-search-options.html#f11348) |
| StepTolerance | Tolerance on the variable. Iterations stop if both the change in position and the mesh size are less than StepTolerance. This option does not apply to MADS polling.  For an options structure, use TolX. | Positive scalar | {1e-6} |
| *TolBind* | Binding tolerance. See [Constraint Parameters](https://www.mathworks.com/help/releases/R2022a/gads/pattern-search-options.html#bqfublf-1). | Positive scalar | {1e-3} |
| UseCompletePoll | Complete poll around the current point. See [How Pattern Search Polling Works](https://www.mathworks.com/help/releases/R2022a/gads/how-pattern-search-polling-works.html).  For an options structure, use CompletePoll = 'on' or 'off'. | true | {false} |
| UseCompleteSearch | Complete search around current point when the search method is a poll method. See [Searching and Polling](https://www.mathworks.com/help/releases/R2022a/gads/searching-and-polling.html).  For an options structure, use CompleteSearch = 'on' or 'off'. | true | {false} |