Python Documentation

version

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Contents

Welcome to moseq2-pca's documentation!

moseq2-pca

moseq2_pca package

Subpackages

moseq2_pca.helpers package

Helpers - Data Module

`moseq2_pca.helpers.data.`**`get_pca_yaml_data`**`(pca_yaml)`

Reads PCA yaml file and returns metadata

Parameters: **pca_yaml (str)** (*path to pca.yaml*)

Returns: **use_fft (bool)** (*indicates whether to use FFT*) **clean_params (dict)** (*dict of image filtering parameters*) **mask_params (dict)** (*dict of mask parameters)*) **missing_data (bool)** (*indicates whether to use mask_params*)

`moseq2_pca.helpers.data.`**`load_pcs_for_cp`**`(pca_file_components, config_data)`

Load computed Principal Components for Model-free Changepoint Analysis.

Parameters:

- **pca_file_components (str)** (*path to pca h5 file to read PCs*)
- **config_data (dict)** (*config parameters*)

Returns: **pca_components (str)** (*path to pca components*) **changepoint_params (dict)** (*dict of relevant changepoint parameters*) **cluster (dask Cluster)** (*Dask Cluster object.*) **client (dask Client)** (*Dask Client Object*) **missing_data (bool)** (*Indicates whether to use mask_params*) **mask_params (dict)** (*Mask parameters to use when computing CPs*)

`moseq2_pca.helpers.data.`**`setup_cp_command`**`(input_dir, config_data, output_dir, output_file, output_directory=None)`

Helper function for changepoints_wrapper to perform data-path existence checks.

Parameters:

- **input_dir (int)** (*path to directory containing all h5+yaml files*)
- **config_data (dict)** (*dict of relevant PCA parameters (image filtering etc.)*)
- **output_dir (str)** (*path to directory to store PCA data*)
- **output_file (str)** (*pca model filename*)
- **output_directory (str)** (*alternative output_dir*)

Returns: **config_data (dict)** (*updated config_data dict with the proper paths*) **pca_file_components (str)** (*path to trained pca file*) **pca_file_scores (str)** (*path to pca_scores file*) **h5s (list)** (*list of relevant pca h5 files*) **yamls (list)** (*list of relevant pca metadata yaml files*) **save_file (str)** (*path to save changepoints*)

Helpers - Wrapper Module

`moseq2_pca.helpers.wrappers.`**`apply_pca_wrapper`**`(input_dir, config_data, output_dir, output_file, output_directory=None, gui=False)`

Wrapper function to obtain PCA Scores.

Parameters:

- **input_dir (int)** (*path to directory containing all h5+yaml files*)
- **config_data (dict)** (*dict of relevant PCA parameters (image filtering etc.)*)
- **output_dir (str)** (*path to directory to store PCA data*)
- **output_file (str)** (*pca model filename*)
- **output_directory (str)** (*alternative output_dir*)
- **gui (bool)** (*indicate GUI is running*)

Returns: **config_data (dict)**

Return type: updated config_data variable to write back in GUI API

`moseq2_pca.helpers.wrappers.`**`compute_changepoints_wrapper`**`(input_dir, config_data, output_dir, output_file, gui=False, output_directory=None)`

Wrapper function to compute model-free (PCA based) Changepoints.

Parameters:

- **input_dir (int)** (*path to directory containing all h5+yaml files*)
- **config_data (dict)** (*dict of relevant PCA parameters (image filtering etc.)*)
- **output_dir (str)** (*path to directory to store PCA data*)
- **output_file (str)** (*pca model filename*)
- **output_directory (str)** (*alternative output_dir*)
- **gui (bool)** (*indicate GUI is running*)

Returns: **config_data (dict)**

Return type: updated config_data variable to write back in GUI API

`moseq2_pca.helpers.wrappers.`**`train_pca_wrapper`**`(input_dir, config_data, output_dir, output_file, output_directory=None, gui=False)`

Wrapper function to train PCA.

