

I. LIST OF FUNCTIONS

Functions starting with the “crcb” prefix are listed first (this prefix is omitted from the name of the function) followed by the non-crcb functions. Scripts named as “test_crcb⟨name⟩” are listed at the end. Where appropriate, the description of a function points the reader to the lectures [? ? ?] in the SLIDES directory where a discussion of the relevant topic can be found.

CRCB function	Description
pso	Implements local best (<i>lbest</i>) PSO[?]. It is assumed that the search space is a hypercube with the coordinate along each dimension lying in the range $[0, 1]$ (standardized coordinates). The function provides flexibility in changing the parameters associated with the <i>lbest</i> PSO algorithm and it can be used on any fitness function provided the latter has a specified interface.
psotestfunc	Implements the generalized Rastrigin fitness function. The primary purpose of this function is to serve as a template for creating new fitness functions that can be fed to the pso function.
genqcsig	Generates the quadratic chirp signal used in the parametric regression problem [? ?]. The amplitude and phase parameters of the signal can be specified through the input arguments to this function
genbsplsig	Generates the single B-spline signal used in the non-parametric regression problem [? ?]. The breakpoints for the B-spline can be specified through the input arguments to this function.
genqcdata	Generate a single data realization containing a quadratic chirp signal added to a white, Gaussian noise realization.
genbspldata	Generate a single data realization containing a single B-spline signal added to a white, Gaussian noise realization.
qcfitfunc	The fitness function for the quadratic chirp regression problem. Returns the sum of squared residuals after maximizing [?] over the amplitude parameter (A). See [?] for the derivation of this fitness function.

regsplfitfunc	The fitness function for the regression spline problem (without the penalized spline regulator). Returns the sum of squared residuals after minimizing it over B-spline coefficients [?].
qcpso	Applies the pso function using the Best-of-M-runs strategy [?] to the quadratic chirp regression fitness function (qcfitunc). It is assumed that the Matlab Parallel Computing Toolbox is available for implementing the BMR strategy. If not, the “parfor” loop should be changed to a “for” loop.
regsplpso	Applies the pso function using the BMR strategy [?] to the regression spline fitness function (regsplfitfunc). It is assumed that the Matlab Parallel Computing Toolbox is available for implementing the BMR strategy. If not, the “parfor” loop should be changed to a “for” loop.
crdnlsplfit	Implements the fitness function for a cardinal spline fit. Note that this fitness function is not to be optimized by pso. It returns the best fit curve.
chkstdsrchrng	Helper function that checks if a given location (standardized coordinates) is inside the unit hypercube. Returns a logical output indicating failure or success of this condition.

Test function	Description
pso	Shows how to call the pso function using the psotestfuncfitness function as the target fitness function to be optimized.
qcpso	Shows how to call pso on qcfitunc.
regsplpso	Shows how to call pso on regsplfitfunc.
crdnlsplfit	Shows how to call the crdnlsplfit function.