

TMVA Configuration Options Reference

Reference version: **TMVA-v4.2.0****TMVA-version @ ROOT**

Reference for configuration options defined in the option string of each MVA method booking, and for the definition of data sets used for training and testing (Factory).

Table fields:

Option:	The option identifier in the option string (given, e.g., in "factory->BookMethod(...)" call).
Array:	Can the option be set individually for each input variable via the "[i]" tag, where "i" is the ith variable?
Default value:	Value used if option is not explicitly set in the configuration option string.
Predefined values:	Options can be categories of predefined values among which the user must choose.
Description:	Info about the option.

Colour codes:

Greenish rows:	Options shared by all MVA methods (through common base class).
Bluish rows:	Specific MVA options.
Yellowish rows:	Configuration options for minimiser (fitter) classes.
Redish rows:	Options for other configurable classes.

Available MVA methods (1st row), minimisation tools (2nd row), and other configurables (3rd row):

[\[MVA::HMatrix\]](#) [\[MVA::Fisher\]](#) [\[MVA::PDERS\]](#) [\[MVA::FDA\]](#) [\[MVA::LD\]](#) [\[MVA::SVM\]](#) [\[MVA::CFMlpANN\]](#) [\[MVA::KNN\]](#) [\[MVA::BDT\]](#)
[\[MVA::Boost\]](#) [\[MVA::RuleFit\]](#) [\[MVA::Likelihood\]](#) [\[MVA::MLP\]](#) [\[MVA::Cuts\]](#) [\[MVA::PDEfoam\]](#) [\[MVA::TMlpANN\]](#)
[\[Fitter_SA\]](#) [\[Fitter_MC\]](#) [\[Fitter_Minuit\]](#) [\[Fitter_GA\]](#)
[\[DataSetFactory\]](#) [\[PDF\]](#) [\[Factory\]](#)

Configuration options for MVA method :



Configuration options reference for MVA method: *HMatrix*

Option	Array	Default value	Predefined values	Description
V	No	False	–	Verbose output (short form of VerbosityLevel below - overrides the latter one)
VerbosityLevel	No	Default	Default, Debug, Verbose, Info, Warning, Error, Fatal	Verbosity level
VarTransform	No	None	–	List of variable transformations performed before training, e.g., D_Background, P_Signal, G, N_AllClasses for: Decorrelation, PCA-transformation, Gaussianisation, Normalisation, each for the given class of events ('AllClasses' denotes all events of all classes, if no class indication is given, 'All' is assumed)
H	No	False	–	Print method-specific help message
CreateMVAPdfs	No	False	–	Create PDFs for classifier outputs (signal and background)
IgnoreNegWeightsInTraining	No	False	–	Events with negative weights are ignored in the training (but are included for testing and performance evaluation)

Configuration options for MVA method :



Configuration options reference for MVA method: *Fisher*

Option	Array	Default value	Predefined values	Description
V	No	False	–	Verbose output (short form of VerbosityLevel below - overrides the latter one)
VerbosityLevel	No	Default	Default, Debug, Verbose, Info, Warning, Error, Fatal	Verbosity level
VarTransform	No	None	–	List of variable transformations performed before training, e.g., D_Background, P_Signal, G, N_AllClasses for: Decorrelation, PCA-transformation, Gaussianisation,

H	No	False	–	Normalisation, each for the given class of events ('AllClasses' denotes all events of all classes, if no class indication is given, 'All' is assumed)
CreateMVAPdfs	No	False	–	Print method-specific help message
IgnoreNegWeightsInTraining	No	False	–	Create PDFs for classifier outputs (signal and background)
Method	No	Fisher	Fisher, Mahalanobis	Events with negative weights are ignored in the training (but are included for testing and performance evaluation)
				Discrimination method

Configuration options for MVA method :