Parameters:

- **input_dir (int)** (*path to directory containing all h5+yaml files*)
- **config_data (dict)** (*dict of relevant PCA parameters (image filtering etc.)*)
- **output_dir (str)** (*path to directory to store PCA data*)
- **output_file (str)** (*pca model filename*)
- **output_directory (str)** (*alternative output_dir*)
- **gui (bool)** (*indicate GUI is running*)

Returns: **config_data (dict)**

Return type: updated config_data variable to write back in GUI API

moseq2_pca.pca package

PCA - Utilties Module

`moseq2_pca.pca.util.`**`apply_pca_dask`**`(pca_components, h5s, yamls, use_fft, clean_params, save_file, chunk_size, mask_params, missing_data, client, fps=30, gui=False)`

"Apply" trained PCA on input frame data to obtain PCA Scores using Distributed Dask cluster.

Parameters:

- **pca_components (np.array)** (*array of computed Principal Components*)
- **h5s (list)** (*list of h5 files*)
- **yamls (list)** (*list of yaml files*)
- **use_fft (bool)** (*indicate whether to use 2D-FFT*)
- **clean_params (dict)** (*dictionary containing filtering options*)
- **save_file (str)** (*path to pca_scores filename to save*)
- **chunk_size (int)** (*size of chunks to process*)
- **mask_params (dict)** (*dictionary of masking parameters (if missing data)*)
- **missing_data (bool)** (*indicates whether to use mask arrays.*)
- **fps (int)** (*frames per second*)

Returns:

Return type: None

`moseq2_pca.pca.util.`**`apply_pca_local`**`(pca_components, h5s, yamls, use_fft, clean_params, save_file, chunk_size, mask_params, missing_data, fps=30)`

"Apply" trained PCA on input frame data to obtain PCA Scores using local cluster/platform.

Parameters:

- **pca_components (np.array)** (*array of computed Principal Components*)
- **h5s (list)** (*list of h5 files*)
- **yamls (list)** (*list of yaml files*)
- **use_fft (bool)** (*indicate whether to use 2D-FFT*)
- **clean_params (dict)** (*dictionary containing filtering options*)
- **save_file (str)** (*path to pca_scores filename to save*)
- **chunk_size (int)** (*size of chunks to process*)
- **mask_params (dict)** (*dictionary of masking parameters (if missing data)*)
- **missing_data (bool)** (*indicates whether to use mask arrays.*)
- **fps (int)** (*frames per second*)

Returns:

Return type: None

`moseq2_pca.pca.util.`**`get_changepoints_dask`**`(changepoint_params, pca_components, h5s, yamls, save_file, chunk_size, mask_params, missing_data, client, fps=30, pca_scores=None, progress_bar=False, gui=False)`

Computes model-free changepoints using PCs and PC Scores on distributed dask cluster.

Parameters:

- **changepoint_params (dict)** (*dict of changepoint parameters*)
- **pca_components (np.array)** (*computed principal components*)
- **h5s (list)** (*list of h5 files*)
- **yamls (list)** (*list of yaml files*)
- **save_file (str)** (*path to save changepoint files*)
- **chunk_size (int)** (*size of chunks to process in dask.*)
- **mask_params (dict)** (*dict of missing_data mask parameters.*)
- **missing_data (bool)** (*indicate whether to use mask_params*)
- **client (dask Client)** (*initialized Dask Client object*)
- **fps (int)** (*frames per second*)
- **pca_scores (np.array)** (*computed principal component scores*)
- **progress_bar (bool)** (*display progress bar*)
- **gui (bool)** (*indicate GUI use*)

Returns:

Return type: None

`moseq2_pca.pca.util.`**`mask_data`**`(original_data, mask, new_data)`

Create a mask subregion given a boolean mask if missing data flag is used.

