

# Scikit MIT Haystack Data Analysis Pipeline Toolkit

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# Contents

<b>1</b>	<b>Namespace Index</b>	<b>1</b>
1.1	Packages . . . . .	1
<b>2</b>	<b>Hierarchical Index</b>	<b>3</b>
2.1	Class Hierarchy . . . . .	3
<b>3</b>	<b>Class Index</b>	<b>5</b>
3.1	Class List . . . . .	5
<b>4</b>	<b>File Index</b>	<b>9</b>
4.1	File List . . . . .	9
<b>5</b>	<b>Namespace Documentation</b>	<b>11</b>
5.1	AlgoParam Namespace Reference . . . . .	11
5.1.1	Detailed Description . . . . .	11
5.2	skdiscovery Namespace Reference . . . . .	11
5.3	skdiscovery.framework Namespace Reference . . . . .	11
5.4	skdiscovery.framework.base Namespace Reference . . . . .	12
5.5	skdiscovery.framework.discoverypipeline Namespace Reference . . . . .	12
5.6	skdiscovery.framework.param Namespace Reference . . . . .	12
5.7	skdiscovery.framework.stagecontainers Namespace Reference . . . . .	12
5.8	skdiscovery.generic Namespace Reference . . . . .	12
5.9	skdiscovery.generic.accumulators Namespace Reference . . . . .	13

5.10	<a href="#">skdiscovery.generic.accumulators.data Namespace Reference</a>	13
5.11	<a href="#">skdiscovery.generic.accumulators.gpsplotter Namespace Reference</a>	13
5.12	<a href="#">skdiscovery.generic.accumulators.hcluster Namespace Reference</a>	13
5.13	<a href="#">skdiscovery.series Namespace Reference</a>	13
5.14	<a href="#">skdiscovery.series.accumulators Namespace Reference</a>	13
5.15	<a href="#">skdiscovery.series.accumulators.plotter Namespace Reference</a>	14
5.16	<a href="#">skdiscovery.series.analysis Namespace Reference</a>	14
5.17	<a href="#">skdiscovery.series.analysis.correlate Namespace Reference</a>	14
5.18	<a href="#">skdiscovery.series.analysis.gca Namespace Reference</a>	14
5.19	<a href="#">skdiscovery.series.analysis.mogi Namespace Reference</a>	14
5.19.1	<a href="#">Function Documentation</a>	14
5.19.1.1	<a href="#">MogiVectors()</a>	14
5.20	<a href="#">skdiscovery.series.filters Namespace Reference</a>	15
5.21	<a href="#">skdiscovery.series.filters.dataremover Namespace Reference</a>	15
5.22	<a href="#">skdiscovery.series.filters.hyperbolictan Namespace Reference</a>	15
5.23	<a href="#">skdiscovery.series.filters.interpolate Namespace Reference</a>	15
5.24	<a href="#">skdiscovery.series.filters.kalman Namespace Reference</a>	16
5.25	<a href="#">skdiscovery.series.filters.lowpass Namespace Reference</a>	16
5.26	<a href="#">skdiscovery.series.filters.median Namespace Reference</a>	16
5.27	<a href="#">skdiscovery.series.filters.offset_detrend Namespace Reference</a>	16
5.28	<a href="#">skdiscovery.series.filters.trend Namespace Reference</a>	16
5.29	<a href="#">skdiscovery.table Namespace Reference</a>	16
5.30	<a href="#">skdiscovery.table.accumulators Namespace Reference</a>	17
5.31	<a href="#">skdiscovery.table.accumulators.plotter Namespace Reference</a>	17
5.32	<a href="#">skdiscovery.table.analysis Namespace Reference</a>	17
5.33	<a href="#">skdiscovery.table.analysis.correlate Namespace Reference</a>	17
5.34	<a href="#">skdiscovery.table.analysis.dbscan Namespace Reference</a>	17
5.35	<a href="#">skdiscovery.table.analysis.gca Namespace Reference</a>	18

5.36	<a href="#">skdiscovery.table.analysis.midas Namespace Reference</a>	18
5.37	<a href="#">skdiscovery.table.analysis.mogi Namespace Reference</a>	18
5.37.1	<a href="#">Function Documentation</a>	18
5.37.1.1	<a href="#">MogiVectors()</a>	18
5.38	<a href="#">skdiscovery.table.analysis.outlier Namespace Reference</a>	19
5.39	<a href="#">skdiscovery.table.analysis.skew Namespace Reference</a>	19
5.40	<a href="#">skdiscovery.table.analysis.vdbscan Namespace Reference</a>	19
5.41	<a href="#">skdiscovery.table.filters Namespace Reference</a>	19
5.42	<a href="#">skdiscovery.table.filters.antenna_offset Namespace Reference</a>	20
5.43	<a href="#">skdiscovery.table.filters.calibrate_grace Namespace Reference</a>	20
5.44	<a href="#">skdiscovery.table.filters.combine_columns Namespace Reference</a>	20
5.45	<a href="#">skdiscovery.table.filters.dataremover Namespace Reference</a>	20
5.46	<a href="#">skdiscovery.table.filters.geolocation Namespace Reference</a>	20
5.47	<a href="#">skdiscovery.table.filters.hyperbolictan Namespace Reference</a>	20
5.48	<a href="#">skdiscovery.table.filters.interpolate Namespace Reference</a>	21
5.49	<a href="#">skdiscovery.table.filters.kalman Namespace Reference</a>	21
5.50	<a href="#">skdiscovery.table.filters.lowpass Namespace Reference</a>	21
5.51	<a href="#">skdiscovery.table.filters.median Namespace Reference</a>	21
5.52	<a href="#">skdiscovery.table.filters.offset_detrend Namespace Reference</a>	21
5.53	<a href="#">skdiscovery.table.filters.propagate_nans Namespace Reference</a>	21
5.54	<a href="#">skdiscovery.table.filters.snow_remover Namespace Reference</a>	22
5.55	<a href="#">skdiscovery.table.filters.stabilization Namespace Reference</a>	22
5.56	<a href="#">skdiscovery.table.filters.table_filter Namespace Reference</a>	22
5.57	<a href="#">skdiscovery.table.filters.trend Namespace Reference</a>	22
5.58	<a href="#">skdiscovery.table.filters.weighted_average Namespace Reference</a>	22
5.59	<a href="#">skdiscovery.table.fusion Namespace Reference</a>	22
5.60	<a href="#">skdiscovery.table.fusion.grace Namespace Reference</a>	23
5.61	<a href="#">skdiscovery.table.fusion.snow Namespace Reference</a>	23

5.62 skdiscovery.table.generators Namespace Reference . . . . .	23
5.63 skdiscovery.table.generators.catalog_generator Namespace Reference . . . . .	23
5.64 skdiscovery.table.generators.data_generator Namespace Reference . . . . .	23
5.65 skdiscovery.utilities Namespace Reference . . . . .	23
5.66 skdiscovery.utilities.amazon_control Namespace Reference . . . . .	24
5.66.1 Function Documentation . . . . .	24
5.66.1.1 clearAmazonList() . . . . .	24
5.66.1.2 close() . . . . .	24
5.66.1.3 closeDispyScheduler() . . . . .	25
5.66.1.4 createTunnels() . . . . .	25
5.66.1.5 generateInfo() . . . . .	25
5.66.1.6 init() . . . . .	25
5.66.1.7 reset() . . . . .	26
5.66.1.8 resetInstances() . . . . .	26
5.66.1.9 setNumInstances() . . . . .	26
5.66.1.10 startDispyNode() . . . . .	26
5.66.1.11 startDispyScheduler() . . . . .	26
5.66.1.12 updateStatus() . . . . .	26
5.66.2 Variable Documentation . . . . .	27
5.66.2.1 amazon_list . . . . .	27
5.66.2.2 aws_access_key . . . . .	27
5.66.2.3 aws_key_name . . . . .	27
5.66.2.4 aws_region . . . . .	27
5.66.2.5 aws_secret . . . . .	27
5.66.2.6 aws_security_group . . . . .	27
5.66.2.7 ec2_client . . . . .	27
5.66.2.8 ec2_res . . . . .	27
5.66.2.9 pem_file . . . . .	27

5.66.2.10 popen	28
5.66.2.11 scheduler	28
5.67 skdiscovery.utilities.amazon_gui Namespace Reference	28
5.67.1 Function Documentation	28
5.67.1.1 changeButtonState()	28
5.67.1.2 checkValidValues()	28
5.67.1.3 drawGUI()	29
5.67.1.4 init()	29
5.67.2 Variable Documentation	29
5.67.2.1 disable_list	29
5.67.2.2 key_value_list	29
5.67.2.3 widget_dict	29
5.68 skdiscovery.utilities.astro_tools Namespace Reference	30
5.68.1 Function Documentation	30
5.68.1.1 abs_mag()	30
5.68.1.2 angular_separation()	30
5.68.1.3 app_mag()	30
5.68.1.4 cdf_dlf()	30
5.68.1.5 dlf()	31
5.68.1.6 inv_cdf_dlf()	31
5.68.1.7 lf()	32
5.68.1.8 move_point()	33
5.68.1.9 nfw()	33
5.68.1.10 v_to_z()	34
5.68.1.11 z_to_v()	34
5.69 skdiscovery.utilities.config Namespace Reference	34
5.69.1 Function Documentation	35
5.69.1.1 getConfig()	35

5.69.1.2	<a href="#">getDispyPassword()</a>	35
5.69.1.3	<a href="#">getHostName()</a>	35
5.69.1.4	<a href="#">writeConfigValue()</a>	35
5.70	<a href="#">skdiscovery.utilities.kalman_smoother Namespace Reference</a>	36
5.70.1	<a href="#">Function Documentation</a>	36
5.70.1.1	<a href="#">FitFOGMPParameters()</a>	36
5.70.1.2	<a href="#">FOGM()</a>	36
5.70.1.3	<a href="#">IterativeGridSearch()</a>	37
5.70.1.4	<a href="#">KalmanFilter()</a>	38
5.70.1.5	<a href="#">KalmanSmoother()</a>	38
5.71	<a href="#">skdiscovery.utilities.pbo_tools Namespace Reference</a>	39
5.71.1	<a href="#">Function Documentation</a>	39
5.71.1.1	<a href="#">closed_pipe()</a>	39
5.71.1.2	<a href="#">constant_open_pipe()</a>	40
5.71.1.3	<a href="#">datetimeToNumber()</a>	40
5.71.1.4	<a href="#">dirEigenvectors()</a>	40
5.71.1.5	<a href="#">finite_sphere()</a>	40
5.71.1.6	<a href="#">mogi()</a>	41
5.71.1.7	<a href="#">rising_open_pipe()</a>	41
5.71.1.8	<a href="#">sill()</a>	41
5.72	<a href="#">skdiscovery.utilities.random_walks Namespace Reference</a>	42
5.72.1	<a href="#">Function Documentation</a>	42
5.72.1.1	<a href="#">gaussian_walk()</a>	42
5.72.1.2	<a href="#">keep_in_bound()</a>	42
5.72.1.3	<a href="#">uniform_walk()</a>	43
5.73	<a href="#">skdiscovery.utilities.spherical_voronoi Namespace Reference</a>	43
5.73.1	<a href="#">Function Documentation</a>	43
5.73.1.1	<a href="#">find_match()</a>	43



5.73.1.2	<a href="#">getVoronoiCollection()</a>	44
5.73.1.3	<a href="#">sphericalToXYZ()</a>	45
5.73.1.4	<a href="#">xyzToSpherical()</a>	45
5.74	<a href="#">skdiscovery.utilities.ssh_reverse Namespace Reference</a>	45
5.74.1	Function Documentation	46
5.74.1.1	<a href="#">handler()</a>	46
5.74.1.2	<a href="#">print_verbose()</a>	46
5.74.1.3	<a href="#">reverse_forward_tunnel()</a>	46
5.75	<a href="#">skdiscovery.utilities.trendTools Namespace Reference</a>	47
5.75.1	Function Documentation	47
5.75.1.1	<a href="#">getTrend()</a>	47
5.75.1.2	<a href="#">interpNaN()</a>	47
5.75.1.3	<a href="#">medianFilter()</a>	47
5.75.1.4	<a href="#">sinuFits()</a>	48
5.76	<a href="#">skdiscovery.utilities.variantdbscan Namespace Reference</a>	48
5.77	<a href="#">skdiscovery.visualization Namespace Reference</a>	48
5.78	<a href="#">skdiscovery.visualization.multi_ca_plot Namespace Reference</a>	48
5.78.1	Function Documentation	48
5.78.1.1	<a href="#">multiCaPlot()</a>	48
5.79	<a href="#">skdiscovery.visualization.multi_dist Namespace Reference</a>	49
5.79.1	Function Documentation	49
5.79.1.1	<a href="#">calc_distance_map()</a>	49
5.79.2	Variable Documentation	49
5.79.2.1	<a href="#">font</a>	49

<b>6</b>	<b>Class Documentation</b>	<b>51</b>
6.1	skdiscovery.table.filters.antenna_offset.AntennaOffset Class Reference	51
6.1.1	Detailed Description	51
6.1.2	Constructor & Destructor Documentation	51
6.1.2.1	__init__()	51
6.1.3	Member Function Documentation	52
6.1.3.1	process()	52
6.2	skdiscovery.framework.param.AutoList Class Reference	52
6.2.1	Detailed Description	53
6.2.2	Constructor & Destructor Documentation	53
6.2.2.1	__init__()	53
6.2.3	Member Function Documentation	53
6.2.3.1	__call__()	53
6.2.3.2	__getitem__()	53
6.2.3.3	__len__()	54
6.2.3.4	__setitem__()	54
6.2.3.5	__str__()	54
6.2.3.6	perturb()	54
6.2.3.7	reset()	55
6.2.3.8	val()	55
6.3	skdiscovery.framework.param.AutoListCycle Class Reference	55
6.3.1	Detailed Description	56
6.3.2	Constructor & Destructor Documentation	56
6.3.2.1	__init__()	56
6.3.3	Member Function Documentation	56
6.3.3.1	__call__()	56
6.3.3.2	__getitem__()	56
6.3.3.3	__len__()	57

6.3.3.4	<a href="#">__setitem__()</a>	57
6.3.3.5	<a href="#">__str__()</a>	57
6.3.3.6	<a href="#">perturb()</a>	57
6.3.3.7	<a href="#">reset()</a>	58
6.3.3.8	<a href="#">val()</a>	58
6.4	<a href="#">skdiscovery.framework.param.AutoListPermute Class Reference</a>	58
6.4.1	<a href="#">Detailed Description</a>	59
6.4.2	<a href="#">Member Function Documentation</a>	59
6.4.2.1	<a href="#">__call__()</a>	59
6.4.2.2	<a href="#">__getitem__()</a>	59
6.4.2.3	<a href="#">__len__()</a>	59
6.4.2.4	<a href="#">__setitem__()</a>	60
6.4.2.5	<a href="#">__str__()</a>	60
6.4.2.6	<a href="#">perturb()</a>	60
6.4.2.7	<a href="#">reset()</a>	60
6.4.2.8	<a href="#">val()</a>	61
6.5	<a href="#">skdiscovery.framework.param.AutoListRemove Class Reference</a>	61
6.5.1	<a href="#">Detailed Description</a>	61
6.5.2	<a href="#">Constructor &amp; Destructor Documentation</a>	61
6.5.2.1	<a href="#">__init__()</a>	61
6.5.3	<a href="#">Member Function Documentation</a>	62
6.5.3.1	<a href="#">__call__()</a>	62
6.5.3.2	<a href="#">__getitem__()</a>	62
6.5.3.3	<a href="#">__len__()</a>	62
6.5.3.4	<a href="#">__setitem__()</a>	63
6.5.3.5	<a href="#">__str__()</a>	63
6.5.3.6	<a href="#">perturb()</a>	63
6.5.3.7	<a href="#">reset()</a>	63

6.5.3.8	<code>val()</code>	64
6.6	<a href="#">skdiscovery.framework.param.AutoListSubset Class Reference</a>	64
6.6.1	Detailed Description	64
6.6.2	Member Function Documentation	65
6.6.2.1	<code>__call__()</code>	65
6.6.2.2	<code>__getitem__()</code>	65
6.6.2.3	<code>__len__()</code>	65
6.6.2.4	<code>__setitem__()</code>	65
6.6.2.5	<code>__str__()</code>	66
6.6.2.6	<code>perturb()</code>	66
6.6.2.7	<code>reset()</code>	66
6.6.2.8	<code>val()</code>	66
6.7	<a href="#">skdiscovery.framework.param.AutoParam Class Reference</a>	67
6.7.1	Detailed Description	67
6.7.2	Constructor & Destructor Documentation	67
6.7.2.1	<code>__init__()</code>	67
6.7.3	Member Function Documentation	67
6.7.3.1	<code>__call__()</code>	67
6.7.3.2	<code>__str__()</code>	68
6.7.3.3	<code>perturb()</code>	68
6.7.3.4	<code>reset()</code>	68
6.8	<a href="#">skdiscovery.framework.param.AutoParamList Class Reference</a>	68
6.8.1	Detailed Description	69
6.8.2	Constructor & Destructor Documentation	69
6.8.2.1	<code>__init__()</code>	69
6.8.3	Member Function Documentation	69
6.8.3.1	<code>__call__()</code>	69
6.8.3.2	<code>__str__()</code>	70

6.8.3.3	<a href="#">perturb()</a>	70
6.8.3.4	<a href="#">reset()</a>	70
6.9	<a href="#">skdiscovery.framework.param.AutoParamListCycle Class Reference</a>	70
6.9.1	<a href="#">Detailed Description</a>	71
6.9.2	<a href="#">Constructor &amp; Destructor Documentation</a>	71
6.9.2.1	<a href="#">__init__()</a>	71
6.9.3	<a href="#">Member Function Documentation</a>	71
6.9.3.1	<a href="#">__call__()</a>	71
6.9.3.2	<a href="#">__str__()</a>	71
6.9.3.3	<a href="#">perturb()</a>	72
6.9.3.4	<a href="#">reset()</a>	72
6.10	<a href="#">skdiscovery.framework.param.AutoParamMinMax Class Reference</a>	72
6.10.1	<a href="#">Detailed Description</a>	72
6.10.2	<a href="#">Constructor &amp; Destructor Documentation</a>	72
6.10.2.1	<a href="#">__init__()</a>	72
6.10.3	<a href="#">Member Function Documentation</a>	73
6.10.3.1	<a href="#">__call__()</a>	73
6.10.3.2	<a href="#">__str__()</a>	73
6.10.3.3	<a href="#">perturb()</a>	73
6.10.3.4	<a href="#">reset()</a>	73
6.11	<a href="#">skdiscovery.framework.param.AutoParamMinMaxExtreme Class Reference</a>	74
6.11.1	<a href="#">Detailed Description</a>	74
6.11.2	<a href="#">Constructor &amp; Destructor Documentation</a>	74
6.11.2.1	<a href="#">__init__()</a>	74
6.11.3	<a href="#">Member Function Documentation</a>	75
6.11.3.1	<a href="#">__call__()</a>	75
6.11.3.2	<a href="#">__str__()</a>	75
6.11.3.3	<a href="#">perturb()</a>	75

6.11.3.4	<a href="#">reset()</a>	75
6.12	<a href="#">skdiscovery.table.filters.calibrate_CalibrateGRACE Class Reference</a>	76
6.12.1	Constructor & Destructor Documentation	76
6.12.1.1	<a href="#">__init__()</a>	76
6.12.2	Member Function Documentation	76
6.12.2.1	<a href="#">__str__()</a>	76
6.12.2.2	<a href="#">getMetadata()</a>	77
6.12.2.3	<a href="#">perturbParams()</a>	77
6.12.2.4	<a href="#">process()</a>	77
6.12.2.5	<a href="#">resetParams()</a>	77
6.13	<a href="#">skdiscovery.table.generators.catalog_generator.CatalogGenerator Class Reference</a>	78
6.13.1	Detailed Description	78
6.13.2	Constructor & Destructor Documentation	78
6.13.2.1	<a href="#">__init__()</a>	78
6.13.3	Member Function Documentation	79
6.13.3.1	<a href="#">inverse_nfw_cumulative()</a>	79
6.13.3.2	<a href="#">nfw_cumulative()</a>	79
6.13.3.3	<a href="#">output()</a>	79
6.14	<a href="#">skdiscovery.table.filters.combine_columns.CombineColumns Class Reference</a>	80
6.14.1	Constructor & Destructor Documentation	80
6.14.1.1	<a href="#">__init__()</a>	80
6.14.2	Member Function Documentation	80
6.14.2.1	<a href="#">__str__()</a>	80
6.14.2.2	<a href="#">getMetadata()</a>	81
6.14.2.3	<a href="#">perturbParams()</a>	81
6.14.2.4	<a href="#">process()</a>	81
6.14.2.5	<a href="#">resetParams()</a>	81
6.15	<a href="#">skdiscovery.table.analysis.Correlate Class Reference</a>	82

6.15.1 Detailed Description . . . . .	82
6.15.2 Constructor & Destructor Documentation . . . . .	82
6.15.2.1 __init__() . . . . .	82
6.15.3 Member Function Documentation . . . . .	82
6.15.3.1 process() . . . . .	83
6.16 skdiscovery.series.analysis.Correlate Class Reference . . . . .	83
6.16.1 Detailed Description . . . . .	83
6.16.2 Constructor & Destructor Documentation . . . . .	83
6.16.2.1 __init__() . . . . .	83
6.16.3 Member Function Documentation . . . . .	84
6.16.3.1 process() . . . . .	84
6.17 skdiscovery.generic.accumulators.DataAccumulator Class Reference . . . . .	84
6.17.1 Detailed Description . . . . .	84
6.17.2 Member Function Documentation . . . . .	84
6.17.2.1 process() . . . . .	84
6.18 skdiscovery.table.generators.data_generator.DataGenerator Class Reference . . . . .	85
6.18.1 Detailed Description . . . . .	85
6.18.2 Constructor & Destructor Documentation . . . . .	85
6.18.2.1 __init__() . . . . .	85
6.18.3 Member Function Documentation . . . . .	86
6.18.3.1 output() . . . . .	86
6.19 skdiscovery.table.filters.DataRemover Class Reference . . . . .	86
6.19.1 Detailed Description . . . . .	86
6.19.2 Constructor & Destructor Documentation . . . . .	86
6.19.2.1 __init__() . . . . .	86
6.19.3 Member Function Documentation . . . . .	87
6.19.3.1 process() . . . . .	87
6.20 skdiscovery.series.filters.DataRemover Class Reference . . . . .	87

6.20.1 Detailed Description . . . . .	88
6.20.2 Constructor & Destructor Documentation . . . . .	88
6.20.2.1 <code>__init__()</code> . . . . .	88
6.20.3 Member Function Documentation . . . . .	88
6.20.3.1 <code>process()</code> . . . . .	88
6.21 <code>skdiscovery.table.analysis.dbscan.DBScan</code> Class Reference . . . . .	89
6.21.1 Detailed Description . . . . .	89
6.21.2 Constructor & Destructor Documentation . . . . .	89
6.21.2.1 <code>__init__()</code> . . . . .	89
6.21.3 Member Function Documentation . . . . .	89
6.21.3.1 <code>process()</code> . . . . .	90
6.22 <code>skdiscovery.DiscoveryPipeline</code> Class Reference . . . . .	90
6.22.1 Detailed Description . . . . .	90
6.22.2 Constructor & Destructor Documentation . . . . .	90
6.22.2.1 <code>__init__()</code> . . . . .	90
6.22.2.2 <code>__del__()</code> . . . . .	91
6.22.3 Member Function Documentation . . . . .	91
6.22.3.1 <code>__str__()</code> . . . . .	91
6.22.3.2 <code>getMetadata()</code> . . . . .	91
6.22.3.3 <code>getMetadataHistory()</code> . . . . .	91
6.22.3.4 <code>getMetadataNestedGraph()</code> . . . . .	92
6.22.3.5 <code>getMetadataNestedTypes()</code> . . . . .	92
6.22.3.6 <code>getResults()</code> . . . . .	92
6.22.3.7 <code>perturb()</code> . . . . .	92
6.22.3.8 <code>perturbData()</code> . . . . .	93
6.22.3.9 <code>plotPipelineInstance()</code> . . . . .	93
6.22.3.10 <code>plotPipelineStructure()</code> . . . . .	93
6.22.3.11 <code>reset()</code> . . . . .	93



6.22.3.12 resultIter()	93
6.22.3.13 run()	94
6.23 skdiscovery.table.analysis.General_Component_Analysis Class Reference	94
6.23.1 Constructor & Destructor Documentation	95
6.23.1.1 __init__()	95
6.23.2 Member Function Documentation	95
6.23.2.1 process()	95
6.24 skdiscovery.series.analysis.General_Component_Analysis Class Reference	96
6.24.1 Detailed Description	96
6.24.2 Constructor & Destructor Documentation	96
6.24.2.1 __init__()	96
6.24.3 Member Function Documentation	96
6.24.3.1 process()	97
6.25 skdiscovery.table.filters.geolocation.GeoLocationFilter Class Reference	97
6.25.1 Constructor & Destructor Documentation	97
6.25.1.1 __init__()	97
6.25.2 Member Function Documentation	98
6.25.2.1 __str__()	98
6.25.2.2 getMetadata()	98
6.25.2.3 perturbParams()	98
6.25.2.4 process()	98
6.25.2.5 resetParams()	99
6.26 skdiscovery.generic.accumulators.GPSHPlotter Class Reference	99
6.26.1 Detailed Description	99
6.26.2 Constructor & Destructor Documentation	100
6.26.2.1 __init__()	100
6.26.3 Member Function Documentation	100
6.26.3.1 process()	100

6.27	<a href="#">skdiscovery.table.fusion.GraceFusion Class Reference</a>	101
6.27.1	Detailed Description	101
6.27.2	Constructor & Destructor Documentation	101
6.27.2.1	<code>__init__()</code>	101
6.27.3	Member Function Documentation	102
6.27.3.1	<code>__str__()</code>	102
6.27.3.2	<code>getMetadata()</code>	102
6.27.3.3	<code>perturbParams()</code>	102
6.27.3.4	<code>process()</code>	102
6.27.3.5	<code>resetParams()</code>	103
6.28	<a href="#">skdiscovery.generic.accumulators.HCluster Class Reference</a>	103
6.28.1	Detailed Description	103
6.28.2	Constructor & Destructor Documentation	103
6.28.2.1	<code>__init__()</code>	103
6.28.3	Member Function Documentation	104
6.28.3.1	<code>process()</code>	104
6.29	<a href="#">skdiscovery.table.filters.HTanFilter Class Reference</a>	104
6.29.1	Detailed Description	104
6.29.2	Constructor & Destructor Documentation	105
6.29.2.1	<code>__init__()</code>	105
6.29.3	Member Function Documentation	105
6.29.3.1	<code>process()</code>	105
6.30	<a href="#">skdiscovery.series.filters.HTanFilter Class Reference</a>	106
6.30.1	Constructor & Destructor Documentation	106
6.30.1.1	<code>__init__()</code>	106
6.30.2	Member Function Documentation	107
6.30.2.1	<code>process()</code>	107
6.31	<a href="#">skdiscovery.table.filters.InterpolateFilter Class Reference</a>	107

6.31.1 Detailed Description . . . . .	107
6.31.2 Member Function Documentation . . . . .	107
6.31.2.1 process() . . . . .	107
6.32 skdiscovery.series.filters.InterpolateFilter Class Reference . . . . .	108
6.32.1 Detailed Description . . . . .	108
6.32.2 Member Function Documentation . . . . .	108
6.32.2.1 process() . . . . .	108
6.33 skdiscovery.table.filters.KalmanFilter Class Reference . . . . .	109
6.33.1 Detailed Description . . . . .	109
6.33.2 Constructor & Destructor Documentation . . . . .	109
6.33.2.1 __init__() . . . . .	109
6.33.3 Member Function Documentation . . . . .	110
6.33.3.1 process() . . . . .	110
6.34 skdiscovery.series.filters.KalmanFilter Class Reference . . . . .	110
6.34.1 Detailed Description . . . . .	110
6.34.2 Constructor & Destructor Documentation . . . . .	110
6.34.2.1 __init__() . . . . .	110
6.34.3 Member Function Documentation . . . . .	111
6.34.3.1 process() . . . . .	111
6.35 skdiscovery.table.filters.LowPassFilter Class Reference . . . . .	111
6.35.1 Detailed Description . . . . .	112
6.35.2 Constructor & Destructor Documentation . . . . .	112
6.35.2.1 __init__() . . . . .	112
6.35.3 Member Function Documentation . . . . .	112
6.35.3.1 process() . . . . .	112
6.36 skdiscovery.series.filters.LowPassFilter Class Reference . . . . .	113
6.36.1 Detailed Description . . . . .	113
6.36.2 Constructor & Destructor Documentation . . . . .	113

6.36.2.1	<code>__init__()</code>	113
6.36.3	Member Function Documentation	113
6.36.3.1	<code>process()</code>	114
6.37	<code>skdiscovery.table.filters.MedianFilter</code> Class Reference	114
6.37.1	Detailed Description	114
6.37.2	Constructor & Destructor Documentation	114
6.37.2.1	<code>__init__()</code>	114
6.37.3	Member Function Documentation	115
6.37.3.1	<code>process()</code>	115
6.38	<code>skdiscovery.series.filters.MedianFilter</code> Class Reference	115
6.38.1	Detailed Description	115
6.38.2	Constructor & Destructor Documentation	116
6.38.2.1	<code>__init__()</code>	116
6.38.3	Member Function Documentation	116
6.38.3.1	<code>process()</code>	116
6.39	<code>skdiscovery.table.analysis.midas.MIDAS</code> Class Reference	116
6.39.1	Constructor & Destructor Documentation	117
6.39.1.1	<code>__init__()</code>	117
6.39.2	Member Function Documentation	117
6.39.2.1	<code>__str__()</code>	117
6.39.2.2	<code>getMetadata()</code>	118
6.39.2.3	<code>perturbParams()</code>	118
6.39.2.4	<code>process()</code>	118
6.39.2.5	<code>resetParams()</code>	118
6.40	<code>skdiscovery.series.analysis.Mogi_Inversion</code> Class Reference	118
6.40.1	Detailed Description	119
6.40.2	Constructor & Destructor Documentation	119
6.40.2.1	<code>__init__()</code>	119

6.40.3	Member Function Documentation	119
6.40.3.1	FitPCA()	119
6.40.3.2	FitTimeSeries()	119
6.40.3.3	process()	120
6.41	skdiscovery.table.analysis.Mogi_Inversion Class Reference	120
6.41.1	Detailed Description	121
6.41.2	Constructor & Destructor Documentation	121
6.41.2.1	__init__()	121
6.41.3	Member Function Documentation	121
6.41.3.1	FitPCA()	121
6.41.3.2	FitTimeSeries()	122
6.41.3.3	process()	122
6.42	skdiscovery.series.filters.OffsetDetrend Class Reference	122
6.42.1	Detailed Description	123
6.42.2	Constructor & Destructor Documentation	123
6.42.2.1	__init__()	123
6.42.3	Member Function Documentation	123
6.42.3.1	process()	123
6.43	skdiscovery.table.filters.OffsetDetrend Class Reference	124
6.43.1	Detailed Description	124
6.43.2	Constructor & Destructor Documentation	124
6.43.2.1	__init__()	124
6.43.3	Member Function Documentation	125
6.43.3.1	process()	125
6.44	skdiscovery.table.analysis.outlier.Outlier Class Reference	125
6.44.1	Constructor & Destructor Documentation	126
6.44.1.1	__init__()	126
6.44.2	Member Function Documentation	126

6.44.2.1	<code>process()</code>	126
6.45	<code>skdiscovery.framework.PipelineItem</code> Class Reference	126
6.45.1	Detailed Description	127
6.45.2	Constructor & Destructor Documentation	127
6.45.2.1	<code>__init__()</code>	127
6.45.3	Member Function Documentation	128
6.45.3.1	<code>__str__()</code>	128
6.45.3.2	<code>getMetadata()</code>	128
6.45.3.3	<code>perturbParams()</code>	128
6.45.3.4	<code>process()</code>	128
6.45.3.5	<code>resetParams()</code>	129
6.46	<code>skdiscovery.series.accumulators.Plotter</code> Class Reference	129
6.46.1	Detailed Description	129
6.46.2	Constructor & Destructor Documentation	129
6.46.2.1	<code>__init__()</code>	129
6.46.3	Member Function Documentation	130
6.46.3.1	<code>process()</code>	130
6.47	<code>skdiscovery.table.accumulators.Plotter</code> Class Reference	130
6.47.1	Detailed Description	131
6.47.2	Constructor & Destructor Documentation	131
6.47.2.1	<code>__init__()</code>	131
6.47.3	Member Function Documentation	131
6.47.3.1	<code>process()</code>	131
6.48	<code>skdiscovery.table.filters.propagate_nans.PropagateNaNs</code> Class Reference	132
6.48.1	Detailed Description	132
6.48.2	Constructor & Destructor Documentation	132
6.48.2.1	<code>__init__()</code>	132
6.48.3	Member Function Documentation	133

6.48.3.1	<a href="#">__str__()</a>	133
6.48.3.2	<a href="#">getMetadata()</a>	133
6.48.3.3	<a href="#">perturbParams()</a>	133
6.48.3.4	<a href="#">process()</a>	133
6.48.3.5	<a href="#">resetParams()</a>	134
6.49	<a href="#">skdiscovery.utilities.ssh_reverse.ReverseTunnel Class Reference</a>	134
6.49.1	<a href="#">Detailed Description</a>	134
6.49.2	<a href="#">Constructor &amp; Destructor Documentation</a>	135
6.49.2.1	<a href="#">__init__()</a>	135
6.49.2.2	<a href="#">__del__()</a>	135
6.49.3	<a href="#">Member Function Documentation</a>	135
6.49.3.1	<a href="#">create_reverse_tunnel()</a>	135
6.50	<a href="#">skdiscovery.table.analysis.skew.Skew Class Reference</a>	136
6.50.1	<a href="#">Detailed Description</a>	136
6.50.2	<a href="#">Member Function Documentation</a>	136
6.50.2.1	<a href="#">process()</a>	136
6.51	<a href="#">skdiscovery.table.fusion.SnowFusion Class Reference</a>	136
6.51.1	<a href="#">Detailed Description</a>	137
6.51.2	<a href="#">Constructor &amp; Destructor Documentation</a>	137
6.51.2.1	<a href="#">__init__()</a>	137
6.51.3	<a href="#">Member Function Documentation</a>	137
6.51.3.1	<a href="#">__str__()</a>	137
6.51.3.2	<a href="#">getMetadata()</a>	138
6.51.3.3	<a href="#">perturbParams()</a>	138
6.51.3.4	<a href="#">process()</a>	138
6.51.3.5	<a href="#">resetParams()</a>	138
6.52	<a href="#">skdiscovery.table.filters.SnowRemover Class Reference</a>	139
6.52.1	<a href="#">Detailed Description</a>	139

6.52.2	Constructor & Destructor Documentation	139
6.52.2.1	__init__()	139
6.52.3	Member Function Documentation	140
6.52.3.1	process()	140
6.53	skdiscovery.table.filters.stabilization.StabilizationFilter Class Reference	140
6.53.1	Detailed Description	140
6.53.2	Member Function Documentation	141
6.53.2.1	__str__()	141
6.53.2.2	getMetadata()	141
6.53.2.3	perturbParams()	141
6.53.2.4	process()	141
6.53.2.5	resetParams()	142
6.54	skdiscovery.framework.StageContainer Class Reference	142
6.54.1	Detailed Description	142
6.54.2	Constructor & Destructor Documentation	142
6.54.2.1	__init__()	142
6.54.3	Member Function Documentation	143
6.54.3.1	getMetadata()	143
6.54.3.2	getMetadataNestedGraph()	143
6.54.3.3	getMetadataNestedTypes()	143
6.54.3.4	getMetadataType()	143
6.54.3.5	getObjects()	144
6.54.3.6	perturb()	144
6.54.3.7	reset()	144
6.54.3.8	run()	144
6.55	skdiscovery.framework.StageContainerAlternative Class Reference	144
6.55.1	Detailed Description	145
6.55.2	Constructor & Destructor Documentation	145



6.55.2.1	<code>__init__()</code>	145
6.55.3	Member Function Documentation	145
6.55.3.1	<code>getMetadata()</code>	145
6.55.3.2	<code>getMetadataNestedGraph()</code>	146
6.55.3.3	<code>getMetadataNestedTypes()</code>	146
6.55.3.4	<code>getMetadataType()</code>	146
6.55.3.5	<code>getObjects()</code>	146
6.55.3.6	<code>perturb()</code>	147
6.55.3.7	<code>reset()</code>	147
6.55.3.8	<code>run()</code>	147
6.56	<code>skdiscovery.framework.StageContainerIncrementalAdd</code> Class Reference	147
6.56.1	Detailed Description	148
6.56.2	Constructor & Destructor Documentation	148
6.56.2.1	<code>__init__()</code>	148
6.56.3	Member Function Documentation	148
6.56.3.1	<code>getMetadata()</code>	148
6.56.3.2	<code>getMetadataNestedGraph()</code>	148
6.56.3.3	<code>getMetadataNestedTypes()</code>	149
6.56.3.4	<code>getMetadataType()</code>	149
6.56.3.5	<code>getObjects()</code>	149
6.56.3.6	<code>perturb()</code>	149
6.56.3.7	<code>reset()</code>	149
6.56.3.8	<code>run()</code>	150
6.57	<code>skdiscovery.table.filters.table_filter.TableFilter</code> Class Reference	150
6.57.1	Detailed Description	150
6.57.2	Constructor & Destructor Documentation	150
6.57.2.1	<code>__init__()</code>	150
6.57.3	Member Function Documentation	151