Configuration options reference for MVA method: *PDERS*

Option	Array	Default value	Predefined values	Description
V	No	False	–	Verbose output (short form of VerbosityLevel below - overrides the latter one)
VerbosityLevel	No	Default	Default, Debug, Verbose, Info, Warning, Error, Fatal	Verbosity level
VarTransform	No	None	–	List of variable transformations performed before training, e.g., D_Background,P_Signal,G,N_AllClasses for: Decorrelation, PCA-transformation, Gaussianisation, Normalisation, each for the given class of events ('AllClasses' denotes all events of all classes, if no class indication is given, 'All' is assumed)
H	No	False	–	Print method-specific help message
CreateMVAPdfs	No	False	–	Create PDFs for classifier outputs (signal and background)
IgnoreNegWeightsInTraining	No	False	–	Events with negative weights are ignored in the training (but are included for testing and performance evaluation)
VolumeRangeMode	No	Adaptive	Unscaled, MinMax, RMS, Adaptive, kNN	Method to determine volume size
KernelEstimator	No	Box	Box, Sphere, Teepee, Gauss, Sinc3, Sinc5, Sinc7, Sinc9, Sinc11, Lanczos2, Lanczos3, Lanczos5, Lanczos8, Trim	Kernel estimation function
DeltaFrac	No	3	–	nEventsMin/Max for minmax and rms volume range
NEventsMin	No	100	–	nEventsMin for adaptive volume range
NEventsMax	No	200	–	nEventsMax for adaptive volume range
MaxVIterations	No	150	–	MaxVIterations for adaptive volume range
InitialScale	No	0.99	–	InitialScale for adaptive volume range
GaussSigma	No	0.1	–	Width (wrt volume size) of Gaussian kernel estimator
NormTree	No	False	–	Normalize binary search tree

Configuration options for MVA method :



Configuration options reference for MVA method: *FDA*

Option	Array	Default value	Predefined values	Description
V	No	False	–	Verbose output (short form of VerbosityLevel below - overrides the latter one)
VerbosityLevel	No	Default	Default, Debug, Verbose, Info, Warning, Error, Fatal	Verbosity level
VarTransform	No	None	–	List of variable transformations performed before training, e.g., D_Background,P_Signal,G,N_AllClasses for: Decorrelation, PCA-transformation, Gaussianisation, Normalisation, each for the given class of events ('AllClasses' denotes all events of all classes, if no

H	No	False	–	class indication is given, 'All' is assumed)
CreateMVAPdfs	No	False	–	Print method-specific help message
IgnoreNegWeightsInTraining	No	False	–	Create PDFs for classifier outputs (signal and background)
Formula	No	(0)	–	Events with negative weights are ignored in the training (but are included for testing and performance evaluation)
ParRanges	No	()	–	The discrimination formula
FitMethod	No	MINUIT	MC, GA, SA, MINUIT	Parameter ranges
Converger	No	None	None, MINUIT	Optimisation Method
				FitMethod uses Converger to improve result

Configuration options for MVA method :



Configuration options reference for MVA method: *LD*

Option	Array	Default value	Predefined values	Description
V	No	False	–	Verbose output (short form of VerbosityLevel below - overrides the latter one)
VerbosityLevel	No	Default	Default, Debug, Verbose, Info, Warning, Error, Fatal	Verbosity level
VarTransform	No	None	–	List of variable transformations performed before training, e.g., D_Background,P_Signal,G,N_AllClasses for: Decorrelation, PCA-transformation, Gaussianisation, Normalisation, each for the given class of events ('AllClasses' denotes all events of all classes, if no class indication is given, 'All' is assumed)
H	No	False	–	Print method-specific help message
CreateMVAPdfs	No	False	–	Create PDFs for classifier outputs (signal and background)
IgnoreNegWeightsInTraining	No	False	–	Events with negative weights are ignored in the training (but are included for testing and performance evaluation)

Configuration options for MVA method :



Configuration options reference for MVA method: *SVM*

Option	Array	Default value	Predefined values	Description
V	No	False	–	Verbose output (short form of VerbosityLevel below - overrides the latter one)
VerbosityLevel	No	Default	Default, Debug, Verbose, Info, Warning, Error, Fatal	Verbosity level
VarTransform	No	None	–	List of variable transformations performed before training, e.g., D_Background,P_Signal,G,N_AllClasses for: Decorrelation, PCA-transformation, Gaussianisation, Normalisation, each for the given class of events ('AllClasses' denotes all events of all classes, if no class indication is given, 'All' is assumed)
H	No	False	–	Print method-specific help message
CreateMVAPdfs	No	False	–	Create PDFs for classifier outputs (signal and background)
IgnoreNegWeightsInTraining	No	False	–	Events with negative weights are ignored in the training (but are included for testing and performance evaluation)
Gamma	No	1	–	RBF kernel parameter: Gamma (size of the Kernel)
C	No	1	–	Cost parameter
Tol	No	0.01	–	Tolerance parameter
MaxIter	No	1000	–	Maximum number of training loops

Configuration options for MVA method :