Parameters:

- **original_data (3d np.ndarray)** (*input frames*)
- **mask (3d boolean np.ndarray)** (*mask array*)
- **new_data (3d np.ndarray)** (*frames to use*)

Returns: **output (3d np.ndarray)**

Return type: masked data array

`moseq2_pca.pca.util.`**`train_pca_dask`**`(dask_array, clean_params, use_fft, rank, cluster_type, client, workers, cache, mask=None, iters=10, recon_pcs=10, min_height=10, max_height=100)`

Train PCA using dask arrays.

Parameters:

- **dask_array (dask array)** (*chunked frames to train PCA*)
- **clean_params (dict)** (*dictionary containing filtering parameters*)
- **use_fft (bool)** (*indicates whether to use 2d-FFT on images.*)
- **rank (int)** (*Matrix rank to use*)
- **cluster_type (str)** (*indicates which cluster to use.*)
- **client (Dask.Client)** (*client object to execute dask operations*)
- **workers (int)** (*number of dask workers*)
- **cache (str)** (*path to cache directory*)
- **mask (dask array)** (*dask array of masked data if missing_data parameter==True*)
- **iters (int)** (*number of SVD iterations*)
- **recon_pcs (int)** (*number of PCs to reconstruct. (if missing_data = True)*)
- **min_height (int)** (*minimum mouse height from floor in (mm)*)
- **max_height (int)** (*maximum mouse height from floor in (mm)*)

Returns: **output_dict (dict)**

Return type: dictionary containing PCA training results.

CLI Module

cli

```
cli [OPTIONS] COMMAND [ARGS]...
```

apply-pca

```
cli apply-pca [OPTIONS]
```

Options

-i, --input-dir <input_dir>
Directory to find h5 files [default: /Users/aymanzeine/Desktop/moseq/moseq2-pca/docs]

--cluster-type <cluster_type>
Cluster type [default: local]

Options: local|slurm|nodask

-o, --output-dir <output_dir>
Directory to store results [default: /Users/aymanzeine/Desktop/moseq/moseq2-pca/docs/_pca]

--output-file <output_file>
Name of h5 file for storing pca results [default: pca_scores]

--h5-path <h5_path>
Path to data in h5 files [default: /frames]

--h5-mask-path <h5_mask_path>
Path to log-likelihood mask in h5 files [default: /frames_mask]

--pca-path <pca_path>
Path to pca components [default: /components]

--pca-file <pca_file>
Path to PCA results

--chunk-size <chunk_size>
Number of frames per chunk [default: 4000]

--fill-gaps <fill_gaps>
Fill dropped frames with nans [default: True]

--fps <fps>
Fps (only used if no timestamps found) [default: 30]

--detrend-window <detrend_window>
Length of detrend window (in seconds, 0 for no detrending) [default: 0]

--config-file <config_file>
Path to configuration file

-d, --dask-cache-path <dask_cache_path>
Path to spill data to disk for dask local scheduler [default: /Users/aymanzeine/moseq2_pca]

-q, --queue <queue>
Cluster queue/partition for submitting jobs [default: debug]

-n, --nworkers <nworkers>
Number of workers [default: 10]

-c, --cores <cores>
Number of cores per worker [default: 1]

-p, --processes <processes>
Number of processes to run on each worker [default: 1]

-m, --memory <memory>

RAM usage per workers [default: 15GB]

-w, --wall-time <wall_time>
Wall time for workers [default: 06:00:00]

--timeout <timeout>
Time to wait for workers to initialize before proceeding (minutes) [default: 5]

clip-scores

Clips PCA scores from the beginning or end

Args:

pca_file (string): Path to PCA scores clip_samples (int): number of samples to clip from beginning or end from_end (bool): if true clip from end rather than beginning

Note that scores are modified *in place*.

```
cli clip-scores [OPTIONS] PCA_FILE CLIP_SAMPLES
```

Options

--from-end
[default: False]