6.57.3.1	<a href="#">__str__()</a>	151
6.57.3.2	<a href="#">getMetadata()</a>	151
6.57.3.3	<a href="#">perturbParams()</a>	151
6.57.3.4	<a href="#">process()</a>	151
6.57.3.5	<a href="#">resetParams()</a>	152
6.58	<a href="#">skdiscovery.table.filters.TrendFilter Class Reference</a>	152
6.58.1	<a href="#">Detailed Description</a>	152
6.58.2	<a href="#">Constructor &amp; Destructor Documentation</a>	152
6.58.2.1	<a href="#">__init__()</a>	152
6.58.3	<a href="#">Member Function Documentation</a>	153
6.58.3.1	<a href="#">process()</a>	153
6.59	<a href="#">skdiscovery.series.filters.TrendFilter Class Reference</a>	153
6.59.1	<a href="#">Detailed Description</a>	153
6.59.2	<a href="#">Constructor &amp; Destructor Documentation</a>	154
6.59.2.1	<a href="#">__init__()</a>	154
6.59.3	<a href="#">Member Function Documentation</a>	154
6.59.3.1	<a href="#">process()</a>	154
6.60	<a href="#">skdiscovery.utilities.VariantDBScan Class Reference</a>	154
6.60.1	<a href="#">Detailed Description</a>	155
6.60.2	<a href="#">Constructor &amp; Destructor Documentation</a>	155
6.60.2.1	<a href="#">__init__()</a>	155
6.60.3	<a href="#">Member Function Documentation</a>	155
6.60.3.1	<a href="#">run()</a>	155
6.61	<a href="#">skdiscovery.table.analysis.VDBScan Class Reference</a>	156
6.61.1	<a href="#">Detailed Description</a>	156
6.61.2	<a href="#">Constructor &amp; Destructor Documentation</a>	156
6.61.2.1	<a href="#">__init__()</a>	156
6.61.3	<a href="#">Member Function Documentation</a>	157
6.61.3.1	<a href="#">process()</a>	157
6.62	<a href="#">skdiscovery.table.filters.weighted_average.WeightedAverage Class Reference</a>	157
6.62.1	<a href="#">Detailed Description</a>	158
6.62.2	<a href="#">Constructor &amp; Destructor Documentation</a>	158
6.62.2.1	<a href="#">__init__()</a>	158
6.62.3	<a href="#">Member Function Documentation</a>	158
6.62.3.1	<a href="#">__str__()</a>	158
6.62.3.2	<a href="#">getMetadata()</a>	158
6.62.3.3	<a href="#">perturbParams()</a>	159
6.62.3.4	<a href="#">process()</a>	159
6.62.3.5	<a href="#">resetParams()</a>	159

<b>7</b>	<b>File Documentation</b>	<b>161</b>
7.1	framework/base.py File Reference . . . . .	161
7.2	framework/discoverypipeline.py File Reference . . . . .	161
7.3	framework/param.py File Reference . . . . .	161
7.4	framework/stagecontainers.py File Reference . . . . .	162
7.5	generic/accumulators/data.py File Reference . . . . .	162
7.6	generic/accumulators/gpshplotter.py File Reference . . . . .	162
7.7	generic/accumulators/hcluster.py File Reference . . . . .	163
7.8	series/accumulators/plotter.py File Reference . . . . .	163
7.9	table/accumulators/plotter.py File Reference . . . . .	163
7.10	series/analysis/correlate.py File Reference . . . . .	163
7.11	table/analysis/correlate.py File Reference . . . . .	164
7.12	series/analysis/gca.py File Reference . . . . .	164
7.13	table/analysis/gca.py File Reference . . . . .	164
7.14	series/analysis/mogi.py File Reference . . . . .	164
7.15	table/analysis/mogi.py File Reference . . . . .	165
7.16	series/filters/dataremover.py File Reference . . . . .	165
7.17	table/filters/dataremover.py File Reference . . . . .	165
7.18	series/filters/hyperbolictan.py File Reference . . . . .	166
7.19	table/filters/hyperbolictan.py File Reference . . . . .	166
7.20	series/filters/interpolate.py File Reference . . . . .	166
7.21	table/filters/interpolate.py File Reference . . . . .	166
7.22	series/filters/kalman.py File Reference . . . . .	167
7.23	table/filters/kalman.py File Reference . . . . .	167
7.24	series/filters/lowpass.py File Reference . . . . .	167
7.25	table/filters/lowpass.py File Reference . . . . .	167
7.26	series/filters/median.py File Reference . . . . .	168
7.27	table/filters/median.py File Reference . . . . .	168

7.28 series/filters/offset_detrend.py File Reference . . . . .	168
7.29 table/filters/offset_detrend.py File Reference . . . . .	168
7.30 series/filters/trend.py File Reference . . . . .	169
7.31 table/filters/trend.py File Reference . . . . .	169
7.32 table/analysis/dbscan.py File Reference . . . . .	169
7.33 table/analysis/midas.py File Reference . . . . .	169
7.34 table/analysis/outlier.py File Reference . . . . .	170
7.35 table/analysis/skew.py File Reference . . . . .	170
7.36 table/analysis/vdbscan.py File Reference . . . . .	170
7.37 table/filters/antenna_offset.py File Reference . . . . .	170
7.38 table/filters/calibrate_py File Reference . . . . .	171
7.39 table/filters/combine_columns.py File Reference . . . . .	171
7.40 table/filters/geolocation.py File Reference . . . . .	171
7.41 table/filters/propagate_nans.py File Reference . . . . .	171
7.42 table/filters/snow_remover.py File Reference . . . . .	172
7.43 table/filters/stabilization.py File Reference . . . . .	172
7.44 table/filters/table_filter.py File Reference . . . . .	172
7.45 table/filters/weighted_average.py File Reference . . . . .	172
7.46 table/fusion/grace.py File Reference . . . . .	173
7.47 table/fusion/snow.py File Reference . . . . .	173
7.48 table/generators/catalog_generator.py File Reference . . . . .	173
7.49 table/generators/data_generator.py File Reference . . . . .	173
7.50 utilities/amazon_control.py File Reference . . . . .	174
7.51 utilities/amazon_gui.py File Reference . . . . .	174
7.52 utilities/astro_tools.py File Reference . . . . .	175
7.53 utilities/config.py File Reference . . . . .	175
7.54 utilities/kalman_smoother.py File Reference . . . . .	176
7.55 utilities/pbo_tools.py File Reference . . . . .	176
7.56 utilities/random_walks.py File Reference . . . . .	176
7.57 utilities/spherical_voronoi.py File Reference . . . . .	177
7.58 utilities/ssh_reverse.py File Reference . . . . .	177
7.59 utilities/trendTools.py File Reference . . . . .	177
7.60 utilities/variantdbscan.py File Reference . . . . .	178
7.61 visualization/multi_ca_plot.py File Reference . . . . .	178
7.62 visualization/multi_dist.py File Reference . . . . .	178

# Chapter 1

## Namespace Index

### 1.1 Packages

Here are the packages with brief descriptions (if available):

<a href="#">AlgoParam</a>	
Provides tunable parameter classes for use in the Computer-Aided Discovery pipeline . . . . .	11
<a href="#">skdiscovery</a> . . . . .	11
<a href="#">skdiscovery.framework</a> . . . . .	11
<a href="#">skdiscovery.framework.base</a> . . . . .	12
<a href="#">skdiscovery.framework.discoverypipeline</a> . . . . .	12
<a href="#">skdiscovery.framework.param</a> . . . . .	12
<a href="#">skdiscovery.framework.stagecontainers</a> . . . . .	12
<a href="#">skdiscovery.generic</a> . . . . .	12
<a href="#">skdiscovery.generic.accumulators</a> . . . . .	13
<a href="#">skdiscovery.generic.accumulators.data</a> . . . . .	13
<a href="#">skdiscovery.generic.accumulators.gpshplotter</a> . . . . .	13
<a href="#">skdiscovery.generic.accumulators.hcluster</a> . . . . .	13
<a href="#">skdiscovery.series</a> . . . . .	13
<a href="#">skdiscovery.series.accumulators</a> . . . . .	13
<a href="#">skdiscovery.series.accumulators.plotter</a> . . . . .	14
<a href="#">skdiscovery.series.analysis</a> . . . . .	14
<a href="#">skdiscovery.series.analysis.correlate</a> . . . . .	14
<a href="#">skdiscovery.series.analysis.gca</a> . . . . .	14
<a href="#">skdiscovery.series.analysis.mogi</a> . . . . .	14
<a href="#">skdiscovery.series.filters</a> . . . . .	15
<a href="#">skdiscovery.series.filters.dataremover</a> . . . . .	15
<a href="#">skdiscovery.series.filters.hyperbolictan</a> . . . . .	15
<a href="#">skdiscovery.series.filters.interpolate</a> . . . . .	15
<a href="#">skdiscovery.series.filters.kalman</a> . . . . .	16
<a href="#">skdiscovery.series.filters.lowpass</a> . . . . .	16
<a href="#">skdiscovery.series.filters.median</a> . . . . .	16
<a href="#">skdiscovery.series.filters.offset_detrend</a> . . . . .	16
<a href="#">skdiscovery.series.filters.trend</a> . . . . .	16
<a href="#">skdiscovery.table</a> . . . . .	16
<a href="#">skdiscovery.table.accumulators</a> . . . . .	17

skdiscovery.table.accumulators.plotter	17
skdiscovery.table.analysis	17
skdiscovery.table.analysis.correlate	17
skdiscovery.table.analysis.dbscan	17
skdiscovery.table.analysis.gca	18
skdiscovery.table.analysis.midas	18
skdiscovery.table.analysis.mogi	18
skdiscovery.table.analysis.outlier	19
skdiscovery.table.analysis.skew	19
skdiscovery.table.analysis.vdbscan	19
skdiscovery.table.filters	19
skdiscovery.table.filters.antenna_offset	20
skdiscovery.table.filters.calibrate_grace	20
skdiscovery.table.filters.combine_columns	20
skdiscovery.table.filters.dataremover	20
skdiscovery.table.filters.geolocation	20
skdiscovery.table.filters.hyperbolictan	20
skdiscovery.table.filters.interpolate	21
skdiscovery.table.filters.kalman	21
skdiscovery.table.filters.lowpass	21
skdiscovery.table.filters.median	21
skdiscovery.table.filters.offset_detrend	21
skdiscovery.table.filters.propagate_nans	21
skdiscovery.table.filters.snow_remover	22
skdiscovery.table.filters.stabilization	22
skdiscovery.table.filters.table_filter	22
skdiscovery.table.filters.trend	22
skdiscovery.table.filters.weighted_average	22
skdiscovery.table.fusion	22
skdiscovery.table.fusion.grace	23
skdiscovery.table.fusion.snow	23
skdiscovery.table.generators	23
skdiscovery.table.generators.catalog_generator	23
skdiscovery.table.generators.data_generator	23
skdiscovery.utilities	23
skdiscovery.utilities.amazon_control	24
skdiscovery.utilities.amazon_gui	28
skdiscovery.utilities.astro_tools	30
skdiscovery.utilities.config	34
skdiscovery.utilities.kalman_smoother	36
skdiscovery.utilities.pbo_tools	39
skdiscovery.utilities.random_walks	42
skdiscovery.utilities.spherical_voronoi	43
skdiscovery.utilities.ssh_reverse	45
skdiscovery.utilities.trendTools	47
skdiscovery.utilities.variantdbscan	48
skdiscovery.visualization	48
skdiscovery.visualization.multi_ca_plot	48
skdiscovery.visualization.multi_dist	49

## Chapter 2

# Hierarchical Index

### 2.1 Class Hierarchy

This inheritance list is sorted roughly, but not completely, alphabetically:

skdiscovery.framework.param.AutoParam . . . . .	67
skdiscovery.framework.param.AutoParamList . . . . .	68
skdiscovery.framework.param.AutoParamListCycle . . . . .	70
skdiscovery.framework.param.AutoParamMinMax . . . . .	72
skdiscovery.framework.param.AutoParamMinMaxExtreme . . . . .	74
skdiscovery.DiscoveryPipeline . . . . .	90
object	
skdiscovery.framework.param.AutoList . . . . .	52
skdiscovery.framework.param.AutoListCycle . . . . .	55
skdiscovery.framework.param.AutoListPermute . . . . .	58
skdiscovery.framework.param.AutoListRemove . . . . .	61
skdiscovery.framework.param.AutoListSubset . . . . .	64
skdiscovery.utilities.ssh_reverse.ReverseTunnel . . . . .	134
skdiscovery.utilities.VariantDBScan . . . . .	154
skdiscovery.framework.PipelineItem . . . . .	126
skdiscovery.table.analysis.midas.MIDAS . . . . .	116
skdiscovery.table.filters.calibrate_CalibrateGRACE . . . . .	76
skdiscovery.table.filters.combine_columns.CombineColumns . . . . .	80
skdiscovery.table.filters.geolocation.GeoLocationFilter . . . . .	97
skdiscovery.table.filters.propagate_nans.PropagateNaNs . . . . .	132
skdiscovery.table.filters.stabilization.StabilizationFilter . . . . .	140
skdiscovery.table.filters.table_filter.TableFilter . . . . .	150
skdiscovery.table.filters.weighted_average.WeightedAverage . . . . .	157
skdiscovery.table.fusion.GraceFusion . . . . .	101
skdiscovery.table.fusion.SnowFusion . . . . .	136
skdiscovery.framework.StageContainer . . . . .	142
skdiscovery.framework.StageContainerAlternative . . . . .	144
skdiscovery.framework.StageContainerIncrementalAdd . . . . .	147
DataFetcherBase	
skdiscovery.table.generators.catalog_generator.CatalogGenerator . . . . .	78

skdiscovery.table.generators.data_generator.DataGenerator . . . . .	85
PipelineItem	
skdiscovery.generic.accumulators.DataAccumulator . . . . .	84
skdiscovery.generic.accumulators.GPSHPlotter . . . . .	99
skdiscovery.generic.accumulators.HCluster . . . . .	103
skdiscovery.series.accumulators.Plotter . . . . .	129
skdiscovery.series.analysis.Correlate . . . . .	83
skdiscovery.series.analysis.General_Component_Analysis . . . . .	96
skdiscovery.series.analysis.Mogi_Inversion . . . . .	118
skdiscovery.series.filters.DataRemover . . . . .	87
skdiscovery.series.filters.HTanFilter . . . . .	106
skdiscovery.series.filters.InterpolateFilter . . . . .	108
skdiscovery.series.filters.KalmanFilter . . . . .	110
skdiscovery.series.filters.LowPassFilter . . . . .	113
skdiscovery.series.filters.MedianFilter . . . . .	115
skdiscovery.series.filters.OffsetDetrend . . . . .	122
skdiscovery.series.filters.TrendFilter . . . . .	153
skdiscovery.table.accumulators.Plotter . . . . .	130
skdiscovery.table.analysis.Correlate . . . . .	82
skdiscovery.table.analysis.dbscan.DBScan . . . . .	89
skdiscovery.table.analysis.General_Component_Analysis . . . . .	94
skdiscovery.table.analysis.Mogi_Inversion . . . . .	120
skdiscovery.table.analysis.outlier.Outlier . . . . .	125
skdiscovery.table.analysis.skew.Skew . . . . .	136
skdiscovery.table.analysis.VDBScan . . . . .	156
skdiscovery.table.filters.antenna_offset.AntennaOffset . . . . .	51
skdiscovery.table.filters.DataRemover . . . . .	86
skdiscovery.table.filters.HTanFilter . . . . .	104
skdiscovery.table.filters.InterpolateFilter . . . . .	107
skdiscovery.table.filters.KalmanFilter . . . . .	109
skdiscovery.table.filters.LowPassFilter . . . . .	111
skdiscovery.table.filters.MedianFilter . . . . .	114
skdiscovery.table.filters.OffsetDetrend . . . . .	124
skdiscovery.table.filters.SnowRemover . . . . .	139
skdiscovery.table.filters.TrendFilter . . . . .	152



## Chapter 3

# Class Index

### 3.1 Class List

Here are the classes, structs, unions and interfaces with brief descriptions:

<a href="#">skdiscovery.table.filters.antenna_offset.AntennaOffset</a>	
Applies corrections to fix offsets in PBO GPS data induced by antenna changes . . . . .	51
<a href="#">skdiscovery.framework.param.AutoList</a>	
List for returning selections of lists, as opposed to a single element . . . . .	52
<a href="#">skdiscovery.framework.param.AutoListCycle</a>	
Cycles through a list of list selections . . . . .	55
<a href="#">skdiscovery.framework.param.AutoListPermute</a>	
A perturber that permutes a list . . . . .	58
<a href="#">skdiscovery.framework.param.AutoListRemove</a>	
Removes a different single element from the initial list at each perturb call . . . . .	61
<a href="#">skdiscovery.framework.param.AutoListSubset</a>	
A list perturber that creates random subsets of a list . . . . .	64
<a href="#">skdiscovery.framework.param.AutoParam</a>	
Defines a tunable parameter class inherited by specific subclasses . . . . .	67
<a href="#">skdiscovery.framework.param.AutoParamList</a>	
Tunable parameter with a specified list of choices that perturb randomly selects from . . . . .	68
<a href="#">skdiscovery.framework.param.AutoParamListCycle</a>	
Cycles through a list of paramters . . . . .	70
<a href="#">skdiscovery.framework.param.AutoParamMinMax</a>	
Tunable parameter with min and max ranges, perturbs to a random value in range . . . . .	72
<a href="#">skdiscovery.framework.param.AutoParamMinMaxExtreme</a>	
Tunable parameter with min and max ranges, picks extreme value min or max every nMax call . . . .	74
<a href="#">skdiscovery.table.filters.calibrate_CalibrateGRACE</a>	
<a href="#">skdiscovery.table.generators.catalog_generator.CatalogGenerator</a>	
Generates galaxy catalogs for use in DiscoveryPipeline . . . . .	78
<a href="#">skdiscovery.table.filters.combine_columns.CombineColumns</a>	
<a href="#">skdiscovery.table.analysis.Correlate</a>	
Computes the correlation for table data and stores the result as a matrix . . . . .	82
<a href="#">skdiscovery.series.analysis.Correlate</a>	
Computes the correlation for series data . . . . .	83
<a href="#">skdiscovery.generic.accumulators.DataAccumulator</a>	
Stores a copy of the data in its current state in the pipeline . . . . .	84

<a href="#">skdiscovery.table.generators.data_generator.DataGenerator</a>	
Class for generating random data	85
<a href="#">skdiscovery.table.filters.DataRemover</a>	
Sets specified table data to NaN	86
<a href="#">skdiscovery.series.filters.DataRemover</a>	
Sets specified series data to NaN	87
<a href="#">skdiscovery.table.analysis.dbscan.DBScan</a>	
Runs DBScan on table data	89
<a href="#">skdiscovery.DiscoveryPipeline</a>	
Pipeline for running the analysis	90
<a href="#">skdiscovery.table.analysis.General_Component_Analysis</a>	94
<a href="#">skdiscovery.series.analysis.General_Component_Analysis</a>	
Performs either ICA or PCA analysis on series data	96
<a href="#">skdiscovery.table.filters.geolocation.GeoLocationFilter</a>	97
<a href="#">skdiscovery.generic.accumulators.GPSHPlotter</a>	
Plots results from General_Component_Analysis, for the GPS horizontal or vertical components	99
<a href="#">skdiscovery.table.fusion.GraceFusion</a>	
Fuses GRACE equivalent water depth time series	101
<a href="#">skdiscovery.generic.accumulators.HCluster</a>	
Hierarchical Clustering function that produces a cluster map of the distance matrix	103
<a href="#">skdiscovery.table.filters.HTanFilter</a>	
Filter to subtract an arctan fit from data	104
<a href="#">skdiscovery.series.filters.HTanFilter</a>	106
<a href="#">skdiscovery.table.filters.InterpolateFilter</a>	
Interpolate missing values on table data	107
<a href="#">skdiscovery.series.filters.InterpolateFilter</a>	
Interpolate missing values on series data	108
<a href="#">skdiscovery.table.filters.KalmanFilter</a>	
Runs a Kalman Smoother on table data	109
<a href="#">skdiscovery.series.filters.KalmanFilter</a>	
Runs a Kalman Smoother on series data	110
<a href="#">skdiscovery.table.filters.LowPassFilter</a>	
A remez low pass filter for table data	111
<a href="#">skdiscovery.series.filters.LowPassFilter</a>	
A FIR Remez (Parks-McLellan) designed low pass filter for series data	113
<a href="#">skdiscovery.table.filters.MedianFilter</a>	
A Median filter for table data	114
<a href="#">skdiscovery.series.filters.MedianFilter</a>	
A Median filter for series data	115
<a href="#">skdiscovery.table.analysis.midas.MIDAS</a>	116
<a href="#">skdiscovery.series.analysis.Mogi_Inversion</a>	
Perform a Mogi source inversion on a set of gps series data	118
<a href="#">skdiscovery.table.analysis.Mogi_Inversion</a>	
Perform a mogi source inversion on a set of gps table data	120
<a href="#">skdiscovery.series.filters.OffsetDetrend</a>	
Trend filter that fits a stepwise function to linearly detrended series data	122
<a href="#">skdiscovery.table.filters.OffsetDetrend</a>	
Trend filter that fits a stepwise function to linearly detrended table data	124
<a href="#">skdiscovery.table.analysis.outlier.Outlier</a>	125
<a href="#">skdiscovery.framework.PipelineItem</a>	
The general class used to create pipeline items	126
<a href="#">skdiscovery.series.accumulators.Plotter</a>	
Make a plot of series data	129

<a href="#">skdiscovery.table.accumulators.Plotter</a>	
Make a plot of table data	130
<a href="#">skdiscovery.table.filters.propagate_nans.PropagateNaNs</a>	
Propagates NaN's from one column to other columns	132
<a href="#">skdiscovery.utilities.ssh_reverse.ReverseTunnel</a>	
Create a reverse ssh tunnel	134
<a href="#">skdiscovery.table.analysis.skew.Skew</a>	
Calculates the skew of table data	136
<a href="#">skdiscovery.table.fusion.SnowFusion</a>	
Adds snow time series data to table based on geographic coordinates	136
<a href="#">skdiscovery.table.filters.SnowRemover</a>	
Removes data with snow errors	139
<a href="#">skdiscovery.table.filters.stabilization.StabilizationFilter</a>	
This filter transforms GPS stations in a region to a local reference frame	140
<a href="#">skdiscovery.framework.StageContainer</a>	
Container to hold a stage for the DiscoveryPipeline	142
<a href="#">skdiscovery.framework.StageContainerAlternative</a>	
Stage Container that holds a list of stage containers and randomly chooses one to use	144
<a href="#">skdiscovery.framework.StageContainerIncrementalAdd</a>	
In each perturb call, it incrementally adds one of the filters specified in the constructor	147
<a href="#">skdiscovery.table.filters.table_filter.TableFilter</a>	
This class removes tables based on their label	150
<a href="#">skdiscovery.table.filters.TrendFilter</a>	
Trend Filter that removes linear and sinusoidal (annual, semi-annual) trends on series data	152
<a href="#">skdiscovery.series.filters.TrendFilter</a>	
Trend Filter that removes linear and sinusoidal (annual, semi-annual) trends on series data	153
<a href="#">skdiscovery.utilities.VariantDBScan</a>	
Wrapper for <a href="#">VariantDBScan</a>	154
<a href="#">skdiscovery.table.analysis.VDBScan</a>	
Runs Variant DBscan on table data	156
<a href="#">skdiscovery.table.filters.weighted_average.WeightedAverage</a>	
This filter performs a rolling weighted average using standard deviations as weight	157



## Chapter 4

# File Index

### 4.1 File List

Here is a list of all files with brief descriptions:

framework/ <a href="#">base.py</a>	161
framework/ <a href="#">discoverypipeline.py</a>	161
framework/ <a href="#">param.py</a>	161
framework/ <a href="#">stagecontainers.py</a>	162
generic/accumulators/ <a href="#">data.py</a>	162
generic/accumulators/ <a href="#">gpsplotter.py</a>	162
generic/accumulators/ <a href="#">hcluster.py</a>	163
series/accumulators/ <a href="#">plotter.py</a>	163
series/analysis/ <a href="#">correlate.py</a>	163
series/analysis/ <a href="#">gca.py</a>	164
series/analysis/ <a href="#">mogi.py</a>	164
series/filters/ <a href="#">dataremoval.py</a>	165
series/filters/ <a href="#">hyperbolictan.py</a>	166
series/filters/ <a href="#">interpolate.py</a>	166
series/filters/ <a href="#">kalman.py</a>	167
series/filters/ <a href="#">lowpass.py</a>	167
series/filters/ <a href="#">median.py</a>	168
series/filters/ <a href="#">offset_detrend.py</a>	168
series/filters/ <a href="#">trend.py</a>	169
table/accumulators/ <a href="#">plotter.py</a>	163
table/analysis/ <a href="#">correlate.py</a>	164
table/analysis/ <a href="#">dbscan.py</a>	169
table/analysis/ <a href="#">gca.py</a>	164
table/analysis/ <a href="#">midas.py</a>	169
table/analysis/ <a href="#">mogi.py</a>	165
table/analysis/ <a href="#">outlier.py</a>	170
table/analysis/ <a href="#">skew.py</a>	170
table/analysis/ <a href="#">vdbscan.py</a>	170
table/filters/ <a href="#">antenna_offset.py</a>	170
table/filters/ <a href="#">calibrate.py</a>	171
table/filters/ <a href="#">combine_columns.py</a>	171

table/filters/dataremover.py	165
table/filters/geolocation.py	171
table/filters/hyperbolictan.py	166
table/filters/interpolate.py	166
table/filters/kalman.py	167
table/filters/lowpass.py	167
table/filters/median.py	168
table/filters/offset_detrend.py	168
table/filters/propagate_nans.py	171
table/filters/snow_remover.py	172
table/filters/stabilization.py	172
table/filters/table_filter.py	172
table/filters/trend.py	169
table/filters/weighted_average.py	172
table/fusion/grace.py	173
table/fusion/snow.py	173
table/generators/catalog_generator.py	173
table/generators/data_generator.py	173
utilities/amazon_control.py	174
utilities/amazon_gui.py	174
utilities/astro_tools.py	175
utilities/config.py	175
utilities/kalman_smoother.py	176
utilities/pbo_tools.py	176
utilities/random_walks.py	176
utilities/spherical_voronoi.py	177
utilities/ssh_reverse.py	177
utilities/trendTools.py	177
utilities/variantdbscan.py	178
visualization/multi_ca_plot.py	178
visualization/multi_dist.py	178

## Chapter 5

# Namespace Documentation

### 5.1 AlgoParam Namespace Reference

#### 5.1.1 Detailed Description

Provides tunable parameter classes for use in the Computer-Aided Discovery pipeline.

### 5.2 skdiscovery Namespace Reference

#### Namespaces

- [framework](#)
- [generic](#)
- [series](#)
- [table](#)
- [utilities](#)
- [visualization](#)

### 5.3 skdiscovery.framework Namespace Reference

#### Namespaces

- [base](#)
- [discoverypipeline](#)
- [param](#)
- [stagecontainers](#)

## 5.4 skdiscovery.framework.base Namespace Reference

### Classes

- class [PipelineItem](#)

## 5.5 skdiscovery.framework.discoverypipeline Namespace Reference

### Classes

- class [DiscoveryPipeline](#)

## 5.6 skdiscovery.framework.param Namespace Reference

### Classes

- class [AutoList](#)
- class [AutoListCycle](#)
- class [AutoListPermute](#)
- class [AutoListRemove](#)
- class [AutoListSubset](#)
- class [AutoParam](#)
- class [AutoParamList](#)
- class [AutoParamListCycle](#)
- class [AutoParamMinMax](#)
- class [AutoParamMinMaxExtreme](#)

## 5.7 skdiscovery.framework.stagecontainers Namespace Reference

### Classes

- class [StageContainer](#)
- class [StageContainerAlternative](#)
- class [StageContainerIncrementalAdd](#)

## 5.8 skdiscovery.generic Namespace Reference

### Namespaces

- [accumulators](#)



## 5.9 skdiscovery.generic.accumulators Namespace Reference

### Namespaces

- [data](#)
- [gpsplotter](#)
- [hcluster](#)

## 5.10 skdiscovery.generic.accumulators.data Namespace Reference

### Classes

- class [DataAccumulator](#)

## 5.11 skdiscovery.generic.accumulators.gpsplotter Namespace Reference

### Classes

- class [GPSHPlotter](#)

## 5.12 skdiscovery.generic.accumulators.hcluster Namespace Reference

### Classes

- class [HCluster](#)

## 5.13 skdiscovery.series Namespace Reference

### Namespaces

- [accumulators](#)
- [analysis](#)
- [filters](#)

## 5.14 skdiscovery.series.accumulators Namespace Reference

### Namespaces

- [plotter](#)

## 5.15 skdiscovery.series.accumulators.plotter Namespace Reference

### Classes

- class [Plotter](#)

## 5.16 skdiscovery.series.analysis Namespace Reference

### Namespaces

- [correlate](#)
- [gca](#)
- [mogi](#)

## 5.17 skdiscovery.series.analysis.correlate Namespace Reference

### Classes

- class [Correlate](#)

## 5.18 skdiscovery.series.analysis.gca Namespace Reference

### Classes

- class [General\\_Component\\_Analysis](#)

## 5.19 skdiscovery.series.analysis.mogi Namespace Reference

### Classes

- class [Mogi\\_Inversion](#)

### Functions

- def [MogiVectors](#) (mogi\_res, station\_lat\_list, station\_lon\_list, flag3D=False)

### 5.19.1 Function Documentation

#### 5.19.1.1 MogiVectors()

```
def skdiscovery.series.analysis.MogiVectors (
    mogi_res,
    station_lat_list,
    station_lon_list,
    flag3D = False )
```

Creates a set of Mogi vectors for plotting.

## Parameters

<i>mogi_res</i>	Magma source inversion results
<i>station_lat_list</i>	List of station latitudes
<i>station_lon_list</i>	List of station longitudes
<i>flag3D</i>	Flag for generating 3 dimensional vectors instead of only horizontal

## Returns

x and y Mogi vectors scaled by pca amplitude change

## 5.20 skdiscovery.series.filters Namespace Reference

## Namespaces

- [dataremoval](#)
- [hyperbolicity](#)
- [interpolate](#)
- [kalman](#)
- [lowpass](#)
- [median](#)
- [offset\\_detrend](#)
- [trend](#)

## 5.21 skdiscovery.series.filters.dataremoval Namespace Reference

## Classes

- class [DataRemover](#)

## 5.22 skdiscovery.series.filters.hyperbolicity Namespace Reference

## Classes

- class [HTanFilter](#)

## 5.23 skdiscovery.series.filters.interpolate Namespace Reference

## Classes

- class [InterpolateFilter](#)

## 5.24 skdiscovery.series.filters.kalman Namespace Reference

### Classes

- class [KalmanFilter](#)

## 5.25 skdiscovery.series.filters.lowpass Namespace Reference

### Classes

- class [LowPassFilter](#)

## 5.26 skdiscovery.series.filters.median Namespace Reference

### Classes

- class [MedianFilter](#)

## 5.27 skdiscovery.series.filters.offset\_detrend Namespace Reference

### Classes

- class [OffsetDetrend](#)

## 5.28 skdiscovery.series.filters.trend Namespace Reference

### Classes

- class [TrendFilter](#)

## 5.29 skdiscovery.table Namespace Reference

### Namespaces

- [accumulators](#)
- [analysis](#)
- [filters](#)
- [fusion](#)
- [generators](#)

## 5.30 skdiscovery.table.accumulators Namespace Reference

### Namespaces

- [plotter](#)

## 5.31 skdiscovery.table.accumulators.plotter Namespace Reference

### Classes

- class [Plotter](#)

## 5.32 skdiscovery.table.analysis Namespace Reference

### Namespaces

- [correlate](#)
- [dbscan](#)
- [gca](#)
- [midas](#)
- [mogi](#)
- [outlier](#)
- [skew](#)
- [vdbscan](#)

## 5.33 skdiscovery.table.analysis.correlate Namespace Reference

### Classes

- class [Correlate](#)

## 5.34 skdiscovery.table.analysis.dbscan Namespace Reference

### Classes

- class [DBScan](#)

### 5.35 skdiscovery.table.analysis.gca Namespace Reference

#### Classes

- class [General\\_Component\\_Analysis](#)

### 5.36 skdiscovery.table.analysis.midas Namespace Reference

#### Classes

- class [MIDAS](#)

### 5.37 skdiscovery.table.analysis.mogi Namespace Reference

#### Classes

- class [Mogi\\_Inversion](#)

#### Functions

- def [MogiVectors](#) (mogi\_res, station\_lat\_list, station\_lon\_list, flag3D=False)

#### 5.37.1 Function Documentation

##### 5.37.1.1 MogiVectors()

```
def skdiscovery.table.analysis.MogiVectors (
    mogi_res,
    station_lat_list,
    station_lon_list,
    flag3D = False )
```

Creates a set of mogi vectors for plotting.

#### Parameters

<i>mogi_res</i>	Magma source
<i>station_lat_list</i>	List of station latitudes
<i>station_lon_list</i>	List of station longitudes
<i>flag3D</i>	Make vectors 3 dimensional, defaults to False (2D)

## 5.38 skdiscovery.table.analysis.outlier Namespace Reference

### Classes

- class [Outlier](#)

## 5.39 skdiscovery.table.analysis.skew Namespace Reference

### Classes

- class [Skew](#)

## 5.40 skdiscovery.table.analysis.vdbscan Namespace Reference

### Classes

- class [VDBScan](#)

## 5.41 skdiscovery.table.filters Namespace Reference

### Namespaces

- [antenna\\_offset](#)
- [calibrate\\_grace](#)
- [combine\\_columns](#)
- [dataremover](#)
- [geolocation](#)
- [hyperbolictan](#)
- [interpolate](#)
- [kalman](#)
- [lowpass](#)
- [median](#)
- [offset\\_detrend](#)
- [propagate\\_nans](#)
- [snow\\_removal](#)
- [stabilization](#)
- [table\\_filter](#)
- [trend](#)
- [weighted\\_average](#)

## 5.42 skdiscovery.table.filters.antenna\_offset Namespace Reference

### Classes

- class [AntennaOffset](#)

## 5.43 skdiscovery.table.filters.calibrate\_grace Namespace Reference

### Classes

- class [CalibrateGRACE](#)

## 5.44 skdiscovery.table.filters.combine\_columns Namespace Reference

### Classes

- class [CombineColumns](#)

## 5.45 skdiscovery.table.filters.dataremover Namespace Reference

### Classes

- class [DataRemover](#)

## 5.46 skdiscovery.table.filters.geolocation Namespace Reference

### Classes

- class [GeoLocationFilter](#)

## 5.47 skdiscovery.table.filters.hyperbolictan Namespace Reference

### Classes

- class [HTanFilter](#)



## 5.48 skdiscovery.table.filters.interpolate Namespace Reference

### Classes

- class [InterpolateFilter](#)

## 5.49 skdiscovery.table.filters.kalman Namespace Reference

### Classes

- class [KalmanFilter](#)

## 5.50 skdiscovery.table.filters.lowpass Namespace Reference

### Classes

- class [LowPassFilter](#)

## 5.51 skdiscovery.table.filters.median Namespace Reference

### Classes

- class [MedianFilter](#)

## 5.52 skdiscovery.table.filters.offset\_detrend Namespace Reference

### Classes

- class [OffsetDetrend](#)

## 5.53 skdiscovery.table.filters.propagate\_nans Namespace Reference

### Classes

- class [PropagateNaNs](#)

## 5.54 skdiscovery.table.filters.snow\_remover Namespace Reference

### Classes

- class [SnowRemover](#)

## 5.55 skdiscovery.table.filters.stabilization Namespace Reference

### Classes

- class [StabilizationFilter](#)

## 5.56 skdiscovery.table.filters.table\_filter Namespace Reference

### Classes

- class [TableFilter](#)

## 5.57 skdiscovery.table.filters.trend Namespace Reference

### Classes

- class [TrendFilter](#)

## 5.58 skdiscovery.table.filters.weighted\_average Namespace Reference

### Classes

- class [WeightedAverage](#)

## 5.59 skdiscovery.table.fusion Namespace Reference

### Namespaces

- [grace](#)
- [snow](#)

## 5.60 skdiscovery.table.fusion.grace Namespace Reference

### Classes

- class [GraceFusion](#)

## 5.61 skdiscovery.table.fusion.snow Namespace Reference

### Classes

- class [SnowFusion](#)

## 5.62 skdiscovery.table.generators Namespace Reference

### Namespaces

- [catalog\\_generator](#)
- [data\\_generator](#)

## 5.63 skdiscovery.table.generators.catalog\_generator Namespace Reference

### Classes

- class [CatalogGenerator](#)

## 5.64 skdiscovery.table.generators.data\_generator Namespace Reference

### Classes

- class [DataGenerator](#)

## 5.65 skdiscovery.utilities Namespace Reference

### Namespaces

- [amazon\\_control](#)
- [amazon\\_gui](#)
- [astro\\_tools](#)
- [config](#)
- [kalman\\_smoother](#)
- [pbo\\_tools](#)
- [random\\_walks](#)
- [spherical\\_voronoi](#)
- [ssh\\_reverse](#)
- [trendTools](#)
- [variantdbscan](#)

## 5.66 skdiscovery.utilities.amazon\_control Namespace Reference

### Functions

- def [init](#) (in\_aws\_access\_key, in\_aws\_secret, in\_aws\_region, in\_aws\_security\_group, in\_aws\_key\_name, in\_aws\_pem\_file)
- def [closeDispyScheduler](#) ()
- def [startDispyScheduler](#) ()
- def [generateInfo](#) (instance)
- def [updateStatus](#) ()
- def [setNumInstances](#) (new\_total\_instances, instance\_type, image\_id)
- def [createTunnels](#) ()
- def [startDispyNode](#) ()
- def [resetInstances](#) ()
- def [reset](#) ()
- def [close](#) ()
- def [clearAmazonList](#) ()

### Variables

- [aws\\_access\\_key](#) = None
- [aws\\_secret](#) = None
- [aws\\_region](#) = None
- [aws\\_security\\_group](#) = None
- [aws\\_key\\_name](#) = None
- [pem\\_file](#) = None
- [ec2\\_res](#) = None
- [ec2\\_client](#) = None
- list [amazon\\_list](#) = []
- [scheduler](#) = None
- [popen](#) = None

### 5.66.1 Function Documentation

#### 5.66.1.1 [clearAmazonList\(\)](#)

```
def skdiscovery.utilities.amazon_control.clearAmazonList ( )
```

Shutdown connection tunnels to Amazon instances and clear amazon list.

#### 5.66.1.2 [close\(\)](#)

```
def skdiscovery.utilities.amazon_control.close ( )
```

Shutdown all instances, close dispy scheduler and clear Amazon list.

#### 5.66.1.3 closeDispyScheduler()

```
def skdiscovery.utilities.amazon_control.closeDispyScheduler ( )
```

Close the Dispy Scheduler.

#### 5.66.1.4 createTunnels()

```
def skdiscovery.utilities.amazon_control.createTunnels ( )
```

Create reverse ssh tunnels to all instances.

#### 5.66.1.5 generateInfo()

```
def skdiscovery.utilities.amazon_control.generateInfo (
    instance )
```

Read metadata from an Amazon instance.

##### Returns

metadata for Amazon instance

#### 5.66.1.6 init()

```
def skdiscovery.utilities.amazon_control.init (
    in_aws_access_key,
    in_aws_secret,
    in_aws_region,
    in_aws_security_group,
    in_aws_key_name,
    in_pem_file )
```

The underlying functionality for the Amazon GUI, the user should not need to directly interface with this function.