Configuration options reference for MVA method: *CFMlpANN*

Option	Array	Default value	Predefined values	Description
V	No	False	–	Verbose output (short form of VerbosityLevel below - overrides the latter one)
VerbosityLevel	No	Default	Default, Debug, Verbose, Info, Warning, Error, Fatal	Verbosity level
VarTransform	No	None	–	List of variable transformations performed before training, e.g., D_Background,P_Signal,G,N_AllClasses for: Decorrelation, PCA-transformation, Gaussianisation, Normalisation, each for the given class of events ('AllClasses' denotes all events of all classes, if no class indication is given, 'All' is assumed)
H	No	False	–	Print method-specific help message
CreateMVAPdfs	No	False	–	Create PDFs for classifier outputs (signal and background)
IgnoreNegWeightsInTraining	No	False	–	Events with negative weights are ignored in the training (but are included for testing and performance evaluation)
NCycles	No	3000	–	Number of training cycles
HiddenLayers	No	N,N-1	–	Specification of hidden layer architecture

Configuration options for MVA method :

**Configuration options reference for MVA method: *KNN***

Option	Array	Default value	Predefined values	Description
V	No	False	–	Verbose output (short form of VerbosityLevel below - overrides the latter one)
VerbosityLevel	No	Default	Default, Debug, Verbose, Info, Warning, Error, Fatal	Verbosity level
VarTransform	No	None	–	List of variable transformations performed before training, e.g., D_Background,P_Signal,G,N_AllClasses for: Decorrelation, PCA-transformation, Gaussianisation, Normalisation, each for the given class of events ('AllClasses' denotes all events of all classes, if no class indication is given, 'All' is assumed)
H	No	False	–	Print method-specific help message
CreateMVAPdfs	No	False	–	Create PDFs for classifier outputs (signal and background)
IgnoreNegWeightsInTraining	No	False	–	Events with negative weights are ignored in the training (but are included for testing and performance evaluation)
nkNN	No	20	–	Number of k-nearest neighbors
BalanceDepth	No	6	–	Binary tree balance depth
ScaleFrac	No	0.8	–	Fraction of events used to compute variable width
SigmaFact	No	1	–	Scale factor for sigma in Gaussian kernel
Kernel	No	Gaus	–	Use polynomial (=Poln) or Gaussian (=Gaus) kernel
Trim	No	False	–	Use equal number of signal and background events
UseKernel	No	False	–	Use polynomial kernel weight
UseWeight	No	True	–	Use weight to count kNN events
UseLDA	No	False	–	Use local linear discriminant - experimental feature

Configuration options for MVA method :

**Configuration options reference for MVA method: *BDT***

Option	Array	Default value	Predefined values	Description
V	No	False	–	Verbose output (short form of VerbosityLevel below - overrides the latter one)

VerbosityLevel	No	Default	Default, Debug, Verbose, Info, Warning, Error, Fatal	Verbosity level
				List of variable transformations performed before training, e.g., D_Background, P_Signal, G_N_AllClasses
VarTransform	No	None	–	for: Decorrelation, PCA-transformation, Gaussianisation, Normalisation, each for the given class of events ('AllClasses' denotes all events of all classes, if no class indication is given, 'All' is assumed)
H	No	False	–	Print method-specific help message
CreateMVAPdfs	No	False	–	Create PDFs for classifier outputs (signal and background)
IgnoreNegWeightsInTraining	No	False	–	Events with negative weights are ignored in the training (but are included for testing and performance evaluation)
NTrees	No	800	–	Number of trees in the forest
MaxDepth	No	3	–	Max depth of the decision tree allowed
MinNodeSize	No	5%	–	Minimum percentage of training events required in a leaf node (default: Classification: 5%, Regression: 0.2%)
nCuts	No	20	–	Number of grid points in variable range used in finding optimal cut in node splitting
BoostType	No	AdaBoost	AdaBoost, RealAdaBoost, Bagging, AdaBoostR2, Grad	Boosting type for the trees in the forest
AdaBoostR2Loss	No	Quadratic	Linear, Quadratic, Exponential	Type of Loss function in AdaBoostR2
UseBaggedBoost	No	False	–	Use only a random subsample of all events for growing the trees in each iteration.
Shrinkage	No	1	–	Learning rate for GradBoost algorithm
AdaBoostBeta	No	0.5	–	Learning rate for AdaBoost algorithm
UseRandomisedTrees	No	False	–	Determine at each node splitting the cut variable only as the best out of a random subset of variables (like in RandomForests)
UseNvars	No	2	–	Size of the subset of variables used with RandomisedTree option
UsePoissonNvars	No	True	–	Interpret UseNvars not as fixed number but as mean of a Poisson distribution in each split with RandomisedTree option
BaggedSampleFraction	No	0.6	–	Relative size of bagged event sample to original size of the data sample (used whenever bagging is used (i.e. UseBaggedGrad, Bagging,))
UseYesNoLeaf	No	True	–	Use Sig or Bkg categories, or the purity=S/(S+B) as classification of the leaf node -> Real-AdaBoost
NegWeightTreatment	No	InverseBoostNegWeights	InverseBoostNegWeights, IgnoreNegWeightsInTraining, PairNegWeightsGlobal, Pray	How to treat events with negative weights in the BDT training (particular the boosting) : IgnoreInTraining; Boost With inverse boostweight; Pair events with negative and positive weights in training sample and *annihilate* them (experimental!)
NodePurityLimit	No	0.5	–	In boosting/pruning, nodes with purity > NodePurityLimit are signal; background otherwise.
SeparationType	No	GiniIndex	CrossEntropy, GiniIndex, GiniIndexWithLaplace, MisClassificationError, SDivSqrtSPlusB, RegressionVariance	Separation criterion for node splitting
DoBoostMonitor	No	False	–	Create control plot with ROC integral vs tree number
UseFisherCuts	No	False	–	Use multivariate splits using the Fisher criterion