Arguments

PCA_FILE
Required argument

CLIP_SAMPLES
Required argument

compute-changepoints

```
cli compute-changepoints [OPTIONS]
```

Options

-i, --input-dir <input_dir>
Directory to find h5 files [default: /Users/aymanzeine/Desktop/moseq/moseq2-pca/docs]

-o, --output-dir <output_dir>
Directory to store results [default: /Users/aymanzeine/Desktop/moseq/moseq2-pca/docs/_pca/]

--output-file <output_file>
Name of h5 file for storing pca results [default: changepoints]

--cluster-type <cluster_type>
Cluster type [default: local]

Options: local|slurm

--pca-file-components <pca_file_components>
Path to PCA components

--pca-file-scores <pca_file_scores>
Path to PCA results

--pca-path <pca_path>
Path to pca components [default: /components]

--neighbors <neighbors>
Neighbors to use for peak identification [default: 1]

--threshold <threshold>
Peak threshold to use for changepoints [default: 0.5]

-k, --klags <klags>
Lag to use for derivative calculation [default: 6]

-s, --sigma <sigma>
Standard deviation of gaussian smoothing filter [default: 3.5]

-d, --dims <dims>
Number of random projections to use [default: 300]

--fps <fps>
Fps (only used if no timestamps found) [default: 30]

--h5-path <h5_path>
Path to data in h5 files [default: /frames]

--h5-mask-path <h5_mask_path>
Path to log-likelihood mask in h5 files [default: /frames_mask]

--chunk-size <chunk_size>
Number of frames per chunk [default: 4000]

--config-file <config_file>
Path to configuration file

--dask-cache-path <dask_cache_path>
Path to spill data to disk for dask local scheduler [default: /Users/aymanzeine/moseq2_pca]

--visualize-results <visualize_results>
Visualize results [default: True]

-q, --queue <queue>
Cluster queue/partition for submitting jobs [default: debug]

-n, --nworkers <nworkers>
Number of workers [default: 10]

-c, --cores <cores>
Number of cores per worker [default: 1]

-p, --processes <processes>
Number of processes to run on each worker [default: 1]

-m, --memory <memory>
RAM usage per workers [default: 15GB]

-w, --wall-time <wall_time>
Wall time for workers [default: 06:00:00]

--timeout <timeout>
Time to wait for workers to initialize before proceeding (minutes) [default: 5]

train-pca

```
cli train-pca [OPTIONS]
```

Options

-i, --input-dir <input_dir>
Directory to find h5 files [default: /Users/aymanzeine/Desktop/moseq/moseq2-pca/docs]

--cluster-type <cluster_type>
Cluster type [default: local]

Options: local|slurm

-o, --output-dir <output_dir>
Directory to store results [default: /Users/aymanzeine/Desktop/moseq/moseq2-pca/docs/_pca]

--gaussfilter-space <gaussfilter_space>
Spatial filter for data (Gaussian) [default: 1.5, 1]

--gaussfilter-time <gaussfilter_time>
Temporal filter for data (Gaussian) [default: 0]

--medfilter-space <medfilter_space>
Median spatial filter [default: 0]

--medfilter-time <medfilter_time>
Median temporal filter [default: 0]

--missing-data
Use missing data PCA [default: False]

--missing-data-iters <missing_data_iters>
Missing data PCA iterations [default: 10]

--mask-threshold <mask_threshold>
Threshold for mask (missing data only) [default: -16]

--mask-height-threshold <mask_height_threshold>
Threshold for mask based on floor height [default: 5]

--min-height <min_height>
Min mouse height from floor (mm) [default: 10]

--max-height <max_height>
Max mouse height from floor (mm) [default: 100]

--tailfilter-size <tailfilter_size>
Tail filter size [default: 9, 9]

--tailfilter-shape <tailfilter_shape>
Tail filter shape [default: ellipse]

--use-fft
Use 2D fft [default: False]

--recon-pcs <recon_pcs>
Number of PCs to use for missing data reconstruction [default: 10]