##### Parameters

<i>in_aws_access_key</i>	AWS access key
<i>in_aws_secret</i>	AWS Secret Access Key
<i>in_aws_region</i>	AWS region (e.g. us-west-2)
<i>in_aws_security_group</i>	Security Group Name
<i>in_aws_key_name</i>	Name of Key Pair
<i>in_pem_file</i>	Filename of ssh key

#### 5.66.1.7 reset()

```
def skdiscovery.utilities.amazon_control.reset ( )
```

Close and clear Amazon List.

#### 5.66.1.8 resetInstances()

```
def skdiscovery.utilities.amazon_control.resetInstances ( )
```

Reboot Amazon instances.

#### 5.66.1.9 setNumInstances()

```
def skdiscovery.utilities.amazon_control.setNumInstances (
    new_total_instances,
    instance_type,
    image_id )
```

Change the number of running instances.

##### Parameters

<i>new_total_instances</i>	New number of instances
<i>instance_type</i>	Instance type for new instances
<i>image_id</i>	ID of image (ami-xxxxxxx)

#### 5.66.1.10 startDispyNode()

```
def skdiscovery.utilities.amazon_control.startDispyNode ( )
```

Start dispy on each Amazon instance.

#### 5.66.1.11 startDispyScheduler()

```
def skdiscovery.utilities.amazon_control.startDispyScheduler ( )
```

Start the Dispy Scheduler.

#### 5.66.1.12 updateStatus()

```
def skdiscovery.utilities.amazon_control.updateStatus ( )
```

Update status information in amazon\_list.

## 5.66.2 Variable Documentation

### 5.66.2.1 amazon\_list

```
list skdiscovery.utilities.amazon_control.amazon_list = []
```

### 5.66.2.2 aws\_access\_key

```
skdiscovery.utilities.amazon_control.aws_access_key = None
```

### 5.66.2.3 aws\_key\_name

```
skdiscovery.utilities.amazon_control.aws_key_name = None
```

### 5.66.2.4 aws\_region

```
skdiscovery.utilities.amazon_control.aws_region = None
```

### 5.66.2.5 aws\_secret

```
skdiscovery.utilities.amazon_control.aws_secret = None
```

### 5.66.2.6 aws\_security\_group

```
skdiscovery.utilities.amazon_control.aws_security_group = None
```

### 5.66.2.7 ec2\_client

```
skdiscovery.utilities.amazon_control.ec2_client = None
```

### 5.66.2.8 ec2\_res

```
skdiscovery.utilities.amazon_control.ec2_res = None
```

### 5.66.2.9 pem\_file

```
skdiscovery.utilities.amazon_control.pem_file = None
```

#### 5.66.2.10 popen

```
skdiscovery.utilities.amazon_control.popen = None
```

#### 5.66.2.11 scheduler

```
skdiscovery.utilities.amazon_control.scheduler = None
```

## 5.67 skdiscovery.utilities.amazon\_gui Namespace Reference

### Functions

- def [init](#) ()
- def [drawGUI](#) ()
- def [changeButtonState](#) (enabled=True)
- def [checkValidValues](#) ()

### Variables

- [widget\\_dict](#) = OrderedDict()
- list [disable\\_list](#)
- list [key\\_value\\_list](#)

### 5.67.1 Function Documentation

#### 5.67.1.1 changeButtonState()

```
def skdiscovery.utilities.amazon_gui.changeButtonState (
    enabled = True )
```

Enable or disable the buttons and slider in the GUI.

#### Parameters

<i>enabled</i>	State to change the buttons to.
----------------	---------------------------------

#### 5.67.1.2 checkValidValues()

```
def skdiscovery.utilities.amazon_gui.checkValidValues ( )
```

Check if Amazon information is valid.



### Returns

True if all AWS text fields have data in them, false otherwise

#### 5.67.1.3 drawGUI()

```
def skdiscovery.utilities.amazon_gui.drawGUI ( )
```

Draw the GUI on the screen.

#### 5.67.1.4 init()

```
def skdiscovery.utilities.amazon_gui.init ( )
```

Initialize GUI for controlling Amazon instances.

### 5.67.2 Variable Documentation

#### 5.67.2.1 disable\_list

```
list skdiscovery.utilities.amazon_gui.disable_list
```

##### Initial value:

```
1 = ['execute_instances_button', 'initialize_button', 'cache_button', 'restore_button',  
2   'new_num_instances_widget']
```

#### 5.67.2.2 key\_value\_list

```
list skdiscovery.utilities.amazon_gui.key_value_list
```

##### Initial value:

```
1 = ['aws_id_widget', 'aws_secret_widget', 'aws_region_widget', 'aws_security_widget',  
2   'aws_keyname_widget', 'aws_pem_widget', 'aws_image_id', 'instance_type_widget']
```

#### 5.67.2.3 widget\_dict

```
skdiscovery.utilities.amazon_gui.widget_dict = OrderedDict()
```

## 5.68 skdiscovery.utilities.astro\_tools Namespace Reference

### Functions

- def [z\\_to\\_v](#) (z)
- def [v\\_to\\_z](#) (v)
- def [angular\\_separation](#) (ra1, dec1, ra2, dec2)
- def [move\\_point](#) (ra, dec, ang\_dist, bearing)
- def [abs\\_mag](#) ([app\\_mag](#), z)
- def [app\\_mag](#) ([abs\\_mag](#), z)
- def [nfw](#) (R, norm\_constant, Rs, Rcore)
- def [lf](#) (x, A, mstar, alpha)
- def [dlf](#) (x, A, m1, a1, m2, a2)
- def [cdf\\_dlf](#) (x, A, m1, a1, m2, a2, start=-26)
- def [inv\\_cdf\\_dlf](#) (p, A, m1, a1, m2, a2, start=-26, end=-15)

### 5.68.1 Function Documentation

#### 5.68.1.1 [abs\\_mag\(\)](#)

```
def skdiscovery.utilities.astro_tools.abs_mag (
    app_mag,
    z )
```

#### 5.68.1.2 [angular\\_separation\(\)](#)

```
def skdiscovery.utilities.astro_tools.angular_separation (
    ra1,
    dec1,
    ra2,
    dec2 )
```

#### 5.68.1.3 [app\\_mag\(\)](#)

```
def skdiscovery.utilities.astro_tools.app_mag (
    abs_mag,
    z )
```

#### 5.68.1.4 [cdf\\_dlf\(\)](#)

```
def skdiscovery.utilities.astro_tools.cdf_dlf (
    x,
    A,
    m1,
    a1,
    m2,
    a2,
    start = -26 )
```

Cumulative Schechter function.

Second LF is set to be 2\*A of first LF

**Parameters**

<i>x</i>	magnitude
<i>A</i>	Scale factor
<i>m1</i>	Knee of distribution 1
<i>a1</i>	Faint-end turnover of first lf
<i>m2</i>	Knee of distribution 2
<i>a2</i>	Faint-end turnover of second lf
<i>start</i>	Brightest magnitude

**Returns**

Probability that galaxy has a magnitude greater than x

**5.68.1.5 dlf()**

```
def skdiscovery.utilities.astro_tools.dlf (
    x,
    A,
    m1,
    a1,
    m2,
    a2 )
```

double Schechter function.

Second LF is set to be 2\*A of first LF

**Parameters**

<i>x</i>	magnitude
<i>A</i>	Scale factor
<i>m1</i>	Knee of distribution 1
<i>a1</i>	Faint-end turnover of first lf
<i>m2</i>	Knee of distribution 2
<i>a2</i>	Faint-end turnover of second lf

**Returns**

float: Double Schechter function at magnitude x

**5.68.1.6 inv\_cdf\_dlf()**

```
def skdiscovery.utilities.astro_tools.inv_cdf_dlf (
    p,
```

```

    A,
    m1,
    a1,
    m2,
    a2,
    start = -26,
    end = -15 )

```

Inverse Cumulative Schechter function.

Second LF is set to be 2\*A of first LF

#### Parameters

<i>p</i>	probability
<i>A</i>	Scale factor
<i>m1</i>	Knee of distribution 1
<i>a1</i>	Faint-end turnover of first lf
<i>m2</i>	Knee of distribution 2
<i>a2</i>	Faint-end turnover of second lf
<i>start</i>	Brightest magnitude
<i>end</i>	Faintest possible magnitude

#### Returns

Magnitude associated with cdf probability p

#### 5.68.1.7 lf()

```

def skdiscovery.utilities.astro_tools.lf (
    x,
    A,
    mstar,
    alpha )

```

Schechter function.

#### Parameters

<i>x</i>	magnitude
<i>A</i>	Scale factor
<i>mstar</i>	Knee of distribution
<i>alpha</i>	Faint-end turnover

#### Returns

float: Schechter function at magnitude x

## 5.68.1.8 move\_point()

```
def skdiscovery.utilities.astro_tools.move_point (
    ra,
    dec,
    ang_dist,
    bearing )
```

Move a point along a great circle at a particular bearing.

All inputs are in degrees The formula was obtained from <http://www.movable-type.co.uk/scripts/latlong.html>

## Parameters

<i>ra</i>	Starting right ascension
<i>dec</i>	Starting declination
<i>ang_dist</i>	Angular distance to travel
<i>bearing</i>	Direction to travel (0 is north, 90 is positive RA)

## Returns

tuple containing updated ra and dec

## 5.68.1.9 nfw()

```
def skdiscovery.utilities.astro_tools.nfw (
    R,
    norm_constant,
    Rs,
    Rcore )
```

2D Navarro-Frenk-White surface radial profile probability density

## See

Navarro, J. F., Frenk, C. S., & White, S. D. M. 1996, ApJ, 462, 563 Bartelmann, M., A&A, 1996, 313, 697 Rykoff, E.S., et al., ApJ, 746, 178

## Parameters

<i>R</i>	Radius
<i>norm_constant</i>	Normalization constant
<i>Rs</i>	Scale radius
<i>Rcore</i>	Since NFW profile diverges at R=0, the value at the center is held fixed starting at Rcore

**Returns**

probability density of profile at R

**5.68.1.10 v\_to\_z()**

```
def skdiscovery.utilities.astro_tools.v_to_z (
    v )
```

Convert km/s to redshift assuming all are using special relativity.

**Parameters**

v	velocity in km/s
---	------------------

**Returns**

Redshift of object with speed in km/s

**5.68.1.11 z\_to\_v()**

```
def skdiscovery.utilities.astro_tools.z_to_v (
    z )
```

Convert redshift to km/s assuming shift is due to velocity using special relativity.

**Parameters**

z	Redshift
---	----------

**Returns**

speed in km/s assuming shift is due to motion using special relativity

**5.69 skdiscovery.utilities.config Namespace Reference****Functions**

- def [getConfig](#) ()
- def [writeConfigValue](#) (section, key, value)
- def [getDispyPassword](#) ()
- def [getHostName](#) ()

## 5.69.1 Function Documentation

### 5.69.1.1 getConfig()

```
def skdiscovery.utilities.config.getConfig ( )
```

Retrieve skdiscovery configuraration.

#### Returns

skdiscovery configparser

### 5.69.1.2 getDispyPassword()

```
def skdiscovery.utilities.config.getDispyPassword ( )
```

Get dispy password.

#### Returns

dispy password

### 5.69.1.3 getHostName()

```
def skdiscovery.utilities.config.getHostName ( )
```

Get Host name for displaying link to dispy status.

#### Returns

Hostname

### 5.69.1.4 writeConfigValue()

```
def skdiscovery.utilities.config.writeConfigValue (
    section,
    key,
    value )
```

Write config to disk.

#### Parameters

<i>section</i>	Name of section
<i>key</i>	Name of key
<i>value</i>	Value to write

## 5.70 skdiscovery.utilities.kalman\_smoother Namespace Reference

### Functions

- def [KalmanFilter](#) (in\_data, t, sigma\_sq, R, Pinit, x0=0, invert=False, clipping=5)
- def [FitFOGMPParameters](#) (data, Pinit=100, R=1, method='brute', x0=0, clipping=5)
- def [IterativeGridSearch](#) (f, args, intervals, max\_iter=50, tol=0.1, bounds=None, prev\_minimum=None, verbose=False)
- def [KalmanSmoother](#) (in\_data, Pinit=1e6, Restimate=1, clipping=5, method='simple', t=None, sigma\_sq=None, R=1, verbose=False, max\_clip\_iter=10)
- def [FOGM](#) (size, t, sigma\_sq, R)

### 5.70.1 Function Documentation

#### 5.70.1.1 FitFOGMPParameters()

```
def skdiscovery.utilities.kalman_smoother.FitFOGMPParameters (
    data,
    Pinit = 100,
    R = 1,
    method = 'brute',
    x0 = 0,
    clipping = 5 )
```

Find best FOGM parameters for a given data set.

#### Parameters

<i>data</i>	input data
<i>Pinit</i>	Initial updated covariance
<i>R</i>	Noise Variance
<i>method</i>	Method used to fit FOGM parameters. Use "simple", "brute", or "igrid".
<i>x0</i>	Initial value of x0 to use in the kalman filter
<i>clipping</i>	Clipping factor used when computing cost functions

#### Returns

best fit correlation time  
 FOGM variance  
 Noise variance  
 correlation time from L  
 FOGM variance from Chat

#### 5.70.1.2 FOGM()

```
def skdiscovery.utilities.kalman_smoother.FOGM (
    size,
```



```

    t,
    sigma_sq,
    R )

```

Generates data from a First Order Gaussian-Markov process.

#### Parameters

<i>size</i>	Number of data points
<i>t</i>	Correlation time
<i>sigma_sq</i>	FOGM variance
<i>R</i>	Measurement variance

#### Returns

Data generated from a FOGM

#### 5.70.1.3 IterativeGridSearch()

```

def skdiscovery.utilities.kalman_smoother.IterativeGridSearch (
    f,
    args,
    intervals,
    max_iter = 50,
    tol = 0.1,
    bounds = None,
    prev_minimum = None,
    verbose = False )

```

Find the minimum of f using an iterative grid search with 3 points per dimension.

#### Parameters

<i>f</i>	Function to be minimized. The function must accept a tuple with coordinates for the first input.
<i>args</i>	additional arguments to pass on to the function.
<i>intervals</i>	Space that contains the minimum. Must be a list of tuples, even if only 1 dimension.
<i>max_iter</i>	Maximum number of iterations before stopping search.
<i>tol</i>	Error tolerance on result.
<i>bounds</i>	Additional set of bounds for ending search.
<i>prev_minimum</i>	Previous minimum of function. If the current minimum is close to the previous minimum the search will stop
<i>verbose</i>	Output debugging information.

#### Returns

A tuple containing a numpy array with the location of the minimum; and the minimum value of the function.

#### 5.70.1.4 KalmanFilter()

```
def skdiscovery.utilities.kalman_smoother.KalmanFilter (
    in_data,
    t,
    sigma_sq,
    R,
    Pinit,
    x0 = 0,
    invert = False,
    clipping = 5 )
```

Runs the kalman filter on data.

##### Parameters

<i>in_data</i>	Input data
<i>t</i>	Correlation time
<i>sigma_sq</i>	FOGM variance
<i>R</i>	Noise variance
<i>Pinit</i>	Initial variance
<i>x0</i>	Intial updated state (default: 0)
<i>invert</i>	Run the filter backwards (boolean flag)
<i>clipping</i>	Clipping factor to use when computing cost functions

##### Returns

- the predicted state
- the predicted covariance
- the updated state
- the updated covariance
- C\_hat, the sample innovation variance
- L, a different log variance cost function

#### 5.70.1.5 KalmanSmoother()

```
def skdiscovery.utilities.kalman_smoother.KalmanSmoother (
    in_data,
    Pinit = 1e6,
    Restimate = 1,
    clipping = 5,
    method = 'simple',
    t = None,
    sigma_sq = None,
    R = 1,
    verbose = False,
    max_clip_iter = 10 )
```

Smoother based on a forward and a backward kalman filter.

## Parameters

<i>in_data</i>	Data to be smoothed (must be in a Pandas DataFrame)
<i>Pinit</i>	Initial updated covariance
<i>Restimate</i>	Initial estimate for noise variance
<i>clipping</i>	Iteratively remove points beyond clipping * MSE.
<i>method</i>	Method used to fit FOGM parameters. Use either "simple", "brute", or "igrid".
<i>t</i>	Fixed correlation time to use. Both sigma_sq and R must also be specified.
<i>sigma_sq</i>	Fixed sigma squared to use. Both t and R must also be specified.
<i>R</i>	Fixed measurement error to use Both t and sigma_sq must also be specified.
<i>verbose</i>	Output additional information.
<i>max_clip_iter</i>	Maximum number of clip iterations.

## Returns

values smoothed by the kalman smoother  
 associated variance of smoothed result  
 t, same as input, might have been altered by fitting parameters  
 sigma\_sq, same as input, might have been altered by fitting parameters  
 R, same as input, might have been altered by fitting parameters

## 5.71 skdiscovery.utilities.pbo\_tools Namespace Reference

## Functions

- def [mogi](#) (xdata, lat, lon, source\_depth, amplitude)
- def [finite\\_sphere](#) (xdata, lat, lon, source\_depth, amplitude, alpha\_rad)
- def [closed\\_pipe](#) (xdata, lat, lon, source\_depth, amplitude, pipe\_delta)
- def [constant\\_open\\_pipe](#) (xdata, lat, lon, source\_depth, amplitude, pipe\_delta)
- def [rising\\_open\\_pipe](#) (xdata, lat, lon, source\_depth, amplitude, pipe\_delta, open\_pipe\_top)
- def [sill](#) (xdata, lat, lon, source\_depth, amplitude)
- def [dirEigenvectors](#) (coord\_list, pca\_comps, pdir='H')
- def [datetimeToNumber](#) (in\_time)

## 5.71.1 Function Documentation

## 5.71.1.1 closed\_pipe()

```

def skdiscovery.utilities.pbo_tools.closed_pipe (
    xdata,
    lat,
    lon,
    source_depth,
    amplitude,
    pipe_delta )

```

#### 5.71.1.2 constant\_open\_pipe()

```
def skdiscovery.utilities.pbo_tools.constant_open_pipe (
    xdata,
    lat,
    lon,
    source_depth,
    amplitude,
    pipe_delta )
```

#### 5.71.1.3 datetimeToNumber()

```
def skdiscovery.utilities.pbo_tools.datetimeToNumber (
    in_time )
```

Converts input pandas Timestamp or pandas DatetimeIndex to unix time.

##### Parameters

<i>in_time</i>	Input pandas timestamp or pandas DatetimeIndex
----------------	--

##### Returns

unix time

#### 5.71.1.4 dirEigenvectors()

```
def skdiscovery.utilities.pbo_tools.dirEigenvectors (
    coord_list,
    pca_comps,
    pdir = 'H' )
```

#### 5.71.1.5 finite\_sphere()

```
def skdiscovery.utilities.pbo_tools.finite_sphere (
    xdata,
    lat,
    lon,
    source_depth,
    amplitude,
    alpha_rad )
```

#### 5.71.1.6 mogi()

```
def skdiscovery.utilities.pbo_tools.mogi (
    xdata,
    lat,
    lon,
    source_depth,
    amplitude )
```

Compute the surface deformation due to changes in a mogi source.

##### Parameters

<i>xdata</i>	List of the position data with each array element containing [ direction (x, y, or z), lat, lon ]
<i>lat</i>	Latitude of source
<i>lon</i>	Longitude of source
<i>source_depth</i>	Depth of source
<i>amplitude</i>	Amplitude of mogi source

##### Returns

list of resulting deformation for each point in xdata

#### 5.71.1.7 rising\_open\_pipe()

```
def skdiscovery.utilities.pbo_tools.rising_open_pipe (
    xdata,
    lat,
    lon,
    source_depth,
    amplitude,
    pipe_delta,
    open_pipe_top )
```

#### 5.71.1.8 sill()

```
def skdiscovery.utilities.pbo_tools.sill (
    xdata,
    lat,
    lon,
    source_depth,
    amplitude )
```

## 5.72 skdiscovery.utilities.random\_walks Namespace Reference

### Functions

- def [uniform\\_walk](#) (pos, grid, step\_size=None)
- def [gaussian\\_walk](#) (pos, grid, step\_size=None)
- def [keep\\_in\\_bound](#) (pos, grid)

### 5.72.1 Function Documentation

#### 5.72.1.1 [gaussian\\_walk\(\)](#)

```
def skdiscovery.utilities.random_walks.gaussian_walk (
    pos,
    grid,
    step_size = None )
```

A gaussian random walk function.

#### Parameters

<i>pos</i>	tuple of input point
<i>grid</i>	bounds for walk
<i>step_size</i>	maximal step size

#### Returns

position tuple

#### 5.72.1.2 [keep\\_in\\_bound\(\)](#)

```
def skdiscovery.utilities.random_walks.keep_in_bound (
    pos,
    grid )
```

Function for truncating and bounding the random walk to within the defined grid.

#### Parameters

<i>pos</i>	tuple of the point to be checked
<i>grid</i>	the bounds for limiting the walk

**Returns**

position tuple after bounding the point

**5.72.1.3 uniform\_walk()**

```
def skdiscovery.utilities.random_walks.uniform_walk (
    pos,
    grid,
    step_size = None )
```

A uniform random walk function.

**Parameters**

<i>pos</i>	tuple of input point
<i>grid</i>	bounds for walk
<i>step_size</i>	maximal step size

**Returns**

position tuple

**5.73 skdiscovery.utilities.spherical\_voronoi Namespace Reference****Functions**

- def [sphericalToXYZ](#) (lat, lon, radius=1)
- def [xyzToSpherical](#) (x, y, z)
- def [find\\_match](#) (region\_index, region\_list)
- def [getVoronoiCollection](#) (data, lat\_name, lon\_name, bmap=None, v\_name=None, full\_sphere=False, max\_v=.3, min\_v=-0.3, cmap=matplotlib.cm.get\_cmap("jet"))

**5.73.1 Function Documentation****5.73.1.1 find\_match()**

```
def skdiscovery.utilities.spherical_voronoi.find_match (
    region_index,
    region_list )
```

Find neighboring regions.

**Parameters**

<i>region_index</i>	Numeric index of region to find matches for (number between 0 and len(vertices))
<i>region_list</i>	list of lists of vertices that define regions

**Returns**

Numeric indices of regions that border the region specified by region\_index

**5.73.1.2 getVoronoiCollection()**

```
def skdiscovery.utilities.spherical_voronoi.getVoronoiCollection (
    data,
    lat_name,
    lon_name,
    bmap = None,
    v_name = None,
    full_sphere = False,
    max_v = .3,
    min_v = -0.3,
    cmap = matplotlib.cm.get_cmap('jet') )
```

Perform a Spherical Voronoi Tessellation on the input data.

In the case where the data is restricted to one part of the globe, a polygon will not be returned for all objects, as matplotlib polygons won't be able to stretch over half the globe.

**Parameters**

<i>data</i>	Input pandas data frame
<i>lat_name</i>	Name of latitude column
<i>lon_name</i>	Name of longitude column
<i>bmap</i>	Basemap instance used to convert from lat, lon coordinates to projection coordinates
<i>v_name</i>	Name of value column. Use this to color each cell according to a value.
<i>full_sphere</i>	Set to true if the data spans the entire globe. If false, a fictional point is created during tessellation and removed later to work around issues when polygons are suppose to span the over half the globe.
<i>max_v</i>	Specify a maximum value to use when assigning values to the tessellation
<i>min_v</i>	Specify a minimum value to use when assigning values to the tessellation
<i>cmap</i>	Matplotlib color map to use

**Returns**

Matplotlib patch collection of tessellation, scipy.spatial.SphericalVoronoi object, integer index of objects in patch collection.



#### 5.73.1.3 sphericalToXYZ()

```
def skdiscovery.utilities.spherical_voronoi.sphericalToXYZ (
    lat,
    lon,
    radius = 1 )
```

Convert spherical coordinates to x,y,z.

##### Parameters

<i>lat</i>	Latitude, scalar or array
<i>lon</i>	Longitude, scalar or array
<i>radius</i>	Sphere's radius

##### Returns

Numpy array of x,y,z coordinates

#### 5.73.1.4 xyzToSpherical()

```
def skdiscovery.utilities.spherical_voronoi.xyzToSpherical (
    x,
    y,
    z )
```

Convert x,y,z to spherical coordinates.

##### Parameters

<i>x</i>	Cartesian coordinate x
<i>y</i>	Cartesian coordinate y
<i>z</i>	Cartesian coordinate z

##### Returns

numpy array of latitude,longitude, and radius

## 5.74 skdiscovery.utilities.ssh\_reverse Namespace Reference

### Classes

- class [ReverseTunnel](#)

## Functions

- def [print\\_verbose](#) (s, verbose=False)
- def [handler](#) (chan, host, port, verbose=False)
- def [reverse\\_forward\\_tunnel](#) (server\_port, remote\_host, remote\_port, transport, check=30, verbose=False)

### 5.74.1 Function Documentation

#### 5.74.1.1 handler()

```
def skdiscovery.utilities.ssh_reverse.handler (
    chan,
    host,
    port,
    verbose = False )
```

Handler is responsible for sending and receiving data through ssh tunnel.

##### Parameters

<i>chan</i>	SSH Channel for transferring data
<i>host</i>	Address of remote host
<i>port</i>	Port to forward
<i>verbose</i>	Print status information

#### 5.74.1.2 print\_verbose()

```
def skdiscovery.utilities.ssh_reverse.print_verbose (
    s,
    verbose = False )
```

Print statement if verbose is True.

##### Parameters

<i>s</i>	Statement to print
<i>verbose</i>	Print only if verbose is True

#### 5.74.1.3 reverse\_forward\_tunnel()

```
def skdiscovery.utilities.ssh_reverse.reverse_forward_tunnel (
    server_port,
    remote_host,
    remote_port,
```

```
transport,  
check = 30,  
verbose = False )
```

Creates a reverse ssh tunnel.

#### Parameters

<i>server_port</i>	Port on local host
<i>remote_host</i>	Address of remote host
<i>remote_port</i>	Port of remote host
<i>transport</i>	SSH Transport
<i>check</i>	Amount of time to wait in seconds when opening up a channel
<i>verbose</i>	Print status information

#### Returns

Thread running reverse ssh tunnel, event used to close ssh tunnel, list of child threads started by main thread

## 5.75 skdiscovery.utilities.trendTools Namespace Reference

### Functions

- def [getTrend](#) (xdata)
- def [sinuFits](#) (xdata, fitN=2, rmve=1)
- def [interpNaN](#) (data)
- def [medianFilter](#) (data, window, interpolate=True)

### 5.75.1 Function Documentation

#### 5.75.1.1 [getTrend\(\)](#)

```
def skdiscovery.utilities.trendTools.getTrend (  
    xdata )
```

#### 5.75.1.2 [interpNaN\(\)](#)

```
def skdiscovery.utilities.trendTools.interpNaN (  
    data )
```

#### 5.75.1.3 [medianFilter\(\)](#)

```
def skdiscovery.utilities.trendTools.medianFilter (  
    data,  
    window,  
    interpolate = True )
```

#### 5.75.1.4 sinuFits()

```
def skdiscovery.utilities.trendTools.sinuFits (
    xdata,
    fitN = 2,
    rmve = 1 )
```

### 5.76 skdiscovery.utilities.variantdbscan Namespace Reference

#### Classes

- class [VariantDBScan](#)

### 5.77 skdiscovery.visualization Namespace Reference

#### Namespaces

- [multi\\_ca\\_plot](#)
- [multi\\_dist](#)

### 5.78 skdiscovery.visualization.multi\_ca\_plot Namespace Reference

#### Functions

- def [multiCaPlot](#) (pipeline, mogiFlag=False, offset=.15, direction='H', pca\_comp=0, scaleFactor=2.5, map\_res='i')

#### 5.78.1 Function Documentation

##### 5.78.1.1 multiCaPlot()

```
def skdiscovery.visualization.multiCaPlot (
    pipeline,
    mogiFlag = False,
    offset = .15,
    direction = 'H',
    pca_comp = 0,
    scaleFactor = 2.5,
    map_res = 'i' )
```

The multiCaPlot function generates a geographic eigenvector plot of several pipeline runs.

This function plots multiple pipeline runs over perturbed pipeline parameters. The various perturbations are plotted more transparently (alpha=.5), while the median eigen\_vector and Mogi inversion are plotted in solid blue and red

## Parameters

<i>pipeline</i>	The pipeline object with multiple runs
<i>mogiFlag</i>	Flag to indicate plotting the Mogi source as well as the PCA
<i>offset</i>	Offset for padding the corners of the generated map
<i>direction</i>	Indicates the eigenvectors to plot. Only Horizontal component is currently supported ('H')
<i>pca_comp</i>	Choose the PCA component to use (integer)
<i>scaleFactor</i>	Size of the arrow scaling factor

## 5.79 skdiscovery.visualization.multi\_dist Namespace Reference

## Functions

- def [calc\\_distance\\_map](#) (pipeline, ap\_name, ca\_name, ca\_type, plotFlag=True, histIdx=False, fontsize=10)

## Variables

- [font](#)

### 5.79.1 Function Documentation

#### 5.79.1.1 [calc\\_distance\\_map\(\)](#)

```
def skdiscovery.visualization.calc_distance_map (  
    pipeline,  
    ap_name,  
    ca_name,  
    ca_type,  
    plotFlag = True,  
    histIdx = False,  
    fontsize = 10 )
```

### 5.79.2 Variable Documentation

#### 5.79.2.1 [font](#)

```
skdiscovery.visualization.font
```

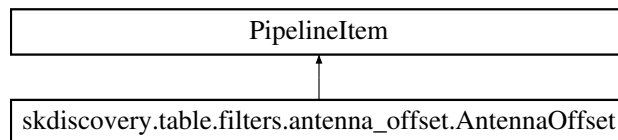


## Chapter 6

# Class Documentation

### 6.1 skdiscovery.table.filters.antenna\_offset.AntennaOffset Class Reference

Inheritance diagram for skdiscovery.table.filters.antenna\_offset.AntennaOffset:



#### Public Member Functions

- def `__init__` (self, str\_description, [antenna\\_data](#), min\_diff=0.0, [column\\_list](#)=None)
- def [process](#) (self, obj\_data)

#### 6.1.1 Detailed Description

Applies corrections to fix offsets in PBO GPS data induced by antenna changes.

#### 6.1.2 Constructor & Destructor Documentation

##### 6.1.2.1 `__init__()`

```
def skdiscovery.table.filters.antenna_offset.AntennaOffset.__init__ (
    self,
    str_description,
    antenna_data,
    min_diff = 0.0,
    column_list = None )
```

Initialize [AntennaOffset](#) function.

## Parameters

<i>str_description</i>	String describing the filter
<i>antenna_data</i>	Data containing the log of antenna changes
<i>min_diff</i>	Difference in position needed to be considered an offset
<i>column_list</i>	Names of the columns to apply the function to

### 6.1.3 Member Function Documentation

#### 6.1.3.1 process()

```
def skdiscovery.table.filters.antenna_offset.AntennaOffset.process (
    self,
    obj_data )
```

Applies the function to the data, updating in place.

## Parameters

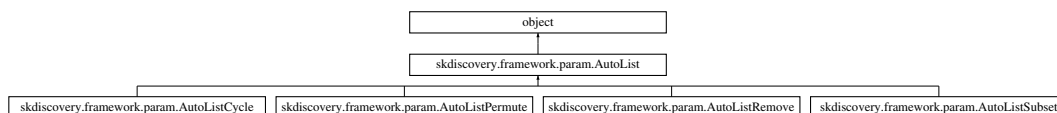
<i>obj_data</i>	Table data wrapper
-----------------	--------------------

The documentation for this class was generated from the following file:

- [table/filters/antenna\\_offset.py](#)

## 6.2 skdiscovery.framework.param.AutoList Class Reference

Inheritance diagram for skdiscovery.framework.param.AutoList:



### Public Member Functions

- def `__init__` (self, `val_list`)
- def `val` (self)
- def `perturb` (self)
- def `reset` (self)
- def `__str__` (self)
- def `__len__` (self)
- def `__getitem__` (self, `ii`)
- def `__setitem__` (self, `ii`, `val`)
- def `__call__` (self)



### 6.2.1 Detailed Description

specifies a list for returning selections of lists, as opposed to a single element

### 6.2.2 Constructor & Destructor Documentation

#### 6.2.2.1 `__init__()`

```
def skdiscovery.framework.param.AutoList.__init__ (
    self,
    val_list )
```

Construct a [AutoList](#) object.

##### Parameters

<i>val_list</i>	List of parameters
-----------------	--------------------

### 6.2.3 Member Function Documentation

#### 6.2.3.1 `__call__()`

```
def skdiscovery.framework.param.AutoList.__call__ (
    self )
```

Retrieve current list.

##### Returns

Current list

#### 6.2.3.2 `__getitem__()`

```
def skdiscovery.framework.param.AutoList.__getitem__ (
    self,
    ii )
```

Retrieves item from list.

##### Parameters

<i>ii</i>	Index of item to be retrieved
-----------	-------------------------------

**Returns**

Item at index *ii*

**6.2.3.3 \_\_len\_\_()**

```
def skdiscovery.framework.param.AutoList.__len__ (
    self )
```

Retrieves the length of parameters contained in the list.

**Returns**

Number of elements in the list

**6.2.3.4 \_\_setitem\_\_()**

```
def skdiscovery.framework.param.AutoList.__setitem__ (
    self,
    ii,
    val )
```

Set a value in the list.

**Parameters**

<i>ii</i>	Index of list to be set
<i>val</i>	Input value

**6.2.3.5 \_\_str\_\_()**

```
def skdiscovery.framework.param.AutoList.__str__ (
    self )
```

String representation of class.

**Returns**

String containing all parameters in list

**6.2.3.6 perturb()**

```
def skdiscovery.framework.param.AutoList.perturb (
    self )
```

This class doesn't change list when being perturbed.

## 6.2.3.7 reset()

```
def skdiscovery.framework.param.AutoList.reset (
    self )
```

Reset current list to initial list.

## 6.2.3.8 val()

```
def skdiscovery.framework.param.AutoList.val (
    self )
```

Retrieves current list of parameters.

## Returns

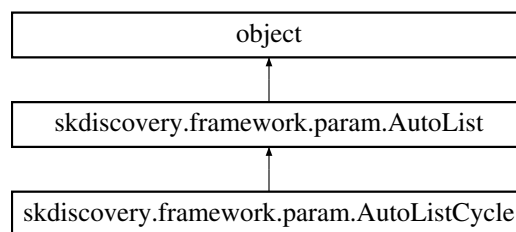
List of current parameters

The documentation for this class was generated from the following file:

- [framework/param.py](#)

## 6.3 skdiscovery.framework.param.AutoListCycle Class Reference

Inheritance diagram for skdiscovery.framework.param.AutoListCycle:



## Public Member Functions

- def `__init__` (self, [list\\_val\\_list](#))
- def [perturb](#) (self)
- def [reset](#) (self)
- def [val](#) (self)
- def `__str__` (self)
- def `__len__` (self)
- def `__getitem__` (self, ii)
- def `__setitem__` (self, ii, [val](#))
- def `__call__` (self)

### 6.3.1 Detailed Description

Cycles through a list of list selections.

### 6.3.2 Constructor & Destructor Documentation

#### 6.3.2.1 `__init__()`

```
def skdiscovery.framework.param.AutoListCycle.__init__ (
    self,
    list_val_list )
```

Construct a AutoList\_Cycle object.

##### Parameters

<i>list_val_list</i>	List of different lists to cycle through
----------------------	--

### 6.3.3 Member Function Documentation

#### 6.3.3.1 `__call__()`

```
def skdiscovery.framework.param.AutoList.__call__ (
    self ) [inherited]
```

Retrieve current list.

##### Returns

Current list

#### 6.3.3.2 `__getitem__()`

```
def skdiscovery.framework.param.AutoList.__getitem__ (
    self,
    ii ) [inherited]
```

Retrieves item from list.

##### Parameters

<i>ii</i>	Index of item to be retrieved
-----------	-------------------------------

**Returns**

Item at index *ii*

**6.3.3.3 \_\_len\_\_()**

```
def skdiscovery.framework.param.AutoList.__len__ (
    self ) [inherited]
```

Retrieves the length of parameters contained in the list.

**Returns**

Number of elements in the list

**6.3.3.4 \_\_setitem\_\_()**

```
def skdiscovery.framework.param.AutoList.__setitem__ (
    self,
    ii,
    val ) [inherited]
```

Set a value in the list.

**Parameters**

<i>ii</i>	Index of list to be set
<i>val</i>	Input value

**6.3.3.5 \_\_str\_\_()**

```
def skdiscovery.framework.param.AutoList.__str__ (
    self ) [inherited]
```

String representation of class.

**Returns**

String containing all parameters in list

**6.3.3.6 perturb()**

```
def skdiscovery.framework.param.AutoListCycle.perturb (
    self )
```

Select next list from list of lists.

#### 6.3.3.7 reset()

```
def skdiscovery.framework.param.AutoListCycle.reset (
    self )
```

Resets to the first list in the list of lists.

#### 6.3.3.8 val()

```
def skdiscovery.framework.param.AutoList.val (
    self ) [inherited]
```

Retrieves current list of parameters.

#### Returns

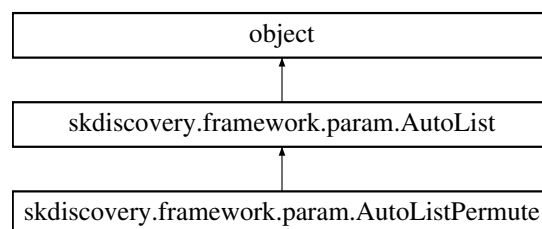
List of current parameters

The documentation for this class was generated from the following file:

- framework/[param.py](#)

## 6.4 skdiscovery.framework.param.AutoListPermute Class Reference

Inheritance diagram for skdiscovery.framework.param.AutoListPermute:



#### Public Member Functions

- def [perturb](#) (self)
- def [val](#) (self)
- def [reset](#) (self)
- def [\\_\\_str\\_\\_](#) (self)
- def [\\_\\_len\\_\\_](#) (self)
- def [\\_\\_getitem\\_\\_](#) (self, ii)
- def [\\_\\_setitem\\_\\_](#) (self, ii, [val](#))
- def [\\_\\_call\\_\\_](#) (self)

### 6.4.1 Detailed Description

A perturber that permutes a list.

### 6.4.2 Member Function Documentation

#### 6.4.2.1 `__call__()`

```
def skdiscovery.framework.param.AutoList.__call__ (
    self ) [inherited]
```

Retrieve current list.

##### Returns

Current list

#### 6.4.2.2 `__getitem__()`

```
def skdiscovery.framework.param.AutoList.__getitem__ (
    self,
    ii ) [inherited]
```

Retrieves item from list.