MinLinCorrForFisher	No	0.8	–	The minimum linear correlation between two variables demanded for use in Fisher criterion in node splitting
UseExclusiveVars	No	False	–	Variables already used in fisher criterion are not anymore analysed individually for node splitting
DoPreselection	No	False	–	and and apply automatic pre-selection for 100% efficient signal (bkg) cuts prior to training
RenormByClass	No	False	–	Individually re-normalize each event class to the original size after boosting
SigToBkgFraction	No	1	–	Sig to Bkg ratio used in Training (similar to NodePurityLimit, which cannot be used in real adaboost)
PruneMethod	No	NoPruning	NoPruning, ExpectedError, CostComplexity	Note: for BDTs use small trees (e.g. MaxDepth=3) and NoPruning: Pruning: Method used for pruning (removal) of statistically insignificant branches
PruneStrength	No	0	–	Pruning strength
PruningValFraction	No	0.5	–	Fraction of events to use for optimizing automatic pruning.
GradBaggingFraction	No	0.6	–	deprecated: Use *BaggedSampleFraction* instead: Defines the fraction of events to be used in each iteration, e.g. when UseBaggedGrad=kTRUE.
UseNTrainEvents	No	0	–	deprecated: Use *BaggedSampleFraction* instead: Number of randomly picked training events used in randomised (and bagged) trees

Configuration options for MVA method :



Configuration options reference for MVA method: *Boost*

Option	Array	Default value	Predefined values	Description
V	No	False	–	Verbose output (short form of VerbosityLevel below - overrides the latter one)
VerbosityLevel	No	Default	Default, Debug, Verbose, Info, Warning, Error, Fatal	Verbosity level
VarTransform	No	None	–	List of variable transformations performed before training, e.g., D_Background, P_Signal, G, N_AllClasses for: Decorrelation, PCA-transformation, Gaussianisation, Normalisation, each for the given class of events ('AllClasses' denotes all events of all classes, if no class indication is given, 'All' is assumed)
H	No	False	–	Print method-specific help message
CreateMVAPdfs	No	False	–	Create PDFs for classifier outputs (signal and background)
IgnoreNegWeightsInTraining	No	False	–	Events with negative weights are ignored in the training (but are included for testing and performance evaluation)
Boost_Num	No	100	–	Number of times the classifier is boosted
Boost_MonitorMethod	No	True	–	Write monitoring histograms for each boosted classifier
Boost_DetailedMonitoring	No	False	–	Produce histograms for detailed boost-wise monitoring
Boost_Type	No	AdaBoost	AdaBoost, Bagging	Boosting type for the classifiers
Boost_BaggedSampleFraction	No	0.6	–	Relative size of bagged event sample to original size of the data sample (used whenever bagging is used)
Boost_RecalculateMVACut	No	True	–	Recalculate the classifier MVA Signallike cut at every boost iteration
Boost_AdaBoostBeta	No	1	–	The ADA boost parameter that sets the effect of every boost step on the events' weights

Boost_Transform	No	step	step, linear, log, gauss	Type of transform applied to every boosted method linear, log, step
Boost_RandomSeed	No	0	–	Seed for random number generator used for bagging

Configuration options for MVA method :