--rank <rank>
Rank for compressed SVD (generally>>nPCS) [default: 50]

--output-file <output_file>
Name of h5 file for storing pca results [default: pca]

--chunk-size <chunk_size>
Number of frames per chunk [default: 4000]

--visualize-results <visualize_results>
Visualize results [default: True]

--config-file <config_file>
Path to configuration file

-d, --dask-cache-path <dask_cache_path>
Path to spill data to disk for dask local scheduler [default: /Users/aymanzeine/moseq2_pca]

--local-processes <local_processes>
Use processes with local scheduler [default: True]

-q, --queue <queue>
Cluster queue/partition for submitting jobs [default: debug]

-n, --nworkers <nworkers>
Number of workers [default: 10]

-c, --cores <cores>
Number of cores per worker [default: 1]

-p, --processes <processes>
Number of processes to run on each worker [default: 1]

-m, --memory <memory>
Total RAM usage per worker [default: 15GB]

-w, --wall-time <wall_time>

Wall time for workers [default: 06:00:00]

--timeout `<timeout>`
Time to wait for workers to initialize before proceeding (minutes) [default: 5]

GUI Module

`moseq2_pca.gui.`**`apply_pca_command`** (`input_dir`, `index_file`, `config_file`, `output_dir`, `output_file`, `output_directory=None`)

Compute PCA Scores given trained PCA using Jupyter Notebook.

Parameters:

- **input_dir (str)** (*path to directory containing training data*)
- **index_file (str)** (*path to index file.*)
- **config_file (str)** (*path to config file*)
- **output_dir (str)** (*path to output pca directory*)
- **output_file (str)** (*name of output pca file.*)
- **output_directory (str)** (*alternative output directory path*)

Returns: **(str)**

Return type: success string.

`moseq2_pca.gui.`**`compute_changepoints_command`** (`input_dir`, `config_file`, `output_dir`, `output_file`, `output_directory=None`)

Compute Changepoint distribution using Jupyter Notebook.

Parameters:

- **input_dir (str)** (*path to directory containing training data*)
- **config_file (str)** (*path to config file*)
- **output_dir (str)** (*path to output pca directory*)
- **output_file (str)** (*name of output pca file.*)
- **output_directory (str)** (*alternative output directory path*)

Returns: **(str)**

Return type: success string.

`moseq2_pca.gui.`**`train_pca_command`** (`input_dir`, `config_file`, `output_dir`, `output_file`, `output_directory=None`)

Train PCA through Jupyter notebook, and updates config file.

Parameters:

- **input_dir (str)** (*path to directory containing training data*)
- **config_file (str)** (*path to config file*)
- **output_dir (str)** (*path to output pca directory*)
- **output_file (str)** (*name of output pca file.*)
- **output_directory (str)** (*alternative output directory path*)

Returns:

Return type: None

Utilities Module

`moseq2_pca.util.`**`clean_frames`** (`frames`, `medfilter_space=None`, `gaussfilter_space=None`, `medfilter_time=None`, `gaussfilter_time=None`, `detrend_time=None`, `tailfilter=None`, `tail_threshold=5`)

Filters spatial/temporal noise from frames using Median and Gaussian filters, given kernel sizes for each respective requested filter.

Parameters:

- **frames (3D numpy array)** (*frames to filter.*)
- **medfilter_space (list)** (*median spatial filter kernel.*)
- **gaussfilter_space (list)** (*gaussian spatial filter kernel.*)
- **medfilter_time (list)** (*median temporal filter.*)
- **gaussfilter_time (list)** (*gaussian temporal filter.*)
- **detrend_time (int)** (*number of frames to lag for.*)
- **tailfilter (int)** (*size of tail-filter kernel.*)
- **tail_threshold (int)** (*threshold value to use for tail filtering*)

Returns: **out (3D numpy array)**

Return type: filtered frames.