##### Parameters

<i>ii</i>	Index of item to be retrieved
-----------	-------------------------------

##### Returns

Item at index ii

#### 6.4.2.3 `__len__()`

```
def skdiscovery.framework.param.AutoList.__len__ (
    self ) [inherited]
```

Retrieves the length of parameters contained in the list.

##### Returns

Number of elements in the list

#### 6.4.2.4 `__setitem__()`

```
def skdiscovery.framework.param.AutoList.__setitem__ (
    self,
    ii,
    val ) [inherited]
```

Set a value in the list.

##### Parameters

<i>ii</i>	Index of list to be set
<i>val</i>	Input value

#### 6.4.2.5 `__str__()`

```
def skdiscovery.framework.param.AutoList.__str__ (
    self ) [inherited]
```

String representation of class.

##### Returns

String containing all parameters in list

#### 6.4.2.6 `perturb()`

```
def skdiscovery.framework.param.AutoListPermute.perturb (
    self )
```

Randomly permutes the initial list.

#### 6.4.2.7 `reset()`

```
def skdiscovery.framework.param.AutoList.reset (
    self ) [inherited]
```

Reset current list to initial list.



## 6.4.2.8 val()

```
def skdiscovery.framework.param.AutoList.val (
    self ) [inherited]
```

Retrieves current list of parameters.

## Returns

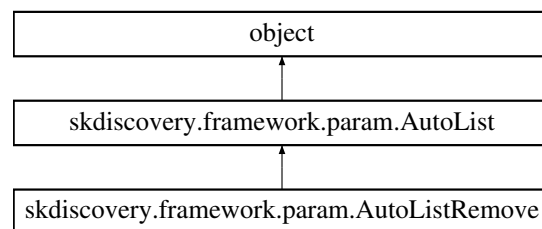
List of current parameters

The documentation for this class was generated from the following file:

- framework/[param.py](#)

## 6.5 skdiscovery.framework.param.AutoListRemove Class Reference

Inheritance diagram for skdiscovery.framework.param.AutoListRemove:



## Public Member Functions

- def `__init__` (self, [val\\_list](#))
- def [perturb](#) (self)
- def [reset](#) (self)
- def [val](#) (self)
- def `__str__` (self)
- def `__len__` (self)
- def `__getitem__` (self, ii)
- def `__setitem__` (self, ii, [val](#))
- def `__call__` (self)

## 6.5.1 Detailed Description

Removes a different single element from the initial list at each perturb call.

## 6.5.2 Constructor &amp; Destructor Documentation

6.5.2.1 `__init__()`

```
def skdiscovery.framework.param.AutoListRemove.__init__ (
    self,
    val_list )
```

Construct a AutoList\_Cycle object.

**Parameters**

<i>val_list</i>	Initial list of parameters.
-----------------	-----------------------------

### 6.5.3 Member Function Documentation

#### 6.5.3.1 `__call__()`

```
def skdiscovery.framework.param.AutoList.__call__ (
    self ) [inherited]
```

Retrieve current list.

**Returns**

Current list

#### 6.5.3.2 `__getitem__()`

```
def skdiscovery.framework.param.AutoList.__getitem__ (
    self,
    ii ) [inherited]
```

Retrieves item from list.

**Parameters**

<i>ii</i>	Index of item to be retrieved
-----------	-------------------------------

**Returns**

Item at index ii

#### 6.5.3.3 `__len__()`

```
def skdiscovery.framework.param.AutoList.__len__ (
    self ) [inherited]
```

Retrieves the length of parameters contained in the list.

**Returns**

Number of elements in the list

#### 6.5.3.4 \_\_setitem\_\_()

```
def skdiscovery.framework.param.AutoList.__setitem__ (
    self,
    ii,
    val ) [inherited]
```

Set a value in the list.

##### Parameters

<i>ii</i>	Index of list to be set
<i>val</i>	Input value

#### 6.5.3.5 \_\_str\_\_()

```
def skdiscovery.framework.param.AutoList.__str__ (
    self ) [inherited]
```

String representation of class.

##### Returns

String containing all parameters in list

#### 6.5.3.6 perturb()

```
def skdiscovery.framework.param.AutoListRemove.perturb (
    self )
```

Systematically change which item is absent from the list.

#### 6.5.3.7 reset()

```
def skdiscovery.framework.param.AutoListRemove.reset (
    self )
```

Reset the list to its initial value.

#### 6.5.3.8 val()

```
def skdiscovery.framework.param.AutoList.val (
    self ) [inherited]
```

Retrieves current list of parameters.

#### Returns

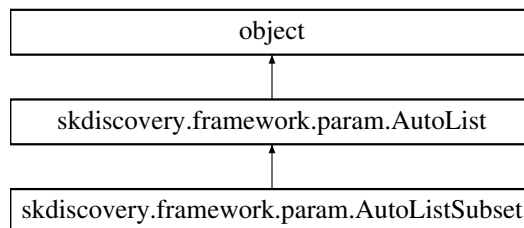
List of current parameters

The documentation for this class was generated from the following file:

- [framework/param.py](#)

## 6.6 skdiscovery.framework.param.AutoListSubset Class Reference

Inheritance diagram for skdiscovery.framework.param.AutoListSubset:



### Public Member Functions

- def [perturb](#) (self)
- def [val](#) (self)
- def [reset](#) (self)
- def [\\_\\_str\\_\\_](#) (self)
- def [\\_\\_len\\_\\_](#) (self)
- def [\\_\\_getitem\\_\\_](#) (self, ii)
- def [\\_\\_setitem\\_\\_](#) (self, ii, [val](#))
- def [\\_\\_call\\_\\_](#) (self)

#### 6.6.1 Detailed Description

A list perturber that creates random subsets of a list.

List can be empty.

## 6.6.2 Member Function Documentation

### 6.6.2.1 `__call__()`

```
def skdiscovery.framework.param.AutoList.__call__ (
    self ) [inherited]
```

Retrieve current list.

#### Returns

Current list

### 6.6.2.2 `__getitem__()`

```
def skdiscovery.framework.param.AutoList.__getitem__ (
    self,
    ii ) [inherited]
```

Retrieves item from list.

#### Parameters

<i>ii</i>	Index of item to be retrieved
-----------	-------------------------------

#### Returns

Item at index ii

### 6.6.2.3 `__len__()`

```
def skdiscovery.framework.param.AutoList.__len__ (
    self ) [inherited]
```

Retrieves the length of parameters contained in the list.

#### Returns

Number of elements in the list

### 6.6.2.4 `__setitem__()`

```
def skdiscovery.framework.param.AutoList.__setitem__ (
    self,
    ii,
    val ) [inherited]
```

Set a value in the list.

**Parameters**

<i>ii</i>	Index of list to be set
<i>val</i>	Input value

**6.6.2.5 \_\_str\_\_()**

```
def skdiscovery.framework.param.AutoList.__str__ (
    self ) [inherited]
```

String representation of class.

**Returns**

String containing all parameters in list

**6.6.2.6 perturb()**

```
def skdiscovery.framework.param.AutoListSubset.perturb (
    self )
```

Perturb the list by selecting a random subset of the initial list.

**6.6.2.7 reset()**

```
def skdiscovery.framework.param.AutoList.reset (
    self ) [inherited]
```

Reset current list to initial list.

**6.6.2.8 val()**

```
def skdiscovery.framework.param.AutoList.val (
    self ) [inherited]
```

Retrieves current list of parameters.

**Returns**

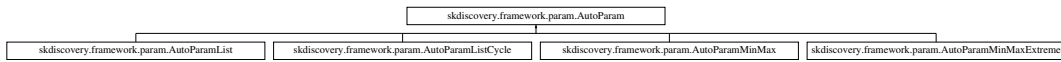
List of current parameters

The documentation for this class was generated from the following file:

- framework/[param.py](#)

## 6.7 skdiscovery.framework.param.AutoParam Class Reference

Inheritance diagram for skdiscovery.framework.param.AutoParam:



### Public Member Functions

- def `__init__` (self, `val_init`)
- def `perturb` (self)
- def `reset` (self)
- def `__str__` (self)
- def `__call__` (self)

#### 6.7.1 Detailed Description

Defines a tunable parameter class inherited by specific subclasses.

[AutoParam](#) class and subclass work on a single value. functions perturb value and reset to initial value

#### 6.7.2 Constructor & Destructor Documentation

##### 6.7.2.1 `__init__()`

```
def skdiscovery.framework.param.AutoParam.__init__ (
    self,
    val_init )
```

Initialize an [AutoParam](#) object.

##### Parameters

<code>val_init</code>	Value for parameter
-----------------------	---------------------

#### 6.7.3 Member Function Documentation

##### 6.7.3.1 `__call__()`

```
def skdiscovery.framework.param.AutoParam.__call__ (
    self )
```

Retrieves current value of the parameter.

**Returns**

Current value of the parameter

**6.7.3.2 \_\_str\_\_()**

```
def skdiscovery.framework.param.AutoParam.__str__ (
    self )
```

String representation of class.

**Returns**

String of current value

**6.7.3.3 perturb()**

```
def skdiscovery.framework.param.AutoParam.perturb (
    self )
```

Perturb paramter.

This class doesn't change the value.

**6.7.3.4 reset()**

```
def skdiscovery.framework.param.AutoParam.reset (
    self )
```

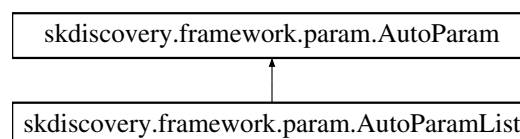
Reset value to initial value.

The documentation for this class was generated from the following file:

- [framework/param.py](#)

## 6.8 skdiscovery.framework.param.AutoParamList Class Reference

Inheritance diagram for skdiscovery.framework.param.AutoParamList:





## Public Member Functions

- def `__init__` (self, `val_init`, `val_list`)
- def `perturb` (self)
- def `reset` (self)
- def `__str__` (self)
- def `__call__` (self)

### 6.8.1 Detailed Description

a tunable parameter with a specified list of choices that perturb randomly selects from

### 6.8.2 Constructor & Destructor Documentation

#### 6.8.2.1 `__init__()`

```
def skdiscovery.framework.param.AutoParamList.__init__ (
    self,
    val_init,
    val_list )
```

Construct an [AutoParamList](#) object.

#### Parameters

<i>val_init</i>	initial value for the parameter
<i>val_list</i>	List of possible variants for the parameter

### 6.8.3 Member Function Documentation

#### 6.8.3.1 `__call__()`

```
def skdiscovery.framework.param.AutoParam.__call__ (
    self ) [inherited]
```

Retrieves current value of the parameter.

#### Returns

Current value of the parameter

### 6.8.3.2 `__str__()`

```
def skdiscovery.framework.param.AutoParam.__str__ (
    self ) [inherited]
```

String representation of class.

#### Returns

String of current value

### 6.8.3.3 `perturb()`

```
def skdiscovery.framework.param.AutoParamList.perturb (
    self )
```

Randomly select a value from `val_list`.

### 6.8.3.4 `reset()`

```
def skdiscovery.framework.param.AutoParamList.reset (
    self )
```

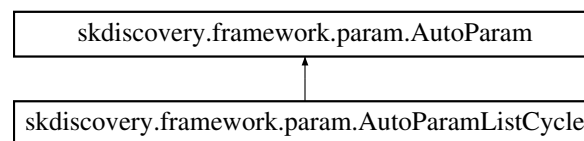
Reset the list to the default value.

The documentation for this class was generated from the following file:

- [framework/param.py](#)

## 6.9 `skdiscovery.framework.param.AutoParamListCycle` Class Reference

Inheritance diagram for `skdiscovery.framework.param.AutoParamListCycle`:



### Public Member Functions

- `def __init__ (self, val_list)`
- `def perturb (self)`
- `def reset (self)`
- `def __str__ (self)`
- `def __call__ (self)`

### 6.9.1 Detailed Description

Cycles through a list of paramters.

### 6.9.2 Constructor & Destructor Documentation

#### 6.9.2.1 \_\_init\_\_()

```
def skdiscovery.framework.param.AutoParamListCycle.__init__ (
    self,
    val_list )
```

Construct an [AutoParamListCycle](#).

##### Parameters

<i>val_list</i>	List of possible variants for the parameter
-----------------	---

### 6.9.3 Member Function Documentation

#### 6.9.3.1 \_\_call\_\_()

```
def skdiscovery.framework.param.AutoParam.__call__ (
    self ) [inherited]
```

Retrieves current value of the parameter.

##### Returns

Current value of the parameter

#### 6.9.3.2 \_\_str\_\_()

```
def skdiscovery.framework.param.AutoParam.__str__ (
    self ) [inherited]
```

String representation of class.

##### Returns

String of current value

### 6.9.3.3 perturb()

```
def skdiscovery.framework.param.AutoParamListCycle.perturb (
    self )
```

Select the next value from the list of parameters.

### 6.9.3.4 reset()

```
def skdiscovery.framework.param.AutoParamListCycle.reset (
    self )
```

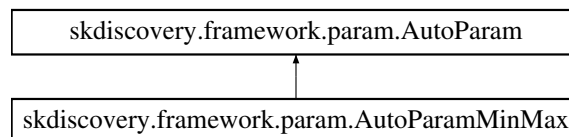
Reset the list to the default values.

The documentation for this class was generated from the following file:

- framework/[param.py](#)

## 6.10 skdiscovery.framework.param.AutoParamMinMax Class Reference

Inheritance diagram for skdiscovery.framework.param.AutoParamMinMax:



### Public Member Functions

- def `__init__` (self, [val\\_init](#), [val\\_min](#), [val\\_max](#))
- def [perturb](#) (self)
- def [reset](#) (self)
- def `__str__` (self)
- def `__call__` (self)

### 6.10.1 Detailed Description

a tunable parameter with min and max ranges, perturbs to a random value in range

### 6.10.2 Constructor & Destructor Documentation

#### 6.10.2.1 `__init__`()

```
def skdiscovery.framework.param.AutoParamMinMax.__init__ (
    self,
    val_init,
    val_min,
    val_max )
```

Construct [AutoParamMinMax](#) object.

**Parameters**

<i>val_init</i>	Initial value for parameter
<i>val_min</i>	Minimum value for parameter
<i>val_max</i>	Maximum value for parameter

**6.10.3 Member Function Documentation****6.10.3.1 \_\_call\_\_()**

```
def skdiscovery.framework.param.AutoParam.__call__ (
    self ) [inherited]
```

Retrieves current value of the parameter.

**Returns**

Current value of the parameter

**6.10.3.2 \_\_str\_\_()**

```
def skdiscovery.framework.param.AutoParam.__str__ (
    self ) [inherited]
```

String representation of class.

**Returns**

String of current value

**6.10.3.3 perturb()**

```
def skdiscovery.framework.param.AutoParamMinMax.perturb (
    self )
```

Peturb the paramter by choosing a random value between *val\_min* and *val\_max*.

**6.10.3.4 reset()**

```
def skdiscovery.framework.param.AutoParam.reset (
    self ) [inherited]
```

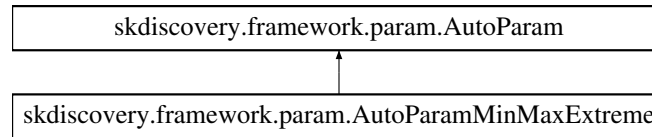
Reset value to initial value.

The documentation for this class was generated from the following file:

- framework/[param.py](#)

## 6.11 skdiscovery.framework.param.AutoParamMinMaxExtreme Class Reference

Inheritance diagram for skdiscovery.framework.param.AutoParamMinMaxExtreme:



### Public Member Functions

- def `__init__` (self, `val_init`, `val_min`, `val_max`, `val_nMax`)
- def `perturb` (self)
- def `reset` (self)
- def `__str__` (self)
- def `__call__` (self)

### Static Public Attributes

- int `n` = 1

#### 6.11.1 Detailed Description

a tunable parameter with min and max ranges, picks extreme value min or max every `nMax` call

#### 6.11.2 Constructor & Destructor Documentation

##### 6.11.2.1 `__init__`()

```

def skdiscovery.framework.param.AutoParamMinMaxExtreme.__init__ (
    self,
    val_init,
    val_min,
    val_max,
    val_nMax )
  
```

Construct an [AutoParamMinMaxExtreme](#).

#### Parameters

<code>val_init</code>	Initial value for parameter
<code>val_min</code>	Minimum value for parameter
<code>val_max</code>	Maximum value for parameter
<code>val_nMax</code>	Choose either the maximum or minimum after <code>val_nMax</code> peturbs

### 6.11.3 Member Function Documentation

#### 6.11.3.1 `__call__()`

```
def skdiscovery.framework.param.AutoParam.__call__ (
    self ) [inherited]
```

Retrieves current value of the parameter.

##### Returns

Current value of the parameter

#### 6.11.3.2 `__str__()`

```
def skdiscovery.framework.param.AutoParam.__str__ (
    self ) [inherited]
```

String representation of class.

##### Returns

String of current value

#### 6.11.3.3 `perturb()`

```
def skdiscovery.framework.param.AutoParamMinMaxExtreme.perturb (
    self )
```

After `val_nMax`, select the maximum or minimum value, otherwise randomly select a number between `val_min` and `val_max`.

#### 6.11.3.4 `reset()`

```
def skdiscovery.framework.param.AutoParam.reset (
    self ) [inherited]
```

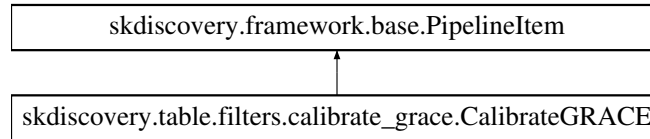
Reset value to initial value.

The documentation for this class was generated from the following file:

- framework/[param.py](#)

## 6.12 skdiscovery.table.filters.calibrate\_CalibrateGRACE Class Reference

Inheritance diagram for skdiscovery.table.filters.calibrate\_CalibrateGRACE:



### Public Member Functions

- `def __init__(self, str_description, ewd_column_name='EWD', round_dates=True)`
- `def process(self, obj_data)`
- `def perturbParams(self)`
- `def resetParams(self)`
- `def __str__(self)`
- `def getMetadata(self)`

### 6.12.1 Constructor & Destructor Documentation

#### 6.12.1.1 \_\_init\_\_()

```

def skdiscovery.table.filters.calibrate_CalibrateGRACE.__init__ (
    self,
    str_description,
    ewd_column_name = 'EWD',
    round_dates = True )
  
```

Initialize GRACE calibration filter.

#### Parameters

<i>str_description</i>	String describing filter
<i>ewd_column_name</i>	Name of new column for the calibrated GRACE data
<i>round_dates</i>	Option for rounding to dates to the nearest day

### 6.12.2 Member Function Documentation

#### 6.12.2.1 \_\_str\_\_()

```

def skdiscovery.framework.PipelineItem.__str__ (
    self ) [inherited]
  
```

String representation of object.



**Returns**

String listing all current parameters

**6.12.2.2 getMetadata()**

```
def skdiscovery.framework.PipelineItem.getMetadata (
    self ) [inherited]
```

Retrieve metadata about filter.

**Returns**

String containing the item description and current parameters for filter.

**6.12.2.3 perturbParams()**

```
def skdiscovery.framework.PipelineItem.perturbParams (
    self ) [inherited]
```

choose other random value for all parameters

**6.12.2.4 process()**

```
def skdiscovery.table.filters.calibrate_CalibrateGRACE.process (
    self,
    obj_data )
```

Calibrates GRACE, updating in place.

**Parameters**

<i>obj_data</i>	Table data wrapper
-----------------	--------------------

**6.12.2.5 resetParams()**

```
def skdiscovery.framework.PipelineItem.resetParams (
    self ) [inherited]
```

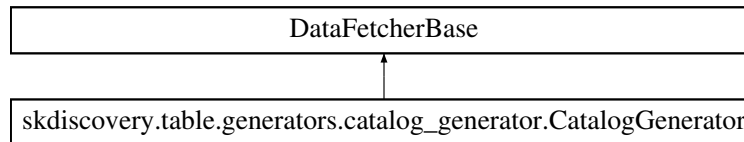
set all parameters to initial value

The documentation for this class was generated from the following file:

- [table/filters/calibrate\\_py](#)

## 6.13 skdiscovery.table.generators.catalog\_generator.CatalogGenerator Class Reference

Inheritance diagram for skdiscovery.table.generators.catalog\_generator.CatalogGenerator:



### Public Member Functions

- def `__init__` (self, ap\_paramList, ra1, dec1, ra2, dec2, background\_density, z)
- def `output` (self)
- def `nfw_cumulative` (self, R)
- def `inverse_nfw_cumulative` (self, p)

### 6.13.1 Detailed Description

Generates galaxy catalogs for use in DiscoveryPipeline.

### 6.13.2 Constructor & Destructor Documentation

#### 6.13.2.1 `__init__()`

```

def skdiscovery.table.generators.catalog_generator.CatalogGenerator.__init__ (
    self,
    ap_paramList,
    ra1,
    dec1,
    ra2,
    dec2,
    background_density,
    z )

```

#### Parameters

<i>ap_paramList</i> [seed]	Seed for random number generator
<i>ra1</i>	Left right ascension
<i>dec1</i>	Bottom declination
<i>ra2</i>	Right right ascension
<i>dec2</i>	Top declination
<i>background_density</i>	galaxy background density in galaxies/square degree
<i>z</i>	Redshift of galaxy cluster

### 6.13.3 Member Function Documentation

#### 6.13.3.1 inverse\_nfw\_cumulative()

```
def skdiscovery.table.generators.catalog_generator.CatalogGenerator.inverse_nfw_cumulative (
    self,
    p )
```

inverse of radial nfw cumulative distribution

##### Parameters

$p$	Probability
-----	-------------

##### Returns

float: Radius corresponding to probability p

#### 6.13.3.2 nfw\_cumulative()

```
def skdiscovery.table.generators.catalog_generator.CatalogGenerator.nfw_cumulative (
    self,
    R )
```

Cumulative radial NFW distribution.

##### Parameters

$R$	Radius
-----	--------

##### Returns

float: Probability of being within R

#### 6.13.3.3 output()

```
def skdiscovery.table.generators.catalog_generator.CatalogGenerator.output (
    self )
```

Generates galaxy catalog.

##### Returns

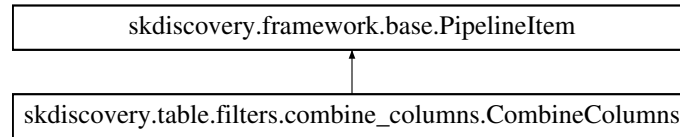
DataWrapper: Table data wrapper of galaxy catalog

The documentation for this class was generated from the following file:

- table/generators/[catalog\\_generator.py](#)

## 6.14 skdiscovery.table.filters.combine\_columns.CombineColumns Class Reference

Inheritance diagram for skdiscovery.table.filters.combine\_columns.CombineColumns:



### Public Member Functions

- def `__init__` (self, `str_description`, `column_1`, `column_2`, `new_column_name`)
- def `process` (self, `obj_data`)
- def `perturbParams` (self)
- def `resetParams` (self)
- def `__str__` (self)
- def `getMetadata` (self)

### 6.14.1 Constructor & Destructor Documentation

#### 6.14.1.1 `__init__()`

```
def skdiscovery.table.filters.combine_columns.CombineColumns.__init__ (
    self,
    str_description,
    column_1,
    column_2,
    new_column_name )
```

Initialize a `CombineColumns` object.

#### Parameters

<i>str_description</i>	String describing filter
<i>column_1</i>	Name of primary column
<i>column_2</i>	Name of secondary column to be used when data from the primary column is not available
<i>new_column_name</i>	Name of resulting column

### 6.14.2 Member Function Documentation

#### 6.14.2.1 `__str__()`

```
def skdiscovery.framework.PipelineItem.__str__ (
    self ) [inherited]
```

String representation of object.

#### Returns

String listing all current parameters

#### 6.14.2.2 getMetadata()

```
def skdiscovery.framework.PipelineItem.getMetadata (
    self ) [inherited]
```

Retrieve metadata about filter.

#### Returns

String containing the item description and current parameters for filter.

#### 6.14.2.3 perturbParams()

```
def skdiscovery.framework.PipelineItem.perturbParams (
    self ) [inherited]
```

choose other random value for all parameters

#### 6.14.2.4 process()

```
def skdiscovery.table.filters.combine_columns.CombineColumns.process (
    self,
    obj_data )
```

Apply combine column filter to data set, operating on the data\_obj.

#### Parameters

<i>obj_data</i>	Table data wrapper.
-----------------	---------------------

#### 6.14.2.5 resetParams()

```
def skdiscovery.framework.PipelineItem.resetParams (
    self ) [inherited]
```

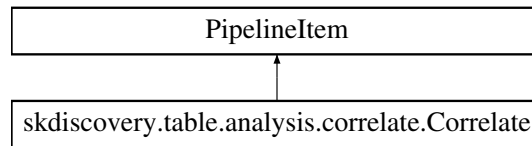
set all parameters to initial value

The documentation for this class was generated from the following file:

- [table/filters/combine\\_columns.py](#)

## 6.15 skdiscovery.table.analysis.Correlate Class Reference

Inheritance diagram for skdiscovery.table.analysis.Correlate:



### Public Member Functions

- def `__init__` (self, str\_description, [column\\_names](#)=None, [local\\_match](#)=False, correlation\_type='pearson')
- def [process](#) (self, obj\_data)

### 6.15.1 Detailed Description

Computes the correlation for table data and stores the result as a matrix.

### 6.15.2 Constructor & Destructor Documentation

#### 6.15.2.1 `__init__()`

```

def skdiscovery.table.analysis.Correlate.__init__ (
    self,
    str_description,
    column_names = None,
    local_match = False,
    correlation_type = 'pearson' )

```

Initialize [Correlate](#) analysis item for use on tables.

#### Parameters

<i>str_description</i>	String describing analysis item
<i>column_names</i>	List of column names to correlate
<i>local_match</i>	Only correlate data on the same frames
<i>correlation_type</i>	Type of correlation to be passed to pandas ('pearson', 'kendall', 'spearman')

### 6.15.3 Member Function Documentation

## 6.15.3.1 process()

```
def skdiscovery.table.analysis.Correlate.process (
    self,
    obj_data )
```

Computes the correlation between columns and stores the results in obj\_

## Parameters

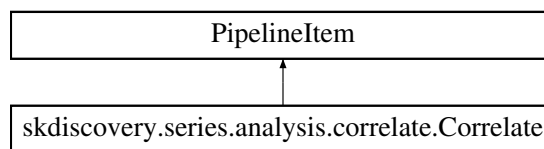
<i>obj_data</i>	Data wrapper
-----------------	--------------

The documentation for this class was generated from the following file:

- table/analysis/[correlate.py](#)

## 6.16 skdiscovery.series.analysis.Correlate Class Reference

Inheritance diagram for skdiscovery.series.analysis.Correlate:



## Public Member Functions

- def [\\_\\_init\\_\\_](#) (self, str\_description, [labels](#)=None, [column\\_names](#)=None)
- def [process](#) (self, obj\_data)

## 6.16.1 Detailed Description

Computes the correlation for series data.

Stores the result as a matrix

## 6.16.2 Constructor &amp; Destructor Documentation

## 6.16.2.1 \_\_init\_\_()

```
def skdiscovery.series.analysis.Correlate.__init__ (
    self,
    str_description,
    labels = None,
    column_names = None )
```

Initialize [Correlate](#) analysis item.

## Parameters

<i>str_description</i>	String describing analysis item
<i>labels</i>	List of labels used to select data
<i>column_names</i>	List of column names used to select data

### 6.16.3 Member Function Documentation

#### 6.16.3.1 process()

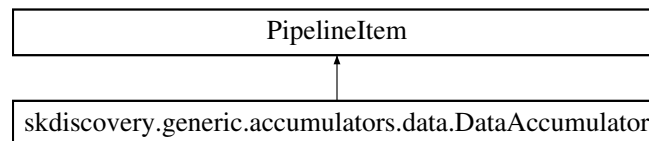
```
def skdiscovery.series.analysis.Correlate.process (
    self,
    obj_data )
```

The documentation for this class was generated from the following file:

- [series/analysis/correlate.py](#)

## 6.17 skdiscovery.generic.accumulators.DataAccumulator Class Reference

Inheritance diagram for skdiscovery.generic.accumulators.DataAccumulator:



### Public Member Functions

- [def process](#) (self, obj\_data)

#### 6.17.1 Detailed Description

Stores a copy of the data in its current state in the pipeline.

### 6.17.2 Member Function Documentation

#### 6.17.2.1 process()

```
def skdiscovery.generic.accumulators.DataAccumulator.process (
    self,
    obj_data )
```

Store a copy of the data in the object wrapper results.



## Parameters

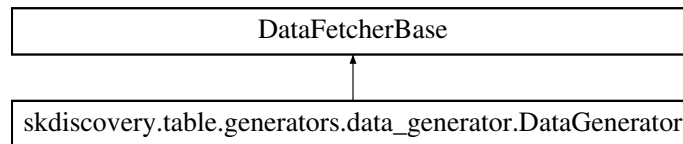
<i>obj_data</i>	Data Wrapper to be copied
-----------------	---------------------------

The documentation for this class was generated from the following file:

- [generic/accumulators/data.py](#)

## 6.18 skdiscovery.table.generators.data\_generator.DataGenerator Class Reference

Inheritance diagram for skdiscovery.table.generators.data\_generator.DataGenerator:



### Public Member Functions

- `def __init__(self, length, args, seed=None, final_function=None)`
- `def output(self)`

### 6.18.1 Detailed Description

Class for generating random data.

### 6.18.2 Constructor & Destructor Documentation

#### 6.18.2.1 \_\_init\_\_()

```

def skdiscovery.table.generators.data_generator.DataGenerator.__init__ (
    self,
    length,
    args,
    seed = None,
    final_function = None )

```

Initialize Random data generator.

## Parameters

<i>length</i>	Number of rows to generate
---------------	----------------------------

### 6.18.3 Member Function Documentation

#### 6.18.3.1 output()

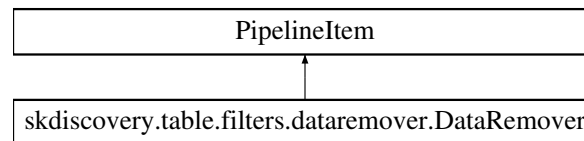
```
def skdiscovery.table.generators.data_generator.DataGenerator.output (
    self )
```

The documentation for this class was generated from the following file:

- [table/generators/data\\_generator.py](#)

## 6.19 skdiscovery.table.filters.DataRemover Class Reference

Inheritance diagram for skdiscovery.table.filters.DataRemover:



### Public Member Functions

- def `__init__` (self, str\_description, [column\\_names](#), start=None, end=None, [labels](#)=None)
- def [process](#) (self, obj\_data)

#### 6.19.1 Detailed Description

Sets specified table data to NaN.

### 6.19.2 Constructor & Destructor Documentation

#### 6.19.2.1 \_\_init\_\_()

```
def skdiscovery.table.filters.DataRemover.__init__ (
    self,
    str_description,
    column_names,
    start = None,
    end = None,
    labels = None )
```

Initialize [DataRemover](#).

## Parameters

<i>str_description</i>	String describing filter column_names: List of column names to select data to be removed (using None will apply to all columns)
<i>start</i>	Starting index value
<i>end</i>	Ending index value (inclusive)
<i>labels</i>	List of labels used to select data to be removed (using None will apply to all labels)

## 6.19.3 Member Function Documentation

## 6.19.3.1 process()

```
def skdiscovery.table.filters.DataRemover.process (
    self,
    obj_data )
```

NaN's data from DataWrapper.

## Parameters

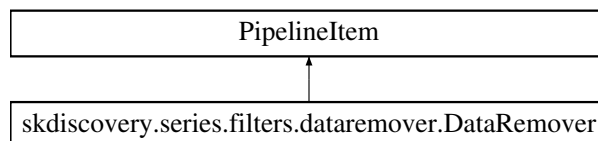
<i>obj_data</i>	Input DataWrapper, will be modified in place
-----------------	--

The documentation for this class was generated from the following file:

- table/filters/[dataremover.py](#)

## 6.20 skdiscovery.series.filters.DataRemover Class Reference

Inheritance diagram for skdiscovery.series.filters.DataRemover:



## Public Member Functions

- def [\\_\\_init\\_\\_](#) (self, str\_description, [start](#)=None, [end](#)=None, [labels](#)=None, [column\\_names](#)=None)
- def [process](#) (self, obj\_data)

### 6.20.1 Detailed Description

Sets specified series data to NaN.

### 6.20.2 Constructor & Destructor Documentation

#### 6.20.2.1 `__init__()`

```
def skdiscovery.series.filters.DataRemover.__init__ (
    self,
    str_description,
    start = None,
    end = None,
    labels = None,
    column_names = None )
```

Initialize [DataRemover](#).

#### Parameters

<i>str_description</i>	String describing filter
<i>start</i>	Starting index value
<i>end</i>	Ending index value (inclusive)
<i>labels</i>	List of labels used to select data to be removed (None will operate on all labels)
<i>column_names</i>	List of column names to select data to be removed (None will operate on all columns)

### 6.20.3 Member Function Documentation

#### 6.20.3.1 `process()`

```
def skdiscovery.series.filters.DataRemover.process (
    self,
    obj_data )
```

NaN's data from DataWrapper.

#### Parameters

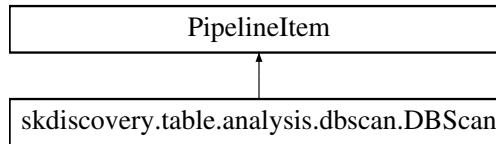
<i>obj_data</i>	Input DataWrapper, which will be modified in place
-----------------	--

The documentation for this class was generated from the following file:

- series/filters/[dataremoover.py](#)

## 6.21 skdiscovery.table.analysis.dbscan.DBScan Class Reference

Inheritance diagram for skdiscovery.table.analysis.dbscan.DBScan:



### Public Member Functions

- def `__init__` (self, str\_description, ap\_paramList, [column\\_names](#))
- def `process` (self, obj\_data)

#### 6.21.1 Detailed Description

Runs [DBScan](#) on table data.

Adds cluster information column to data

#### 6.21.2 Constructor & Destructor Documentation

##### 6.21.2.1 `__init__()`

```

def skdiscovery.table.analysis.dbscan.DBScan.__init__ (
    self,
    str_description,
    ap_paramList,
    column_names )
  
```

Initialize [DBScan](#) pipeline item.

##### Parameters

<i>str_description</i>	Description of item
<i>ap_paramList[epsilon]</i>	Distance between two nodes for them to be considered connected
<i>ap_paramList[min_points]</i>	Minimum number of points for a cluster
<i>column_names</i>	List of column names to use

#### 6.21.3 Member Function Documentation

### 6.21.3.1 process()

```
def skdiscovery.table.analysis.dbscan.DBScan.process (
    self,
    obj_data )
```

Run [DBScan](#) on data.

Stores result in data wrapper

```
@param obj_data: Data wrapper to be processed
```

The documentation for this class was generated from the following file:

- [table/analysis/dbscan.py](#)

## 6.22 skdiscovery.DiscoveryPipeline Class Reference

### Public Member Functions

- def [\\_\\_init\\_\\_](#) (self, [data\\_fetcher](#), list\_StageContainers)
- def [run](#) (self, num\_runs=1, perturb\_data=False, num\_cores=1, amazon=False, verbose=False)
- def [perturb](#) (self)
- def [reset](#) (self)
- def [getMetadata](#) (self)
- def [getMetadataHistory](#) (self)
- def [perturbData](#) (self)
- def [getResults](#) (self, index=None)
- def [resultIter](#) (self)
- def [plotPipelineInstance](#) (self)
- def [plotPipelineStructure](#) (self)
- def [getMetadataNestedTypes](#) (self)
- def [getMetadataNestedGraph](#) (self)
- def [\\_\\_del\\_\\_](#) (self)
- def [\\_\\_str\\_\\_](#) (self)

### 6.22.1 Detailed Description

Pipeline for running the analysis.

### 6.22.2 Constructor & Destructor Documentation

#### 6.22.2.1 \_\_init\_\_()

```
def skdiscovery.DiscoveryPipeline.__init__ (
    self,
    data_fetcher,
    list_StageContainers )
```

Initialize a new pipeline.

## Parameters

<i>data_fetcher</i>	Data fetcher to use as a data source (from skdaccess)
<i>list_StageContainers</i>	List of stage containers

6.22.2.2 `__del__()`

```
def skdiscovery.DiscoveryPipeline.__del__ (
    self )
```

Shutdown dispy cluster manager.

## 6.22.3 Member Function Documentation

6.22.3.1 `__str__()`

```
def skdiscovery.DiscoveryPipeline.__str__ (
    self )
```

String representation of the pipeline.

## Returns

String of current metadata of pipeline containers.

6.22.3.2 `getMetadata()`

```
def skdiscovery.DiscoveryPipeline.getMetadata (
    self )
```

Retrieve Metadata from stage containers.

## Returns

list of metadata for the current run

6.22.3.3 `getMetadataHistory()`

```
def skdiscovery.DiscoveryPipeline.getMetadataHistory (
    self )
```

Get the metadata for each run in the pipeline.

## Returns

list of metadata configurations for all runs

**6.22.3.4 getMetadataNestedGraph()**

```
def skdiscovery.DiscoveryPipeline.getMetadataNestedGraph (
    self )
```

Retrieve the metadata nested graph.

**Returns**

String: Metadata nested graph

**6.22.3.5 getMetadataNestedTypes()**

```
def skdiscovery.DiscoveryPipeline.getMetadataNestedTypes (
    self )
```

Get the Metadata Nested Types.

**Returns**

String: Metadata Nested types

**6.22.3.6 getResults()**

```
def skdiscovery.DiscoveryPipeline.getResults (
    self,
    index = None )
```

Return results from previous runs.

**Parameters**

<i>index</i>	Index of run. If None, return all previous results
--------------	--

**Returns**

results from a run at index. If index=None, returns list of all results

**6.22.3.7 perturb()**

```
def skdiscovery.DiscoveryPipeline.perturb (
    self )
```

Perturb the paramters in the stage containers.



#### 6.22.3.8 perturbData()

```
def skdiscovery.DiscoveryPipeline.perturbData (
    self )
```

Perturb the input data.

#### 6.22.3.9 plotPipelineInstance()

```
def skdiscovery.DiscoveryPipeline.plotPipelineInstance (
    self )
```

Plot current instance of pipeline stages with metadata.

##### Returns

iPython display object

#### 6.22.3.10 plotPipelineStructure()

```
def skdiscovery.DiscoveryPipeline.plotPipelineStructure (
    self )
```

Plot pipeline structure.

##### Returns

iPython display object

#### 6.22.3.11 reset()

```
def skdiscovery.DiscoveryPipeline.reset (
    self )
```

Reset the stage containers to their default values and clear previous runs.