**Configuration options reference for MVA method: *RuleFit***

Option	Array	Default value	Predefined values	Description
V	No	False	–	Verbose output (short form of VerbosityLevel below - overrides the latter one)
VerbosityLevel	No	Default	Default, Debug, Verbose, Info, Warning, Error, Fatal	Verbosity level
VarTransform	No	None	–	List of variable transformations performed before training, e.g., D_Background,P_Signal,G,N_AllClasses for: Decorrelation, PCA-transformation, Gaussianisation, Normalisation, each for the given class of events ('AllClasses' denotes all events of all classes, if no class indication is given, 'All' is assumed)
H	No	False	–	Print method-specific help message
CreateMVAPdfs	No	False	–	Create PDFs for classifier outputs (signal and background)
IgnoreNegWeightsInTraining	No	False	–	Events with negative weights are ignored in the training (but are included for testing and performance evaluation)
GDTau	No	-1	–	Gradient-directed (GD) path: default fit cut-off
GDTauPrec	No	0.01	–	GD path: precision of tau
GDStep	No	0.01	–	GD path: step size
GDNSteps	No	10000	–	GD path: number of steps
GDErrScale	No	1.1	–	Stop scan when error > scale*errmin
LinQuantile	No	0.025	–	Quantile of linear terms (removes outliers)
GDPathEveFrac	No	0.5	–	Fraction of events used for the path search
GDValidEveFrac	No	0.5	–	Fraction of events used for the validation
fEventsMin	No	0.1	–	Minimum fraction of events in a splittable node
fEventsMax	No	0.9	–	Maximum fraction of events in a splittable node
nTrees	No	20	–	Number of trees in forest.
ForestType	No	AdaBoost	AdaBoost, Random	Method to use for forest generation (AdaBoost or RandomForest)
RuleMinDist	No	0.001	–	Minimum distance between rules
MinImp	No	0.01	–	Minimum rule importance accepted
Model	No	ModRuleLinear	ModRule, ModRuleLinear, ModLinear	Model to be used
RuleFitModule	No	RFTMVA	RFTMVA, RFFriedman	Which RuleFit module to use
RFWorkDir	No	./rulefit	–	Friedman's RuleFit module (RFF): working dir
RFNrules	No	2000	–	RFF: Mximum number of rules
RFNendnodes	No	4	–	RFF: Average number of end nodes

Configuration options for MVA method :

**Configuration options reference for MVA method: *Likelihood***

Option	Array	Default value	Predefined values	Description
V	No	False	–	Verbose output (short form of VerbosityLevel below - overrides the latter one)
VerbosityLevel	No	Default	Default, Debug, Verbose, Info, Warning, Error, Fatal	Verbosity level
VarTransform	No	None	–	List of variable transformations performed before training, e.g., D_Background,P_Signal,G,N_AllClasses for:

H	No	False	–	Decorrelation, PCA-transformation, Gaussianisation, Normalisation, each for the given class of events ('AllClasses' denotes all events of all classes, if no class indication is given, 'All' is assumed)
CreateMVAPdfs	No	False	–	Print method-specific help message
IgnoreNegWeightsInTraining	No	False	–	Create PDFs for classifier outputs (signal and background)
TransformOutput	No	False	–	Events with negative weights are ignored in the training (but are included for testing and performance evaluation)
				Transform likelihood output by inverse sigmoid function

Configuration options for MVA method :



Configuration options reference for MVA method: *MLP*

Option	Array	Default value	Predefined values	Description
NCycles	No	500	–	Number of training cycles
HiddenLayers	No	N,N-1	–	Specification of hidden layer architecture
NeuronType	No	sigmoid	–	Neuron activation function type
RandomSeed	No	1	–	Random seed for initial synapse weights (0 means unique seed for each run; default value '1')
EstimatorType	No	MSE	MSE, CE, linear, sigmoid, tanh, radial	MSE (Mean Square Estimator) for Gaussian Likelihood or CE(Cross-Entropy) for Bernoulli Likelihood
NeuronInputType	No	sum	sum, sqsum, abssum	Neuron input function type
V	No	False	–	Verbose output (short form of VerbosityLevel below - overrides the latter one)
VerbosityLevel	No	Default	Default, Debug, Verbose, Info, Warning, Error, Fatal	Verbosity level
VarTransform	No	None	–	List of variable transformations performed before training, e.g., D_Background,P_Signal,G,N_AllClasses for: Decorrelation, PCA-transformation, Gaussianisation, Normalisation, each for the given class of events ('AllClasses' denotes all events of all classes, if no class indication is given, 'All' is assumed)
H	No	False	–	Print method-specific help message
CreateMVAPdfs	No	False	–	Create PDFs for classifier outputs (signal and background)
IgnoreNegWeightsInTraining	No	False	–	Events with negative weights are ignored in the training (but are included for testing and performance evaluation)
TrainingMethod	No	BP	BP, GA, BFGS	Train with Back-Propagation (BP), BFGS Algorithm (BFGS), or Genetic Algorithm (GA - slower and worse)
LearningRate	No	0.02	–	ANN learning rate parameter
DecayRate	No	0.01	–	Decay rate for learning parameter
TestRate	No	10	–	Test for overtraining performed at each #th epochs
EpochMonitoring	No	False	–	Provide epoch-wise monitoring plots according to TestRate (caution: causes big ROOT output file!)
Sampling	No	1	–	Only 'Sampling' (randomly selected) events are trained each epoch
SamplingEpoch	No	1	–	Sampling is used for the first 'SamplingEpoch' epochs, afterwards, all events are taken for training
SamplingImportance	No	1	–	The sampling weights of events in epochs which successful (worse estimator than before) are multiplied with SamplingImportance, else they are divided.
SamplingTraining	No	True	–	The training sample is sampled
SamplingTesting	No	False	–	The testing sample is sampled