`moseq2_pca.util.`**`command_with_config`** `(config_file_param_name)`

`moseq2_pca.util.`**`gauss_smooth`** `(signal, win_length=None, sig=1.5, kernel=None)`

Perform Gaussian Smoothing on a 1D signal.

Parameters:

- **signal (1d numpy array)** (*signal to perform smoothing*)
- **win_length (int)** (*window_size for gaussian kernel filter*)
- **sig (float)** (*variance of 1d gaussian kernel.*)
- **kernel (tuple)** (*kernel size to use for smoothing*)

Returns: **result (1d numpy array)**

Return type: smoothed signal

`moseq2_pca.util.`**`gaussian_kernel1d`** `(n=None, sig=3)`

Get 1D gaussian kernel.

Parameters:

- **n (int)** (*number of points to use.*)
- **sig (int)** (*variance of kernel to use.*)

Returns: **kernel (1d array)**

Return type: 1D numpy kernel.

`moseq2_pca.util.`**`get_changepoints`** `(scores, k=5, sigma=3, peak_height=0.5, peak_neighbors=1, baseline=True, timestamps=None)`

Compute changepoints distribution and CP Curve.

Parameters:

- **scores (3D numpy array)** (*nframes * r * c*)
- **k (int)** (*klags - Lag to use for derivative calculation.*)
- **sigma (int)** (*Standard deviation of gaussian smoothing filter.*)
- **peak_height (float)** (*user-defined peak Changepoint length.*)
- **peak_neighbors (int)** (*number of peaks in the CP curve.*)
- **baseline (bool)** (*normalize data.*)
- **timestamps (array)** (*loaded timestamps.*)

Returns: **cps (2D numpy array)** (*array of values for CP curve*) **normed_df (1D numpy array)** (*array of values for bar plot*)

`moseq2_pca.util.`**`get_metadata_path`** `(h5file)`

Return path within h5 file that contains the kinect extraction metadata.

Parameters: **h5file (str)** (*path to h5 file.*)

Returns: **(str)**

Return type: path to acquistion metadata within h5 file.

`moseq2_pca.util.`**`get_rps`** (`frames`, `rps=600`, `normalize=True`)

Get random projections of frames.

Parameters:

- **frames (2D or 3D numpy array)** (*Frames to get dimensions from.*)
- **rps (int)** (*Number of random projections.*)
- **normalize (bool)** (*indicates whether to normalize frames.*)

Returns: **rproj (2D or 3D numpy array)**

Return type: Computed random projections with same shape as frames

`moseq2_pca.util.`**`get_timestamp_path`** (`h5file`)

Return path within h5 file that contains the kinect timestamps

Parameters: **h5file (str)** (*path to h5 file.*)

Returns: **(str)**

Return type: path to metadata timestamps within h5 file

`moseq2_pca.util.`**`initialize_dask`** (`nworkers=50`, `processes=1`, `memory='4GB'`, `cores=1`, `wall_time='01:00:00'`, `queue='debug'`, `local_processes=False`, `cluster_type='local'`, `scheduler='distributed'`, `timeout=10`, `cache_path='/Users/aymanzeine/moseq2_pca'`, `**kwargs`)

Initialize dask client, cluster, workers, etc.

Parameters:

- **nworkers (int)** (*number of dask workers to initialize*)
- **processes (int)** (*number of processes per worker*)
- **memory (str)** (*amount of memory to allocate to dask cluster*)
- **cores (int)** (*number of cores to use.*)
- **wall_time (str)** (*amount of time to allow program to run*)
- **queue (str)** (*logging mode*)
- **local_processes (bool)** (*indicate whether the processes are local*)
- **cluster_type (str)** (*indicate what cluster to use*)
- **scheduler (str)** (*indicate what scheduler to use*)
- **timeout (int)** (*number of worker timeouts to allow*)
- **cache_path (str or Pathlike)** (*path to store cached data*)
- **kwargs** (*extra keyward arguments*)

Returns: **client (dask Client)** (*initialized Client*) **cluster (dask Cluster)** (*initialized Cluster*) **workers (dask Workers)** (*intialized workers or None if cluster_type = 'local'*) **cache (dask Chest)** (*initialized Chest (cache) object pointing to given cache path*)

`moseq2_pca.util.`**`insert_nans`** (`timestamps`, `data`, `fps=30`)

Fills NaN values with 0 in timestamps.