#### 6.22.3.12 resultIter()

```
def skdiscovery.DiscoveryPipeline.resultIter (
    self )
```

Retrieves and iterator to the results and history of the pipeline.

##### Returns

A 2 component iterator to the results and history of previous runs

### 6.22.3.13 run()

```
def skdiscovery.DiscoveryPipeline.run (
    self,
    num_runs = 1,
    perturb_data = False,
    num_cores = 1,
    amazon = False,
    verbose = False )
```

Run the pipeline.

#### Parameters

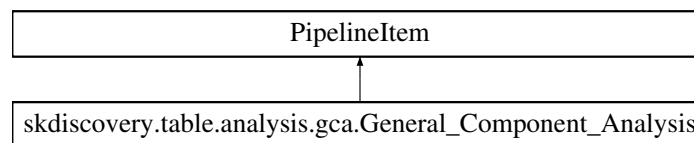
<i>num_runs</i>	Number of times to run the pipeline
<i>perturb_data</i>	Boolean flag. If running the pipeline multiple times then perturb the data instead of the pipeline
<i>num_cores</i>	Number of cores on the local machine to use. Defaults to 1 core. Use 0 to select the minimum between the number of runs and cpu cores.
<i>amazon</i>	Offload the pipeline on amazon
<i>verbose</i>	Display the pipeline for each run

The documentation for this class was generated from the following file:

- framework/[discoverypipeline.py](#)

## 6.23 skdiscovery.table.analysis.General\_Component\_Analysis Class Reference

Inheritance diagram for skdiscovery.table.analysis.General\_Component\_Analysis:



#### Public Member Functions

- def [\\_\\_init\\_\\_](#) (self, [str\\_description](#), [ap\\_paramList](#), [n\\_components](#), [column\\_names](#))
- def [process](#) (self, [obj\\_data](#))

## 6.23.1 Constructor & Destructor Documentation

### 6.23.1.1 `__init__()`

```
def skdiscovery.table.analysis.General_Component_Analysis.__init__ (
    self,
    str_description,
    ap_paramList,
    n_components,
    column_names )
```

Initialize Analysis object.

#### Parameters

<i>str_description</i>	String description of analysis
<i>ap_paramList[component_type]</i>	Type of CA; either PCA or ICA
<i>ap_paramList[start_time]</i>	Starting time for CA
<i>ap_paramList[end_time]</i>	ending time for CA
<i>n_components</i>	Number of components to compute
<i>column_names</i>	Columns names to use

## 6.23.2 Member Function Documentation

### 6.23.2.1 `process()`

```
def skdiscovery.table.analysis.General_Component_Analysis.process (
    self,
    obj_data )
```

Perform component analysis on data.

Results are added to the data wrapper as a dictionary with results['CA'] = Eigenvenctors results['Projection'] = Projection on to the eigenvectors

#### Parameters

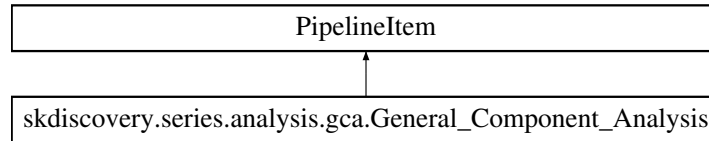
<i>obj_data</i>	Data wrapper
-----------------	--------------

The documentation for this class was generated from the following file:

- [table/analysis/gca.py](#)

## 6.24 skdiscovery.series.analysis.General\_Component\_Analysis Class Reference

Inheritance diagram for skdiscovery.series.analysis.General\_Component\_Analysis:



### Public Member Functions

- def `__init__` (self, [str\\_description](#), [ap\\_paramList](#))
- def [process](#) (self, obj\_data)

### 6.24.1 Detailed Description

Performs either ICA or PCA analysis on series data.

### 6.24.2 Constructor & Destructor Documentation

#### 6.24.2.1 `__init__()`

```
def skdiscovery.series.analysis.General_Component_Analysis.__init__ (
    self,
    str_description,
    ap_paramList )
```

Initialize Analysis object.

#### Parameters

<i>str_description</i>	String description of analysis
<i>ap_paramList[num_components]</i>	Number of components
<i>ap_paramList[component_type]</i>	Type of component analysis (CA); either PCA or ICA
<i>ap_paramList[start_time]</i>	Starting time for CA
<i>ap_paramList[end_time]</i>	ending time for CA
<i>ap_paramList[labels]</i>	Optional list of label names

### 6.24.3 Member Function Documentation

## 6.24.3.1 process()

```
def skdiscovery.series.analysis.General_Component_Analysis.process (
    self,
    obj_data )
```

Perform component analysis on data:

Results are added to the data wrapper as a dictionary with results['CA'] = Eigenvenctors results['Projection'] = Projection on to the eigenvectors

## Parameters

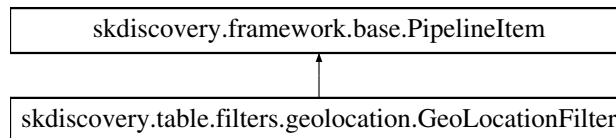
<i>obj_data</i>	Data wrapper containing the data
-----------------	----------------------------------

The documentation for this class was generated from the following file:

- [series/analysis/gca.py](#)

## 6.25 skdiscovery.table.filters.geolocation.GeoLocationFilter Class Reference

Inheritance diagram for skdiscovery.table.filters.geolocation.GeoLocationFilter:



## Public Member Functions

- `def __init__ (self, str\_description, ap\_paramList)`
- `def process (self, obj_data)`
- `def perturbParams (self)`
- `def resetParams (self)`
- `def __str__ (self)`
- `def getMetadata (self)`

## 6.25.1 Constructor &amp; Destructor Documentation

## 6.25.1.1 \_\_init\_\_()

```
def skdiscovery.table.filters.geolocation.GeoLocationFilter.__init__ (
    self,
    str_description,
    ap_paramList )
```

Initialize GeolocationFilter.

## Parameters

<i>str_description</i>	String describing filter
<i>ap_paramList[ap_lat]</i>	Latitude coordinate
<i>ap_paramList[ap_lon]</i>	Longitude coordinate
<i>ap_paramList[ap_radius]</i>	cut objects whose distance from lat/lon is greater than ap_radius

## 6.25.2 Member Function Documentation

6.25.2.1 `__str__()`

```
def skdiscovery.framework.PipelineItem.__str__ (
    self ) [inherited]
```

String representation of object.

## Returns

String listing all current parameters

6.25.2.2 `getMetadata()`

```
def skdiscovery.framework.PipelineItem.getMetadata (
    self ) [inherited]
```

Retrieve metadata about filter.

## Returns

String containing the item description and current parameters for filter.

6.25.2.3 `perturbParams()`

```
def skdiscovery.framework.PipelineItem.perturbParams (
    self ) [inherited]
```

choose other random value for all parameters

6.25.2.4 `process()`

```
def skdiscovery.table.filters.geolocation.GeoLocationFilter.process (
    self,
    obj_data )
```

Apply geolocation filter to data set.

## Parameters

<i>obj_data</i>	Table data wrapper
-----------------	--------------------

## 6.25.2.5 resetParams()

```
def skdiscovery.framework.PipelineItem.resetParams (
    self ) [inherited]
```

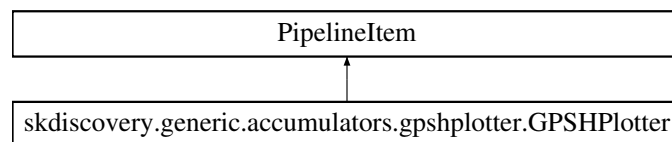
set all parameters to initial value

The documentation for this class was generated from the following file:

- [table/filters/geolocation.py](#)

## 6.26 skdiscovery.generic.accumulators.GPSHPlotter Class Reference

Inheritance diagram for skdiscovery.generic.accumulators.GPSHPlotter:



## Public Member Functions

- def `__init__` (self, str\_description, [comp\\_name](#), [mogi\\_name](#)=None, [pca\\_dir](#)='H', [pca\\_comp](#)=0, [scaleFactor](#)=2.5, [offset](#)=-.15, [KF\\_tau](#)=0, errorEllipses=False, map\_resolution='i')
- def [process](#) (self, obj\_data)

## 6.26.1 Detailed Description

Plots results from General\_Component\_Analysis, for the GPS horizontal or vertical components.

## 6.26.2 Constructor & Destructor Documentation

### 6.26.2.1 `__init__()`

```
def skdiscovery.generic.accumulators.GPSHPlotter.__init__ (
    self,
    str_description,
    comp_name,
    mogi_name = None,
    pca_dir = 'H',
    pca_comp = 0,
    scaleFactor = 2.5,
    offset = .15,
    KF_tau = 0,
    errorEllipses = False,
    map_resolution = 'i' )
```

Initialize GPSHPlotter.

#### Parameters

<i>str_description</i>	String describing accumulator
<i>comp_name</i>	Name of the GPCA results for accessing the GPCA output
<i>mogi_name</i>	Name of the Mogi results (optional)
<i>pca_dir</i>	PCA direction to plot, horizontal (H) or vertical (V)
<i>pca_comp</i>	The PCA component that will be plotted
<i>scaleFactor</i>	Scale factor for arrows
<i>offset</i>	Offset for plotting larger area on map
<i>KF_tau</i>	Tau used in kalman filter
<i>errorEllipses</i>	Boolean indicating whether or not to plot errorEllipses

## 6.26.3 Member Function Documentation

### 6.26.3.1 `process()`

```
def skdiscovery.generic.accumulators.GPSHPlotter.process (
    self,
    obj_data )
```

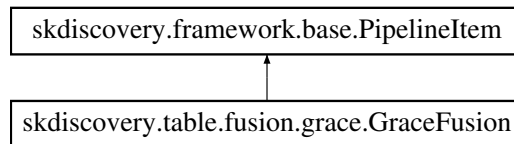
The documentation for this class was generated from the following file:

- [generic/accumulators/gpsplotter.py](#)



## 6.27 skdiscovery.table.fusion.GraceFusion Class Reference

Inheritance diagram for skdiscovery.table.fusion.GraceFusion:



### Public Member Functions

- def `__init__` (self, `str_description`, `metadata`, `column_data_name`='Grace', `column_error_name`='Grace\_Uncertainty', `gldas`="Off")
- def `process` (self, `obj_data`)
- def `perturbParams` (self)
- def `resetParams` (self)
- def `__str__` (self)
- def `getMetadata` (self)

### 6.27.1 Detailed Description

Fuses GRACE equivalent water depth time series.

Works on table data (original data from <http://grace.jpl.nasa.gov/data/get-data/monthly-mass-grids-land/>)

### 6.27.2 Constructor & Destructor Documentation

#### 6.27.2.1 `__init__()`

```

def skdiscovery.table.fusion.GraceFusion.__init__ (
    self,
    str_description,
    metadata,
    column_data_name = 'Grace',
    column_error_name = 'Grace_Uncertainty',
    gldas = "Off" )

```

Initialize Grace Fusion item.

#### Parameters

<i>str_description</i>	String describing item
<i>metadata</i>	Metadata that contains lat,lon coordinates based on data labels
<i>column_data_name</i>	Name of column for GRACE data
<i>column_error_name</i>	Grace Uncertainty column name
<i>gldas</i>	Indicating use of the global land data assimilation water model

### 6.27.3 Member Function Documentation

#### 6.27.3.1 `__str__()`

```
def skdiscovery.framework.PipelineItem.__str__ (
    self ) [inherited]
```

String representation of object.

##### Returns

String listing all current parameters

#### 6.27.3.2 `getMetadata()`

```
def skdiscovery.framework.PipelineItem.getMetadata (
    self ) [inherited]
```

Retrieve metadata about filter.

##### Returns

String containing the item description and current parameters for filter.

#### 6.27.3.3 `perturbParams()`

```
def skdiscovery.framework.PipelineItem.perturbParams (
    self ) [inherited]
```

choose other random value for all parameters

#### 6.27.3.4 `process()`

```
def skdiscovery.table.fusion.GraceFusion.process (
    self,
    obj_data )
```

Adds columns for GRACE data and uncertainties.

##### Parameters

<i>obj_data</i>	Input DataWrapper, will be modified in place
-----------------	--

## 6.27.3.5 resetParams()

```
def skdiscovery.framework.PipelineItem.resetParams (
    self ) [inherited]
```

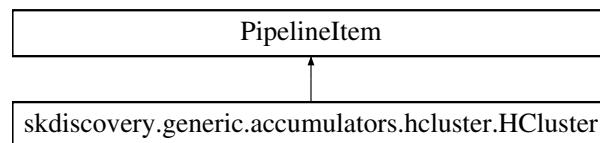
set all parameters to initial value

The documentation for this class was generated from the following file:

- [table/fusion/grace.py](#)

## 6.28 skdiscovery.generic.accumulators.HCluster Class Reference

Inheritance diagram for skdiscovery.generic.accumulators.HCluster:



## Public Member Functions

- def `__init__` (self, str\_description, [obj\\_name](#))
- def [process](#) (self, obj\_data)

## 6.28.1 Detailed Description

Hierarchical Clustering function that produces a cluster map of the distance matrix.

## 6.28.2 Constructor &amp; Destructor Documentation

6.28.2.1 `__init__`()

```
def skdiscovery.generic.accumulators.HCluster.__init__ (
    self,
    str_description,
    obj_name )
```

Initialize [HCluster](#).

## Parameters

<i>str_description</i>	String describing accumulator
<i>obj_name</i>	Name of distance matrix parameter in the <i>obj_data</i> results

### 6.28.3 Member Function Documentation

#### 6.28.3.1 process()

```
def skdiscovery.generic.accumulators.HCluster.process (
    self,
    obj_data )
```

Produces a cluster map and stores the linkage results.

## Parameters

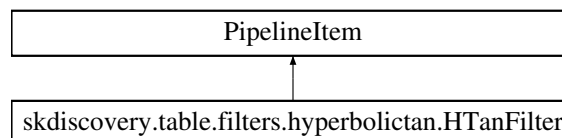
<i>obj_data</i>	Data wrapper
-----------------	--------------

The documentation for this class was generated from the following file:

- generic/accumulators/[hcluster.py](#)

## 6.29 skdiscovery.table.filters.HTanFilter Class Reference

Inheritance diagram for `skdiscovery.table.filters.HTanFilter`:



### Public Member Functions

- def `__init__` (self, str\_description, [t0](#), amplitude=5, timescale=1., [offset](#)=0, [slope](#)=0, [labels](#)=None, [column\\_names](#)=None, [start\\_time\\_limit](#)=None, [end\\_time\\_limit](#)=None, [start](#)=None, [end](#)=None)
- def [process](#) (self, *obj\_data*)

#### 6.29.1 Detailed Description

Filter to subtract an arctan fit from data.

## 6.29.2 Constructor & Destructor Documentation

### 6.29.2.1 \_\_init\_\_()

```
def skdiscovery.table.filters.HTanFilter.__init__ (
    self,
    str_description,
    t0,
    amplitude = 5,
    timescale = 1.,
    offset = 0,
    slope = 0,
    labels = None,
    column_names = None,
    start_time_limit = None,
    end_time_limit = None,
    start = None,
    end = None )
```

Fit and remove hyperbolic tangent function from data.

#### Parameters

<i>str_description</i>	String description of data
<i>t0</i>	Initial time offset of arctangent
<i>amplitude</i>	initial amplitude of arctangent
<i>timescale</i>	Timescale of fit
<i>offset</i>	Initial Y offset of arctangent
<i>slope</i>	Slope of the data
<i>labels</i>	Labels to apply arctangent function to
<i>column_names</i>	Column names to apply arctanget function to
<i>start_time_limit</i>	Starting time bound for fit to arctan (default: no bound)
<i>end_time_limit</i>	Ending time bound for fit to arctan (default: no bound)
<i>start</i>	Index of the first data point to fit (default: index of first data point)
<i>end</i>	Index of the last data point to fit (default: index of last data point)

## 6.29.3 Member Function Documentation

### 6.29.3.1 process()

```
def skdiscovery.table.filters.HTanFilter.process (
    self,
    obj_data )
```

Apply Arctangent filter to data param.

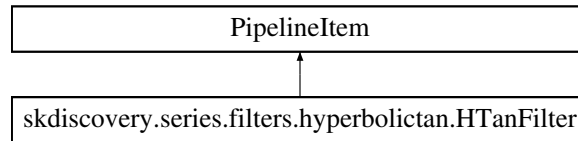
obj\_data: Input data. Changes are made in place.

The documentation for this class was generated from the following file:

- [table/filters/hyperbolictan.py](#)

## 6.30 skdiscovery.series.filters.HTanFilter Class Reference

Inheritance diagram for skdiscovery.series.filters.HTanFilter:



### Public Member Functions

- def `__init__` (self, str\_description, t0, amplitude=5, timescale=1., offset=0, slope=0, labels=None, column\_names=None, start\_time\_limit=None, end\_time\_limit=None, start=None, end=None)
- def `process` (self, obj\_data)

### 6.30.1 Constructor & Destructor Documentation

#### 6.30.1.1 `__init__()`

```

def skdiscovery.series.filters.HTanFilter.__init__ (
    self,
    str_description,
    t0,
    amplitude = 5,
    timescale = 1.,
    offset = 0,
    slope = 0,
    labels = None,
    column_names = None,
    start_time_limit = None,
    end_time_limit = None,
    start = None,
    end = None )

```

Fit and remove hyperbolic tangent function from data.

#### Parameters

<i>str_description</i>	String description of data
<i>t0</i>	Initial time offset of arctangent
<i>amplitude</i>	Initial amplitude of arctangent
<i>timescale</i>	Timescale of fit
<i>offset</i>	Initial Y offset of arctangent
<i>slope</i>	Slope of the data
<i>labels</i>	Labels to apply arctangent function to
<i>column_names</i>	Column names to apply arctanget function to
<i>start_time_limit</i>	Starting time bound for fit to arctan (default: no bound)
<i>end_time_limit</i>	Ending time bound for fit to arctan (default: no bound)
<i>start</i>	Index of the first data point to fit (default: index of first data point)
<i>end</i>	Index of the last data point to fit (default: index of last data point)

## 6.30.2 Member Function Documentation

### 6.30.2.1 process()

```
def skdiscovery.series.filters.HTanFilter.process (
    self,
    obj_data )
```

Apply Arctangent filter to data param.

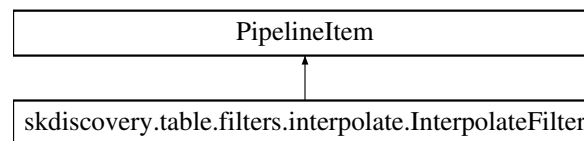
obj\_data: Input data. Changes are made in place.

The documentation for this class was generated from the following file:

- [series/filters/hyperbolicatan.py](#)

## 6.31 skdiscovery.table.filters.InterpolateFilter Class Reference

Inheritance diagram for skdiscovery.table.filters.InterpolateFilter:



### Public Member Functions

- def [process](#) (self, obj\_data)

### 6.31.1 Detailed Description

Interpolate missing values on table data.

## 6.31.2 Member Function Documentation

### 6.31.2.1 process()

```
def skdiscovery.table.filters.InterpolateFilter.process (
    self,
    obj_data )
```

Interpolate missing data in obj\_data DataWrapper.

**Parameters**

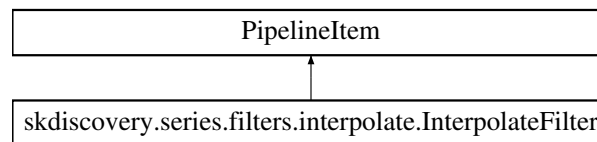
<i>obj_data</i>	Input DataWrapper, will be modified in place
-----------------	--

The documentation for this class was generated from the following file:

- [table/filters/interpolate.py](#)

## 6.32 skdiscovery.series.filters.InterpolateFilter Class Reference

Inheritance diagram for skdiscovery.series.filters.InterpolateFilter:

**Public Member Functions**

- def [process](#) (self, *obj\_data*)

### 6.32.1 Detailed Description

Interpolate missing values on series data.

### 6.32.2 Member Function Documentation

#### 6.32.2.1 process()

```
def skdiscovery.series.filters.InterpolateFilter.process (
    self,
    obj_data )
```

Interpolate missing data in *obj\_data* DataWrapper.

**Parameters**

<i>obj_data</i>	Input DataWrapper, will be modified in place
-----------------	--

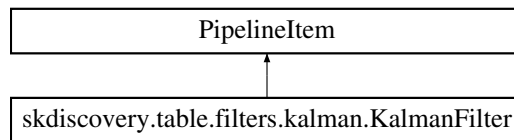
The documentation for this class was generated from the following file:



- [series/filters/interpolate.py](#)

## 6.33 skdiscovery.table.filters.KalmanFilter Class Reference

Inheritance diagram for skdiscovery.table.filters.KalmanFilter:



### Public Member Functions

- `def __init__ (self, str_description, ap_paramList, uncertainty\_clip=5, column\_names=None, error\_column\_names=None, pool_num=0, fillna=True)`
- `def process (self, obj_data)`

### 6.33.1 Detailed Description

Runs a Kalman Smoother on table data.

For more information see: Ji, K. H. 2011, PhD thesis, MIT.

### 6.33.2 Constructor & Destructor Documentation

#### 6.33.2.1 \_\_init\_\_()

```

def skdiscovery.table.filters.KalmanFilter.__init__ (
    self,
    str_description,
    ap_paramList,
    uncertainty_clip = 5,
    column_names = None,
    error_column_names = None,
    pool_num = 0,
    fillna = True )
  
```

Initialize [KalmanFilter](#).

#### Parameters

<i>str_description</i>	String describing filter
<i>ap_paramList[ap_tau]</i>	the correlation time
<i>ap_paramList[ap_sigmaSq]</i>	the data noise
<i>ap_paramList[ap_R]</i>	the process noise
<i>uncertainty_clip</i>	Clip data with uncertainties greater than <code>uncertainty_clip * median uncertainty</code>
<i>column_names</i>	List of column names to smooth (using None will apply to all columns)
<i>error_column_names</i>	List of error column names to smooth (using None will use default error columns)

### 6.33.3 Member Function Documentation

#### 6.33.3.1 process()

```
def skdiscovery.table.filters.KalmanFilter.process (
    self,
    obj_data )
```

Apply kalman smoother to data set.

#### Parameters

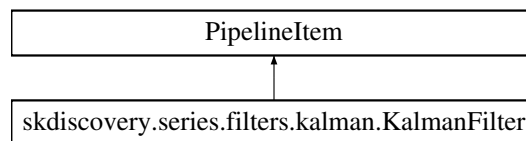
<i>obj_data</i>	Input data. Changes are made in place.
-----------------	--

The documentation for this class was generated from the following file:

- [table/filters/kalman.py](#)

## 6.34 skdiscovery.series.filters.KalmanFilter Class Reference

Inheritance diagram for skdiscovery.series.filters.KalmanFilter:



### Public Member Functions

- def [\\_\\_init\\_\\_](#) (self, str\_description, ap\_paramList, [uncertainty\\_clip](#)=5)
- def [process](#) (self, obj\_data)

#### 6.34.1 Detailed Description

Runs a Kalman Smoother on series data.

For more information see: Ji, K. H. 2011, PhD thesis, MIT.

#### 6.34.2 Constructor & Destructor Documentation

##### 6.34.2.1 \_\_init\_\_()

```
def skdiscovery.series.filters.KalmanFilter.__init__ (
    self,
    str_description,
    ap_paramList,
    uncertainty_clip = 5 )
```

Initialize [KalmanFilter](#).

## Parameters

<i>str_description</i>	String describing filter
<i>ap_paramList[ap_tau]</i>	the correlation time
<i>ap_paramList[ap_sigmaSq]</i>	the data noise
<i>ap_paramList[ap_R]</i>	the process noise
<i>uncertainty_clip</i>	Clip data with uncertainties greater than uncertainty_clip * median uncertainty

## 6.34.3 Member Function Documentation

## 6.34.3.1 process()

```
def skdiscovery.series.filters.KalmanFilter.process (
    self,
    obj_data )
```

Apply kalman smoother to data set.

## Parameters

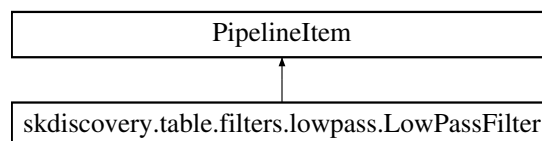
<i>obj_data</i>	Input DataWrapper. Changes are made in place.
-----------------	---

The documentation for this class was generated from the following file:

- series/filters/[kalman.py](#)

## 6.35 skdiscovery.table.filters.LowPassFilter Class Reference

Inheritance diagram for skdiscovery.table.filters.LowPassFilter:



## Public Member Functions

- def [\\_\\_init\\_\\_](#) (self, str\_description, ap\_paramList)
- def [process](#) (self, obj\_data)

### 6.35.1 Detailed Description

A remez low pass filter for table data.

### 6.35.2 Constructor & Destructor Documentation

#### 6.35.2.1 `__init__()`

```
def skdiscovery.table.filters.LowPassFilter.__init__ (
    self,
    str_description,
    ap_paramList )
```

Initialize [LowPassFilter](#).

#### Parameters

<i>str_description</i>	String describing filter
<i>ap_paramList[ntaps]</i>	number of filter taps
<i>ap_paramList[fpassf_per]</i>	frequency passband ratio/percentage
<i>ap_paramList[fstopf_per]</i>	frequency stopband ratio/percentage
<i>ap_paramList[wghts]</i>	band importance weights
<i>ap_paramList[miter]</i>	maximum number of iterations for generating the filter

### 6.35.3 Member Function Documentation

#### 6.35.3.1 `process()`

```
def skdiscovery.table.filters.LowPassFilter.process (
    self,
    obj_data )
```

Apply lowpass filter to data set.

#### Parameters

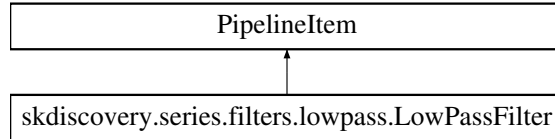
<i>obj_data</i>	Input data. Changes are made in place.
-----------------	--

The documentation for this class was generated from the following file:

- [table/filters/lowpass.py](#)

## 6.36 skdiscovery.series.filters.LowPassFilter Class Reference

Inheritance diagram for skdiscovery.series.filters.LowPassFilter:



### Public Member Functions

- def `__init__` (self, str\_description, ap\_paramList)
- def `process` (self, obj\_data)

#### 6.36.1 Detailed Description

A FIR Remez (Parks-McLellan) designed low pass filter for series data.

#### 6.36.2 Constructor & Destructor Documentation

##### 6.36.2.1 `__init__()`

```
def skdiscovery.series.filters.LowPassFilter.__init__ (
    self,
    str_description,
    ap_paramList )
```

Initialize [LowPassFilter](#).

##### Parameters

<i>str_description</i>	String describing filter
<i>ap_paramList[ntaps]</i>	Number of filter taps
<i>ap_paramList[fpassf_per]</i>	Frequency passband ratio/percentage
<i>ap_paramList[fstopf_per]</i>	Frequency stopband ratio/percentage
<i>ap_paramList[wgghts]</i>	Band importance weights
<i>ap_paramList[miter]</i>	Maximum number of iterations for generating the filter

#### 6.36.3 Member Function Documentation

### 6.36.3.1 process()

```
def skdiscovery.series.filters.LowPassFilter.process (
    self,
    obj_data )
```

Apply lowpass filter to data set, with changes applied in place.

#### Parameters

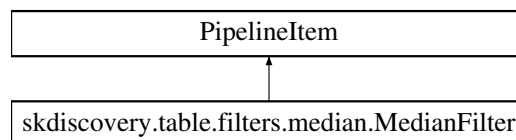
<i>obj_data</i>	Input data with data
-----------------	----------------------

The documentation for this class was generated from the following file:

- [series/filters/lowpass.py](#)

## 6.37 skdiscovery.table.filters.MedianFilter Class Reference

Inheritance diagram for `skdiscovery.table.filters.MedianFilter`:



### Public Member Functions

- `def __init__` (self, str\_description, ap\_paramList, [interpolate](#)=True, [subtract](#)=False, [regular\\_period](#)=True, [min\\_periods](#)=1)
- `def process` (self, obj\_data)

### 6.37.1 Detailed Description

A Median filter for table data.

### 6.37.2 Constructor & Destructor Documentation

#### 6.37.2.1 \_\_init\_\_()

```
def skdiscovery.table.filters.MedianFilter.__init__ (
    self,
    str_description,
    ap_paramList,
    interpolate = True,
    subtract = False,
    regular_period = True,
    min_periods = 1 )
```

Initialize [MedianFilter](#).

## Parameters

<i>str_description</i>	String describing filter
<i>ap_paramList[ap_window]</i>	median filter window width
<i>interpolate</i>	Interpolate data points before filtering
<i>subtract</i>	Subtract filtered result from original

## 6.37.3 Member Function Documentation

## 6.37.3.1 process()

```
def skdiscovery.table.filters.MedianFilter.process (
    self,
    obj_data )
```

Apply median filter to data set.

## Parameters

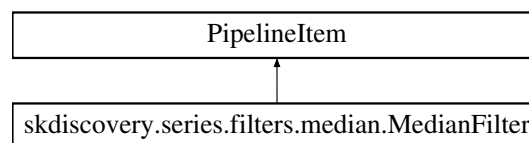
<i>obj_data</i>	Input panda's data series. Changes are made in place.
-----------------	---

The documentation for this class was generated from the following file:

- [table/filters/median.py](#)

## 6.38 skdiscovery.series.filters.MedianFilter Class Reference

Inheritance diagram for skdiscovery.series.filters.MedianFilter:



## Public Member Functions

- def `__init__` (self, str\_description, ap\_paramList, [interpolate](#)=True, [subtract](#)=False)
- def [process](#) (self, obj\_data)

## 6.38.1 Detailed Description

A Median filter for series data.

## 6.38.2 Constructor & Destructor Documentation

### 6.38.2.1 `__init__()`

```
def skdiscovery.series.filters.MedianFilter.__init__ (
    self,
    str_description,
    ap_paramList,
    interpolate = True,
    subtract = False )
```

Initialize [MedianFilter](#).

#### Parameters

<i>str_description</i>	String describing filter
<i>ap_paramList</i> [ <i>ap_window</i> ]	median filter window width
<i>interpolate</i>	Flag to interpolate data points before filtering
<i>subtract</i>	Flag to subtract filtered result from original

## 6.38.3 Member Function Documentation

### 6.38.3.1 `process()`

```
def skdiscovery.series.filters.MedianFilter.process (
    self,
    obj_data )
```

Apply median filter to data set.

#### Parameters

<i>obj_data</i>	Input DataWrapper. Changes are made in place.
-----------------	---

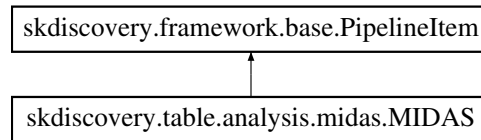
The documentation for this class was generated from the following file:

- series/filters/[median.py](#)

## 6.39 skdiscovery.table.analysis.midas.MIDAS Class Reference

Inheritance diagram for skdiscovery.table.analysis.midas.MIDAS:





## Public Member Functions

- def `__init__` (self, `str_description`, `column_names`=None)
- def `process` (self, `obj_data`)
- def `perturbParams` (self)
- def `resetParams` (self)
- def `__str__` (self)
- def `getMetadata` (self)

## 6.39.1 Constructor & Destructor Documentation

### 6.39.1.1 `__init__()`

```
def skdiscovery.table.analysis.midas.MIDAS.__init__ (
    self,
    str_description,
    column_names = None )
```

Initiatlize the `MIDAS` filtering item.

#### Parameters

<code>obj_data</code>	Data wrapper
-----------------------	--------------

## 6.39.2 Member Function Documentation

### 6.39.2.1 `__str__()`

```
def skdiscovery.framework.PipelineItem.__str__ (
    self ) [inherited]
```

String represntation of object.

#### Returns

String listing all currenter parameters

**6.39.2.2 getMetadata()**

```
def skdiscovery.framework.PipelineItem.getMetadata (
    self ) [inherited]
```

Retrieve metadata about filter.

**Returns**

String containing the item description and current parameters for filter.

**6.39.2.3 perturbParams()**

```
def skdiscovery.framework.PipelineItem.perturbParams (
    self ) [inherited]
```

choose other random value for all parameters

**6.39.2.4 process()**

```
def skdiscovery.table.analysis.midas.MIDAS.process (
    self,
    obj_data )
```

**6.39.2.5 resetParams()**

```
def skdiscovery.framework.PipelineItem.resetParams (
    self ) [inherited]
```

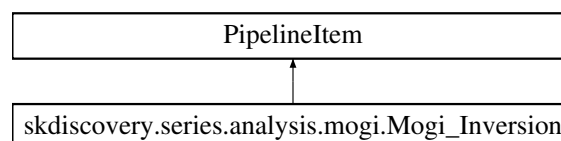
set all parameters to initial value

The documentation for this class was generated from the following file:

- [table/analysis/midas.py](#)

**6.40 skdiscovery.series.analysis.Mogi\_Inversion Class Reference**

Inheritance diagram for skdiscovery.series.analysis.Mogi\_Inversion:



## Public Member Functions

- def `__init__` (self, str\_description, ap\_paramList)
- def `FitPCA` (self, hPCA\_Proj)
- def `FitTimeSeries` (self, pd\_series, ct)
- def `process` (self, obj\_data)

### 6.40.1 Detailed Description

Perform a Mogi source inversion on a set of gps series data.

The source is assumed to be a Mogi source (point source), but other source models can be selected. Assumes directions are named ('dN', 'dE', 'dU').

### 6.40.2 Constructor & Destructor Documentation

#### 6.40.2.1 `__init__()`

```
def skdiscovery.series.analysis.Mogi_Inversion.__init__ (
    self,
    str_description,
    ap_paramList )
```

Initialize Mogi analysis item.

#### Parameters

<i>str_description</i>	Description of the item
<i>ap_paramList[h_pca_name]</i>	Name of the pca computed by General_Component_Analysis. Gets start and end date from the PCA fit.
<i>ap_paramList[source_type]</i>	Type of magma chamber source model to use (mogi [default],finite_sphere,closed_pipe,constant_open_pipe,rising_open_pipe,sill)

### 6.40.3 Member Function Documentation

#### 6.40.3.1 `FitPCA()`

```
def skdiscovery.series.analysis.Mogi_Inversion.FitPCA (
    self,
    hPCA_Proj )
```

#### 6.40.3.2 `FitTimeSeries()`

```
def skdiscovery.series.analysis.Mogi_Inversion.FitTimeSeries (
    self,
```

```
pd_series,
ct )
```

### 6.40.3.3 process()

```
def skdiscovery.series.analysis.Mogi_Inversion.process (
    self,
    obj_data )
```

Finds the magma source (default-mogi) from PBO GPS data.

Assumes time series columns are named ('dN', 'dE', 'dU'). Predictes location of the magma source using scipy.optimize.curve\_fit

The location of the magma source is stored in the data wrapper as a list res[0] = latitude res[1] = longitude res[2] = source depth (km) res[3] = volume change (meters<sup>3</sup>) res[4] = extra parameters (depends on mogi fit type)

#### Parameters

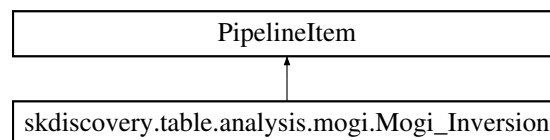
<i>obj_data</i>	Data object containing the results from the PCA stage
-----------------	---

The documentation for this class was generated from the following file:

- series/analysis/[mogi.py](#)

## 6.41 skdiscovery.table.analysis.Mogi\_Inversion Class Reference

Inheritance diagram for skdiscovery.table.analysis.Mogi\_Inversion:



### Public Member Functions

- def `__init__` (self, str\_description, ap\_paramList, [pca\\_name](#), [column\\_names](#)=['dN', dE, dU])
- def [FitPCA](#) (self, hPCA\_Proj)
- def [FitTimeSeries](#) (self, pd\_series, ct)
- def [process](#) (self, obj\_data)

### 6.41.1 Detailed Description

Perform a mogi source inversion on a set of gps table data.

The source is assumed to be a mogi source (point source), but other source models can be selected. Assumes directions are named ('dN', 'dE', 'dU').

### 6.41.2 Constructor & Destructor Documentation

#### 6.41.2.1 \_\_init\_\_()

```
def skdiscovery.table.analysis.Mogi_Inversion.__init__ (
    self,
    str_description,
    ap_paramList,
    pca_name,
    column_names = ['dN',
                    dE,
                    dU ]
)
```

Initialize Mogi analysis item.

#### Parameters

<i>str_description</i>	Description of item
<i>ap_paramList[source_type]</i>	Type of magma chamber source model to use (default-mogi,finite_sphere,closed_pipe,constant_open_pipe,rising_open_pipe,sill)
<i>pca_name</i>	Name of pca result
<i>column_names</i>	The data direction column names

### 6.41.3 Member Function Documentation

#### 6.41.3.1 FitPCA()

```
def skdiscovery.table.analysis.Mogi_Inversion.FitPCA (
    self,
    hPCA_Proj )
```

Determine the timing of the inflation event from the first component of the pca projection.

fits  $A * \arctan((t - t_0) / c) + B$  to the first pca projection, in order to estimate source amplitude parameters

#### Parameters

<i>hPCA_Proj</i>	The sklearn PCA
------------------	-----------------

**Returns**

ct: the t0, c, and B parameters from the fit  
 pA[0]: the fitted amplitude parameter

**6.41.3.2 FitTimeSeries()**

```
def skdiscovery.table.analysis.Mogi_Inversion.FitTimeSeries (
    self,
    pd_series,
    ct )
```

**6.41.3.3 process()**

```
def skdiscovery.table.analysis.Mogi_Inversion.process (
    self,
    obj_data )
```

Finds the magma source (default-mogi) from PBO GPS data.

Assumes time series columns are named ('dN', 'dE', 'dU'). Predicts the location of the magma source using `scipy.optimize.curve_fit`

The result is added to the data wrapper as a list, with the four elements describing the location of the magma source:  
 res[0] = latitude res[1] = longitude res[2] = source depth (km) res[3] = volume change (meters<sup>3</sup>)

**Parameters**

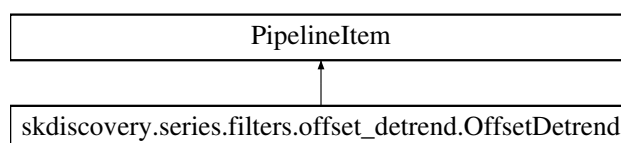
<i>obj_data</i>	
-----------------	--

The documentation for this class was generated from the following file:

- [table/analysis/mogi.py](#)

**6.42 skdiscovery.series.filters.OffsetDetrend Class Reference**

Inheritance diagram for `skdiscovery.series.filters.OffsetDetrend`:



## Public Member Functions

- def `__init__` (self, str\_description, ap\_paramList=[], labels=None, column\_names=None, time\_point=None, time\_interval=None)
- def `process` (self, obj\_data)

### 6.42.1 Detailed Description

Trend filter that fits a stepwise function to linearly detrended series data.