ResetStep	No	50	–	How often BFGS should reset history
Tau	No	3	–	LineSearch size step
BPMODE	No	sequential	sequential, batch	Back-propagation learning mode: sequential or batch
BatchSize	No	-1	–	Batch size: number of events/batch, only set if in Batch Mode, -1 for BatchSize=number_of_events
ConvergenceImprove	No	1e-30	–	Minimum improvement which counts as improvement (<0 means automatic convergence check is turned off)
ConvergenceTests	No	-1	–	Number of steps (without improvement) required for convergence (<0 means automatic convergence check is turned off)
UseRegulator	No	False	–	Use regulator to avoid over-training
UpdateLimit	No	10000	–	Maximum times of regulator update
CalculateErrors	No	False	–	Calculates inverse Hessian matrix at the end of the training to be able to calculate the uncertainties of an MVA value
WeightRange	No	1	–	Take the events for the estimator calculations from small deviations from the desired value to large deviations only over the weight range

Configuration options for MVA method :



Configuration options reference for MVA method: *Cuts*

Option	Array	Default value	Predefined values	Description
V	No	False	–	Verbose output (short form of VerbosityLevel below - overrides the latter one)
VerbosityLevel	No	Default	Default, Debug, Verbose, Info, Warning, Error, Fatal	Verbosity level
VarTransform	No	None	–	List of variable transformations performed before training, e.g., D_Background, P_Signal, G, N_AllClasses for: Decorrelation, PCA-transformation, Gaussianisation, Normalisation, each for the given class of events ('AllClasses' denotes all events of all classes, if no class indication is given, 'All' is assumed)
H	No	False	–	Print method-specific help message
CreateMVAPdfs	No	False	–	Create PDFs for classifier outputs (signal and background)
IgnoreNegWeightsInTraining	No	False	–	Events with negative weights are ignored in the training (but are included for testing and performance evaluation)
FitMethod	No	GA	GA, SA, MC, MCEvents, MINUIT, EventScan	Minimisation Method (GA, SA, and MC are the primary methods to be used; the others have been introduced for testing purposes and are deprecated)
EffMethod	No	EffSel	EffSel, EffPDF	Selection Method
CutRangeMin	Yes	-1	–	Minimum of allowed cut range (set per variable)
CutRangeMax	Yes	-1	–	Maximum of allowed cut range (set per variable)
VarProp	Yes	NotEnforced	NotEnforced, FMax, FMin, FSmart	Categorisation of cuts

Configuration options for MVA method :



Configuration options reference for MVA method: *PDEFoam*

Option	Array	Default value	Predefined values	Description
V	No	False	–	Verbose output (short form of VerbosityLevel below - overrides the latter one)
VerbosityLevel	No	Default	Default, Debug, Verbose, Info, Warning, Error, Fatal	Verbosity level
VarTransform	No	None	–	List of variable transformations performed before training, e.g., D_Background, P_Signal, G, N_AllClasses for:

H	No	False	–	Decorrelation, PCA-transformation, Gaussianisation, Normalisation, each for the given class of events ('AllClasses' denotes all events of all classes, if no class indication is given, 'All' is assumed)
CreateMVAPdfs	No	False	–	Print method-specific help message
IgnoreNegWeightsInTraining	No	False	–	Create PDFs for classifier outputs (signal and background)
SigBgSeparate	No	False	–	Events with negative weights are ignored in the training (but are included for testing and performance evaluation)
TailCut	No	0.001	–	Separate foams for signal and background
VolFrac	No	0.0666667	–	Fraction of outlier events that are excluded from the foam in each dimension
nActiveCells	No	500	–	Size of sampling box, used for density calculation during foam build-up (maximum value: 1.0 is equivalent to volume of entire foam)
nSampl	No	2000	–	Maximum number of active cells to be created by the foam
nBin	No	5	–	Number of generated MC events per cell
Compress	No	True	–	Number of bins in edge histograms
MultiTargetRegression	No	False	–	Compress foam output file
Nmin	No	100	–	Do regression with multiple targets
MaxDepth	No	0	–	Number of events in cell required to split cell
FillFoamWithOrigWeights	No	False	–	Maximum depth of cell tree (0=unlimited)
UseYesNoCell	No	False	–	Fill foam with original or boost weights
DTLogic	No	None	None, GiniIndex, MisClassificationError, CrossEntropy, GiniIndexWithLaplace, SdivSqrtSplusB	Return -1 or 1 for bkg or signal like events
Kernel	No	None	None, Gauss, LinNeighbors	Use decision tree algorithm to split cells
TargetSelection	No	Mean	Mean, Mpv	Kernel type used

Configuration options for MVA method :



Configuration options reference for MVA method: *TMlpANN*

Option	Array	Default value	Predefined values	Description
V	No	False	–	Verbose output (short form of VerbosityLevel below - overrides the latter one)
VerbosityLevel	No	Default	Default, Debug, Verbose, Info, Warning, Error, Fatal	Verbosity level
VarTransform	No	None	–	List of variable transformations performed before training, e.g., D_Background, P_Signal, G_N_AllClasses for: Decorrelation, PCA-transformation, Gaussianisation, Normalisation, each for the given class of events ('AllClasses' denotes all events of all classes, if no class indication is given, 'All' is assumed)
H	No	False	–	Print method-specific help message
CreateMVAPdfs	No	False	–	Create PDFs for classifier outputs (signal and background)
IgnoreNegWeightsInTraining	No	False	–	Events with negative weights are ignored in the training (but are included for testing and performance evaluation)
NCycles	No	200	–	Number of training cycles
HiddenLayers	No	N,N-1	–	Specification of hidden layer architecture (N stands for number of variables; any integers may also be used)

ValidationFraction	No	0.5	–	Fraction of events in training tree used for cross validation
LearningMethod	No	Stochastic	Stochastic, Batch, SteepestDescent, RibierePolak, FletcherReeves, BFGS	Learning method

Configuration options for setup and tuning of specific fitter :

Configuration options reference for fitting method: *Simulated Annealing (SA)*

Option	Array	Default value	Predefined values	Description
MaxCalls	No	100000	–	Maximum number of minimisation calls
InitialTemp	No	1e+06	–	Initial temperature
MinTemp	No	1e-06	–	Minimum temperature
Eps	No	1e-10	–	Epsilon
TempScale	No	1	–	Temperature scale
AdaptiveSpeed	No	1	–	Adaptive speed
TempAdaptiveStep	No	0.009875	–	Step made in each generation temperature adaptive
UseDefaultScale	No	False	–	Use default temperature scale for temperature minimisation algorithm
UseDefaultTemp	No	False	–	Use default initial temperature
KernelTemp	No	IncAdaptive	IncAdaptive, DecAdaptive, Sqrt, Log, Sin, Homo, Geo	Temperature minimisation algorithm

Configuration options for setup and tuning of specific fitter :

Configuration options reference for fitting method: *Monte Carlo sampling (MC)*

Option	Array	Default value	Predefined values	Description
SampleSize	No	100000	–	Number of Monte Carlo events in toy sample
Sigma	No	-1	–	If > 0: new points are generated according to Gauss around best value and with Sigma in units of interval length
Seed	No	100	–	Seed for the random generator (0 takes random seeds)

Configuration options for setup and tuning of specific fitter :

Configuration options reference for fitting method: *TMinuit (MT)*

Option	Array	Default value	Predefined values	Description
ErrorLevel	No	1	–	TMinuit: error level: 0.5=logL fit, 1=chi-squared fit
PrintLevel	No	-1	–	TMinuit: output level: -1=least, 0, +1=all garbage
FitStrategy	No	2	–	TMinuit: fit strategy: 2=best
PrintWarnings	No	False	–	TMinuit: suppress warnings
UseImprove	No	True	–	TMinuit: use IMPROVE
UseMinos	No	True	–	TMinuit: use MINOS
SetBatch	No	False	–	TMinuit: use batch mode
MaxCalls	No	1000	–	TMinuit: approximate maximum number of function calls
Tolerance	No	0.1	–	TMinuit: tolerance to the function value at the minimum