Parameters:

- **timestamps (1D array)** (*timestamp time-strs*)
- **data (1D array)** (*timestamp values*)
- **fps (int)** (*frames per second*)

Returns: **filled_data (1D array)** (*filled missing timestamp values.*) **data_idx (1D array)** (*indices of inserted 0s*) **filled_timestamps (1D array)** (*filled timestamp-strs*)

`moseq2_pca.util.`**`read_yaml`** (`yaml_file`)

Reads yaml file and returns dictionary representation of file contents.

Parameters: **yaml_file (str)** (*path to yaml file*)

Returns: **return_dict (dict)**

Return type: dict of yaml file contents moseq2_pca.util.**recursive_find_h5s** (root_dir='/Users/aymanzeine/Desktop/moseq/moseq2-pca/docs', ext='.h5', yaml_string='{}.yaml')

Recursively find h5 files, along with yaml files with the same basename

Parameters:

- **root_dir (str or os.Pathlike)** (*path to directory to start recursive search*)
- **ext (str)** (*extension to search for, e.g. .h5*)
- **yaml_string (str)** (*a format to use to name yaml files*)

Returns: **h5s (list)** (*list of h5 file paths*) **dicts (list)** (*list of dicts containing metadata file contents*) **yamls (list)** (*list of yaml file paths*)

moseq2_pca.util.**recursively_load_dict_contents_from_group** (h5file, path)

Reads all contents from h5 and returns them in a nested dict object.

Parameters:

- **h5file (str)** (*path to h5 file*)
- **path (str)** (*path to group within h5 file*)

Returns: **ans (dict)**

Return type: dictionary of all h5 group contents

moseq2_pca.util.**select_strel** (string='e', size=(10, 10))

Selects Structuring Element Shape

Parameters:

- **string (str)** (*e for Ellipse, r for Rectangle*)
- **size (tuple)** (*size of StructuringElement*)

Returns: **strel (cv2.StructuringElement)**

Return type: returned StructuringElement with specified size.

moseq2_pca.util.**shutdown_dask** (scheduler)

Graceful shutdown dask scheduler. source: https://github.com/dask/distributed/issues/1703#issuecomment-361291492

Parameters: **scheduler (dask Scheduler)** (*scheduler to shutdown.*)

Returns:

Return type: None

Visualization Module

moseq2_pca.viz.**changepoint_dist** (cps, headless=False)

Creates bar plot describing computed Changepoint Distribution.

Parameters:

- **cps (np.ndarray)** (*changepoints to graph*)
- **headless (bool)** (*trim first element in PC list*)

Returns: **plt (plt.figure)** (*figure to save/graph*) **ax (plt.ax)** (*figure axis variable*)

moseq2_pca.viz.**display_components** (components, cmap='gray', headless=False)

Creates grid of computed Principal Components.

Parameters:

- **components (2D np.ndarray)** (*components to graph*)
- **cmap (str)** (*color map to use*)
- **headless (bool)** (*trim first element in PC list*)

Returns: **plt (plt.figure)** (*figure to save/graph*) **ax (plt.ax)** (*figure axis variable*)

moseq2_pca.viz.**scree_plot** (explained_variance_ratio, headless=False)

Creates Scree plot describing principal components.

Parameters:

- **explained_variance_ratio (1D np.array)** (*explained variance ratio of each principal component*)
- **headless (bool)** (*trim first element in PC list*)

Returns: **plt (plt.figure)**

Return type: figure to save/graph

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