On detrended data this filter fits a stepwise function (number of steps provided by the user) to correct the linear fit by accounting for discontinuous offsets, such as due to a change in the antenna or from an earthquake. The final linear fit handles each portion of the offset independently. If the number of discontinuities is not provided as an autoparam, the filter assumes a single discontinuity.

### 6.42.2 Constructor & Destructor Documentation

#### 6.42.2.1 `__init__`()

```
def skdiscovery.series.filters.OffsetDetrend.__init__ (
    self,
    str_description,
    ap_paramList = [],
    labels = None,
    column_names = None,
    time_point = None,
    time_interval = None )
```

Initialize `OffsetDetrend` filter.

#### Parameters

<i>str_description</i>	String describing filter
<i>ap_paramList[step_count]</i>	Number of steps to remove from data (Default: 1)
<i>labels</i>	List of labels used to select data to be removed (using None will apply to all labels)
<i>column_names</i>	List of column names to select data to be removed (using None will apply to all columns)
<i>time_point</i>	Time of offset
<i>time_interval</i>	Interval within which the offset occurs

### 6.42.3 Member Function Documentation

#### 6.42.3.1 `process`()

```
def skdiscovery.series.filters.OffsetDetrend.process (
    self,
    obj_data )
```

Apply offset estimation and detrending filter to data set.

#### Parameters

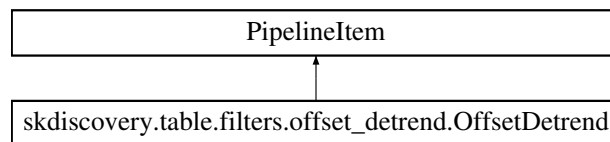
<i>obj_data</i>	Input data. Changes are made in place.
-----------------	--

The documentation for this class was generated from the following file:

- [series/filters/offset\\_detrend.py](#)

## 6.43 skdiscovery.table.filters.OffsetDetrend Class Reference

Inheritance diagram for `skdiscovery.table.filters.OffsetDetrend`:



### Public Member Functions

- `def __init__ (self, str_description, column\_names, ap_paramList=[], labels=None, time\_point=None, time\_interval=None)`
- `def process (self, obj_data)`

### 6.43.1 Detailed Description

Trend filter that fits a stepwise function to linearly detrended table data.

On detrended data this filter fits a stepwise function (number of steps provided by the user) to correct the linear fit by accounting for discontinuous offsets, such as due to a change in the antenna or from an earthquake. The final linear fit handles each portion of the offset independently. If the number of discontinuities is not provided as an autoparam, the filter assumes a single discontinuity.

### 6.43.2 Constructor & Destructor Documentation

#### 6.43.2.1 \_\_init\_\_()

```

def skdiscovery.table.filters.OffsetDetrend.__init__ (
    self,
    str_description,
    column_names,
    ap_paramList = [],
    labels = None,
    time_point = None,
    time_interval = None )
  
```

Initialize [OffsetDetrend](#) filter for use on table data.



## Parameters

<i>str_description</i>	String describing filter
<i>column_names</i>	List of column names to select data to be removed (using None will apply to all columns)
<i>ap_paramList[step_count]</i>	Number of steps to remove from data (Default: 1)
<i>labels</i>	List of labels used to select data to be removed (using None will apply to all labels)
<i>time_point</i>	Time of offset
<i>time_interval</i>	Interval within which the offset occurs

## 6.43.3 Member Function Documentation

## 6.43.3.1 process()

```
def skdiscovery.table.filters.OffsetDetrend.process (
    self,
    obj_data )
```

Apply offset estimation and detrending filter to data set.

## Parameters

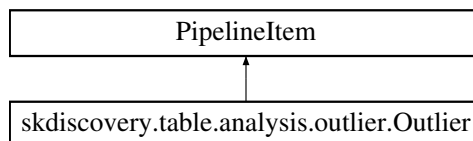
<i>obj_data</i>	Input data. Changes are made in place.
-----------------	--

The documentation for this class was generated from the following file:

- [table/filters/offset\\_detrend.py](#)

## 6.44 skdiscovery.table.analysis.outlier.Outlier Class Reference

Inheritance diagram for skdiscovery.table.analysis.outlier.Outlier:



## Public Member Functions

- def `__init__` (self, str\_description, [columns](#)=None, [name\\_prefix](#)='MAD\_Scale\_')
- def [process](#) (self, obj\_data)

### 6.44.1 Constructor & Destructor Documentation

#### 6.44.1.1 `__init__()`

```
def skdiscovery.table.analysis.outlier.Outlier.__init__ (
    self,
    str_description,
    columns = None,
    name_prefix = 'MAD_Scale_' )
```

Initialize [Outlier](#) Item.

##### Parameters

<i>str_description</i>	Name of Item
<i>columns</i>	List of of column names
<i>new_column_name</i>	Name of newly created column

### 6.44.2 Member Function Documentation

#### 6.44.2.1 `process()`

```
def skdiscovery.table.analysis.outlier.Outlier.process (
    self,
    obj_data )
```

Process the data object to add a column with the outlier scores.

##### Parameters

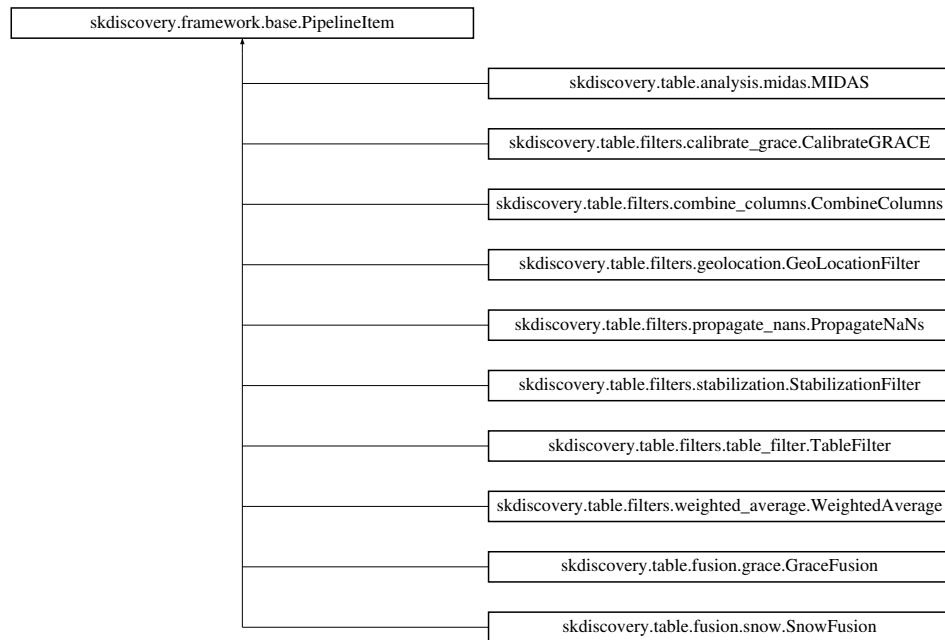
<i>obj_data</i>	Input table data wrapper
-----------------	--------------------------

The documentation for this class was generated from the following file:

- [table/analysis/outlier.py](#)

## 6.45 `skdiscovery.framework.PipelineItem` Class Reference

Inheritance diagram for `skdiscovery.framework.PipelineItem`:



## Public Member Functions

- def `__init__` (self, `str_description`, `ap_paramList`=[])
- def `perturbParams` (self)
- def `resetParams` (self)
- def `process` (self, `obj_data`)
- def `__str__` (self)
- def `getMetadata` (self)

### 6.45.1 Detailed Description

The general class used to create pipeline items.

### 6.45.2 Constructor & Destructor Documentation

#### 6.45.2.1 `__init__`()

```
def skdiscovery.framework.PipelineItem.__init__ (
    self,
    str_description,
    ap_paramList = [] )
```

Initialize an object.

**Parameters**

<i>str_description</i>	String description of filter
<i>ap_paramList</i>	List of AutoParam parameters.

**6.45.3 Member Function Documentation****6.45.3.1 \_\_str\_\_()**

```
def skdiscovery.framework.PipelineItem.__str__ (
    self )
```

String represntation of object.

**Returns**

String listing all current parameters

**6.45.3.2 getMetadata()**

```
def skdiscovery.framework.PipelineItem.getMetadata (
    self )
```

Retrieve metadata about filter.

**Returns**

String containing the item description and current parameters for filter.

**6.45.3.3 perturbParams()**

```
def skdiscovery.framework.PipelineItem.perturbParams (
    self )
```

choose other random value for all parameters

**6.45.3.4 process()**

```
def skdiscovery.framework.PipelineItem.process (
    self,
    obj_data )
```

The actual filter processing.

Empty in this generic filter.

```
@param obj_data: Data wrapper that will be processed
```

## 6.45.3.5 resetParams()

```
def skdiscovery.framework.PipelineItem.resetParams (
    self )
```

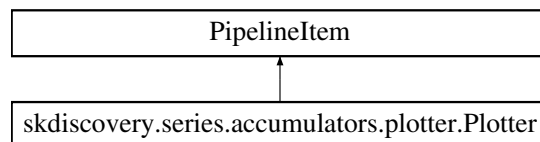
set all parameters to initial value

The documentation for this class was generated from the following file:

- framework/[base.py](#)

## 6.46 skdiscovery.series.accumulators.Plotter Class Reference

Inheritance diagram for skdiscovery.series.accumulators.Plotter:



## Public Member Functions

- def [\\_\\_init\\_\\_](#) (self, str\_description, [num\\_columns](#)=3, [errorbars](#)=False, [width](#)=13, [height](#)=4, [kwargs](#))
- def [process](#) (self, obj\_data)

## 6.46.1 Detailed Description

Make a plot of series data.

## 6.46.2 Constructor &amp; Destructor Documentation

## 6.46.2.1 \_\_init\_\_()

```
def skdiscovery.series.accumulators.Plotter.__init__ (
    self,
    str_description,
    num_columns = 3,
    errorbars = False,
    width = 13,
    height = 4,
    kwargs )
```

Initialize [Plotter](#).

## Parameters

<i>str_description</i>	String describing accumulator
<i>num_columns</i>	Number of columns to use when plotting data
<i>errorbars</i>	Flag indicating if errorbars should be used
<i>width</i>	Total width of all columns combined
<i>height</i>	Height of single row of plots
<i>**kwargs</i>	Any additional keyword arguments are passed on to matplotlib

### 6.46.3 Member Function Documentation

#### 6.46.3.1 process()

```
def skdiscovery.series.accumulators.Plotter.process (
    self,
    obj_data )
```

Plot each column in obj\_

## Parameters

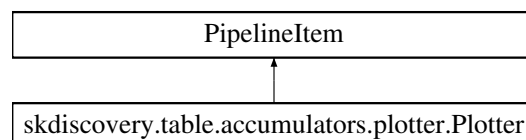
<i>obj_data</i>	Data Wrapper
-----------------	--------------

The documentation for this class was generated from the following file:

- [series/accumulators/plotter.py](#)

## 6.47 skdiscovery.table.accumulators.Plotter Class Reference

Inheritance diagram for skdiscovery.table.accumulators.Plotter:



### Public Member Functions

- def `__init__` (self, str\_description, column\_names=None, error\_column\_names=None, num\_columns=3, width=13, height=4, columns\_together=False, annotate\_column=None, annotate\_data=None, xlim=None, ylim=None, kwargs)
- def `process` (self, obj\_data)

### 6.47.1 Detailed Description

Make a plot of table data.

### 6.47.2 Constructor & Destructor Documentation

#### 6.47.2.1 `__init__()`

```
def skdiscovery.table.accumulators.Plotter.__init__ (
    self,
    str_description,
    column_names = None,
    error_column_names = None,
    num_columns = 3,
    width = 13,
    height = 4,
    columns_together = False,
    annotate_column = None,
    annotate_data = None,
    xlim = None,
    ylim = None,
    kwargs )
```

Initialize [Plotter](#).

#### Parameters

<i>str_description</i>	String describing accumulator
<i>column_names</i>	Columns to be plot
<i>error_column_names</i>	Columns containing uncertainties to be plot, no errorbars if None
<i>num_columns</i>	Number of columns to use when plotting data
<i>width</i>	Total width of all columns combined
<i>height</i>	Height of single row of plots
<i>columns_together</i>	If true, plot the columns on the same graph
<i>annotate_column</i>	Column of annotation data to use for annotation
<i>annotate_data</i>	Annotation data
<i>**kwargs</i>	Any additional keyword arguments are passed on to matplotlib

### 6.47.3 Member Function Documentation

#### 6.47.3.1 `process()`

```
def skdiscovery.table.accumulators.Plotter.process (
    self,
    obj_data )
```

Plot each column in `obj_`

## Parameters

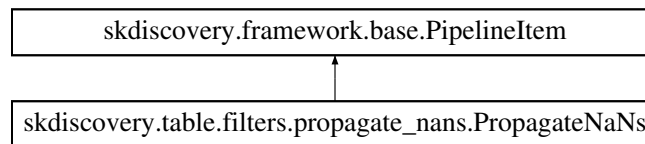
<i>obj_data</i>	Data Wrapper
-----------------	--------------

The documentation for this class was generated from the following file:

- [table/accumulators/plotter.py](#)

## 6.48 skdiscovery.table.filters.propagate\_nans.PropagateNaNs Class Reference

Inheritance diagram for `skdiscovery.table.filters.propagate_nans.PropagateNaNs`:



### Public Member Functions

- `def __init__ (self, str\_description, nan\_column, target\_columns)`
- `def process (self, obj\_data)`
- `def perturbParams (self)`
- `def resetParams (self)`
- `def \_\_str\_\_ (self)`
- `def getMetadata (self)`

### 6.48.1 Detailed Description

Propagates NaN's from one column to other columns.

### 6.48.2 Constructor & Destructor Documentation

#### 6.48.2.1 `__init__()`

```

def skdiscovery.table.filters.propagate_nans.PropagateNaNs.__init__ (
    self,
    str_description,
    nan_column,
    target_columns )
  
```

Initialize [PropagateNaNs](#) Filter.



## Parameters

<i>str_description</i>	String describing filter
<i>nan_column</i>	Column used to select which rows should be NaN's
<i>target_columns</i>	Rows in these column will be set to NaN's based on nan_column

## 6.48.3 Member Function Documentation

## 6.48.3.1 \_\_str\_\_()

```
def skdiscovery.framework.PipelineItem.__str__ (
    self ) [inherited]
```

String represntation of object.

## Returns

String listing all current parameters

## 6.48.3.2 getMetadata()

```
def skdiscovery.framework.PipelineItem.getMetadata (
    self ) [inherited]
```

Retrieve metadata about filter.

## Returns

String containing the item description and current parameters for filter.

## 6.48.3.3 perturbParams()

```
def skdiscovery.framework.PipelineItem.perturbParams (
    self ) [inherited]
```

choose other random value for all parameters

## 6.48.3.4 process()

```
def skdiscovery.table.filters.propagate_nans.PropagateNaNs.process (
    self,
    obj_data )
```

[PropagateNaNs](#) on table data wrapper.

## Parameters

<i>obj_data</i>	Input table data wrapper
-----------------	--------------------------

## 6.48.3.5 resetParams()

```
def skdiscovery.framework.PipelineItem.resetParams (
    self ) [inherited]
```

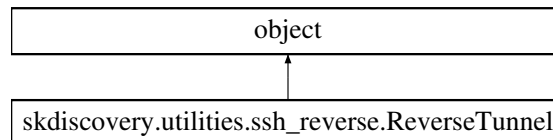
set all parameters to initial value

The documentation for this class was generated from the following file:

- [table/filters/propagate\\_nans.py](#)

## 6.49 skdiscovery.utilities.ssh\_reverse.ReverseTunnel Class Reference

Inheritance diagram for skdiscovery.utilities.ssh\_reverse.ReverseTunnel:



## Public Member Functions

- `def __init__ (self, server\_address, username, key\_filename, server\_port, remote\_host, remote\_port, check=30, verbose=False)`
- `def create\_reverse\_tunnel (self)`
- `def __del__ (self)`

## 6.49.1 Detailed Description

Create a reverse ssh tunnel.

## 6.49.2 Constructor & Destructor Documentation

### 6.49.2.1 \_\_init\_\_()

```
def skdiscovery.utilities.ssh_reverse.ReverseTunnel.__init__ (
    self,
    server_address,
    username,
    key_filename,
    server_port,
    remote_host,
    remote_port,
    check = 30,
    verbose = False )
```

Initialize [ReverseTunnel](#) object.

#### Parameters

<i>server_address</i>	Local server address
<i>username</i>	Valid username on remote host
<i>key_filename</i>	Filename of ssh key associated with remote host
<i>server_port</i>	Local port
<i>remote_host</i>	Address of remote host
<i>remote_port</i>	Remote port
<i>check</i>	Amount of time to wait in seconds when opening up a channel
<i>verbose</i>	Print status information

### 6.49.2.2 \_\_del\_\_()

```
def skdiscovery.utilities.ssh_reverse.ReverseTunnel.__del__ (
    self )
```

Deconstructor.

## 6.49.3 Member Function Documentation

### 6.49.3.1 create\_reverse\_tunnel()

```
def skdiscovery.utilities.ssh_reverse.ReverseTunnel.create_reverse_tunnel (
    self )
```

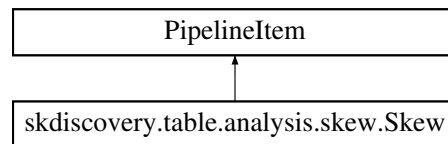
Create the reverse tunnel.

The documentation for this class was generated from the following file:

- [utilities/ssh\\_reverse.py](#)

## 6.50 skdiscovery.table.analysis.skew.Skew Class Reference

Inheritance diagram for skdiscovery.table.analysis.skew.Skew:



### Public Member Functions

- def [process](#) (self, obj\_data)

#### 6.50.1 Detailed Description

Calculates the skew of table data.

#### 6.50.2 Member Function Documentation

##### 6.50.2.1 process()

```
def skdiscovery.table.analysis.skew.Skew.process (  
    self,  
    obj_data )
```

Apply [Skew](#) analysis with results added to the data wrapper.

#### Parameters

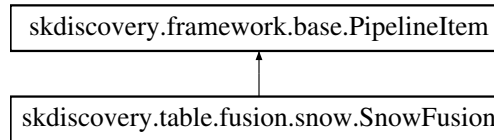
<i>obj_data</i>	Data wrapper
-----------------	--------------

The documentation for this class was generated from the following file:

- [table/analysis/skew.py](#)

## 6.51 skdiscovery.table.fusion.SnowFusion Class Reference

Inheritance diagram for skdiscovery.table.fusion.SnowFusion:



## Public Member Functions

- def `__init__` (self, `str_description`, `metadata`, `column_data_name`='Snow')
- def `process` (self, `obj_data`)
- def `perturbParams` (self)
- def `resetParams` (self)
- def `__str__` (self)
- def `getMetadata` (self)

### 6.51.1 Detailed Description

Adds snow time series data to table based on geographic coordinates.

Works on table data (original data from <http://nsidc.org/data/g02156>)

### 6.51.2 Constructor & Destructor Documentation

#### 6.51.2.1 `__init__()`

```
def skdiscovery.table.fusion.SnowFusion.__init__ (
    self,
    str_description,
    metadata,
    column_data_name = 'Snow' )
```

Initialize Snow Fusion item.

#### Parameters

<i>str_description</i>	String describing item
<i>metadata</i>	Metadata that contains lat,lon coordinates based on data labels
<i>column_data_name</i>	Name of column for Snow data

### 6.51.3 Member Function Documentation

#### 6.51.3.1 `__str__()`

```
def skdiscovery.framework.PipelineItem.__str__ (
```

```
self ) [inherited]
```

String represntation of object.

#### Returns

String listing all currenter parameters

#### 6.51.3.2 getMetadata()

```
def skdiscovery.framework.PipelineItem.getMetadata (
    self ) [inherited]
```

Retrieve metadata about filter.

#### Returns

String containing the item description and current parameters for filter.

#### 6.51.3.3 perturbParams()

```
def skdiscovery.framework.PipelineItem.perturbParams (
    self ) [inherited]
```

choose other random value for all parameters

#### 6.51.3.4 process()

```
def skdiscovery.table.fusion.SnowFusion.process (
    self,
    obj_data )
```

Adds column for snow (g02156) data.

#### Parameters

<i>obj_data</i>	Input DataWrapper, will be modified in place
-----------------	--

#### 6.51.3.5 resetParams()

```
def skdiscovery.framework.PipelineItem.resetParams (
    self ) [inherited]
```

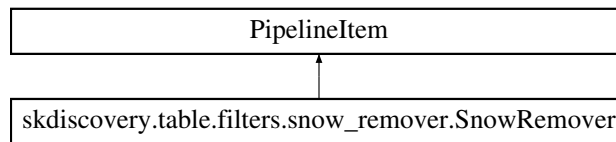
set all parameters to initial value

The documentation for this class was generated from the following file:

- [table/fusion/snow.py](#)

## 6.52 skdiscovery.table.filters.SnowRemover Class Reference

Inheritance diagram for skdiscovery.table.filters.SnowRemover:



### Public Member Functions

- def `__init__` (self, str\_description, ap\_paramList=[AutoParam(1.5)], column\_name='dN', snow\_column='Snow')
- def `process` (self, obj\_data)

### 6.52.1 Detailed Description

Removes data with snow errors.

### 6.52.2 Constructor & Destructor Documentation

#### 6.52.2.1 `__init__()`

```

def skdiscovery.table.filters.SnowRemover.__init__ (
    self,
    str_description,
    ap_paramList = [AutoParam(1.5)],
    column_name = 'dN',
    snow_column = 'Snow' )
  
```

Initialize snow remover for use on table data.

#### Parameters

<i>str_description</i>	String describing filter
<i>ap_paramList[sigma_clip]</i>	remove station if the stddev of snowdays is sigma_clip times greater than non-snow days, default 1.5
<i>column_name</i>	Name of column to check
<i>snow_column</i>	Name of snow column to determine snowdays/non snow days

### 6.52.3 Member Function Documentation

#### 6.52.3.1 process()

```
def skdiscovery.table.filters.SnowRemover.process (
    self,
    obj_data )
```

Removes table data with large snow errors.

##### Parameters

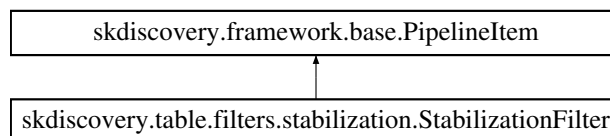
<i>obj_data</i>	Input DataWrapper, will be modified in place
-----------------	--

The documentation for this class was generated from the following file:

- [table/filters/snow\\_remover.py](#)

## 6.53 skdiscovery.table.filters.stabilization.StabilizationFilter Class Reference

Inheritance diagram for skdiscovery.table.filters.stabilization.StabilizationFilter:



### Public Member Functions

- def [process](#) (self, obj\_data)
- def [perturbParams](#) (self)
- def [resetParams](#) (self)
- def [\\_\\_str\\_\\_](#) (self)
- def [getMetadata](#) (self)

#### 6.53.1 Detailed Description

This filter transforms GPS stations in a region to a local reference frame.



## 6.53.2 Member Function Documentation

### 6.53.2.1 \_\_str\_\_()

```
def skdiscovery.framework.PipelineItem.__str__ (
    self ) [inherited]
```

String representation of object.

#### Returns

String listing all current parameters

### 6.53.2.2 getMetadata()

```
def skdiscovery.framework.PipelineItem.getMetadata (
    self ) [inherited]
```

Retrieve metadata about filter.

#### Returns

String containing the item description and current parameters for filter.

### 6.53.2.3 perturbParams()

```
def skdiscovery.framework.PipelineItem.perturbParams (
    self ) [inherited]
```

choose other random value for all parameters

### 6.53.2.4 process()

```
def skdiscovery.table.filters.stabilization.StabilizationFilter.process (
    self,
    obj_data )
```

Apply stabilization filter to data set.

#### Parameters

<i>obj_data</i>	Table data wrapper.
-----------------	---------------------

### 6.53.2.5 resetParams()

```
def skdiscovery.framework.PipelineItem.resetParams (
    self ) [inherited]
```

set all parameters to initial value

The documentation for this class was generated from the following file:

- [table/filters/stabilization.py](#)

## 6.54 skdiscovery.framework.StageContainer Class Reference

### Public Member Functions

- def [\\_\\_init\\_\\_](#) (self, [obj\\_content](#), obj\_runmethod=None, obj\_perturbmethod=None, obj\_reset=None)
- def [run](#) (self, obj\_data\_container)
- def [perturb](#) (self)
- def [reset](#) (self)
- def [getMetadata](#) (self)
- def [getObjects](#) (self)
- def [getMetadataType](#) (self)
- def [getMetadataNestedTypes](#) (self)
- def [getMetadataNestedGraph](#) (self)

### 6.54.1 Detailed Description

Container to hold a stage for the DiscoveryPipeline.

### 6.54.2 Constructor & Destructor Documentation

#### 6.54.2.1 \_\_init\_\_()

```
def skdiscovery.framework.StageContainer.__init__ (
    self,
    obj_content,
    obj_runmethod = None,
    obj_perturbmethod = None,
    obj_reset = None )
```

Get the object and its run method into this container.

#### Parameters

<i>obj_content</i>	filter, analysis, or accumulator
<i>obj_runmethod</i>	Run method of the obj_content (default process)
<i>obj_perturbmethod</i>	Perturb method of the obj_content (default perturbParams)
<i>obj_reset</i>	Reset method of the obj_content (default resetParams)

### 6.54.3 Member Function Documentation

#### 6.54.3.1 getMetadata()

```
def skdiscovery.framework.StageContainer.getMetadata (
    self )
```

Retrieves the obj\_content metadata.

##### Returns

obj\_content metadata

#### 6.54.3.2 getMetadataNestedGraph()

```
def skdiscovery.framework.StageContainer.getMetadataNestedGraph (
    self )
```

Get the nested graph for the container.

##### Returns

String: Stage container subgraph

#### 6.54.3.3 getMetadataNestedTypes()

```
def skdiscovery.framework.StageContainer.getMetadataNestedTypes (
    self )
```

Get the metadata along with container type.

##### Returns

string of container and metadata

#### 6.54.3.4 getMetadataType()

```
def skdiscovery.framework.StageContainer.getMetadataType (
    self )
```

Get metadata type.

##### Returns

String: container type

#### 6.54.3.5 `getObjects()`

```
def skdiscovery.framework.StageContainer.getObjects (
    self )
```

Return the `obj_content` in a list.

##### Returns

Contained object in a list

#### 6.54.3.6 `perturb()`

```
def skdiscovery.framework.StageContainer.perturb (
    self )
```

Execute the `obj_content` `perturb` method.

#### 6.54.3.7 `reset()`

```
def skdiscovery.framework.StageContainer.reset (
    self )
```

Execute the `obj_content` `reset` method.

#### 6.54.3.8 `run()`

```
def skdiscovery.framework.StageContainer.run (
    self,
    obj_data_container )
```

Execute the `obj_content` `run` method.

##### Parameters

<code>obj_data_container</code>	Data container to be passed to the held <code>obj_content</code> 's <code>run</code> method
---------------------------------	---

The documentation for this class was generated from the following file:

- [framework/stagecontainers.py](#)

## 6.55 `skdiscovery.framework.StageContainer` Alternative Class Reference

## Public Member Functions

- def `__init__` (self, `list_stagecontainers`)
- def `run` (self, `obj_data_container`)
- def `perturb` (self)
- def `getMetadata` (self)
- def `getObjects` (self)
- def `reset` (self)
- def `getMetadataType` (self)
- def `getMetadataNestedTypes` (self)
- def `getMetadataNestedGraph` (self)

## Static Public Attributes

- list `currentContainer` = []

### 6.55.1 Detailed Description

Stage Container that holds a list of stage containers and randomly chooses one to use.

### 6.55.2 Constructor & Destructor Documentation

#### 6.55.2.1 `__init__()`

```
def skdiscovery.framework.StageContainerAlternative.__init__ (
    self,
    list_stagecontainers )
```

Initialize the [StageContainerAlternative](#).

#### Parameters

<code>list_stagecontainers</code>	List of stage containers
-----------------------------------	--------------------------

### 6.55.3 Member Function Documentation

#### 6.55.3.1 `getMetadata()`

```
def skdiscovery.framework.StageContainerAlternative.getMetadata (
    self )
```

Return metadata from the current container.

#### Returns

metadata from the currently selected container

#### 6.55.3.2 `getMetadataNestedGraph()`

```
def skdiscovery.framework.StageContainerAlternative.getMetadataNestedGraph (
    self )
```

Get the nested graph for the container.

##### Returns

String: Container subgraph

#### 6.55.3.3 `getMetadataNestedTypes()`

```
def skdiscovery.framework.StageContainerAlternative.getMetadataNestedTypes (
    self )
```

Get the metadata along with container type.

##### Returns

string of container and metadata

#### 6.55.3.4 `getMetadataType()`

```
def skdiscovery.framework.StageContainerAlternative.getMetadataType (
    self )
```

Get metadata type.

##### Returns

String: container type

#### 6.55.3.5 `getObjects()`

```
def skdiscovery.framework.StageContainerAlternative.getObjects (
    self )
```

retrieve the current container as a list

##### Returns

Current container being used as a list

## 6.55.3.6 perturb()

```
def skdiscovery.framework.StageContainerAlternative.perturb (
    self )
```

choose one of the containers as an alternative and perturb its parameters

## 6.55.3.7 reset()

```
def skdiscovery.framework.StageContainerAlternative.reset (
    self )
```

## 6.55.3.8 run()

```
def skdiscovery.framework.StageContainerAlternative.run (
    self,
    obj_data_container )
```

Run the currently selected stage container.

## Parameters

<i>obj_datacontainer</i>	Data container to be passed to the current stagecontainer
--------------------------	---

The documentation for this class was generated from the following file:

- framework/[stagecontainers.py](#)

## 6.56 skdiscovery.framework.StageContainerIncrementalAdd Class Reference

## Public Member Functions

- def [\\_\\_init\\_\\_](#) (self, list\_stagecontainers)
- def [reset](#) (self)
- def [run](#) (self, obj\_data\_container)
- def [perturb](#) (self)
- def [getMetadata](#) (self)
- def [getObjects](#) (self)
- def [getMetadataType](#) (self)
- def [getMetadataNestedTypes](#) (self)
- def [getMetadataNestedGraph](#) (self)

## Static Public Attributes

- int `length` = 0
- int `currentindex` = 0
- list `list_currentContainers` = []

### 6.56.1 Detailed Description

In each perturb call, it incrementally adds one of the filters specified in the constructor.

### 6.56.2 Constructor & Destructor Documentation

#### 6.56.2.1 `__init__()`

```
def skdiscovery.framework.StageContainerIncrementalAdd.__init__ (
    self,
    list_stagecontainers )
```

Initialize the container.

#### Parameters

<i>list_stagecontainers</i>	List of stage containers.
-----------------------------	---------------------------

### 6.56.3 Member Function Documentation

#### 6.56.3.1 `getMetadata()`

```
def skdiscovery.framework.StageContainerIncrementalAdd.getMetadata (
    self )
```

Return the metadata from the currently used stage containers.

#### Returns

List of metadata from current containers

#### 6.56.3.2 `getMetadataNestedGraph()`

```
def skdiscovery.framework.StageContainerIncrementalAdd.getMetadataNestedGraph (
    self )
```

Get the nested graph for the container.

#### Returns

String: Container subgraph



### 6.56.3.3 getMetadataNestedTypes()

```
def skdiscovery.framework.StageContainerIncrementalAdd.getMetadataNestedTypes (
    self )
```

Get the metadata along with container type.

#### Returns

string of container and metadata

### 6.56.3.4 getMetadataType()

```
def skdiscovery.framework.StageContainerIncrementalAdd.getMetadataType (
    self )
```

Get metadata type.

#### Returns

String: container type

### 6.56.3.5 getObjects()

```
def skdiscovery.framework.StageContainerIncrementalAdd.getObjects (
    self )
```

Retrieve objects in the current list of stage containers.

#### Returns

List of current obj\_content from the current list of stage containers

### 6.56.3.6 perturb()

```
def skdiscovery.framework.StageContainerIncrementalAdd.perturb (
    self )
```

Add another stage container to the current list of stage containers.

### 6.56.3.7 reset()

```
def skdiscovery.framework.StageContainerIncrementalAdd.reset (
    self )
```

Reset the container so that it will only run the first stage container again.

### 6.56.3.8 run()

```
def skdiscovery.framework.StageContainerIncrementalAdd.run (
    self,
    obj_data_container )
```

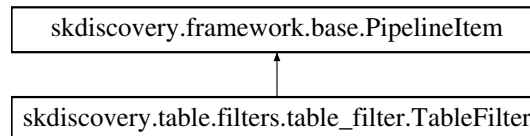
Run the current list of stage containers.

The documentation for this class was generated from the following file:

- framework/[stagecontainers.py](#)

## 6.57 skdiscovery.table.filters.table\_filter.TableFilter Class Reference

Inheritance diagram for skdiscovery.table.filters.table\_filter.TableFilter:



### Public Member Functions

- def `__init__` (self, [str\\_description](#), [ap\\_paramList](#))
- def [process](#) (self, obj\_data)
- def [perturbParams](#) (self)
- def [resetParams](#) (self)
- def `__str__` (self)
- def [getMetadata](#) (self)

### 6.57.1 Detailed Description

This class removes tables based on their label.

### 6.57.2 Constructor & Destructor Documentation

#### 6.57.2.1 `__init__`()

```
def skdiscovery.table.filters.table_filter.TableFilter.__init__ (
    self,
    str_description,
    ap_paramList )
```

Initialize Table Filter.

## Parameters

<i>str_description</i>	String describing this filter
<i>ap_paramList[ap_label_list]</i>	AutoList of table labels to remove

### 6.57.3 Member Function Documentation

#### 6.57.3.1 \_\_str\_\_()

```
def skdiscovery.framework.PipelineItem.__str__ (
    self ) [inherited]
```

String represntation of object.

## Returns

String listing all current parameters

#### 6.57.3.2 getMetadata()

```
def skdiscovery.framework.PipelineItem.getMetadata (
    self ) [inherited]
```

Retrieve metadata about filter.

## Returns

String containing the item description and current parameters for filter.

#### 6.57.3.3 perturbParams()

```
def skdiscovery.framework.PipelineItem.perturbParams (
    self ) [inherited]
```

choose other random value for all parameters

#### 6.57.3.4 process()

```
def skdiscovery.table.filters.table_filter.TableFilter.process (
    self,
    obj_data )
```

Apply geolocation filter to data set.

**Parameters**

<i>obj_data</i>	Table data wrapper
-----------------	--------------------

**6.57.3.5 resetParams()**

```
def skdiscovery.framework.PipelineItem.resetParams (
    self ) [inherited]
```

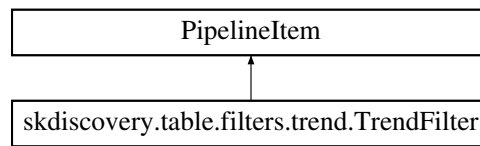
set all parameters to initial value

The documentation for this class was generated from the following file:

- [table/filters/table\\_filter.py](#)

**6.58 skdiscovery.table.filters.TrendFilter Class Reference**

Inheritance diagram for skdiscovery.table.filters.TrendFilter:

**Public Member Functions**

- def `__init__` (self, str\_description, ap\_paramList, [columns](#)=None)
- def [process](#) (self, obj\_data)

**6.58.1 Detailed Description**

Trend Filter that removes linear and sinusoidal (annual, semi-annual) trends on series data.

Works on table data

**6.58.2 Constructor & Destructor Documentation****6.58.2.1 \_\_init\_\_()**

```
def skdiscovery.table.filters.TrendFilter.__init__ (
    self,
    str_description,
    ap_paramList,
    columns = None )
```

Initialize Trend Filter.

## Parameters

<i>str_description</i>	String describing filter [list_trendTypes]: List of trend types. List can contain "linear", "annual", or "semiannual"
------------------------	---

## 6.58.3 Member Function Documentation

## 6.58.3.1 process()

```
def skdiscovery.table.filters.TrendFilter.process (
    self,
    obj_data )
```

Apply trend filter to data set.

## Parameters

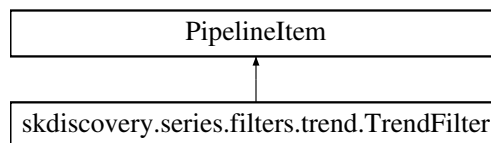
<i>obj_data</i>	Input data. Changes are made in place.
-----------------	--

The documentation for this class was generated from the following file:

- [table/filters/trend.py](#)

## 6.59 skdiscovery.series.filters.TrendFilter Class Reference

Inheritance diagram for skdiscovery.series.filters.TrendFilter:



## Public Member Functions

- def [\\_\\_init\\_\\_](#) (self, str\_description, ap\_paramList)
- def [process](#) (self, obj\_data)

## 6.59.1 Detailed Description

Trend Filter that removes linear and sinusoidal (annual, semi-annual) trends on series data.

## 6.59.2 Constructor & Destructor Documentation

### 6.59.2.1 `__init__()`

```
def skdiscovery.series.filters.TrendFilter.__init__ (
    self,
    str_description,
    ap_paramList )
```

Initialize Trend Filter.

#### Parameters

<i>str_description</i>	String describing filter
<i>ap_paramList</i> [ <i>list_trendTypes</i> ]	List of trend types. List can contain any mix of "linear", "annual", or "semiannual". The default is to remove the linear, annual, and semiannual trends

## 6.59.3 Member Function Documentation

### 6.59.3.1 `process()`

```
def skdiscovery.series.filters.TrendFilter.process (
    self,
    obj_data )
```

Apply trend filter to data set.

#### Parameters

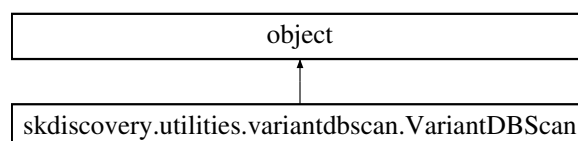
<i>obj_data</i>	Input data. Changes are made in place.
-----------------	--

The documentation for this class was generated from the following file:

- [series/filters/trend.py](#)

## 6.60 `skdiscovery.utilities.VariantDBScan` Class Reference

Inheritance diagram for `skdiscovery.utilities.VariantDBScan`:



## Public Member Functions

- def `__init__` (self, variants, data, column\_names)
- def `run` (self, verbose=False)

### 6.60.1 Detailed Description

Wrapper for [VariantDBScan](#).