Configuration options for setup and tuning of specific fitter :

Configuration options reference for fitting method: *Genetic Algorithm (GA)*

Option	Array	Default value	Predefined values	Description
PopSize	No	300	–	Population size for GA
Steps	No	40	–	Number of steps for convergence
Cycles	No	3	–	Independent cycles of GA fitting
SC_steps	No	10	–	Spread control, steps
SC_rate	No	5	–	Spread control, rate: factor is changed depending on the rate

SC_factor	No	0.95	–	Spread control, factor
ConvCrit	No	0.001	–	Convergence criteria
SaveBestGen	No	1	–	Saves the best n results from each generation. They are included in the last cycle
SaveBestCycle	No	10	–	Saves the best n results from each cycle. They are included in the last cycle. The value should be set to at least 1.0
Trim	No	False	–	Trim the population to PopSize after assessing the fitness of each individual
Seed	No	100	–	Set seed of random generator (0 gives random seeds)

Configuration options given in the "PrepareForTrainingAndTesting" call; these options define the creation of the data sets used for training and expert validation by TMVA :

Configuration options reference for class: *DataSetFactory*

Option	Array	Default value	Predefined values	Description
SplitMode	No	Random	Random, Alternate, Block	Method of picking training and testing events (default: random)
MixMode	No	SameAsSplitMode	SameAsSplitMode, Random, Alternate, Block	Method of mixing events of different classes into one dataset (default: SameAsSplitMode)
SplitSeed	No	100	–	Seed for random event shuffling
NormMode	No	EqualNumEvents	None, NumEvents, EqualNumEvents	Overall renormalisation of event-by-event weights used in the training (NumEvents: average weight of 1 per event, independently for signal and background; EqualNumEvents: average weight of 1 per event for signal, and sum of weights for background equal to sum of weights for signal)
nTrain_Signal	No	0	–	Number of training events of class Signal (default: 0 = all)
nTest_Signal	No	0	–	Number of test events of class Signal (default: 0 = all)
nTrain_Background	No	0	–	Number of training events of class Background (default: 0 = all)
nTest_Background	No	0	–	Number of test events of class Background (default: 0 = all)
V	No	False	–	Verbosity (default: true)
VerboseLevel	No	Info	Debug, Verbose, Info	VerboseLevel (Debug/Verbose/Info)

Configuration options for the PDF class :

Configuration options reference for class: *PDF*

Option	Array	Default value	Predefined values	Description
NSmooth	No	0	–	Number of smoothing iterations for the input histograms
MinNSmooth	No	-1	–	Min number of smoothing iterations, for bins with most data
MaxNSmooth	No	-1	–	Max number of smoothing iterations, for bins with least data
NAvEvtPerBin	No	50	–	Average number of events per PDF bin
Nbins	No	0	–	Defined number of bins for the histogram from which the PDF is created
CheckHist	No	False	–	Whether or not to check the source histogram of the PDF
PDFInterpol	No	Spline2	Spline0, Spline1, Spline2, Spline3, Spline5, KDE	Interpolation method for reference histograms (e.g. Spline2 or KDE)
KDEtype	No	Gauss	Gauss	KDE kernel type (1=Gauss)
KDEiter	No	Nonadaptive	Nonadaptive, Adaptive	Number of iterations (1=non-adaptive, 2=adaptive)
KDEFineFactor	No	1	–	Fine tuning factor for Adaptive KDE: Factor to multiply the width of the kernel
KDEborder	No	None	None, Renorm, Mirror	Border effects treatment (1=no treatment, 2=kernel renormalization, 3=sample mirroring)

Configuration options for Factory running :

Configuration options reference for class: *Factory*

Option	Array	Default value	Predefined values	Description
V	No	False	–	Verbose flag
Color	No	True	–	Flag for coloured screen output (default: True, if in batch mode: False)
Transformations	No		–	List of transformations to test; formatting example: Transformations=I;D;P;U;G;D, for identity, decorrelation, PCA, Uniform and Gaussianisation followed by decorrelation transformations
Silent	No	False	–	Batch mode: boolean silent flag inhibiting any output from TMVA after the creation of the factory class object (default: False)
DrawProgressBar	No	True	–	Draw progress bar to display training, testing and evaluation schedule (default: True)
AnalysisType	No	Auto	Classification, Regression, Multiclass, Auto	Set the analysis type (Classification, Regression, Multiclass, Auto) (default: Auto)