### 6.60.2 Constructor & Destructor Documentation

#### 6.60.2.1 `__init__()`

```
def skdiscovery.utilities.VariantDBScan.__init__ (
    self,
    variants,
    data,
    column_names )
```

Initialize DBScan pipeline item.

#### Parameters

<i>variants</i>	DataFrame of epsilon (label column 'eps') and minpoints (label column 'mp')
<i>data</i>	Data Pandas DataFrame to be clustered
<i>column_names</i>	List of column names in DataFrame to cluster (Can be 2 or 3 columns)

### 6.60.3 Member Function Documentation

#### 6.60.3.1 `run()`

```
def skdiscovery.utilities.VariantDBScan.run (
    self,
    verbose = False )
```

Runs [VariantDBScan](#) on data.

#### Parameters

<i>verbose</i>	Print additional information about run
----------------	--

**Returns**

a dataframe with a column for each dbscan run which contains the cluster id for each object.

**Note**

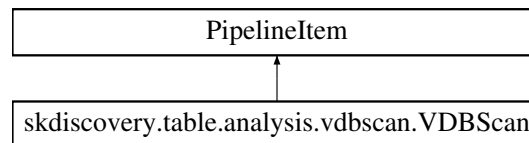
A value of 0 indicates object is a noise point

The documentation for this class was generated from the following file:

- [utilities/variantdbscan.py](#)

## 6.61 skdiscovery.table.analysis.VDBScan Class Reference

Inheritance diagram for skdiscovery.table.analysis.VDBScan:

**Public Member Functions**

- `def \_\_init\_\_(self, str_description, variants, column_names)`
- `def process(self, obj_data)`

### 6.61.1 Detailed Description

Runs Variant DBscan on table data.

Adds cluster information columns to data

### 6.61.2 Constructor & Destructor Documentation

#### 6.61.2.1 `__init__()`

```
def skdiscovery.table.analysis.VDBScan.__init__(
    self,
    str_description,
    variants,
    column_names )
```

Initialize [VDBScan](#) pipeline item.



## Parameters

<i>str_description</i>	Description of item
<i>variants</i>	Dataframe containing column of epsilon values and column of min points
<i>column_names</i>	List of column names to use

## 6.61.3 Member Function Documentation

## 6.61.3.1 process()

```
def skdiscovery.table.analysis.VDBScan.process (
    self,
    obj_data )
```

Run [VDBScan](#) on data.

## Parameters

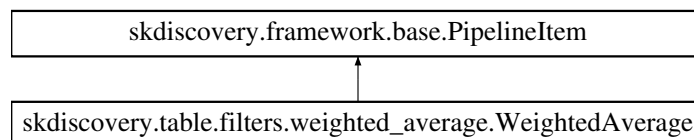
<i>obj_data</i>	Data wrapper to process
-----------------	-------------------------

The documentation for this class was generated from the following file:

- [table/analysis/vdbscan.py](#)

## 6.62 skdiscovery.table.filters.weighted\_average.WeightedAverage Class Reference

Inheritance diagram for skdiscovery.table.filters.weighted\_average.WeightedAverage:



## Public Member Functions

- `def __init__ (self, str\_description, ap\_paramList, column\_names, std\_dev\_column\_names=None)`
- `def process (self, obj\_data)`
- `def perturbParams (self)`
- `def resetParams (self)`
- `def \_\_str\_\_ (self)`
- `def getMetadata (self)`

### 6.62.1 Detailed Description

This filter performs a rolling weighted average using standard deviations as weight.

### 6.62.2 Constructor & Destructor Documentation

#### 6.62.2.1 `__init__()`

```
def skdiscovery.table.filters.weighted_average.WeightedAverage.__init__ (
    self,
    str_description,
    ap_paramList,
    column_names,
    std_dev_column_names = None )
```

Initializes a [WeightedAverage](#) object.

#### Parameters

<i>str_description</i>	String describing filter
<i>ap_paramList[window]</i>	Window to use for computing rolling weighted average
<i>column_names</i>	Names of columns to apply the weighted average
<i>std_dev_column_names</i>	Names of columns of the standard deviations. If none a regular mean is computed.

### 6.62.3 Member Function Documentation

#### 6.62.3.1 `__str__()`

```
def skdiscovery.framework.PipelineItem.__str__ (
    self ) [inherited]
```

String representation of object.

#### Returns

String listing all current parameters

#### 6.62.3.2 `getMetadata()`

```
def skdiscovery.framework.PipelineItem.getMetadata (
    self ) [inherited]
```

Retrieve metadata about filter.

#### Returns

String containing the item description and current parameters for filter.

### 6.62.3.3 perturbParams()

```
def skdiscovery.framework.PipelineItem.perturbParams (
    self ) [inherited]
```

choose other random value for all parameters

### 6.62.3.4 process()

```
def skdiscovery.table.filters.weighted_average.WeightedAverage.process (
    self,
    obj_data )
```

### 6.62.3.5 resetParams()

```
def skdiscovery.framework.PipelineItem.resetParams (
    self ) [inherited]
```

set all parameters to initial value

The documentation for this class was generated from the following file:

- [table/filters/weighted\\_average.py](#)



## Chapter 7

# File Documentation

### 7.1 framework/base.py File Reference

#### Classes

- class [skdiscovery.framework.PipelineItem](#)

#### Namespaces

- [skdiscovery.framework.base](#)

### 7.2 framework/discoverypipeline.py File Reference

#### Classes

- class [skdiscovery.DiscoveryPipeline](#)

#### Namespaces

- [skdiscovery.framework.discoverypipeline](#)

### 7.3 framework/param.py File Reference

#### Classes

- class [skdiscovery.framework.param.AutoParam](#)
- class [skdiscovery.framework.param.AutoParamMinMax](#)
- class [skdiscovery.framework.param.AutoParamMinMaxExtreme](#)
- class [skdiscovery.framework.param.AutoParamList](#)
- class [skdiscovery.framework.param.AutoParamListCycle](#)
- class [skdiscovery.framework.param.AutoList](#)
- class [skdiscovery.framework.param.AutoListSubset](#)
- class [skdiscovery.framework.param.AutoListPermute](#)
- class [skdiscovery.framework.param.AutoListRemove](#)
- class [skdiscovery.framework.param.AutoListCycle](#)

## Namespaces

- [skdiscovery.framework.param](#)
- [AlgoParam](#)

## 7.4 framework/stagecontainers.py File Reference

### Classes

- class [skdiscovery.framework.StageContainer](#)
- class [skdiscovery.framework.StageContainerAlternative](#)
- class [skdiscovery.framework.StageContainerIncrementalAdd](#)

### Namespaces

- [skdiscovery.framework.stagecontainers](#)

## 7.5 generic/accumulators/data.py File Reference

### Classes

- class [skdiscovery.generic.accumulators.DataAccumulator](#)

### Namespaces

- [skdiscovery.generic.accumulators.data](#)

## 7.6 generic/accumulators/gpshplotter.py File Reference

### Classes

- class [skdiscovery.generic.accumulators.GPSHPlotter](#)

### Namespaces

- [skdiscovery.generic.accumulators.gpshplotter](#)

## 7.7 generic/accumulators/hcluster.py File Reference

### Classes

- class [skdiscovery.generic.accumulators.HCluster](#)

### Namespaces

- [skdiscovery.generic.accumulators.hcluster](#)

## 7.8 series/accumulators/plotter.py File Reference

### Classes

- class [skdiscovery.series.accumulators.Plotter](#)

### Namespaces

- [skdiscovery.series.accumulators.plotter](#)

## 7.9 table/accumulators/plotter.py File Reference

### Classes

- class [skdiscovery.table.accumulators.Plotter](#)

### Namespaces

- [skdiscovery.table.accumulators.plotter](#)

## 7.10 series/analysis/correlate.py File Reference

### Classes

- class [skdiscovery.series.analysis.Correlate](#)

### Namespaces

- [skdiscovery.series.analysis.correlate](#)

## 7.11 `table/analysis/correlate.py` File Reference

### Classes

- class [skdiscovery.table.analysis.Correlate](#)

### Namespaces

- [skdiscovery.table.analysis.correlate](#)

## 7.12 `series/analysis/gca.py` File Reference

### Classes

- class [skdiscovery.series.analysis.General\\_Component\\_Analysis](#)

### Namespaces

- [skdiscovery.series.analysis.gca](#)

## 7.13 `table/analysis/gca.py` File Reference

### Classes

- class [skdiscovery.table.analysis.General\\_Component\\_Analysis](#)

### Namespaces

- [skdiscovery.table.analysis.gca](#)

## 7.14 `series/analysis/mogi.py` File Reference

### Classes

- class [skdiscovery.series.analysis.Mogi\\_Inversion](#)

### Namespaces

- [skdiscovery.series.analysis.mogi](#)



## Functions

- def [skdiscovery.series.analysis.MogiVectors](#) (mogi\_res, station\_lat\_list, station\_lon\_list, flag3D=False)

## 7.15 table/analysis/mogi.py File Reference

## Classes

- class [skdiscovery.table.analysis.Mogi\\_Inversion](#)

## Namespaces

- [skdiscovery.table.analysis.mogi](#)

## Functions

- def [skdiscovery.table.analysis.MogiVectors](#) (mogi\_res, station\_lat\_list, station\_lon\_list, flag3D=False)

## 7.16 series/filters/dataremover.py File Reference

## Classes

- class [skdiscovery.series.filters.DataRemover](#)

## Namespaces

- [skdiscovery.series.filters.dataremover](#)

## 7.17 table/filters/dataremover.py File Reference

## Classes

- class [skdiscovery.table.filters.DataRemover](#)

## Namespaces

- [skdiscovery.table.filters.dataremover](#)

## 7.18 `series/filters/hyperbolictan.py` File Reference

### Classes

- class [skdiscovery.series.filters.HTanFilter](#)

### Namespaces

- [skdiscovery.series.filters.hyperbolictan](#)

## 7.19 `table/filters/hyperbolictan.py` File Reference

### Classes

- class [skdiscovery.table.filters.HTanFilter](#)

### Namespaces

- [skdiscovery.table.filters.hyperbolictan](#)

## 7.20 `series/filters/interpolate.py` File Reference

### Classes

- class [skdiscovery.series.filters.InterpolateFilter](#)

### Namespaces

- [skdiscovery.series.filters.interpolate](#)

## 7.21 `table/filters/interpolate.py` File Reference

### Classes

- class [skdiscovery.table.filters.InterpolateFilter](#)

### Namespaces

- [skdiscovery.table.filters.interpolate](#)

## 7.22 series/filters/kalman.py File Reference

### Classes

- class [skdiscovery.series.filters.KalmanFilter](#)

### Namespaces

- [skdiscovery.series.filters.kalman](#)

## 7.23 table/filters/kalman.py File Reference

### Classes

- class [skdiscovery.table.filters.KalmanFilter](#)

### Namespaces

- [skdiscovery.table.filters.kalman](#)

## 7.24 series/filters/lowpass.py File Reference

### Classes

- class [skdiscovery.series.filters.LowPassFilter](#)

### Namespaces

- [skdiscovery.series.filters.lowpass](#)

## 7.25 table/filters/lowpass.py File Reference

### Classes

- class [skdiscovery.table.filters.LowPassFilter](#)

### Namespaces

- [skdiscovery.table.filters.lowpass](#)

## 7.26 `series/filters/median.py` File Reference

### Classes

- class [skdiscovery.series.filters.MedianFilter](#)

### Namespaces

- [skdiscovery.series.filters.median](#)

## 7.27 `table/filters/median.py` File Reference

### Classes

- class [skdiscovery.table.filters.MedianFilter](#)

### Namespaces

- [skdiscovery.table.filters.median](#)

## 7.28 `series/filters/offset_detrend.py` File Reference

### Classes

- class [skdiscovery.series.filters.OffsetDetrend](#)

### Namespaces

- [skdiscovery.series.filters.offset\\_detrend](#)

## 7.29 `table/filters/offset_detrend.py` File Reference

### Classes

- class [skdiscovery.table.filters.OffsetDetrend](#)

### Namespaces

- [skdiscovery.table.filters.offset\\_detrend](#)

## 7.30 series/filters/trend.py File Reference

### Classes

- class [skdiscovery.series.filters.TrendFilter](#)

### Namespaces

- [skdiscovery.series.filters.trend](#)

## 7.31 table/filters/trend.py File Reference

### Classes

- class [skdiscovery.table.filters.TrendFilter](#)

### Namespaces

- [skdiscovery.table.filters.trend](#)

## 7.32 table/analysis/dbscan.py File Reference

### Classes

- class [skdiscovery.table.analysis.dbscan.DBScan](#)

### Namespaces

- [skdiscovery.table.analysis.dbscan](#)

## 7.33 table/analysis/midas.py File Reference

### Classes

- class [skdiscovery.table.analysis.midas.MIDAS](#)

### Namespaces

- [skdiscovery.table.analysis.midas](#)

### 7.34 table/analysis/outlier.py File Reference

#### Classes

- class [skdiscovery.table.analysis.outlier.Outlier](#)

#### Namespaces

- [skdiscovery.table.analysis.outlier](#)

### 7.35 table/analysis/skew.py File Reference

#### Classes

- class [skdiscovery.table.analysis.skew.Skew](#)

#### Namespaces

- [skdiscovery.table.analysis.skew](#)

### 7.36 table/analysis/vdbscan.py File Reference

#### Classes

- class [skdiscovery.table.analysis.VDBScan](#)

#### Namespaces

- [skdiscovery.table.analysis.vdbscan](#)

### 7.37 table/filters/antenna\_offset.py File Reference

#### Classes

- class [skdiscovery.table.filters.antenna\\_offset.AntennaOffset](#)

#### Namespaces

- [skdiscovery.table.filters.antenna\\_offset](#)

## 7.38 table/filters/calibrate\_py File Reference

### Classes

- class [skdiscovery.table.filters.calibrate\\_CalibrateGRACE](#)

### Namespaces

- [skdiscovery.table.filters.calibrate\\_grace](#)

## 7.39 table/filters/combine\_columns.py File Reference

### Classes

- class [skdiscovery.table.filters.combine\\_columns.CombineColumns](#)

### Namespaces

- [skdiscovery.table.filters.combine\\_columns](#)

## 7.40 table/filters/geolocation.py File Reference

### Classes

- class [skdiscovery.table.filters.geolocation.GeoLocationFilter](#)

### Namespaces

- [skdiscovery.table.filters.geolocation](#)

## 7.41 table/filters/propagate\_nans.py File Reference

### Classes

- class [skdiscovery.table.filters.propagate\\_nans.PropagateNaNs](#)

### Namespaces

- [skdiscovery.table.filters.propagate\\_nans](#)

## 7.42 table/filters/snow\_remover.py File Reference

### Classes

- class [skdiscovery.table.filters.SnowRemover](#)

### Namespaces

- [skdiscovery.table.filters.snow\\_remover](#)

## 7.43 table/filters/stabilization.py File Reference

### Classes

- class [skdiscovery.table.filters.stabilization.StabilizationFilter](#)

### Namespaces

- [skdiscovery.table.filters.stabilization](#)

## 7.44 table/filters/table\_filter.py File Reference

### Classes

- class [skdiscovery.table.filters.table\\_filter.TableFilter](#)

### Namespaces

- [skdiscovery.table.filters.table\\_filter](#)

## 7.45 table/filters/weighted\_average.py File Reference

### Classes

- class [skdiscovery.table.filters.weighted\\_average.WeightedAverage](#)

### Namespaces

- [skdiscovery.table.filters.weighted\\_average](#)



## 7.46 table/fusion/grace.py File Reference

### Classes

- class [skdiscovery.table.fusion.GraceFusion](#)

### Namespaces

- [skdiscovery.table.fusion.grace](#)

## 7.47 table/fusion/snow.py File Reference

### Classes

- class [skdiscovery.table.fusion.SnowFusion](#)

### Namespaces

- [skdiscovery.table.fusion.snow](#)

## 7.48 table/generators/catalog\_generator.py File Reference

### Classes

- class [skdiscovery.table.generators.catalog\\_generator.CatalogGenerator](#)

### Namespaces

- [skdiscovery.table.generators.catalog\\_generator](#)

## 7.49 table/generators/data\_generator.py File Reference

### Classes

- class [skdiscovery.table.generators.data\\_generator.DataGenerator](#)

### Namespaces

- [skdiscovery.table.generators.data\\_generator](#)

## 7.50 utilities/amazon\_control.py File Reference

### Namespaces

- [skdiscovery.utilities.amazon\\_control](#)

### Functions

- def [skdiscovery.utilities.amazon\\_control.init](#) (in\_aws\_access\_key, in\_aws\_secret, in\_aws\_region, in\_aws\_security\_group, in\_aws\_key\_name, in\_pem\_file)
- def [skdiscovery.utilities.amazon\\_control.closeDispyScheduler](#) ()
- def [skdiscovery.utilities.amazon\\_control.startDispyScheduler](#) ()
- def [skdiscovery.utilities.amazon\\_control.generateInfo](#) (instance)
- def [skdiscovery.utilities.amazon\\_control.updateStatus](#) ()
- def [skdiscovery.utilities.amazon\\_control.setNumInstances](#) (new\_total\_instances, instance\_type, image\_id)
- def [skdiscovery.utilities.amazon\\_control.createTunnels](#) ()
- def [skdiscovery.utilities.amazon\\_control.startDispyNode](#) ()
- def [skdiscovery.utilities.amazon\\_control.resetInstances](#) ()
- def [skdiscovery.utilities.amazon\\_control.reset](#) ()
- def [skdiscovery.utilities.amazon\\_control.close](#) ()
- def [skdiscovery.utilities.amazon\\_control.clearAmazonList](#) ()

### Variables

- [skdiscovery.utilities.amazon\\_control.aws\\_access\\_key](#) = None
- [skdiscovery.utilities.amazon\\_control.aws\\_secret](#) = None
- [skdiscovery.utilities.amazon\\_control.aws\\_region](#) = None
- [skdiscovery.utilities.amazon\\_control.aws\\_security\\_group](#) = None
- [skdiscovery.utilities.amazon\\_control.aws\\_key\\_name](#) = None
- [skdiscovery.utilities.amazon\\_control.pem\\_file](#) = None
- [skdiscovery.utilities.amazon\\_control.ec2\\_res](#) = None
- [skdiscovery.utilities.amazon\\_control.ec2\\_client](#) = None
- list [skdiscovery.utilities.amazon\\_control.amazon\\_list](#) = []
- [skdiscovery.utilities.amazon\\_control.scheduler](#) = None
- [skdiscovery.utilities.amazon\\_control.popen](#) = None

## 7.51 utilities/amazon\_gui.py File Reference

### Namespaces

- [skdiscovery.utilities.amazon\\_gui](#)

## Functions

- def [skdiscovery.utilities.amazon\\_gui.init](#) ()
- def [skdiscovery.utilities.amazon\\_gui.drawGUI](#) ()
- def [skdiscovery.utilities.amazon\\_gui.changeButtonState](#) (enabled=True)
- def [skdiscovery.utilities.amazon\\_gui.checkValidValues](#) ()

## Variables

- [skdiscovery.utilities.amazon\\_gui.widget\\_dict](#) = OrderedDict()
- list [skdiscovery.utilities.amazon\\_gui.disable\\_list](#)
- list [skdiscovery.utilities.amazon\\_gui.key\\_value\\_list](#)

## 7.52 utilities/astro\_tools.py File Reference

### Namespaces

- [skdiscovery.utilities.astro\\_tools](#)

## Functions

- def [skdiscovery.utilities.astro\\_tools.z\\_to\\_v](#) (z)
- def [skdiscovery.utilities.astro\\_tools.v\\_to\\_z](#) (v)
- def [skdiscovery.utilities.astro\\_tools.angular\\_separation](#) (ra1, dec1, ra2, dec2)
- def [skdiscovery.utilities.astro\\_tools.move\\_point](#) (ra, dec, ang\_dist, bearing)
- def [skdiscovery.utilities.astro\\_tools.abs\\_mag](#) (app\_mag, z)
- def [skdiscovery.utilities.astro\\_tools.app\\_mag](#) (abs\_mag, z)
- def [skdiscovery.utilities.astro\\_tools.nfw](#) (R, norm\_constant, Rs, Rcore)
- def [skdiscovery.utilities.astro\\_tools.lf](#) (x, A, mstar, alpha)
- def [skdiscovery.utilities.astro\\_tools.dlf](#) (x, A, m1, a1, m2, a2)
- def [skdiscovery.utilities.astro\\_tools.cdf\\_dlf](#) (x, A, m1, a1, m2, a2, start=-26)
- def [skdiscovery.utilities.astro\\_tools.inv\\_cdf\\_dlf](#) (p, A, m1, a1, m2, a2, start=-26, end=-15)

## 7.53 utilities/config.py File Reference

### Namespaces

- [skdiscovery.utilities.config](#)

## Functions

- def [skdiscovery.utilities.config.getConfig](#) ()
- def [skdiscovery.utilities.config.writeConfigValue](#) (section, key, value)
- def [skdiscovery.utilities.config.getDispyPassword](#) ()
- def [skdiscovery.utilities.config.getHostName](#) ()

## 7.54 utilities/kalman\_smoother.py File Reference

### Namespaces

- [skdiscovery.utilities.kalman\\_smoother](#)

### Functions

- def [skdiscovery.utilities.kalman\\_smoother.KalmanFilter](#) (in\_data, t, sigma\_sq, R, Pinit, x0=0, invert=False, clipping=5)
- def [skdiscovery.utilities.kalman\\_smoother.FitFOGMPParameters](#) (data, Pinit=100, R=1, method='brute', x0=0, clipping=5)
- def [skdiscovery.utilities.kalman\\_smoother.IterativeGridSearch](#) (f, args, intervals, max\_iter=50, tol=0.↵1, bounds=None, prev\_minimum=None, verbose=False)
- def [skdiscovery.utilities.kalman\\_smoother.KalmanSmoother](#) (in\_data, Pinit=1e6, Restimate=1, clipping=5, method='simple', t=None, sigma\_sq=None, R=1, verbose=False, max\_clip\_iter=10)
- def [skdiscovery.utilities.kalman\\_smoother.FOGM](#) (size, t, sigma\_sq, R)

## 7.55 utilities/pbo\_tools.py File Reference

### Namespaces

- [skdiscovery.utilities.pbo\\_tools](#)

### Functions

- def [skdiscovery.utilities.pbo\\_tools.mogi](#) (xdata, lat, lon, source\_depth, amplitude)
- def [skdiscovery.utilities.pbo\\_tools.finite\\_sphere](#) (xdata, lat, lon, source\_depth, amplitude, alpha\_rad)
- def [skdiscovery.utilities.pbo\\_tools.closed\\_pipe](#) (xdata, lat, lon, source\_depth, amplitude, pipe\_delta)
- def [skdiscovery.utilities.pbo\\_tools.constant\\_open\\_pipe](#) (xdata, lat, lon, source\_depth, amplitude, pipe\_delta)
- def [skdiscovery.utilities.pbo\\_tools.rising\\_open\\_pipe](#) (xdata, lat, lon, source\_depth, amplitude, pipe\_delta, open↵\_pipe\_top)
- def [skdiscovery.utilities.pbo\\_tools.sill](#) (xdata, lat, lon, source\_depth, amplitude)
- def [skdiscovery.utilities.pbo\\_tools.dirEigenvectors](#) (coord\_list, pca\_comps, pdir='H')
- def [skdiscovery.utilities.pbo\\_tools.datetimeToNumber](#) (in\_time)

## 7.56 utilities/random\_walks.py File Reference

### Namespaces

- [skdiscovery.utilities.random\\_walks](#)

## Functions

- def [skdiscovery.utilities.random\\_walks.uniform\\_walk](#) (pos, grid, step\_size=None)
- def [skdiscovery.utilities.random\\_walks.gaussian\\_walk](#) (pos, grid, step\_size=None)
- def [skdiscovery.utilities.random\\_walks.keep\\_in\\_bound](#) (pos, grid)

## 7.57 utilities/spherical\_voronoi.py File Reference

### Namespaces

- [skdiscovery.utilities.spherical\\_voronoi](#)

## Functions

- def [skdiscovery.utilities.spherical\\_voronoi.sphericalToXYZ](#) (lat, lon, radius=1)
- def [skdiscovery.utilities.spherical\\_voronoi.xyzToSpherical](#) (x, y, z)
- def [skdiscovery.utilities.spherical\\_voronoi.find\\_match](#) (region\_index, region\_list)
- def [skdiscovery.utilities.spherical\\_voronoi.getVoronoiCollection](#) (data, lat\_name, lon\_name, bmap=None, v\_name=None, full\_sphere=False, max\_v=.3, min\_v=-0.3, cmap=matplotlib.cm.get\_cmap('jet'))

## 7.58 utilities/ssh\_reverse.py File Reference

### Classes

- class [skdiscovery.utilities.ssh\\_reverse.ReverseTunnel](#)

### Namespaces

- [skdiscovery.utilities.ssh\\_reverse](#)

## Functions

- def [skdiscovery.utilities.ssh\\_reverse.print\\_verbose](#) (s, verbose=False)
- def [skdiscovery.utilities.ssh\\_reverse.handler](#) (chan, host, port, verbose=False)
- def [skdiscovery.utilities.ssh\\_reverse.reverse\\_forward\\_tunnel](#) (server\_port, remote\_host, remote\_port, transport, check=30, verbose=False)

## 7.59 utilities/trendTools.py File Reference

### Namespaces

- [skdiscovery.utilities.trendTools](#)

## Functions

- def [skdiscovery.utilities.trendTools.getTrend](#) (xdata)
- def [skdiscovery.utilities.trendTools.sinuFits](#) (xdata, fitN=2, rmve=1)
- def [skdiscovery.utilities.trendTools.interpNaN](#) (data)
- def [skdiscovery.utilities.trendTools.medianFilter](#) (data, window, interpolate=True)

## 7.60 utilities/variantdbscan.py File Reference

### Classes

- class [skdiscovery.utilities.VariantDBScan](#)

### Namespaces

- [skdiscovery.utilities.variantdbscan](#)

## 7.61 visualization/multi\_ca\_plot.py File Reference

### Namespaces

- [skdiscovery.visualization.multi\\_ca\\_plot](#)

### Functions

- def [skdiscovery.visualization.multiCaPlot](#) (pipeline, mogiFlag=False, offset=.15, direction='H', pca\_comp=0, scaleFactor=2.5, map\_res='i')

## 7.62 visualization/multi\_dist.py File Reference

### Namespaces

- [skdiscovery.visualization.multi\\_dist](#)

### Functions

- def [skdiscovery.visualization.calc\\_distance\\_map](#) (pipeline, ap\_name, ca\_name, ca\_type, plotFlag=True, hist←  
idx=False, fontsize=10)

### Variables

- [skdiscovery.visualization.font](#)

# Index

## `__call__`

`skdiscovery::framework::param::AutoList`, [53](#)  
`skdiscovery::framework::param::AutoListCycle`, [56](#)  
`skdiscovery::framework::param::AutoListPermute`, [59](#)  
`skdiscovery::framework::param::AutoListRemove`, [62](#)  
`skdiscovery::framework::param::AutoListSubset`, [65](#)  
`skdiscovery::framework::param::AutoParam`, [67](#)  
`skdiscovery::framework::param::AutoParamList`, [69](#)  
`skdiscovery::framework::param::AutoParamList↔  
Cycle`, [71](#)  
`skdiscovery::framework::param::AutoParamMinMax`,  
[73](#)  
`skdiscovery::framework::param::AutoParamMin↔  
MaxExtreme`, [75](#)

## `__del__`

`skdiscovery::framework::discoverypipeline::Discovery↔  
Pipeline`, [91](#)  
`skdiscovery::utilities::ssh_reverse::ReverseTunnel`,  
[135](#)

## `__getitem__`

`skdiscovery::framework::param::AutoList`, [53](#)  
`skdiscovery::framework::param::AutoListCycle`, [56](#)  
`skdiscovery::framework::param::AutoListPermute`, [59](#)  
`skdiscovery::framework::param::AutoListRemove`, [62](#)  
`skdiscovery::framework::param::AutoListSubset`, [65](#)

## `__init__`

`skdiscovery::framework::base::PipelineItem`, [127](#)  
`skdiscovery::framework::discoverypipeline::Discovery↔  
Pipeline`, [90](#)  
`skdiscovery::framework::param::AutoList`, [53](#)  
`skdiscovery::framework::param::AutoListCycle`, [56](#)  
`skdiscovery::framework::param::AutoListRemove`, [61](#)  
`skdiscovery::framework::param::AutoParam`, [67](#)  
`skdiscovery::framework::param::AutoParamList`, [69](#)  
`skdiscovery::framework::param::AutoParamList↔  
Cycle`, [71](#)  
`skdiscovery::framework::param::AutoParamMinMax`,  
[72](#)  
`skdiscovery::framework::param::AutoParamMin↔  
MaxExtreme`, [74](#)  
`skdiscovery::framework::stagecontainers::Stage↔  
Container`, [142](#)  
`skdiscovery::framework::stagecontainers::Stage↔  
ContainerAlternative`, [145](#)  
`skdiscovery::framework::stagecontainers::Stage↔`

`ContainerIncrementalAdd`, [148](#)

`skdiscovery::generic::accumulators::gpshplotter::G↔  
PSHPlotter`, [100](#)  
`skdiscovery::generic::accumulators::hcluster::H↔  
Cluster`, [103](#)  
`skdiscovery::series::accumulators::plotter::Plotter`,  
[129](#)  
`skdiscovery::series::analysis::correlate::Correlate`, [83](#)  
`skdiscovery::series::analysis::gca::General_↔  
Component_Analysis`, [96](#)  
`skdiscovery::series::analysis::mogi::Mogi_Inversion`,  
[119](#)  
`skdiscovery::series::filters::dataremove::Data↔  
Remover`, [88](#)  
`skdiscovery::series::filters::hyperbolictan::HTanFilter`,  
[106](#)  
`skdiscovery::series::filters::kalman::KalmanFilter`,  
[110](#)  
`skdiscovery::series::filters::lowpass::LowPassFilter`,  
[113](#)  
`skdiscovery::series::filters::median::MedianFilter`,  
[116](#)  
`skdiscovery::series::filters::offset_detrend::Offset↔  
Detrend`, [123](#)  
`skdiscovery::series::filters::trend::TrendFilter`, [154](#)  
`skdiscovery::table::accumulators::plotter::Plotter`, [131](#)  
`skdiscovery::table::analysis::correlate::Correlate`, [82](#)  
`skdiscovery::table::analysis::dbscan::DBScan`, [89](#)  
`skdiscovery::table::analysis::gca::General_Component↔  
_Analysis`, [95](#)  
`skdiscovery::table::analysis::midas::MIDAS`, [117](#)  
`skdiscovery::table::analysis::mogi::Mogi_Inversion`,  
[121](#)  
`skdiscovery::table::analysis::outlier::Outlier`, [126](#)  
`skdiscovery::table::analysis::vdbscan::VDBScan`, [156](#)  
`skdiscovery::table::filters::antenna_offset::Antenna↔  
Offset`, [51](#)  
`skdiscovery::table::filters::calibrate_grace::Calibrate↔  
GRACE`, [76](#)  
`skdiscovery::table::filters::combine_columns::↔  
CombineColumns`, [80](#)  
`skdiscovery::table::filters::dataremove::Data↔  
Remover`, [86](#)  
`skdiscovery::table::filters::geolocation::GeoLocation↔  
Filter`, [97](#)

- skdiscovery::table::filters::hyperbolictan::HTanFilter, 105
- skdiscovery::table::filters::kalman::KalmanFilter, 109
- skdiscovery::table::filters::lowpass::LowPassFilter, 112
- skdiscovery::table::filters::median::MedianFilter, 114
- skdiscovery::table::filters::offset\_detrend::Offset↵  
Detrend, 124
- skdiscovery::table::filters::propagate\_nans::↵  
PropagateNaNs, 132
- skdiscovery::table::filters::snow\_removal::Snow↵  
Remover, 139
- skdiscovery::table::filters::table\_filter::TableFilter, 150
- skdiscovery::table::filters::trend::TrendFilter, 152
- skdiscovery::table::filters::weighted\_average::↵  
WeightedAverage, 158
- skdiscovery::table::fusion::grace::GraceFusion, 101
- skdiscovery::table::fusion::snow::SnowFusion, 137
- skdiscovery::table::generators::catalog\_generator::↵  
CatalogGenerator, 78
- skdiscovery::table::generators::data\_generator::↵  
DataGenerator, 85
- skdiscovery::utilities::ssh\_reverse::ReverseTunnel, 135
- skdiscovery::utilities::variantdbscan::VariantDBScan, 155
- \_\_len\_\_
  - skdiscovery::framework::param::AutoList, 54
  - skdiscovery::framework::param::AutoListCycle, 57
  - skdiscovery::framework::param::AutoListPermute, 59
  - skdiscovery::framework::param::AutoListRemove, 62
  - skdiscovery::framework::param::AutoListSubset, 65
- \_\_setitem\_\_
  - skdiscovery::framework::param::AutoList, 54
  - skdiscovery::framework::param::AutoListCycle, 57
  - skdiscovery::framework::param::AutoListPermute, 59
  - skdiscovery::framework::param::AutoListRemove, 62
  - skdiscovery::framework::param::AutoListSubset, 65
- \_\_str\_\_
  - skdiscovery::framework::base::PipelineItem, 128
  - skdiscovery::framework::discoverypipeline::Discovery↵  
Pipeline, 91
  - skdiscovery::framework::param::AutoList, 54
  - skdiscovery::framework::param::AutoListCycle, 57
  - skdiscovery::framework::param::AutoListPermute, 60
  - skdiscovery::framework::param::AutoListRemove, 63
  - skdiscovery::framework::param::AutoListSubset, 66
  - skdiscovery::framework::param::AutoParam, 68
  - skdiscovery::framework::param::AutoParamList, 69
  - skdiscovery::framework::param::AutoParamList↵  
Cycle, 71
  - skdiscovery::framework::param::AutoParamMinMax, 73
  - skdiscovery::framework::param::AutoParamMin↵  
MaxExtreme, 75
  - skdiscovery::table::analysis::midas::MIDAS, 117
  - skdiscovery::table::filters::calibrate\_grace::Calibrate↵  
GRACE, 76
  - skdiscovery::table::filters::combine\_columns::↵  
CombineColumns, 80
  - skdiscovery::table::filters::geolocation::GeoLocation↵  
Filter, 98
  - skdiscovery::table::filters::propagate\_nans::↵  
PropagateNaNs, 133
  - skdiscovery::table::filters::stabilization::Stabilization↵  
Filter, 141
  - skdiscovery::table::filters::table\_filter::TableFilter, 151
  - skdiscovery::table::filters::weighted\_average::↵  
WeightedAverage, 158
  - skdiscovery::table::fusion::grace::GraceFusion, 102
  - skdiscovery::table::fusion::snow::SnowFusion, 137
- abs\_mag
  - skdiscovery::utilities::astro\_tools, 30
- AlgoParam, 11
- amazon\_list
  - skdiscovery::utilities::amazon\_control, 27
- angular\_separation
  - skdiscovery::utilities::astro\_tools, 30
- app\_mag
  - skdiscovery::utilities::astro\_tools, 30
- aws\_access\_key
  - skdiscovery::utilities::amazon\_control, 27
- aws\_key\_name
  - skdiscovery::utilities::amazon\_control, 27
- aws\_region
  - skdiscovery::utilities::amazon\_control, 27
- aws\_secret
  - skdiscovery::utilities::amazon\_control, 27
- aws\_security\_group
  - skdiscovery::utilities::amazon\_control, 27
- calc\_distance\_map
  - skdiscovery::visualization::multi\_dist, 49
- cdf\_dlf
  - skdiscovery::utilities::astro\_tools, 30
- changeButtonState
  - skdiscovery::utilities::amazon\_gui, 28
- checkValidValues
  - skdiscovery::utilities::amazon\_gui, 28
- clearAmazonList
  - skdiscovery::utilities::amazon\_control, 24
- close
  - skdiscovery::utilities::amazon\_control, 24
- closeDispyScheduler
  - skdiscovery::utilities::amazon\_control, 24
- closed\_pipe
  - skdiscovery::utilities::pbo\_tools, 39



- constant\_open\_pipe
  - skdiscovery::utilities::pbo\_tools, [39](#)
- create\_reverse\_tunnel
  - skdiscovery::utilities::ssh\_reverse::ReverseTunnel, [135](#)
- createTunnels
  - skdiscovery::utilities::amazon\_control, [25](#)
- datetimeToNumber
  - skdiscovery::utilities::pbo\_tools, [40](#)
- dirEigenvectors
  - skdiscovery::utilities::pbo\_tools, [40](#)
- disable\_list
  - skdiscovery::utilities::amazon\_gui, [29](#)
- dlf
  - skdiscovery::utilities::astro\_tools, [31](#)
- drawGUI
  - skdiscovery::utilities::amazon\_gui, [29](#)
- ec2\_client
  - skdiscovery::utilities::amazon\_control, [27](#)
- ec2\_res
  - skdiscovery::utilities::amazon\_control, [27](#)
- FOGM
  - skdiscovery::utilities::kalman\_smoother, [36](#)
- find\_match
  - skdiscovery::utilities::spherical\_voronoi, [43](#)
- finite\_sphere
  - skdiscovery::utilities::pbo\_tools, [40](#)
- FitFOGMPParameters
  - skdiscovery::utilities::kalman\_smoother, [36](#)
- FitPCA
  - skdiscovery::series::analysis::mogi::Mogi\_Inversion, [119](#)
  - skdiscovery::table::analysis::mogi::Mogi\_Inversion, [121](#)
- FitTimeSeries
  - skdiscovery::series::analysis::mogi::Mogi\_Inversion, [119](#)
  - skdiscovery::table::analysis::mogi::Mogi\_Inversion, [122](#)
- font
  - skdiscovery::visualization::multi\_dist, [49](#)
- framework/base.py, [161](#)
- framework/discoverypipeline.py, [161](#)
- framework/param.py, [161](#)
- framework/stagecontainers.py, [162](#)
- gaussian\_walk
  - skdiscovery::utilities::random\_walks, [42](#)
- generateInfo
  - skdiscovery::utilities::amazon\_control, [25](#)
- generic/accumulators/data.py, [162](#)
- generic/accumulators/gpshplotter.py, [162](#)
- generic/accumulators/hcluster.py, [163](#)
- getConfig
  - skdiscovery::utilities::config, [35](#)
- getDispyPassword
  - skdiscovery::utilities::config, [35](#)
- getHostName
  - skdiscovery::utilities::config, [35](#)
- getMetadata
  - skdiscovery::framework::base::PipelineItem, [128](#)
  - skdiscovery::framework::discoverypipeline::DiscoveryPipeline, [91](#)
  - skdiscovery::framework::stagecontainers::StageContainer, [143](#)
  - skdiscovery::framework::stagecontainers::StageContainerAlternative, [145](#)
  - skdiscovery::framework::stagecontainers::StageContainerIncrementalAdd, [148](#)
  - skdiscovery::table::analysis::midas::MIDAS, [117](#)
  - skdiscovery::table::filters::calibrate\_grace::CalibrateGRACE, [77](#)
  - skdiscovery::table::filters::combine\_columns::CombineColumns, [81](#)
  - skdiscovery::table::filters::geolocation::GeoLocationFilter, [98](#)
  - skdiscovery::table::filters::propagate\_nans::PropagateNaNs, [133](#)
  - skdiscovery::table::filters::stabilization::StabilizationFilter, [141](#)
  - skdiscovery::table::filters::table\_filter::TableFilter, [151](#)
  - skdiscovery::table::filters::weighted\_average::WeightedAverage, [158](#)
  - skdiscovery::table::fusion::grace::GraceFusion, [102](#)
  - skdiscovery::table::fusion::snow::SnowFusion, [138](#)
- getMetadataHistory
  - skdiscovery::framework::discoverypipeline::DiscoveryPipeline, [91](#)
- getMetadataNestedGraph
  - skdiscovery::framework::discoverypipeline::DiscoveryPipeline, [91](#)
  - skdiscovery::framework::stagecontainers::StageContainer, [143](#)
  - skdiscovery::framework::stagecontainers::StageContainerAlternative, [145](#)
  - skdiscovery::framework::stagecontainers::StageContainerIncrementalAdd, [148](#)
- getMetadataNestedTypes
  - skdiscovery::framework::discoverypipeline::DiscoveryPipeline, [92](#)
  - skdiscovery::framework::stagecontainers::StageContainer, [143](#)
  - skdiscovery::framework::stagecontainers::StageContainerAlternative, [146](#)
  - skdiscovery::framework::stagecontainers::StageContainerIncrementalAdd, [148](#)

- getMetadataType
  - skdiscovery::framework::stagecontainers::Stage↔ Container, 143
  - skdiscovery::framework::stagecontainers::Stage↔ ContainerAlternative, 146
  - skdiscovery::framework::stagecontainers::Stage↔ ContainerIncrementalAdd, 149
- getObjects
  - skdiscovery::framework::stagecontainers::Stage↔ Container, 143
  - skdiscovery::framework::stagecontainers::Stage↔ ContainerAlternative, 146
  - skdiscovery::framework::stagecontainers::Stage↔ ContainerIncrementalAdd, 149
- getResults
  - skdiscovery::framework::discoverypipeline::Discovery↔ Pipeline, 92
- getTrend
  - skdiscovery::utilities::trendTools, 47
- getVoronoiCollection
  - skdiscovery::utilities::spherical\_voronoi, 44
- handler
  - skdiscovery::utilities::ssh\_reverse, 46
- init
  - skdiscovery::utilities::amazon\_control, 25
  - skdiscovery::utilities::amazon\_gui, 29
- interpNaN
  - skdiscovery::utilities::trendTools, 47
- inv\_cdf\_dlf
  - skdiscovery::utilities::astro\_tools, 31
- inverse\_nfw\_cumulative
  - skdiscovery::table::generators::catalog\_generator::↔ CatalogGenerator, 79
- IterativeGridSearch
  - skdiscovery::utilities::kalman\_smoother, 37
- KalmanFilter
  - skdiscovery::utilities::kalman\_smoother, 37
- KalmanSmoother
  - skdiscovery::utilities::kalman\_smoother, 38
- keep\_in\_bound
  - skdiscovery::utilities::random\_walks, 42
- key\_value\_list
  - skdiscovery::utilities::amazon\_gui, 29
- If
  - skdiscovery::utilities::astro\_tools, 32
- medianFilter
  - skdiscovery::utilities::trendTools, 47
- mogi
  - skdiscovery::utilities::pbo\_tools, 40
- MogiVectors
  - skdiscovery::series::analysis::mogi, 14
  - skdiscovery::table::analysis::mogi, 18
- move\_point
  - skdiscovery::utilities::astro\_tools, 32
- multiCaPlot
  - skdiscovery::visualization::multi\_ca\_plot, 48
- nfw
  - skdiscovery::utilities::astro\_tools, 33
- nfw\_cumulative
  - skdiscovery::table::generators::catalog\_generator::↔ CatalogGenerator, 79
- output
  - skdiscovery::table::generators::catalog\_generator::↔ CatalogGenerator, 79
  - skdiscovery::table::generators::data\_generator::↔ DataGenerator, 86
- pem\_file
  - skdiscovery::utilities::amazon\_control, 27
- perturb
  - skdiscovery::framework::discoverypipeline::Discovery↔ Pipeline, 92
  - skdiscovery::framework::param::AutoList, 54
  - skdiscovery::framework::param::AutoListCycle, 57
  - skdiscovery::framework::param::AutoListPermute, 60
  - skdiscovery::framework::param::AutoListRemove, 63
  - skdiscovery::framework::param::AutoListSubset, 66
  - skdiscovery::framework::param::AutoParam, 68
  - skdiscovery::framework::param::AutoParamList, 70
  - skdiscovery::framework::param::AutoParamList↔ Cycle, 71
  - skdiscovery::framework::param::AutoParamMinMax, 73
  - skdiscovery::framework::param::AutoParamMin↔ MaxExtreme, 75
  - skdiscovery::framework::stagecontainers::Stage↔ Container, 144
  - skdiscovery::framework::stagecontainers::Stage↔ ContainerAlternative, 146
  - skdiscovery::framework::stagecontainers::Stage↔ ContainerIncrementalAdd, 149
- perturbData
  - skdiscovery::framework::discoverypipeline::Discovery↔ Pipeline, 92
- perturbParams
  - skdiscovery::framework::base::PipelineItem, 128
  - skdiscovery::table::analysis::midas::MIDAS, 118
  - skdiscovery::table::filters::calibrate\_grace::Calibrate↔ GRACE, 77
  - skdiscovery::table::filters::combine\_columns::↔ CombineColumns, 81
  - skdiscovery::table::filters::geolocation::GeoLocation↔ Filter, 98

- skdiscovery::table::filters::propagate\_nans::↵  
PropagateNaNs, 133
- skdiscovery::table::filters::stabilization::Stabilization↵  
Filter, 141
- skdiscovery::table::filters::table\_filter::TableFilter, 151
- skdiscovery::table::filters::weighted\_average::↵  
WeightedAverage, 158
- skdiscovery::table::fusion::grace::GraceFusion, 102
- skdiscovery::table::fusion::snow::SnowFusion, 138
- plotPipelineInstance
  - skdiscovery::framework::discoverypipeline::Discovery↵  
Pipeline, 93
- plotPipelineStructure
  - skdiscovery::framework::discoverypipeline::Discovery↵  
Pipeline, 93
- popen
  - skdiscovery::utilities::amazon\_control, 27
- print\_verbose
  - skdiscovery::utilities::ssh\_reverse, 46
- process
  - skdiscovery::framework::base::PipelineItem, 128
  - skdiscovery::generic::accumulators::data::Data↵  
Accumulator, 84
  - skdiscovery::generic::accumulators::gpsplotter::G↵  
PSHPlotter, 100
  - skdiscovery::generic::accumulators::hcluster::H↵  
Cluster, 104
  - skdiscovery::series::accumulators::plotter::Plotter,  
130
  - skdiscovery::series::analysis::correlate::Correlate, 84
  - skdiscovery::series::analysis::gca::General\_↵  
Component\_Analysis, 96
  - skdiscovery::series::analysis::mogi::Mogi\_Inversion,  
120
  - skdiscovery::series::filters::dataremover::Data↵  
Remover, 88
  - skdiscovery::series::filters::hyperbolictan::HTanFilter,  
107
  - skdiscovery::series::filters::interpolate::Interpolate↵  
Filter, 108
  - skdiscovery::series::filters::kalman::KalmanFilter,  
111
  - skdiscovery::series::filters::lowpass::LowPassFilter,  
113
  - skdiscovery::series::filters::median::MedianFilter,  
116
  - skdiscovery::series::filters::offset\_detrend::Offset↵  
Detrend, 123
  - skdiscovery::series::filters::trend::TrendFilter, 154
  - skdiscovery::table::accumulators::plotter::Plotter, 131
  - skdiscovery::table::analysis::correlate::Correlate, 82
  - skdiscovery::table::analysis::dbscan::DBScan, 89
  - skdiscovery::table::analysis::gca::General\_Component↵  
\_Analysis, 95
  - skdiscovery::table::analysis::midas::MIDAS, 118
  - skdiscovery::table::analysis::mogi::Mogi\_Inversion,  
122
  - skdiscovery::table::analysis::outlier::Outlier, 126
  - skdiscovery::table::analysis::skew::Skew, 136
  - skdiscovery::table::analysis::vdbscan::VDBScan, 157
  - skdiscovery::table::filters::antenna\_offset::Antenna↵  
Offset, 52
  - skdiscovery::table::filters::calibrate\_grace::Calibrate↵  
GRACE, 77
  - skdiscovery::table::filters::combine\_columns::↵  
CombineColumns, 81
  - skdiscovery::table::filters::dataremover::Data↵  
Remover, 87
  - skdiscovery::table::filters::geolocation::GeoLocation↵  
Filter, 98
  - skdiscovery::table::filters::hyperbolictan::HTanFilter,  
105
  - skdiscovery::table::filters::interpolate::Interpolate↵  
Filter, 107
  - skdiscovery::table::filters::kalman::KalmanFilter, 110
  - skdiscovery::table::filters::lowpass::LowPassFilter,  
112
  - skdiscovery::table::filters::median::MedianFilter, 115
  - skdiscovery::table::filters::offset\_detrend::Offset↵  
Detrend, 125
  - skdiscovery::table::filters::propagate\_nans::↵  
PropagateNaNs, 133
  - skdiscovery::table::filters::snow\_remover::Snow↵  
Remover, 140
  - skdiscovery::table::filters::stabilization::Stabilization↵  
Filter, 141
  - skdiscovery::table::filters::table\_filter::TableFilter, 151
  - skdiscovery::table::filters::trend::TrendFilter, 153
  - skdiscovery::table::filters::weighted\_average::↵  
WeightedAverage, 159
  - skdiscovery::table::fusion::grace::GraceFusion, 102
  - skdiscovery::table::fusion::snow::SnowFusion, 138
  - reset
    - skdiscovery::framework::discoverypipeline::Discovery↵  
Pipeline, 93
    - skdiscovery::framework::param::AutoList, 54
    - skdiscovery::framework::param::AutoListCycle, 57
    - skdiscovery::framework::param::AutoListPermute, 60
    - skdiscovery::framework::param::AutoListRemove, 63
    - skdiscovery::framework::param::AutoListSubset, 66
    - skdiscovery::framework::param::AutoParam, 68
    - skdiscovery::framework::param::AutoParamList, 70
    - skdiscovery::framework::param::AutoParamList↵  
Cycle, 72
    - skdiscovery::framework::param::AutoParamMinMax,  
73

- skdiscovery::framework::param::AutoParamMin↔  
MaxExtreme, 75
- skdiscovery::framework::stagecontainers::Stage↔  
Container, 144
- skdiscovery::framework::stagecontainers::Stage↔  
ContainerAlternative, 147
- skdiscovery::framework::stagecontainers::Stage↔  
ContainerIncrementalAdd, 149
- skdiscovery::utilities::amazon\_control, 25
- resetInstances
  - skdiscovery::utilities::amazon\_control, 26
- resetParams
  - skdiscovery::framework::base::PipelineItem, 128
  - skdiscovery::table::analysis::midas::MIDAS, 118
  - skdiscovery::table::filters::calibrate\_grace::Calibrate↔  
GRACE, 77
  - skdiscovery::table::filters::combine\_columns::↔  
CombineColumns, 81
  - skdiscovery::table::filters::geolocation::GeoLocation↔  
Filter, 99
  - skdiscovery::table::filters::propagate\_nans::↔  
PropagateNaNs, 134
  - skdiscovery::table::filters::stabilization::Stabilization↔  
Filter, 141
  - skdiscovery::table::filters::table\_filter::TableFilter, 152
  - skdiscovery::table::filters::weighted\_average::↔  
WeightedAverage, 159
  - skdiscovery::table::fusion::grace::GraceFusion, 102
  - skdiscovery::table::fusion::snow::SnowFusion, 138
- resultIter
  - skdiscovery::framework::discoverypipeline::Discovery↔  
Pipeline, 93
- reverse\_forward\_tunnel
  - skdiscovery::utilities::ssh\_reverse, 46
- rising\_open\_pipe
  - skdiscovery::utilities::pbo\_tools, 41
- run
  - skdiscovery::framework::discoverypipeline::Discovery↔  
Pipeline, 93
  - skdiscovery::framework::stagecontainers::Stage↔  
Container, 144
  - skdiscovery::framework::stagecontainers::Stage↔  
ContainerAlternative, 147
  - skdiscovery::framework::stagecontainers::Stage↔  
ContainerIncrementalAdd, 149
  - skdiscovery::utilities::variantdbscan::VariantDBScan,  
155
- scheduler
  - skdiscovery::utilities::amazon\_control, 28
- series/accumulators/plotter.py, 163
- series/analysis/correlate.py, 163
- series/analysis/gca.py, 164
- series/analysis/mogi.py, 164
- series/filters/dataremover.py, 165
- series/filters/hyperbolictan.py, 166
- series/filters/interpolate.py, 166
- series/filters/kalman.py, 167
- series/filters/lowpass.py, 167
- series/filters/median.py, 168
- series/filters/offset\_detrend.py, 168
- series/filters/trend.py, 169
- setNumInstances
  - skdiscovery::utilities::amazon\_control, 26
- sill
  - skdiscovery::utilities::pbo\_tools, 41
- sinuFits
  - skdiscovery::utilities::trendTools, 47
- skdiscovery, 11
- skdiscovery.DiscoveryPipeline, 90
- skdiscovery.framework, 11
- skdiscovery.framework.base, 12
- skdiscovery.framework.discoverypipeline, 12
- skdiscovery.framework.param, 12
- skdiscovery.framework.param.AutoList, 52
- skdiscovery.framework.param.AutoListCycle, 55
- skdiscovery.framework.param.AutoListPermute, 58
- skdiscovery.framework.param.AutoListRemove, 61
- skdiscovery.framework.param.AutoListSubset, 64
- skdiscovery.framework.param.AutoParam, 67
- skdiscovery.framework.param.AutoParamList, 68
- skdiscovery.framework.param.AutoParamListCycle, 70
- skdiscovery.framework.param.AutoParamMinMax, 72
- skdiscovery.framework.param.AutoParamMinMax↔  
Extreme, 74
- skdiscovery.framework.PipelineItem, 126
- skdiscovery.framework.StageContainer, 142
- skdiscovery.framework.StageContainerAlternative, 144
- skdiscovery.framework.StageContainerIncrementalAdd,  
147
- skdiscovery.framework.stagecontainers, 12
- skdiscovery.generic, 12
- skdiscovery.generic.accumulators, 13
- skdiscovery.generic.accumulators.data, 13
- skdiscovery.generic.accumulators.DataAccumulator, 84
- skdiscovery.generic.accumulators.GPSHPlotter, 99
- skdiscovery.generic.accumulators.gpshplotter, 13
- skdiscovery.generic.accumulators.HCluster, 103
- skdiscovery.generic.accumulators.hcluster, 13
- skdiscovery.series, 13
- skdiscovery.series.accumulators, 13
- skdiscovery.series.accumulators.Plotter, 129
- skdiscovery.series.accumulators.plotter, 14
- skdiscovery.series.analysis, 14
- skdiscovery.series.analysis.Correlate, 83
- skdiscovery.series.analysis.correlate, 14
- skdiscovery.series.analysis.gca, 14

- skdiscovery.series.analysis.General\_Component\_Analysis, 96
- skdiscovery.series.analysis.mogi, 14
- skdiscovery.series.analysis.Mogi\_Inversion, 118
- skdiscovery.series.filters, 15
- skdiscovery.series.filters.DataRemover, 87
- skdiscovery.series.filters.dataremover, 15
- skdiscovery.series.filters.HTanFilter, 106
- skdiscovery.series.filters.hyperbolictan, 15
- skdiscovery.series.filters.interpolate, 15
- skdiscovery.series.filters.InterpolateFilter, 108
- skdiscovery.series.filters.kalman, 16
- skdiscovery.series.filters.KalmanFilter, 110
- skdiscovery.series.filters.LowPassFilter, 113
- skdiscovery.series.filters.lowpass, 16
- skdiscovery.series.filters.median, 16
- skdiscovery.series.filters.MedianFilter, 115
- skdiscovery.series.filters.offset\_detrend, 16
- skdiscovery.series.filters.OffsetDetrend, 122
- skdiscovery.series.filters.trend, 16
- skdiscovery.series.filters.TrendFilter, 153
- skdiscovery.table, 16
- skdiscovery.table.accumulators, 17
- skdiscovery.table.accumulators.Plotter, 130
- skdiscovery.table.accumulators.plotter, 17
- skdiscovery.table.analysis, 17
- skdiscovery.table.analysis.Correlate, 82
- skdiscovery.table.analysis.correlate, 17
- skdiscovery.table.analysis.dbscan, 17
- skdiscovery.table.analysis.dbscan.DBScan, 89
- skdiscovery.table.analysis.gca, 18
- skdiscovery.table.analysis.General\_Component\_Analysis, 94
- skdiscovery.table.analysis.midas, 18
- skdiscovery.table.analysis.midas.MIDAS, 116
- skdiscovery.table.analysis.mogi, 18
- skdiscovery.table.analysis.Mogi\_Inversion, 120
- skdiscovery.table.analysis.outlier, 19
- skdiscovery.table.analysis.outlier.Outlier, 125
- skdiscovery.table.analysis.skew, 19
- skdiscovery.table.analysis.skew.Skew, 136
- skdiscovery.table.analysis.VDBScan, 156
- skdiscovery.table.analysis.vdbscan, 19
- skdiscovery.table.filters, 19
- skdiscovery.table.filters.antenna\_offset, 20
- skdiscovery.table.filters.antenna\_offset.AntennaOffset, 51
- skdiscovery.table.filters.calibrate\_CalibrateGRACE, 76
- skdiscovery.table.filters.calibrate\_grace, 20
- skdiscovery.table.filters.combine\_columns, 20
- skdiscovery.table.filters.combine\_columns.CombineColumns, 80
- skdiscovery.table.filters.DataRemover, 86
- skdiscovery.table.filters.dataremover, 20
- skdiscovery.table.filters.geolocation, 20
- skdiscovery.table.filters.geolocation.GeoLocationFilter, 97
- skdiscovery.table.filters.HTanFilter, 104
- skdiscovery.table.filters.hyperbolictan, 20
- skdiscovery.table.filters.interpolate, 21
- skdiscovery.table.filters.InterpolateFilter, 107
- skdiscovery.table.filters.kalman, 21
- skdiscovery.table.filters.KalmanFilter, 109
- skdiscovery.table.filters.LowPassFilter, 111
- skdiscovery.table.filters.lowpass, 21
- skdiscovery.table.filters.median, 21
- skdiscovery.table.filters.MedianFilter, 114
- skdiscovery.table.filters.offset\_detrend, 21
- skdiscovery.table.filters.OffsetDetrend, 124
- skdiscovery.table.filters.propagate\_nans, 21
- skdiscovery.table.filters.propagate\_nans.PropagateNaNs, 132
- skdiscovery.table.filters.snow\_remove, 22
- skdiscovery.table.filters.SnowRemover, 139
- skdiscovery.table.filters.stabilization, 22
- skdiscovery.table.filters.stabilization.StabilizationFilter, 140
- skdiscovery.table.filters.table\_filter, 22
- skdiscovery.table.filters.table\_filter.TableFilter, 150
- skdiscovery.table.filters.trend, 22
- skdiscovery.table.filters.TrendFilter, 152
- skdiscovery.table.filters.weighted\_average, 22
- skdiscovery.table.filters.weighted\_average.WeightedAverage, 157
- skdiscovery.table.fusion, 22
- skdiscovery.table.fusion.grace, 23
- skdiscovery.table.fusion.GraceFusion, 101
- skdiscovery.table.fusion.snow, 23
- skdiscovery.table.fusion.SnowFusion, 136
- skdiscovery.table.generators, 23
- skdiscovery.table.generators.catalog\_generator, 23
- skdiscovery.table.generators.catalog\_generator.CatalogGenerator, 78
- skdiscovery.table.generators.data\_generator, 23
- skdiscovery.table.generators.data\_generator.DataGenerator, 85
- skdiscovery.utilities, 23
- skdiscovery.utilities.amazon\_control, 24
- skdiscovery.utilities.amazon\_gui, 28
- skdiscovery.utilities.astro\_tools, 30
- skdiscovery.utilities.config, 34
- skdiscovery.utilities.kalman\_smoother, 36
- skdiscovery.utilities.pbo\_tools, 39
- skdiscovery.utilities.random\_walks, 42
- skdiscovery.utilities.spherical\_voronoi, 43
- skdiscovery.utilities.ssh\_reverse, 45
- skdiscovery.utilities.ssh\_reverse.ReverseTunnel, 134
- skdiscovery.utilities.trendTools, 47
- skdiscovery.utilities.VariantDBScan, 154
- skdiscovery.utilities.variantdbscan, 48

skdiscovery.visualization, 48  
 skdiscovery.visualization.multi\_ca\_plot, 48  
 skdiscovery.visualization.multi\_dist, 49  
 skdiscovery::framework::base::PipelineItem  
   \_\_init\_\_, 127  
   \_\_str\_\_, 128  
   getMetadata, 128  
   perturbParams, 128  
   process, 128  
   resetParams, 128  
 skdiscovery::framework::discoverypipeline::Discovery←  
   Pipeline  
   \_\_del\_\_, 91  
   \_\_init\_\_, 90  
   \_\_str\_\_, 91  
   getMetadata, 91  
   getMetadataHistory, 91  
   getMetadataNestedGraph, 91  
   getMetadataNestedTypes, 92  
   getResults, 92  
   perturb, 92  
   perturbData, 92  
   plotPipelineInstance, 93  
   plotPipelineStructure, 93  
   reset, 93  
   resultIter, 93  
   run, 93  
 skdiscovery::framework::param::AutoList  
   \_\_call\_\_, 53  
   \_\_getitem\_\_, 53  
   \_\_init\_\_, 53  
   \_\_len\_\_, 54  
   \_\_setitem\_\_, 54  
   \_\_str\_\_, 54  
   perturb, 54  
   reset, 54  
   val, 55  
 skdiscovery::framework::param::AutoListCycle  
   \_\_call\_\_, 56  
   \_\_getitem\_\_, 56  
   \_\_init\_\_, 56  
   \_\_len\_\_, 57  
   \_\_setitem\_\_, 57  
   \_\_str\_\_, 57  
   perturb, 57  
   reset, 57  
   val, 58  
 skdiscovery::framework::param::AutoListPermute  
   \_\_call\_\_, 59  
   \_\_getitem\_\_, 59  
   \_\_len\_\_, 59  
   \_\_setitem\_\_, 59  
   \_\_str\_\_, 60  
   perturb, 60  
   reset, 60  
   val, 60  
 skdiscovery::framework::param::AutoListRemove  
   \_\_call\_\_, 62  
   \_\_getitem\_\_, 62  
   \_\_init\_\_, 61  
   \_\_len\_\_, 62  
   \_\_setitem\_\_, 62  
   \_\_str\_\_, 63  
   perturb, 63  
   reset, 63  
   val, 63  
 skdiscovery::framework::param::AutoListSubset  
   \_\_call\_\_, 65  
   \_\_getitem\_\_, 65  
   \_\_len\_\_, 65  
   \_\_setitem\_\_, 65  
   \_\_str\_\_, 66  
   perturb, 66  
   reset, 66  
   val, 66  
 skdiscovery::framework::param::AutoParam  
   \_\_call\_\_, 67  
   \_\_init\_\_, 67  
   \_\_str\_\_, 68  
   perturb, 68  
   reset, 68  
 skdiscovery::framework::param::AutoParamList  
   \_\_call\_\_, 69  
   \_\_init\_\_, 69  
   \_\_str\_\_, 69  
   perturb, 70  
   reset, 70  
 skdiscovery::framework::param::AutoParamListCycle  
   \_\_call\_\_, 71  
   \_\_init\_\_, 71  
   \_\_str\_\_, 71  
   perturb, 71  
   reset, 72  
 skdiscovery::framework::param::AutoParamMinMax  
   \_\_call\_\_, 73  
   \_\_init\_\_, 72  
   \_\_str\_\_, 73  
   perturb, 73  
   reset, 73  
 skdiscovery::framework::param::AutoParamMinMax←  
   Extreme  
   \_\_call\_\_, 75  
   \_\_init\_\_, 74  
   \_\_str\_\_, 75  
   perturb, 75  
   reset, 75  
 skdiscovery::framework::stagecontainers::StageContainer  
   \_\_init\_\_, 142



- getMetadata, 143
- getMetadataNestedGraph, 143
- getMetadataNestedTypes, 143
- getMetadataType, 143
- getObjects, 143
- perturb, 144
- reset, 144
- run, 144
- skdiscovery::framework::stagecontainers::StageContainer↔
  - Alternative
  - \_\_init\_\_, 145
  - getMetadata, 145
  - getMetadataNestedGraph, 145
  - getMetadataNestedTypes, 146
  - getMetadataType, 146
  - getObjects, 146
  - perturb, 146
  - reset, 147
  - run, 147
- skdiscovery::framework::stagecontainers::StageContainer↔
  - IncrementalAdd
  - \_\_init\_\_, 148
  - getMetadata, 148
  - getMetadataNestedGraph, 148
  - getMetadataNestedTypes, 148
  - getMetadataType, 149
  - getObjects, 149
  - perturb, 149
  - reset, 149
  - run, 149
- skdiscovery::generic::accumulators::data::DataAccumulator
  - process, 84
- skdiscovery::generic::accumulators::gpsplotter::GPSH↔
  - Plotter
  - \_\_init\_\_, 100
  - process, 100
- skdiscovery::generic::accumulators::hcluster::HCluster
  - \_\_init\_\_, 103
  - process, 104
- skdiscovery::series::accumulators::plotter::Plotter
  - \_\_init\_\_, 129
  - process, 130
- skdiscovery::series::analysis::correlate::Correlate
  - \_\_init\_\_, 83
  - process, 84
- skdiscovery::series::analysis::gca::General\_Component↔
  - \_Analysis
  - \_\_init\_\_, 96
  - process, 96
- skdiscovery::series::analysis::mogi
  - MogiVectors, 14
- skdiscovery::series::analysis::mogi::Mogi\_Inversion
  - \_\_init\_\_, 119
  - FitPCA, 119
  - FitTimeSeries, 119
  - process, 120
- skdiscovery::series::filters::datremover::DataRemover
  - \_\_init\_\_, 88
  - process, 88
- skdiscovery::series::filters::hyperbolictan::HTanFilter
  - \_\_init\_\_, 106
  - process, 107
- skdiscovery::series::filters::interpolate::InterpolateFilter
  - process, 108
- skdiscovery::series::filters::kalman::KalmanFilter
  - \_\_init\_\_, 110
  - process, 111
- skdiscovery::series::filters::lowpass::LowPassFilter
  - \_\_init\_\_, 113
  - process, 113
- skdiscovery::series::filters::median::MedianFilter
  - \_\_init\_\_, 116
  - process, 116
- skdiscovery::series::filters::offset\_detrend::OffsetDetrend
  - \_\_init\_\_, 123
  - process, 123
- skdiscovery::series::filters::trend::TrendFilter
  - \_\_init\_\_, 154
  - process, 154
- skdiscovery::table::accumulators::plotter::Plotter
  - \_\_init\_\_, 131
  - process, 131
- skdiscovery::table::analysis::correlate::Correlate
  - \_\_init\_\_, 82
  - process, 82
- skdiscovery::table::analysis::dbscan::DBScan
  - \_\_init\_\_, 89
  - process, 89
- skdiscovery::table::analysis::gca::General\_Component↔
  - Analysis
  - \_\_init\_\_, 95
  - process, 95
- skdiscovery::table::analysis::midas::MIDAS
  - \_\_init\_\_, 117
  - \_\_str\_\_, 117
  - getMetadata, 117
  - perturbParams, 118
  - process, 118
  - resetParams, 118
- skdiscovery::table::analysis::mogi
  - MogiVectors, 18
- skdiscovery::table::analysis::mogi::Mogi\_Inversion
  - \_\_init\_\_, 121
  - FitPCA, 121
  - FitTimeSeries, 122
  - process, 122
- skdiscovery::table::analysis::outlier::Outlier
  - \_\_init\_\_, 126

process, 126  
 skdiscovery::table::analysis::skew::Skew  
   process, 136  
 skdiscovery::table::analysis::vdbscan::VDBScan  
   \_\_init\_\_, 156  
   process, 157  
 skdiscovery::table::filters::antenna\_offset::AntennaOffset  
   \_\_init\_\_, 51  
   process, 52  
 skdiscovery::table::filters::calibrate\_grace::CalibrateGRACE  
   ACE  
   \_\_init\_\_, 76  
   \_\_str\_\_, 76  
   getMetadata, 77  
   perturbParams, 77  
   process, 77  
   resetParams, 77  
 skdiscovery::table::filters::combine\_columns::CombineColumns  
   \_\_init\_\_, 80  
   \_\_str\_\_, 80  
   getMetadata, 81  
   perturbParams, 81  
   process, 81  
   resetParams, 81  
 skdiscovery::table::filters::dataremove::DataRemover  
   \_\_init\_\_, 86  
   process, 87  
 skdiscovery::table::filters::geolocation::GeoLocationFilter  
   \_\_init\_\_, 97  
   \_\_str\_\_, 98  
   getMetadata, 98  
   perturbParams, 98  
   process, 98  
   resetParams, 99  
 skdiscovery::table::filters::hyperbolictan::HTanFilter  
   \_\_init\_\_, 105  
   process, 105  
 skdiscovery::table::filters::interpolate::InterpolateFilter  
   process, 107  
 skdiscovery::table::filters::kalman::KalmanFilter  
   \_\_init\_\_, 109  
   process, 110  
 skdiscovery::table::filters::lowpass::LowPassFilter  
   \_\_init\_\_, 112  
   process, 112  
 skdiscovery::table::filters::median::MedianFilter  
   \_\_init\_\_, 114  
   process, 115  
 skdiscovery::table::filters::offset\_detrend::OffsetDetrend  
   \_\_init\_\_, 124  
   process, 125  
 skdiscovery::table::filters::propagate\_nans::PropagateNaNs  
   \_\_init\_\_, 132  
   \_\_str\_\_, 133  
   getMetadata, 133  
   perturbParams, 133  
   process, 133  
   resetParams, 134  
 skdiscovery::table::filters::snow\_remove::SnowRemover  
   \_\_init\_\_, 139  
   process, 140  
 skdiscovery::table::filters::stabilization::StabilizationFilter  
   \_\_str\_\_, 141  
   getMetadata, 141  
   perturbParams, 141  
   process, 141  
   resetParams, 141  
 skdiscovery::table::filters::table\_filter::TableFilter  
   \_\_init\_\_, 150  
   \_\_str\_\_, 151  
   getMetadata, 151  
   perturbParams, 151  
   process, 151  
   resetParams, 152  
 skdiscovery::table::filters::trend::TrendFilter  
   \_\_init\_\_, 152  
   process, 153  
 skdiscovery::table::filters::weighted\_average::WeightedAverage  
   \_\_init\_\_, 158  
   \_\_str\_\_, 158  
   getMetadata, 158  
   perturbParams, 158  
   process, 159  
   resetParams, 159  
 skdiscovery::table::fusion::grace::GraceFusion  
   \_\_init\_\_, 101  
   \_\_str\_\_, 102  
   getMetadata, 102  
   perturbParams, 102  
   process, 102  
   resetParams, 102  
 skdiscovery::table::fusion::snow::SnowFusion  
   \_\_init\_\_, 137  
   \_\_str\_\_, 137  
   getMetadata, 138  
   perturbParams, 138  
   process, 138  
   resetParams, 138  
 skdiscovery::table::generators::catalog\_generator::CatalogGenerator  
   \_\_init\_\_, 78  
   inverse\_nfw\_cumulative, 79  
   nfw\_cumulative, 79  
   output, 79



skdiscovery::table::generators::data\_generator::DataGenerator  
     \_\_init\_\_, 85  
     output, 86  
 skdiscovery::utilities::amazon\_control  
     amazon\_list, 27  
     aws\_access\_key, 27  
     aws\_key\_name, 27  
     aws\_region, 27  
     aws\_secret, 27  
     aws\_security\_group, 27  
     clearAmazonList, 24  
     close, 24  
     closeDispyScheduler, 24  
     createTunnels, 25  
     ec2\_client, 27  
     ec2\_res, 27  
     generateInfo, 25  
     init, 25  
     pem\_file, 27  
     popen, 27  
     reset, 25  
     resetInstances, 26  
     scheduler, 28  
     setNumInstances, 26  
     startDispyNode, 26  
     startDispyScheduler, 26  
     updateStatus, 26  
 skdiscovery::utilities::amazon\_gui  
     changeButtonState, 28  
     checkValidValues, 28  
     disable\_list, 29  
     drawGUI, 29  
     init, 29  
     key\_value\_list, 29  
     widget\_dict, 29  
 skdiscovery::utilities::astro\_tools  
     abs\_mag, 30  
     angular\_separation, 30  
     app\_mag, 30  
     cdf\_dlf, 30  
     dlf, 31  
     inv\_cdf\_dlf, 31  
     lf, 32  
     move\_point, 32  
     nfw, 33  
     v\_to\_z, 34  
     z\_to\_v, 34  
 skdiscovery::utilities::config  
     getConfig, 35  
     getDispyPassword, 35  
     getHostName, 35  
     writeConfigValue, 35  
 skdiscovery::utilities::kalman\_smoother  
     FOGM, 36  
     FitFOGMPParameters, 36  
     IterativeGridSearch, 37  
     KalmanFilter, 37  
     KalmanSmoother, 38  
 skdiscovery::utilities::pbo\_tools  
     closed\_pipe, 39  
     constant\_open\_pipe, 39  
     datetimeToNumber, 40  
     dirEigenvectors, 40  
     finite\_sphere, 40  
     mogi, 40  
     rising\_open\_pipe, 41  
     sill, 41  
 skdiscovery::utilities::random\_walks  
     gaussian\_walk, 42  
     keep\_in\_bound, 42  
     uniform\_walk, 43  
 skdiscovery::utilities::spherical\_voronoi  
     find\_match, 43  
     getVoronoiCollection, 44  
     sphericalToXYZ, 44  
     xyzToSpherical, 45  
 skdiscovery::utilities::ssh\_reverse  
     handler, 46  
     print\_verbose, 46  
     reverse\_forward\_tunnel, 46  
 skdiscovery::utilities::ssh\_reverse::ReverseTunnel  
     \_\_del\_\_, 135  
     \_\_init\_\_, 135  
     create\_reverse\_tunnel, 135  
 skdiscovery::utilities::trendTools  
     getTrend, 47  
     interpNaN, 47  
     medianFilter, 47  
     sinuFits, 47  
 skdiscovery::utilities::variantdbscan::VariantDBScan  
     \_\_init\_\_, 155  
     run, 155  
 skdiscovery::visualization::multi\_ca\_plot  
     multiCaPlot, 48  
 skdiscovery::visualization::multi\_dist  
     calc\_distance\_map, 49  
     font, 49  
 sphericalToXYZ  
     skdiscovery::utilities::spherical\_voronoi, 44  
 startDispyNode  
     skdiscovery::utilities::amazon\_control, 26  
 startDispyScheduler  
     skdiscovery::utilities::amazon\_control, 26  
 table/accumulators/plotter.py, 163  
 table/analysis/correlate.py, 164  
 table/analysis/dbscan.py, 169

- table/analysis/gca.py, 164
- table/analysis/midas.py, 169
- table/analysis/mogi.py, 165
- table/analysis/outlier.py, 170
- table/analysis/skew.py, 170
- table/analysis/vdbscan.py, 170
- table/filters/antenna\_offset.py, 170
- table/filters/calibrate.py, 171
- table/filters/combine\_columns.py, 171
- table/filters/dataremover.py, 165
- table/filters/geolocation.py, 171
- table/filters/hyperbolictan.py, 166
- table/filters/interpolate.py, 166
- table/filters/kalman.py, 167
- table/filters/lowpass.py, 167
- table/filters/median.py, 168
- table/filters/offset\_detrend.py, 168
- table/filters/propagate\_nans.py, 171
- table/filters/snow\_remover.py, 172
- table/filters/stabilization.py, 172
- table/filters/table\_filter.py, 172
- table/filters/trend.py, 169
- table/filters/weighted\_average.py, 172
- table/fusion/grace.py, 173
- table/fusion/snow.py, 173
- table/generators/catalog\_generator.py, 173
- table/generators/data\_generator.py, 173
  
- uniform\_walk
  - skdiscovery::utilities::random\_walks, 43
- updateStatus
  - skdiscovery::utilities::amazon\_control, 26
- utilities/amazon\_control.py, 174
- utilities/amazon\_gui.py, 174
- utilities/astro\_tools.py, 175
- utilities/config.py, 175
- utilities/kalman\_smoother.py, 176
- utilities/pbo\_tools.py, 176
- utilities/random\_walks.py, 176
- utilities/spherical\_voronoi.py, 177
- utilities/ssh\_reverse.py, 177
- utilities/trendTools.py, 177
- utilities/variantdbscan.py, 178
  
- v\_to\_z
  - skdiscovery::utilities::astro\_tools, 34
- val
  - skdiscovery::framework::param::AutoList, 55
  - skdiscovery::framework::param::AutoListCycle, 58
  - skdiscovery::framework::param::AutoListPermute, 60
  - skdiscovery::framework::param::AutoListRemove, 63
  - skdiscovery::framework::param::AutoListSubset, 66
- visualization/multi\_ca\_plot.py, 178
- visualization/multi\_dist.py, 178
  
- widget\_dict
  - skdiscovery::utilities::amazon\_gui, 29
- writeConfigValue
  - skdiscovery::utilities::config, 35
  
- xyzToSpherical
  - skdiscovery::utilities::spherical\_voronoi, 45
  
- z\_to\_v
  - skdiscovery::utilities::astro\_tools, 34